# APPENDICES

## CASTLE GARDEN

Castle Garden in a lithograph dated 1850

Although what is of interest for the purpose of this book is essentially the function that this building had as a theater - for some ten years around 1850 (when it was known as *Castle Garden*) - one must nonetheless bear in mind that it was originally a fortress, known as *West Battery*, subsequently renamed *Castle Clinton* (currently its name).

Precisely, the fortress was one of the five built in the period between 1808 and 1811, when a system for the defense of the area of New York was set up to fend off the attacks of the English fleet which, ever since 1807, had begun to assault and capture American ships.

The fortress was inaugurated under the name of *West Battery* (subsequently *South-West Battery*) on 25 November 1811, the twenty-eighth anniversary of *Evacuation Day*, that is to say when the English troops definitively abandoned New York. It was built 7.7 meters above the surface of the water, sixty-one meters off the coast; it was connected to the latter by means of a multi-span bridge, which gave access to the fortress. The latter was never attacked during the war against the English. Said war ended in 1814 with the *Treaty of Ghent* (Belgium), which sanctioned the freedom of seas.

Immediately thereafter, *West Battery* became the seat of the Third Military District's headquarters, which was run by General Winfield Scott from 1816 until 1820. The fortress was thus renamed *Castle Clinton*, in honor of DeWitt Clinton, already Mayor of New York, and, subsequently, Governor of the State of New York. However, in 1821, the foregoing headquarters were transferred to Governors Island and, in March of the following year, the building was turned over to the City of New York with an act of Congress.

The building remained unused for a couple of years, until the municipality decided to lease it out for various events

and theatrical performances. Thus, *Castle Clinton* was renamed *Castle Garden*, and was opened on 3 July 1824, its interior decked with a variety of flowers and a large fountain at the center. It was the venue of concerts, fireworks displays, sometimes aerostatical ascents or demonstrations of scientific inventions. Furthermore, welcoming ceremonies in honor of important celebrities, such as the Marquis of Lafayette, President Andrew Jackson, and many others, were held there.

In 1844, Castle Garden was completely covered and used for the representation of major performances, opera in particular, and it thus became the city's largest and most important opera house. Such performances began in 1845 with the operas "Semiramide" and "Barbiere di Siviglia." The night of 11 September 1850 is remembered as the most memorable event, featuring the debut of Jenny Lind, known as the *Swedish nightingale*, which attracted an enthusiastic audience of six thousand, who paid a ticket of at least $3 (just to get in), filling up the cash boxes of Miss Lind's agent, the famous P. T. Barnum.

Castle Garden, immigration center, after 1855

On 3 August 1855, Castle Garden ceased operating as a theater and was leased out by the City to the State of New York, which turned it into an immigration center. A few years before, it had been joined to the dry land by means of extensive filling works, aimed to extend the area of the southern section of Manhattan, known as the *Battery*, towards the sea. Some immigrants had already landed at the Battery even before Castle Garden was turned into an immigration center. It is worth highlighting that prior to that time (1850s), there had been no significant restrictions on immigration to the United States.

The State of New York deemed it necessary to provide a public structure, also to protect the immigrants from all sorts of people who would take advantage of them, on the prowl for unwary immigrants traveling third class on the ships arriving from Europe. On the contrary, the wealthy first and second class travelers were generally welcomed at the piers, reserved for the various navigation companies, by friends or relatives, who saved them from the assaults of exploiters.

After the so-called *Emigrant Landing Depot & Offices "Castle Garden"* was opened, every day thousands of Europeans were diverted from New York's various piers to Castle Garden. Here they were registered, they could change currency, purchase rail tickets, get honest information on housing and job opportunities, and also receive medical assistance, if

necessary. But once out of Castle Garden, the immigrants were confronted by all sorts of people ready to take advantage of them.

It was estimated that, in the thirty-five years during which Castle Garden was in operation, two thirds of all immigrants who landed in the United States transited through said center, for a total of some eight million people. In 1882, on account of ever increasing immigration into the country, it was necessary to expand the center, hence other buildings were erected next to Castle Garden. A few years later, a more modern and functional center was set up at Ellis Island, which was no longer run by the State of New York but by the US Superintendent of Immigration. It was opened on 1 January 1892, and served its purpose until 1943.

As soon as Castle Garden was vacated, New York City decided to transform it into an aquarium. Initially, it showcased all the species of fish that teemed the waters surrounding the city. Later, it featured fish species from all parts of the world. Some thirty thousand visitors were present at its inauguration, on 10 December 1896. Later too, in the course of its forty-five years of life, it continued to attract a great deal of visitors. In 1941, the Aquarium was transferred to Coney Island and the former Castle Garden was closed once again, awaiting a new destination.

On 12 August 1946, The United States Congress proclaimed Castle Garden, renamed with its old name, *Castle Clinton*, a national monument. However, it was only thirty-four years later, in the summer of 1975, that Castle Clinton was opened to the public, following huge restoration work.

As one can behold still today, the outside walls have been preserved quite intact, with their characteristic red bricks. Instead, the interior was completely restored. In it there is also a box office where tickets are sold for the boat ride to the Statue of Liberty. Upon entering, to the right of the large door, visitors can access a room with three large showcases containing relief models of the building, corresponding to the three periods: 1812, 1886 and 1941. Above the showcases are fifteen pictures and drawings with interesting captions. Castle Clinton is perfectly looked after by the *Superintendent, Manhattan Sites* of the *National Park Service, US Department of the Interior*.

## Chronology

1807, 22 June - The English attack the American frigate *Chesapeake*. In New York the decision is made to build five fortresses for the defense of the area

1808 - Work begins for the construction of fort *West Battery* (later called *South-West Battery*), at the southern tip of Manhattan
1811, 25 November - The fortress is completed and inaugurated
1814 - The war against the English ends with the *Treaty of Ghent*, which sanctions the freedom of seas
1815 - Fort *West Battery* becomes the seat of the headquarters of the *Third Military District* and is renamed *Castle Clinton*
1821 - The headquarters of the Third Military District are transferred to *Governors Island* and Castle Clinton is closed
1822, March - Castle Clinton is turned over to New York City with an act of US Congress
1824, June - New York Municipality decides to lease out Castle Clinton for public events. On 3 July it opens under the name of *Castle Garden*
1844 - Castle Garden is completely covered and becomes the city's largest opera house. The 1845 season opens with "Semiramide" and "Il Barbiere di Siviglia." On 11 September 1850, the famous impresario P. T. Barnum introduces Jenny Lind, the *Swedish nightingale*, who makes her debut and achieves unprecedented success
1855, 3 August - New York Municipality turns Castle Garden over to the State of New York, which transforms it into an immigration center. A few years before, it had been joined to the dry land by means of extensive filling works, aimed to extend the area of the Battery southward
1882 - Other buildings are erected around Castle Garden, owing to growing immigration
1890, 18 April - The last immigrants transit through Castle Garden. Control on immigration passes over to the Federal Office, which provides for the construction of a new center at Ellis Island
1892, 1 January - The new immigration center is inaugurated at Ellis Island, which remains operational until 1943
1896, 10 December - Castle Garden is turned into an *Aquarium*
1941 - The *Aquarium* is transferred to Coney Island and Castle Garden is closed once again
1946, 12 August - The US Congress proclaims *Castle Clinton* a national monument
1975, Summer - Following major restoration work, Castle Clinton is opened to the public and remains so until the present day

## Bibliography

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## GIUSEPPE GARIBALDI

### Foreword

We have chosen to devote ample space in this book to the personality of Giuseppe Garibaldi and to his life story. Such special attention is motivated not only by the influence exerted on the life of Antonio Meucci by his proximity and friendship with Garibaldi (which latter endured for thirty years after the General's departure from the United States), but also by their many affinities which - as the reader may gather from this appendix - united the two great Italians. Another likewise important reason has to do with the great enthusiasm and participation of the Italian-Americans in the military and political events connected with the Risorgimento and with the struggles for the unification of Italy, which events permeated the entire life of Antonio Meucci and which, to a large extent, identified with the Garibaldian undertakings.

### His youth for Italy (1807-1835)

*Giuseppe Maria Garibaldi* was born in Nice on 4 July 1807, from *Domenico* and *Rosa Maria Nicoletta Raimondi*. He was the second of five children. His father, Domenico, was a small coastal trader. At the age of fifteen he began to work as a sailor, against the will of his father who wanted him to become a priest. Already in 1822 he was in Odessa, then in Rome, Istanbul and Tunis. On 27 February 1832, he became sea captain. He was second-in-command on the brig *Cortese* and then commander of the brig *Notre Dame de Grace*. In 1833, he met the Mazzinian G. B. Cuneo, in Taganrog, on the Black Sea, and was influenced by his ideals. Later, in Marseilles, he met Giuseppe Mazzini (who was three years older than him) and joined the *Giovine Italia* (Young Italy), under the pseudonym of *Borel*. On 27 January 1834, he joined the Sardinian navy as a simple third-class sailor, since, at the time, Nice was part of the Kingdom of Sardinia, to which Liguria was annexed following the 1815 Treaty of Vienna.

On 5 February 1834, he participated in the revolt of Genoa, taking possession of the frigate *Euridice* and attempting to occupy the arsenal, while Mazzini tried to invade Savoy. Although both campaigns failed, he managed to escape, but, on 3 June 1834, in his absence, he was sentenced to death by the courts of the House of Savoy. He sought refuge in Marseilles, France, where he lived in hiding for some time, and then joined the privateer fleet of Tunis's bey. Finally, around 1836 (oddly enough, just about when Antonio Meucci left for Cuba, ex-

iled from Italy), he went into exile in South America.

## First exile (1836-1848)

Here, in 1837, fighting as a privateer with the supporters of the independence of the Republic of Rio Grande[1] against Brazil, he was captured and subjected to tortures, as a consequence of which his upper limbs were sprained. He managed to free himself and went back to war, conquering Porto Alegre. In 1839, while fighting at Rio Grande, he met the eighteen-year-old Brazilian (Creole) Anna Maria Ribeiro da Silva (*Anita*), whom he married on board the *Rio Pardo* according to the civil rite. On 26 March 1842, they remarried in the church of San Francisco de Asís in Montevideo, according to the religious catholic rite. Garibaldi and Anita had moved to this city in 1841 with their son Menotti, who was born on 16 September 1840. Later (November 1845) they had a little girl, Teresita, shortly after the death of their second child, Rosita, born in 1843, still in Montevideo.

On 3 April 1841, his father, Domenico, died in Nice.

In the years between 1842 and 1847, Garibaldi fought for the República de la Plata[2] against Argentina; there, he set up the *Italian Legion*, made up of Italian immigrants, mostly political exiles, with the intention to prepare them for an expedition to Italy. As of 1843, the legionnaires wore the red shirts for which they were renowned worldwide. They saved the city of Montevideo twice, in 1843 and in 1846, thus earning the trust and love of the population. As an acknowledgment of his valor, Giuseppe Garibaldi was nominated commander of the naval forces and, subsequently, of the stronghold of Montevideo.

[1]It corresponds to the current *Rio Grande do Sul* - Brazil's southernmost State - the capital of which is Porto Alegre. Colonized by the Portuguese between the seventeenth and eighteenth centuries, it rebelled against the central government in 1835, but was defeated and re-annexed to Brazil in 1842.

[2]It was the name of what is known today as Uruguay, derived from the name given by the Spanish to their Vice kingdom of Rio de la Plata, to which today's territory of Uruguay was annexed in 1618. The Uruguayans fought for their independence from both the Spanish and the Argentines from 1811 to 1816, under the command of José Gervasio Artigas, and then against the Brazilians, who dominated the country from 1821 to 1828. The day of independence - which was achieved on 25 August 1828 - is celebrated still today. The country set up a republican government in 1830, but was torn by civil wars between conservatives (*blancos*) and liberals (*colorados*), while wars were waged with outside states. In particular, during the *Great War*, waged against the Argentine dictator Juan Manuel de Rosas, which lasted from 1839 to 1852, Garibaldi fought with the *colorados*.

In 1844, Garibaldi was introduced to the Masonry, in Montevideo's 'Asilo de la Virtud' lodge. In that same year, he attained the so-called 'regularization,' swearing obedience to the *Grand Orient of France*, with the 'Les Amis de la Patrie' lodge, always in Montevideo.

Upon Garibaldi's victory at San Antonio del Salto, on 8 February 1846, Mazzini, who was living in London at the time, pronounced words of praise for the *Italian Legion*. In 1847, Anita gave birth to their fourth child, Ricciotti, who like Menotti, was named after a worthy man who died for Italy. Some time later (December 1847), Garibaldi sent his family to Genoa, because of his imminent participation in the Italian independence fights of 1848.

### First war of independence and the defense of Rome (1848-1849)

On 5 April 1848, Garibaldi set sail for Italy on a brig, renamed *La Speranza* (*The Hope*) for the occasion, along with a maniple from the Italian Legion comprised of sixty-three men. He was thus preparing to fight against the Austrians, in Italy's first war of independence, which began with the uprisings in Milan, Venice and Modena and with Piedmont immediately declaring war on Austria. He landed in Nice on 23 June 1848, and, after spending a few days with his family, he headed for Genoa. Here, he attended a meeting of the 'Circolo Nazionale' and stated, openly in contrast with Mazzini: *"… I was a republican, but when I discovered that Charles Albert had become the defender of Italy I swore to obey him, and to faithfully follow his flag …"* However, a few days later, Charles Albert was advised by his own government to refuse Garibaldi's offer to fight with Piedmont against Austria, just because the commanding authorities did not appreciate the help of irregular troops. On the contrary, they gladly accepted the help of the regular troops of the King of Naples and those of Pope Pious IX (who later withdrew, not intending to wage war against a Catholic country, such as Austria).

Instead, Garibaldi was welcomed by Milan's *Temporary Government*, which invited him to organize its troops, after the heroic *Five Days* of the previous March. Unfortunately, events took a turn for the worse: Charles Albert was defeated in Custoza, near Verona, on 25 July and on 8 August the Austrians reached Milan. Garibaldi's legionnaires, who had remained isolated after the armistice of Salasco, signed on 9 August, continued their war against the

Austrians, fighting valiantly in Luino, Varese and Morazzone. In the end, however, Garibaldi and his decimated companions were forced to flee to friendly Switzerland. Upon leaving this country, in October 1848, Garibaldi tried to attack the Papal troops and those of the Kingdom of Naples. Then, at the beginning of the following year, he rushed to give support to Mazzini, who had set up the *Roman Republic* on 9 February 1849, while Pope Pious IX had sought refuge in Gaeta, under the protection of the King of Naples. The Roman Republic was ruled by a triumvirate comprised of *Giuseppe Mazzini*, *Carlo Armellini* and *Aurelio Saffi*.

On 25 April 1849, the French army, composed of eight thousand men and a great deal of artillery, landed in Civitavecchia to give assistance to the Pope, and, on 30 April it attacked the new republic. Garibaldi fought against the French, who were under the command of Gen. Nicolas Charles Victor Oudinot (to whom the sentence *"les italiens ne se battent pas,"* namely *"the Italians do not fight"* was attributed), and defeated them at Porta S. Pancrazio. He then faced the Bourbon troops, which had rushed from the South, also with the purpose to support the Pope, and beat them in Palestrina on 9 May and in Velletri on 19 May. A few days later, he returned to take part in the defense of Rome; the latter had been attacked on 3 June by General Oudinot, who broke the cease fire that was agreed to last until 4 June. After one month of the French troops' siege and shellings, the Constituent Assembly of the Roman Republic had to acknowledge that it could no longer hold out and surrendered. It did so without consulting Garibaldi who, in disagreement with Mazzini, had suggested to announce the state of emergency, appointing a dictator to replace the eternally wavering triumvirate. Upon entering Rome, on 4 July 1849, the French troops restored the Pope to power.

Garibaldi, with some four thousand followers, accompanied by his wife Anita, escaped the encirclement and fled northwards, dodging the French, Austrian, Spanish and Bourbon armies with a maneuver that has remained memorable in the history of military science. It is worth recalling the offer of asylum sent him by the US plenipotentiary Minister, Mr. Cass, a few days before the fall of Rome. Mr. Cass had suggested for him to hide on board an American corvette moored in the port of Civitavecchia. Garibaldi declined the offer with a letter in which he said, among other things: *"I have not lost all hope for my*

*country and I want to fight for it out in the field."*

In his retreat, Garibaldi passed through Tivoli, Terni and Todi, where he received a request for help from the republican Francesco Domenico Guerrazzi, a member of the triumvirate ruling the *Tuscan Republic*, which, like her *Roman* sister, had been set up in February 1849. Garibaldi maneuvered through Orvieto, Chiusi and Arezzo to reach Florence, but he had to realize that he could not count on support from the Tuscan population, of which, on the contrary, he could sense a hostile attitude. Therefore, he resumed his march northwards, eluding the Austrians in Citerna; he then forded the Tiber, crossed the Apennines and from there came down to S. Angelo in Vado. He then deviated for Macerata Feltria (north-west of Urbino) and was finally forced to cross the frontier of the Republic of San Marino, also in order to engage in battle the consistent Austrian army that was after him from a vantage point.

Mr. Belzoppi, the regent of the small republic, acted as intermediary with the Austrians, also with the aim to prevent an armed conflict on his territory. Since the Austrians offered to let go free anyone who would leave S. Marino unarmed (except for Garibaldi, who would have to be sent in exile to the United States), on 31 July Garibaldi left it up to his companions-in-arms to decide, freeing them from any obligation towards him. However, it was discovered later that the Austrians did not keep their promise, as expressed to Mr. Belzoppi, and captured most of Garibaldi's men as soon as they exited S. Marino unarmed; most of them were executed, including Garibaldi's chaplain Rev. Ugo Bassi. As for Gen. Garibaldi, he had already decided not to accept the conditions offered by the Austrians and to try, instead, to reach Venice with a few courageous men, to support the difficult defense of that city, besieged by the Austrians.

He, therefore, secretly left S. Marino in the night, together with a small group of valiant followers and his wife Anita; they reached Cesenatico, on the Adriatic Sea, where he got the best of a small Austrian garrison. He confiscated thirteen bragozzi[3] and some food and, setting out on the stormy sea, he tried to reach Venice. The following night (by the light of a full moon) the Austrians caught him by surprise at the Point of Goro. He lost nine bragozzi and was forced to land with one third of his men, under the fire of the enemy cannons. Many of Garibaldi's

[3]A *bragozzo* is a two-mast fishing boat, typically used in the Adriatic Sea.

followers fled in the attempt to save themselves, while Anita, who was pregnant and very much tried by the ordeals, almost lost her life. Anita and the faithful Captain Leggiero[4], who were hiding in a corn field, were rescued by an old companion-in-arms who lived nearby. At a locality called *Le Mandriole*, close to Ravenna's pine woods, on 4 August 1849, just when Garibaldi had found a trusted doctor to take care of his wife, the latter died in his arms, at the age of just 28.

Of the four children Anita had given him, Menotti and Ricciotti fought bravely for the unity of Italy by their father's side, while, in 1862, Teresita married a soldier and hero in Garibaldi's army, who later was promoted at the rank of General, Stefano Canzio. Anita herself had fought valiantly by her husband's side - often better than a man - ever since Garibaldi's exploits at Rio Grande and Montevideo.

Unfortunately, Venice, the last bulwark of the Italian resistance against the Austrians, also fell, on August 24, 1849, thus tragically marking the end of the *Republic of St. Mark*, which had been set up by *Daniele Manin* in August of the previous year, as well as of Italy's first war of independence.

After her death, Anita was buried by the friends who had rescued her. Garibaldi, hunted down by the Austrians and the Papal troops, in about one month managed to cross the Futa Pass in the Apennines and to reach the Tyrrhenian coast, in the vicinity of Massa Marittima, on 4 September 1849. He was accompanied by one follower alone, Giovanni Culiolo (better known by the previously-mentioned pseudonym of Captain Leggiero), who was still suffering from the wounds inflicted him during the defense of Rome, and another worthy soldier, Luigi Cucelli[5]. At night they climbed into a fishing boat and thus managed to reach the town of Lavagna, in the territory of the Kingdom of Sardinia[6], where they hoped to be safe at last. Unfortunately, however, Piedmont was in a delicate position, for it had been defeated by Austria again in March of that year and had signed with it the *Treaty of Milan* on 10 August. The treaty had not yet been ratified by the Parliament of Piedmont, which was troubled by the death of the unfortunate Charles Albert in Oporto, Portugal, on 28 July, and by another uprising in Genoa, clearly of Mazzinian

[4]Captain Leggiero was the pseudonym of Giovanni Battista Culiolo (sometimes referred to as Cogliolo).

[5]*Cucelli* was mentioned in Garibaldi's Autobiographical Memoirs as *Coccelli*.

[6]We recall that the so-called *Kingdom of Sardinia* comprised Piedmont, Liguria and Sardinia.

inspiration, which had been quelled a few months before.

Therefore, the presence of Gen. Garibaldi on Piedmontese territory was undesirable, both because new demonstrations against the government were feared and because the possible granting of political asylum would have jeopardized the ratification of peace with Austria. For these reasons, on 7 September, the Carabinieri escorted Garibaldi to Genoa, where he was shut in the dungeon of the Ducal Palace. Here, he was advised to choose a place for his exile, where he would go after a short visit to his three children in Nice. If he accepted, he would be given a monthly subsidy for his old mother. The Piedmont Minister, Gen. Alfonso La Marmora (brother of Gen. Alessandro La Marmora, the founder of the Bersaglieri corps), who conducted the negotiations with Garibaldi, also suggested that, a few months later, when the political situation had cooled off, he could return to Piedmont. Garibaldi chose Tunis as a place of exile.

Garibaldi and his two companions, Cucelli and Leggiero, were embarked on the war ship *Tripoli*, which left Genoa on 16 September 1849, and stopped in Cagliari, where a third Garibaldian, Raffaele Teggia, was taken on board. The ship arrived in Tunis on 19 September. Here, the bey informed the captain of the ship that, fearing inconvenient demonstrations in Tunis kindled by the presence of Garibaldi, the latter was not allowed to leave the ship. Very likely, the bey was pressured by the French, not to give hospitality to the defender of the Roman Republic. At first, the captain of the *Tripoli* thought to seek asylum for Garibaldi in Malta, but then he decided to return to Sardinia. The *Tripoli* berthed at Cagliari on 21 September, and there the captain received instructions from the government of Piedmont to take the General and his three companions to the Island of Maddalena, where the *Tripoli* landed them on 25 September. At Maddalena, though under strict surveillance, Garibaldi could enjoy a certain freedom: he could go hunting, fishing and play bocce with his local friends. Sometimes he was seen working with farmers in the fields.

It was on that occasion that he noticed the Island of Caprera for the first time; indeed, the island is separated from Maddalena by a narrow strait. After some twenty days, the government of Piedmont delivered instructions to send Garibaldi on exile to Gibraltar. Therefore, on 24 October, the four men embarked on the war brig *Colombo,* bound for Gibraltar, where it arrived on 9 November. Much to every-

one's surprise, the English governor said he would allow them to land only if the Sardinian consul in Gibraltar could guarantee that within fifteen days the General and his three followers would leave either for England or the United States. Also the consul of Spain, who was consulted on that occasion, refused to allow the exiles into the country. Indignant with such attitudes, the United States consul in Gibraltar and a group of officers of the US Navy offered to take Garibaldi and his three companions to the United States on an American war ship which was about to set sail. However, Garibaldi preferred to stay closer to Italy, waiting for things to simmer, in order that he could return, as Gen. La Marmora had suggested.

On 14 November, Garibaldi decided to set out for Tangier on board a Spanish steamer, leaving Gibraltar within the deadline set by the English Governor. Fortunately, in Tangier he and his three companions, Teggia, Leggiero and Cucelli, were put up for six months by the Sardinian Consul Giovanni Battista (nicknamed *Giobatta*) Carpenetti. They were later joined by Major Paolo Bovi Campeggi, another brave Garibaldi's companion-in-arms. Garibaldi, in particular, greatly appreciated such kind and generous hospitality offered by a *Royal* Consul. A few months later, three of his companions left, so as not to abuse the Consul's generosity, and tried to find a job in Tangier to earn their living. Therefore, only Major Bovi stayed with Garibaldi.

Garibaldi too was thinking about how to earn his living; he would have been more than happy to go back to his original occupation as merchant captain, possibly if permitted to sail under the Sardinian flag. A friend of his from Genoa, Francesco Carpaneto, set out to look for subscribers in order to build a ship to entrust him with. However, some time later, he informed Garibaldi that it would have been more convenient to purchase the ship in the United States, so he advised Garibaldi to go there, while waiting for their project to take off. According to Roy Bredholt (see bibl.), Garibaldi sent a letter dated 22 February 1850, to the US Consul in Tangier, Mr. T. H. Hyatt, asking him to kindly get authorization from his country for him to sail under the American flag, in command of the ship that was to be purchased by Carpaneto. Since he did not receive positive assurance in that regard, Garibaldi decided leave anyway, with Major Bovi, at the beginning of June 1850; they headed for Liverpool, making a stop in

Gibraltar, where they arrived on 13 June. On 27 June 1850, they left Liverpool on board the American sailing vessel *Waterloo*, bound for the United States. At 10 o'clock in the morning, on 30 July 1850, the *Waterloo* reached the bay of New York.

The ship was to berth at the Battery piers, at the southern tip of Manhattan; on that occasion, a special celebration had been prepared to welcome Garibaldi on behalf of the various New York committees and important Italian exiles, like Quirico Filopanti, Prof. Felice Foresti, Gen. Giuseppe Avezzana and Antonio Meucci, as well as of the Mayor of New York himself, Mr. Woodhull, and Messrs. Coleman and Stetson, the owners of *Astor House* Hotel, who had arranged a suite for him at the hotel. However, none of all of this could ever took place.

### Second exile (1850-1854)

Indeed, as soon as the *Waterloo* reached the bay of New York, the health officer of the New York port, Dr. A. Sidney Doane, who had climbed on board the ship to visit the passengers as usual and to be the first to welcome Garibaldi, announced that, on account of his poor health conditions, the General could not attend any public event. For this reason, the General was taken to Staten Island. Precisely, Garibaldi - owing to strong rheumatic pains that he had suffered throughout the journey, and that paralyzed his right arm - was landed *like a trunk* (these are the words he used in his Memoirs) at the Quarantine Ground, in the vicinity of Clifton, on Staten Island.

Major Bovi and Garibaldi lodged in St. George, at the Pavilion Hotel, which was run by the Frenchman Blanchard. Henry Tyrrell (see bibl.), who visited Antonio Meucci in 1884, stated that Meucci went to visit the General at the Pavilion Hotel, to pay him his respects and offer him his help. Others (among them, Roy Bredholt, see bibl.) stated that Antonio Meucci met Garibaldi for the first time in New York, in Pastacaldi's home, towards the end of August. However, it seems very likely that Antonio Meucci, as did many important Italian exiles, went to see him at the Pavilion Hotel, which was not far from his home, in Clifton. On 4 August 1850, the anniversary of Anita's death, Garibaldi, feeling better, left the Pavilion and, at 2:00 PM, landed at the South Ferry pier in Manhattan. Here, he was welcomed by an improvised display of sympathy on behalf of Italians and Germans, who were setting out to visit him at the Pavilion. The latter introduced themselves as republi-

cans and Garibaldi called them *brothers, as all republicans worldwide should be*. After this, a coach took him to the house of his friend, Maestro Bagioli, in Hastings-on-Hudson.

In Hastings, he was looked after by a trusted physician, Dr. Valentine Mott Jr. (some erroneously indicate him as 'Dr. Motta,' others as 'Dr. Motto') - an American who had fought in Palermo during the 1848 revolutions - and received many visits from Italian exiles, including the martyr of the Spielberg, Prof. E. Felice Foresti, the spiritual leader of the Italian community in New York. According to a letter written by Foresti to the *New York Daily Tribune*, sent from Hastings on 6 August, the General could barely walk and his arm was still immobilized. In another letter sent from Hastings on 7 August, Garibaldi politely declined an invitation to another event organized in his honor, that was to take place at the Astor House on 10 August. In his letter, Garibaldi expressed the wish to *"be permitted, quietly and humbly, to become a citizen of this great Republic of Freemen, to sail under its flag, to engage in business to earn my livelihood, and await a more favorable opportunity for the redemption of my country from foreign and domestic oppressors …"*

It is to be remarked that Garibaldi never became a citizen of the United States, although he openly stated his intention[7]. Garibaldi's letter, published by the *New York Tribune* on 8 August 1850, deeply impressed the American readers, who vividly remembered the magnificent welcoming ceremonies dedicated, about a year before (September 1849), to Gen. Avezzana and, in those very days, to Gen. Paez. Furthermore, towards the end of the following year, the celebrations devoted to the Hungarian hero Lajos Kossuth - who was

[7]An authoritative scholar, Roy Bredholt, stated that the reason for this was that Garibaldi never complied with the requirement according to which, in order to obtain citizenship, one must be resident of the United States for a minimum of five consecutive years. Some authors maintained that Garibaldi never formally renounced allegiance to his country by signing the related papers, as required by the procedure, but only signed a statement of intent. For this reason, on 2 April 1851, shortly before Garibaldi left New York for Central America, the Mayor of New York, A. C. Kingsland, presented him with an American passport stating that he "*has declared his intention to become a citizen* (of the USA)," which gave him the same rights as an American citizen. In a letter to a friend, dated 9 March 1855 (quoted by Bredholt), Garibaldi complained that he had tried in vain to get American citizenship notwithstanding the fact that during his two visits he had accumulated almost one year of residence in the United States and had sailed under their flag.

luxuriously lodged with many followers of his at *Howard House*, on Broadway, opposite City Hall - cost the United States government a staggering sum.

After fifteen days of convalescence in Hastings on Hudson, Garibaldi paid a short visit to General Ferrero's father in Yonkers, NY, after which he stayed for six weeks at the house of Michele Pastacaldi, where Foresti was also living, at Irving Place, Manhattan.

Here, he came into contact with many Italian exiles, as well as with writers Theodore Dwight (who would publish his Memoirs in English) and Henry Theodore Tuckerman (who was to publish a long article, which aroused the interest of President Abraham Lincoln, as we shall see later). Garibaldi spoke French and Spanish fluently, but knew very little English. According to Bredholt (op. cit.), in Pastacaldi's home people came and went all the time, and there was an uninterrupted succession of disquisitions, often of an academic nature or, even worse, totally groundless, which Garibaldi hardly appreciated.

Toward the end of the summer of 1850, his friend Carpaneto informed him that he had only been able to come up with shares for thirty thousand lire, not enough to buy even a small merchant ship. Thus, Garibaldi decided to settle down somewhere out in the country, not far from New York. Together with Antonio Meucci - with whom he discovered to have much in common - he visited Harlem, Hoboken, Long Island and Staten Island, looking for a house. Finally, Max Maretzek, a theater impresario residing in New York, gave them his vacation cottage situated in Clifton, Staten Island, which he did not plan to use for the entire winter, since he had business engagements abroad. Garibaldi, the Meuccis and Major Bovi Campeggi moved there in early October[8]. The latter - who had fought with Garibaldi in various campaigns and lost his right hand in the defense of Rome - had been chosen by Garibaldi, among the companions that had caught up with him in Tangier, to accompany him to America, since he was not fit to work.

At the cottage in Clifton, Garibaldi worked in a candle factory that was jointly financed by tenor Lorenzo Salvi and Antonio Meucci. Prior to that, they had worked in the production of salami, as sug-

[8]See Prof. Foresti's letter to Mazzini dated 21 October 1850, quoted in the main text (p. 47). We may note here that Roy Bredholt (see bibl.) dated said relocation to 'the end of August,' though this is in contrast with the dates of preceding stays, that he himself admitted.

gested by Major Bovi Campeggi, a Bolognese, while waiting for business at the candle factory to take off. It is worth noting that in New York at the time Antonio Meucci was known as a wealthy man; indeed, he offered lodging and support to both Garibaldi and Bovi, without expecting them to work for him in return. As a matter of fact, in his Memoirs, Garibaldi wrote as follows: *"… in Meucci's house… I was always very free: I could work if I wanted to - and, naturally, I preferred useful work to any other occupation - but I could also go hunting every now and then - and we often also went fishing, with the boss himself, and various other friends from Staten Island and New York, who often came to visit. At home there was no luxury - although nothing lacked of life's basic needs - in terms of food as well as lodging …"*

During his temporary residence in Clifton, Garibaldi often went to New York, especially to meet with his friends Foresti and Pastacaldi, in whose home he had had the opportunity to meet many eminent Americans and, especially, many Italian exiles, to whom he recommended not to accept financial aid from others, but to earn a living on their own, even with a humble job. He was seen dining in the company of Avezzana, Foresti and Filopanti on some Sardinian merchant ship that stopped at the port of New York [see Nelson Gay in bibl.]. Garibaldi also attempted to settle the differences of opinion within the different fringes of New York's Italian community, as to how to achieve the unity of Italy. He also took part in a charity concert for Italian exiles which featured the singers Adelina Patti and Teresa Parodi.

After working with Meucci for a few months, Garibaldi tried unsuccessfully (he himself relates that it was winter and that it snowed) to find a job that suited him better, offering to work at the Staten Island piers even as a simple sailor or docker, and even without salary. Disappointed by the negative responses, he went back to *working with tallow*. When he had a chance, he went hunting in the hilly woods of Dongan Hills or in the salty fields of Great Kills and, much more often, he went fishing. To this purpose, Antonio Meucci had purchased a small catboat that, with the competent help of Garibaldi, was restored to perfect conditions. They made a sail bearing the three colors of the Italian flag, and baptized the boat *Ugo Bassi*, after the chaplain who was executed by the Austrians during the 1849 campaign. With that small boat, now as good as new, they sailed the New York bay far and wide,

and even went all the way out to Long Island.

Another one of the General's hobbies was to write the short biographies of his companions who had died in battle, and of his wife Anita. Theodore Dwight, whom Garibaldi had entrusted them to, published a faithful English translation of them in 1859 ("The life of General Garibaldi, translated from his private papers," see bibl.). He could often be found at the market in Stapleton, or at Bergamo's Italian restaurant by the sea, where there was a bocce court. Furthermore, when he went to visit Pastacaldi and Foresti at Irving Place, in New York City, he often spent time at the Lorenzo Ventura's restaurant on Fulton Street, where he played dominos and, naturally, had the opportunity to meet old as well as new friends.

Eventually, in spring of 1851, his friend Francesco Carpaneto came to New York. He had bought a cargo ship, the *San Giorgio* (which was sailing from Genoa to Lima at the time) and asked Garibaldi to accompany him on various business trips to Central America. Garibaldi accepted and, shortly after, he left Meucci's house, when the candle factory was doing well. He prudently traveled under the pseudonym of *Giuseppe Pane* (already adopted in 1834, during his first exile). They set out on the steamer *Prometheus*, on 28 April 1851. They first landed in Chagres, a port on the Atlantic coast, near one end of the Isthmus of Panama, and crossed the isthmus several times, to attend to Carpaneto's business. During their last crossing (ostensibly on 15 August 1851, after they sailed from the port of San Juan de Nicaragua, heading to Lima), Garibaldi had to stop for he contracted a very severe form of a deadly tropical fever (probably, malaria), from which he was miraculously saved by the loving care of his Italian friends in Panama, and which caused him to suffer painful after-effects for many years afterwards.

Still convalescent, Garibaldi embarked on an English steamer bound for Lima, which stopped one day in Paita, a port on the northernmost coast of Peru. He took this opportunity to visit there doña Manuelita de Saenz, Simón Bolívar's life-companion, who had been paralyzed in bed for years. He then took off again and eventually arrived in Lima (at the Callao port), where he found his friend Carpaneto, just in time to see him before the latter took off for Central America on the *San Giorgio*. Garibaldi would never see him again, for Carpaneto died of cholera a few years later, with-

out seeing again his native country.

In Lima, Garibaldi was given hospitality by a family of Italian immigrants who cured him of the after-effects of the fever contracted in Panama. However, he risked his life in a fight with three Frenchmen who had insulted him, mocking him about the unfortunate defense of Rome. He was able to chase the three attackers away, but was severely wounded in the process; although the local French Consul demanded that he be sent to jail, he managed to avoid it, thanks to the intervention a multitude of Italian immigrants and of the Sardinian Consul in Lima, who dissuaded the local police.

His wish to command a ship finally came true thanks to a certain Pietro de Negri, born in Chiavari (known as Don Pedro to the local people), who, having made a fortune with the silver mines of Peru, made him captain of a four-hundred-ton cargo ship, the *Carmen*. With this ship, on 10 January 1852, Garibaldi set sail from Lima with a cargo of guano, bound for Canton, in China, where he arrived after ninety-three days of navigation, according to his memoirs[9].

A tablet, which hangs outside the *Teatro García Lorca* in Havana and was donated by the city of Rome, is there[10] to remind that Garibaldi passed through Havana on 2 June 1852. We refer the reader to the next chapter "Garibaldi in Havana," where we give a detailed reconstruction of events as they occurred during that period, from which reconstruction it appears that the above date should be corrected.

Garibaldi loaded various goods in Canton, and then sailed towards Australia. After stopping at one of the Hunter Islands[11] to stock up on water and vegetables, he crossed the Pacific Ocean once again and returned to Lima, where he landed on 24 January 1853, after hundred days of navigation. Upon his arrival, he was given the sad news of his mother's death, which had occurred in March of the previous year, during his journey to Canton.

A few weeks later, with the Carmen in ballast, he went to Valparaiso, in Chile, to load

[9]Daniel Santoro (see bibl.) gave a different version, stating that he sailed with a cargo of silver and wheat, bound for Hong Kong (which is quite close to Canton).

[10]The author has been informed that, after his visit to Havana in 1990, the tablet was moved to the side wall of the "Museo de la Ciudad de La Habana," on the Calle Obispo.

[11]Hunter Islands are located in south-east Australia, near Tasmania, separated from the mainland by the Bass Strait.

copper, and to various other ports in Chile and Peru to load wool, which he was to take to Boston, MA. Garibaldi landed in Boston on Tuesday, 6 September 1853. There, he received instructions from Don Pedro to go to New York, where he would be given further orders. Therefore, on Friday, 9 September, Garibaldi took the train to New York and, as soon as he arrived, he was appalled to find out that someone had been telling lies about him to Don Pedro, who, as a result, no longer trusted him. Offended and disappointed, he decided to leave the command of the *Carmen*.

In his autobiographical Memoirs Garibaldi relates that he then stayed "*… a few more days in New York, enjoying the dear company of my precious friends Foresti, Avezzana and Pastacaldi …"* Although Antonio Meucci is not mentioned, it is certain that Garibaldi spent part of the four months between his arrival in New York (9 September 1853) and his final departure for Italy (10 January 1854) at the cottage in Clifton, which he now considered his home in the United States. The commemorative plaque at the cottage (now the "Garibaldi-Meucci Museum" of Staten Island) says that Garibaldi lived there from 1851 to 1853, rounding off the dates to a certain extent, the actual dates being October 1850 - January 1854, including his long absences of the previously-mentioned sea voyages.

Garibaldi traveled back and forth between Boston and New York several times, judging from his letter written from Boston to Prof. Foresti, dated 19 September 1853, where, among other things, he wrote: *"… I have decided to work actively, as much as I can, to foster the reconciliation of Italians of whatever color … if it is possible, I shall return to New York …"* The opportunity then came up for Garibaldi to embark (ostensibly as second-in-command, since he was not an American citizen) on a merchant ship, that a captain from Genoa, Antonio Figari, intended to buy in America. Garibaldi accepted and went to Baltimore, where he purchased the *Commonwealth* on behalf of Capt. Figari, after which he loaded his cargo of flour and wheat to be shipped to London.

Before parting with Meucci, Garibaldi gave him his famous red shirt, which he had worn during the defense of Rome (currently on display at the *Museo del Risorgimento* in Rome); he also left him some walking canes, a dagger with a silver handle, a brooch with a cameo, a bronze medallion, a brass box that he had taken along from Montevideo where he kept the cigars he rolled himself, three big altar candles - one red, one white and one

green - that he had made with his own hands when he worked at the candle factory, which Meucci later put in a glass case and, finally, the famous parrot that screamed 'Viva Italy, away with the foreigner!'

Garibaldi definitively left the United States on 10 January 1854, and never returned afterwards. From London, where he landed on February 1854, he went to Newcastle to pick up a load of pit-coal to be shipped to Genoa, where he arrived on 10 May. He then had to stop in Genoa some fifteen days on account of another rheumatic attack, after which he went to Nice, where he could finally embrace his children after an exile that had lasted some five years.

## Second war of Independence - The Thousand (1854-1860)

Garibaldi stayed in Nice for the rest of 1854, providing services in the coasting trade along the coasts of Liguria with a small hull, *L'Esploratore*. He also often sailed to Sardinia. With the money he earned in 1854, and with a small bequest left by his deceased brother Felice, Garibaldi purchased a piece of land in Caprera. In this semi-deserted island which, however, satisfied his need for serenity, between the adventures of his stormy life, he built a small square house, in the style of the ones in Montevideo, with a terrace roof, to collect rain water and channel it into an underground tank. In 1855, he joined the Sardinian navy, which granted him the rank of captain. In 1857, he joined the *Società Nazionale*, the President of which was Giuseppe La Farina, who, in 1860, was to watch the expedition of the Thousand (a task entrusted to him by Count Camillo Benso di Cavour), and whom he himself was to oust.

The reconciliation of Garibaldi with Piedmont was not free from difficulties. Although his first meeting with the Prime Minister, the Count of Cavour, on 13 August 1858, had been promising, the following one, in February 1859 (on the eve of the second war of independence), was quite disappointing. Indeed, Cavour intended to use Garibaldi's prestige essentially as a pole of attraction for recruiting young volunteers, who would fight with the regular army. On his part, Garibaldi did not approve of the alliance between Piedmont and France, which Cavour had considered indispensable in order to defeat Austria. In his Memoirs, Garibaldi accuses the politicians of the time to be *"accustomed to doing plenty of talking, and not taking forceful action."* Notwithstanding, he accepted everything for the love of Italy and was able to

set up, with trusted commanders (whose ranks in the regular army were not recognized by Piedmont's War Minister), the *Cacciatori delle Alpi* corps (the *Alpine Huntsmen*), comprised of some three thousand men.

The King, Victor Emmanuel II, whom Garibaldi defined *"certainly a better man than those who surrounded him in '59,"* granted him absolute freedom of action, when, in April 1859, war against Austria began. The first victorious engagement of Garibaldi's army with the Austrians occurred in Casale (Piedmont) on 8 May. On 23 May, with his three thousand *'Cacciatori'* Garibaldi crossed the Ticino River, entering Lombardy. In the days that followed, he once again defeated the Austrians in Varese and in San Fermo, and on the night of 27 May, he entered Como, victorious. After a short stay, he advanced towards Lecco and from here he went to Bergamo. On 14 June he entered Brescia, which, in the meantime, had revolted against the Austrians. He then occupied Salò, on the Garda Lake, where he received instructions to go North to the Valtellina Valley. At the time when the armistice of Villafranca was stipulated (11 July 1859), the *Cacciatori delle Alpi*, who were joined by the *Cacciatori degli Appennini* (the *Apennine Huntsmen*, volunteers from Central Italy) counted some twelve thousand men.

On 11 August, while peace talks between Piedmont and Austria were under way in Zurich (the peace was officially signed on 10 November), Garibaldi withdrew from the Piedmontese army and the command of the *Cacciatori* was passed over to General Pomaretto. The main reason why he resigned was that the volunteer corps was gradually being dismantled by the government (which, immediately after the armistice of Villafranca, passed from Cavour to Gen. Alfonso La Marmora) with the pretext that it was difficult to incorporate it - in time of peace - into the regular ranks of the army. Shortly before his resignation, Garibaldi was elected deputy of the town of Stradella (Lombardy) with the vast majority of votes. On his return to Como, he married the daughter of the Marquis Raimondi, Giuseppina, who had helped him greatly in his recent campaigns.

Victor Emmanuel, fearing that, in such a delicate moment, Garibaldi would undertake heedless enterprises, such as the invasion of the Papal States through Romagna (which had welcomed with enthusiasm Garibaldi's visit to Anita's burial), summoned him to Turin. After their talk,

which remained secret, Garibaldi also renounced the command of the Second Division and accepted the Presidency of the *Società Nazionale Italiana*. After some visits to various cities, particularly Nice, he then retired to Caprera, where he arrived on 6 January 1860. On 24 March, much to Garibaldi's dismay, Nice and Savoy were given over to France, in compliance with the *Plombières Agreements*, stipulated between Cavour and Napoleon III, as a reward for France's help in the war against Austria.

On 7 April 1860, when in Genoa, Garibaldi learned the news that Sicily, led by the city of Palermo, had risen against the Bourbons. Immediately, with the help of Agostino Bertani, Nino Bixio, Francesco Crispi and others, Garibaldi collected weapons and money and confiscated two ships, the *Lombardo* and the *Piedmont*, though with the consent of their owner, the Genoese shipbuilder and patriot, Raffaello Rubattino. It is worth mentioning that he also received help from the American owner of a vessel, the *Washington*, moored at Quarto. On 5 May, he set sail from the small port of Quarto, in Liguria, bound for Marsala (Sicily), with 1089 men, who later dropped to 1072, the famous *Thousand*. Before leaving, Garibaldi sent a letter to the King of Piedmont, in which he wrote, among other things: *"… I did not communicate my plan to Your Majesty for I feared that my great devotion to you would have persuaded me to abandon it … Our war cry will always be: 'Long live the unity of Italy: long live Victor Emmanuel, its first and most valiant warrior' …"* It must be remarked that Garibaldi also received counsel and moral support from the English Minister, Sir James Hudson, as well as financial aid from Great Britain. Also the presence of English ships in Marsala and Palermo, under command of Admiral Mundy, though formally maintaining neutrality, was of great help to Garibaldians.

On his way to Sicily, Garibaldi stopped in Talamone and in Orbetello (Tuscany), where he stocked up on arms and munitions. On 11 May, he landed in Marsala (Sicily), preceding, with a skilled maneuver, three enemy cruisers, which he then forced to stand offshore. On 14 May, he occupies Salemi, where he proclaimed himself dictator, stating that *"… considering that during war time it is necessary for the civil and military powers to concentrate on the same objectives; decrees that, in the name of Victor Emmanuel, the King of Italy, he takes over the dictatorship of Sicily."* Notice, however, that

Victor Emmanuel had not in any way endorsed either the expedition of the Thousand or the use of his name. On the next day, 15 May, there was a difficult engagement with a large Bourbon contingent positioned in Calatafimi where, with great valor and many casualties, the Garibaldians were able to climb and conquer the heavily fortified hill. It is here that Garibaldi, in the crucial moment in which many had lost all hope in the battle, said to Bixio: *"Here we either make Italy or die!"*

Another venture was the conquest of Palermo. The Garibaldians were able to enter into the city at six o'clock in the morning on 27 May, while two powerful Bourbon columns were outwitted and misled from the city by a sparse band of daring men. However, two Bourbon bulwarks remained in Palermo, as well as their navy, which was anchored there, still intact. For three days, its cannons fired more than five hundred bombs over the city, garrisoned by the Garibaldians and the rebel population. The battle lasted until 2 June, when the commander of the Bourbon troops, having lost all hope, asked and obtained from Garibaldi permission to embark the entire Bourbon contingent, amounting to some twenty thousand men, for Naples, releasing, on his part, the political prisoners that were being held. In the exultation of the city's population and of the Thousand, there was also bitterness on account of the behavior of the commanders of the Piedmontese ships anchored in the port of Palermo, which refused to give the Thousand, exhausted by then, even a handful of bullets, while the officers and sailors of the English and American ships went so far as to give the Garibaldians their own revolvers, rifles and munitions. As regards the Piedmontese, Garibaldi wrote: *"They had been instructed to kick us down if we were defeated, and to act like great friends if we won!"*

In less than twenty days, almost all of Sicily was freed, with the help of the population, while in Palermo recruiting began and arms and munitions were built for the following battle against the Bourbon army, which had positioned itself in the vicinity of Milazzo, towards the northeast corner of the island. Here, the Garibaldians were joined by reinforcements that came by sea from all over Italy, some on board English ships. After having adequately organized the administration of the liberated territories and restored his troops, Garibaldi set out to Milazzo, which he conquered on 20 July after 5 days of strenuous fighting, during which the Bourbons defended

themselves with valor, *worthy of the best of causes*, as Garibaldi commented. After the surrender of Milazzo, Messina surrendered on 28 July, practically without fighting. Bourbon General Clary was forced to lease French ships to take most of his twenty thousand men from Messina to Reggio Calabria, on account of the evident sympathy displayed by the Bourbon navy for the Garibaldians, proven by the fact that it had done nothing to stop the latter from stocking up on supplies.

In Messina, the Garibaldians received other reinforcements and munitions from every which way, and even Piedmontese deserters and the English with their ships. Thanks to such aid, the force that Garibaldi was able to concentrate on 8 August 1860, at Punta del Faro, on the far tip of Sicily towards Calabria, consisted of twenty thousand men, backed by dozens of steamers and cargo ships, and by a considerable number of cannons, recently forged in Palermo.

The Garibaldians landed in Calabria on the night of 9 August 1860. After landing, Garibaldi implemented his tactic of marches and countermarches to deceive the enemy, then he advanced straight toward Reggio Calabria, which was attacked from three different directions and fell on 21 August. Other Garibaldians landed more to the north, in Bagnara and in Villa S. Giovanni. The fifteen thousand Bourbons of the latter garrison surrendered on 23 August, after a few hours of fighting, and most of them sided with the Garibaldians. While the Garibaldians landed on the continent, riots broke out in almost all cities of the Kingdom of the Two Sicilies. Around twenty thousand volunteers were recruited in Potenza and three thousand in Benevento, all ready to join the Garibaldians. In Calabria, the Piedmontese Statute was proclaimed. Also Altamura, Bari and Catanzaro revolted. By now, without counting the volunteers, the Garibaldian army counted as many as thirty thousand men, perfectly equipped and organized. On 29 August, the Garibaldians reached Nicastro, some thirty kilometers from Cosenza, wherefrom the rebel citizens were able to oust the royal army, before the Garibaldians entered the city. Then, while a detachment of Garibaldians was advancing toward Potenza, to give support to the rebels in that city, Garibaldi entered Salerno on 7 September and from there he was immediately invited to go to Naples by the Bourbon Minister of the Interior Liborio Romano, later reconfirmed in his post by Garibaldi. Thus, on that same day, 7 September 1860, Garibaldi

entered Naples, welcomed by a cheering crowd and accompanied by only eighteen men, while the main body of his army advanced from Calabria. On the previous day, the King of Naples, Francis II, had fled northward to Capua and from here to the fortress in Gaeta, near the border with the Papal States, protected by most of his army.

The engagement with this army occurred at dawn of 1 October, on initiative of the Bourbons, who attacked the Garibaldian lines near Capua from six different positions. Exacting fighting was concentrated on the Volturno River and on Maddaloni, often with alternating events, in the course of which Garibaldi himself almost lost his life; at five in the afternoon, the Bourbons fled. That same night of his victory in Capua, Garibaldi had to rush to Caserta Vecchia, where a column of almost five thousand Bourbons threatened the old city. Once again, fighting broke out and the Garibaldians won, thanks to their great courage and the skills of their General.

The battle of Caserta Vecchia, of 2 October 1860, was the last one fought by the Thousand. In only one hundred and fifty days, Giuseppe Garibaldi and his Thousand had overthrown an army that was one hundred times superior to them, and achieved a great and decisive step towards the unity of Italy, although Garibaldi's modesty led him to concede that he had only helped the population of Southern Italy to free itself from tyranny.

On 9 October 1860, Garibaldi prepared a plebiscite in favor or against the following decree: *"The people want Italy to be one and indivisible under Victor Emmanuel, the constitutional King, and his legal descendants."* On 21 October, all of Southern Italy voted; as expected, the outcome was positive. On 29 October, Garibaldi sent a letter to Victor Emmanuel from Caserta in which he said, among other things: *"now that the people of the southern provinces have solemnly voted in favor of the unity of Italy … I acknowledge your supreme authority over ten million Italians … I implore that your high protection be granted to those who collaborated with me … and that you take into your army my companions-in-arms …"*

Meanwhile, Count Cavour, who had recently returned to the government, had convinced Victor Emmanuel to cross through the Papal States (with France's permission) in order to block the march of the Garibaldians, who most probably would not have stopped at the northern borders of the Kingdom of the Two Sicilies. Therefore, on 11 September, two columns of Piedmontese

troops crossed the borders of the Marches and Umbria respectively, easily defeating the papal army at Castelfidardo (18 September) and Ancona (29 September). According to the agreements with the French, the Piedmontese troops steered clear of Rome and Latium, which were garrisoned by the troops of Napoleon III.

When, during his march to the South, on 26 October, Victor Emmanuel met Garibaldi in Teano (not far from the border with the Papal States) the latter exclaimed: *"Greetings to the first King of Italy!"* to which Victor Emmanuel replied *"Greetings to my best friend!"* a salute which, however, avoided any reference to the heroic exploit of that *best friend* of his. Therefore, Garibaldi's forecast punctually came true, namely that if he had won, the Piedmontese would have acted as the *best of friends.* At any rate, on 3 November, the result of the plebiscite was officially proclaimed and on 7 November, Victor Emmanuel made his triumphant entrance in Naples, taking Garibaldi with him in the open royal coach, to erase many doubts that existed in Naples as to whether Garibaldi would be present at that celebration. Unfortunately, as soon as the celebration was over, the royal government repealed all the reforms implemented or introduced by Garibaldi in Southern Italy, revoked all the public works envisaged and the nominations made by him, thus letting down the population of Southern Italy and those who had fought for it.

On the other hand, Cavour's fears as to Garibaldi's intentions, after the liberation of the Kingdom of the Two Sicilies, were not groundless. Indeed, already on 31 October of that year, Garibaldi had made a revealing speech in Paola (Calabria), on the occasion of the awarding of two flags to the Hungarian Legion which, under General Stephen Türr, had fought valiantly with the Garibaldians. In that speech, Garibaldi harshly attacked the 'Pope-King,' saying, among other things: *"… the cancer, the ruin of our Italy have always been and continue to be personal ambitions. It is personal ambition that blinds the Pope-King … It is the Pope-King who is holding back the complete liberation of Italy … I am a good Christian and I speak to good Christians. I love and worship the religion of Christ, because Christ came to the world to free humanity from slavery, for which God didn't create it. But the Pope, who wants men to be slaves, who asks of the powerful of the earth shackles and chains for the Italians, the Pope-King forsakes Christ …"*

On 9 November 1860, two days after his coach ride in Naples with the King, Garibaldi embarked on the *Washington*, the ship of an American friend of his (the same friend who had helped him in Quarto, when the Thousand had set out), bound for Caprera, accompanied by one of his sons, some friends and bringing with him a few sacks of seeds. Before leaving, he dictated a proclamation, in which he defined the enterprise just accomplished as the *"second-to-last step of our Risorgimento,"* and added: *" … a more glorious one still shall follow … if March of '61 doesn't find one million Italians up in arms, freedom is doomed … Today, I must withdraw, but only for a few days. In the hour of battle I shall be by your side … We will meet again soon to march united towards new victories …"* So, Cavour got something more to be concerned with …

Meanwhile, on 13 February 1861, the Piedmontese army completed the work begun by the Garibaldians, forcing the fortress of Gaeta, where the last king of Naples, Francis II, had sought refuge, to surrender after a long siege. On 14 March 1861, in Turin, the Parliament voted the proclamation of the Kingdom of Italy, and, on 17 March, Victor Emmanuel took on officially the title of King of Italy.

## The tragedy at Aspromonte and the victory of Bezzecca (1861-1866)

In Caprera, although his friends had built a new and more comfortable home for him, Garibaldi lived in the small old Montevideo-style house. He worked as a farmer, getting up at dawn, as usual, and he often went hunting and fishing. However, he would inevitably receive visits from a great deal of people (including many exiles from all parts of the world), on account of his popularity, which had now greatly increased following the exploit of the Thousand. By now Caprera had become a point of reference for every liberal and radical movement of that period, almost in every part of the world.

Since no good news arrived from the government in Piedmont, Garibaldi - who had been elected deputy in Naples at the March elections of 1861 - left for Turin on 1 April 1861. Here, much to everyone's surprise, he showed up in Parliament on 18 April, wearing a poncho and a red shirt, thus leaving the rest of the deputies, who donned the black dress-coat, utterly baffled. He violently attacked Cavour, both for his government's interference during the last two campaigns of '59 and '60, and for not having found a destination for the men who

had survived the expedition of the Thousand. That intervention got him many enemies, including General Enrico Cialdini (whom he would confront at Aspromonte a few years later), and it failed to reach its main objective, that is to convince the Parliament to withdraw its decision to liquidate the *irregular bands*, as the Garibaldians were defined. Therefore, Garibaldi, hardly pleased, returned to Caprera on following 1 May.

Map of Italy in 1861

On 6 June 1861, the Count of Cavour died and was succeeded in government by the Baron Bettino Ricasoli, but this did not entail any radical change in the attitude of the government towards Garibaldi, as we shall see.

Two days later, that is to say on 8 June 1861, the United States President, Abraham Lincoln, anxious to find a highly prestigious commander for the Federal army to fight against the skillful southerner General Robert Edward Lee, offered the job to Garibaldi through the United States Consul in Antwerp, Y. W. Quiggle. Garibaldi declined the offer, for all of his strength was now focused on freeing Rome and Venice. It was also rumored that he had not been assured that the Civil War in America would have led to the freeing of the slaves also in the southern states of the Union. Lincoln's offer was reiterated in September of 1862, through the US Consul in Vienna, but at the time, as we shall see, Garibaldi, wounded at Aspromonte and then held captive in the fortress of Varignano, had once again to renounce the great honor offered him. He replied to the US President that he would hope to serve in the future the *"American Republic, of which I am a citizen*[12]*."* Lincoln's appreciation of Garibaldi was returned, as is witnessed by a letter sent by the latter on 4 August 1863, in which he wrote, among other things: *"You shall go down in history with the title of 'emancipator,' more enviable than any crown or human treasure."*

Getting back to Baron Ricasoli, in February 1862, he sent a senator to Caprera in great secrecy, whose task was to assure Garibaldi that the efforts to achieve national unity had not waned, but that, since the time was not right, he was asked to *"kindly refrain from jeopardizing, with untimely undertakings, the work successfully initiated,"* promising, at the same time, that he would be the first to be informed on any initiative in that regard, in due time.

Meanwhile, Baron Ricasoli (as his successor, Urbano Rattazzi, would later do) invited

[12]Probably, he referred to his US passport that gave him the same rights as an American citizen.

Garibaldi to guide and spread the *Tiri a Segno Nazionali* (*National Shooting Ranges*), also offering him other representative jobs, with the aim to divert his attention from more exuberant initiatives. Garibaldi, on his part, deemed the institution of the *Tiri a Segno* useful, with a view to introducing and training Italian youths to the use of arms, following the model of the Swiss army, which he held in great esteem, and always with the aim to prepare soldiers to fight for the unity of Italy. Hence, in the spring of 1862, he went on many visits in various Italian cities, promoting the institution of the *Tiri a Segno*.

In the first months of his mandate (spring of 1862), Mr. Rattazzi had given reason to hope that he would support (if only morally) possible initiatives on the part of Garibaldi, aimed to liberate Rome or Venice. Relations between the two were broken off on account of the events that occurred in Sarnico (Bergamo), where some one hundred Garibaldians, under the orders of Colonel Francesco Nullo, preparing for an expedition to Tyrol (inspired, if not directly, by Garibaldi), were arrested on 15 May 1862, and put in jail. In Brescia, where Colonel Nullo was jailed, a popular uprising in his favor was stifled, in the process of which people in the crowd were killed and wounded. Garibaldi - who was at the Trescore thermal baths (Bergamo), ostensibly to cure his gout, and who took upon himself the political responsibility for the Sarnico and Brescia events - faced Rattazzi, but the latter rejected his intervention. Meanwhile, from Trescore, Garibaldi wrote to the British Prime Minister, Lord Palmerston, asking to enforce the principle of non-intervention, preventing Napoleon III from proceeding with an armed intervention in Italy, especially in Rome. When Garibaldi and Rattazzi met in Turin (apparently) in March 1862, Garibaldi was so upset when he came out of their talks, that he immediately resigned from his post as President of the new *Società Emancipatrice Italiana* (which had been set up in Genoa on 9 March 1862, by followers of Mazzini and Garibaldi) and, once again, rushed back to Caprera.

On 27 June 1862, the General took action: with a small band of red shirts, convened in Caprera, he set sail on a small ship, the *Tortoli*, and headed for Palermo, where he knew he could count on the help of the *southern provinces*, to recruit a few thousand men, with whom to march on Rome. He also knew that this initiative would have interfered with the agreement between the Italian government and the French,

who had evacuated their troops from Rome, on the condition that Italy would commit itself to defending the temporal power of the Pope. This notwithstanding, Garibaldi, opposed by the Prefect of Palermo (who executed the orders received from Turin), managed to put together an army of three thousand men that, on the night of 21 August, was embarked on two steamers in Catania and landed on 23 August in Melito Porto Salvo, in the vicinity of Reggio Calabria.

The Italian regular army was immediately sent to halt Garibaldi, in compliance with the agreements with the French. In the meantime, Garibaldi's march in Calabria proceeded quite differently with respect to that of the Thousand of two years before, mainly for two reasons: the first one was that they couldn't find food in the towns they passed through, therefore, his troops were considerably weakened. The second and much more significant reason was that Garibaldi gave his troops the definite order not to reply to the fire of the regular troops, so as not to stain their hands with the blood of their brothers.

Perhaps the General was confident that the *Italian* army (now, thanks to him, it was no longer just *Piedmontese*) would not have opened fire against other Italians. But he was wrong. Indeed, he himself was severely wounded on the right foot, on the slopes of the massif of Aspromonte, while he never tired of ordering his men not to shoot, even stopping his own son, Menotti, who, having been wounded, had ordered his battalion to counterattack, and reluctantly obeyed his father's instructions. The soldiers of the two rival factions ended up familiarizing, as Garibaldi had hoped, but Commander Pallavicino very politely communicated to Garibaldi the order he had received from the government to get him to yield, no matter what. Thus, Garibaldi, his son Menotti and some ten of his men who decided to follow him were made prisoners; the others were held in custody for a long time before they were sent back home. Garibaldi was taken to Scilla (Calabria), and embarked with his companions on the *Duca di Genova*, headed for La Spezia, where they were all locked up in the Varignano Fortress. Various soldiers of the regular army, who had abandoned it to join Garibaldi, were brought to trial and executed.

Naturally, France did not fail to express its satisfaction to the Italian government. On his side, however, Garibaldi received expressions of solidarity and sympathy, as well as money, from many English

and American citizens (remember also Lincoln's invitation), as well as from Leipzig, Stockholm, and even from French workers, disagreeing with their own government. An English surgeon was paid by a popular subscription to operate on Garibaldi's wounded foot. La Spezia was submerged by telegrams, letters and visits from all over, which, fortunately, were not denied to the famous prisoner. A French republican exiled in London, Félix Pyat, wrote to Garibaldi an exalting letter (on display at the *Museo del Risorgimento* in Turin) in which he invited him to say to Victor Emmanuel: "*I have made you King of Italy, and you have made yourself France's slave …*" This notwithstanding, the Italian government, deaf to the complaints that came from all parts of the world, was firm in its intent to bring the hero to trial. Victor Emmanuel II avoided the unpopularity of such an action, by promulgating a general amnesty, on 5 October 1862, on the occasion of the wedding of Princess Maria Pia of Savoy with the King of Portugal.

Thus, Garibaldi was released under amnesty, but for a long time he couldn't move for the (seventeen!) surgeons, who succeeded one another at his bedside, could not localize, hence remove, the bullet that was lodged almost five centimeters beneath the lower end of the shinbone, and thought they had no choice but to amputate the leg. Fortunately, on 29 October, a French physician, Nélaton, with a probe he himself had designed, was able to detect the bullet, asserting that to amputate the leg would have been a crime. Thus, on the morning of 23 November, after eighty-six days of unsuccessful tortures, trials and attempts on the part of numerous doctors, Professor Zannetti from Florence was able to extract the bullet and all bone splinters, although he had to inform the fifty-five-year-old patient that he would be lamed for the rest of his life. It was only in January 1863, after a long stay in La Spezia and Pisa on account of the foregoing surgery, that Garibaldi could finally return to Caprera.

At the end of that year, 1863, Agostino Bertani, Garibaldi's friend, invited all of the deputies to resign as a sign of protest against the government's blind and repressive policy. Garibaldi was among the first to resign, on 7 January 1864, only followed, however, by some twenty deputies. In the same period, Garibaldi reached an agreement with the Mazzinians, with whom he set up the *Comitato Centrale Unitario*, the aim of which was the liberation of the country.

Spring of 1864 was characterized by a very significant

event, Garibaldi's visit to England, which lasted a few weeks. Here, together with his sons and a few of his followers, he was given a triumphant welcome in Southampton, the Isle of Wight and London, where he arrived on 11 April. He was visited by political celebrities and by members of the British aristocracy, like the Prime Minister Lord Palmerston, Lord Shaftesbury, Lord Russell, the Duke of Sutherland, the First Lord of the Admiralty, Somerset, culminating with the coveted visit of the Prince of Wales. He was also made an Honorary Citizen of London, and was awarded the sword of honor at the Crystal Palace. The *Times* and the *Illustrated London News* published extensive articles on him. He met with many political exiles, including Victor Hugo, Félix Pyat, Louis Blanc, Karl Marx and the Russian Alexander Herzen, in whose home he met Mazzini; this meeting sealed the reconciliation between the two great Italians.

Garibaldi in Caprera, after the Aspromonte events (portrait by G. Mantegazza, Museo del Risorgimento, Milan)

A planned tour of the British provinces was put off to a better occasion, in order to prevent further protestations, which were arriving from Paris and from Turin, and were shared in part by London circles close to the Crown. Therefore, 'for reasons connected to his health,' Garibaldi, who, on the other hand, was extremely pleased about the honors received, left ahead of time, on 22 April 1864, from a small port in Cornwall, and returned to Caprera. Here, he received a warm letter from Victor Hugo, who, from the tiny British Isle of Guernsey, where he was exiled, wrote to him the following words: "*… Guernesey salue Caprera … Votre triomphe en Angleterre est une victoire pour la liberté. La vieille Europe de la Sainte Alliance en a tremblé…*" ("*… Guernsey salutes Caprera … Your triumph in England is a victory for freedom. The Old Europe of the Holy Alliance has trembled in its wake …*").

On 17 June 1864, Garibaldi took off for the Island of Ischia - ostensibly for a course of thermal baths - and, in Casamicciola, he attended a political meeting with some Mazzinians and with an emissary of the King, whose task was to distract him from domestic affairs by proposing to him an intervention in the Balkans or in Eastern Europe. On 14 July, Garibaldi, hardly enthralled by the government's attempts, formally refused to embark on any military action outside of Italy, after which he broke off relations and returned to Caprera. On 15 September 1864, however, a great disappointment was lying in store for him, as the Italian government signed an agreement with Napoleon III (that

went down in history as the *September Convention*) by which it committed itself to defend the Papal States from any attack, practically renouncing any territorial claim over Rome. Consequently, Italy was bound to move its capital from Turin to Florence, instead of Rome, obtaining in return the withdrawal of the French troops from Rome within two years time. However, the promoter of said agreement, Prime Minister Marco Minghetti, on account of the popular demonstrations and unanimous execration (there were protests also in Parliament) was forced to resign, leaving his place to Alfonso La Marmora. This notwithstanding, in June 1865, in compliance with the *September Convention*, Florence became the capital of Italy.

Other political quibbles, to which Garibaldi was strongly opposed, were the root cause of the third war of independence, which began and ended in 1866. Indeed, it ended with Italy annexing Venetia (excluding Trentino), even though the Italian regular army was defeated - once again in Custoza - by the Austrian troops, and the Italian fleet was destroyed. Briefly, here is how things went. In April 1866, Italy allied with Prussia against Austria. In June, Prussia declared war on Austria, followed by Italy. The Italians, under Gen. La Marmora, were defeated in Custoza on 24 June 1866, even though their troops were twice as big as Austria's. The Prussians, instead, won in Sadowa on 3 July, reaching as far as a few kilometers from Vienna. On 20 July, the entire Italian fleet was sunk by the Austrian fleet in Lissa. On 26 July, Austria asked Prussia for the armistice, which was followed by the *Prague Peace Treaty*, on 23 August. The armistice with Italy was signed on 12 August and the peace treaty on 3 October (the *Vienna Peace Treaty*). With the latter, Austria gave Venetia to France, as a reward for its neutrality in the conflict against Prussia, and, in turn, France gave Venetia over to Italy (miracles of politics!).

And what about Garibaldi? As soon as the war broke out, precisely on 10 June, his friend, Gen. Nicola Fabrizi, arrived in Caprera, sent by the Italian government to convince the hero (regardless of the Aspromonte events) to once again organize the groups of volunteers, who were gathering in Como and in Bari. The government expected the General to accept on any condition, just for the sake of the unity of Italy, and it took advantage of this by skimping on the weapons and equipment for the volunteers, leaving all the good rifles, artillery and uniforms for the regular army.

Furthermore, it was imposed that, of the one hundred thousand youths who volunteered, only thirty thousand be accepted, to lessen their weight with respect to the regular army.

This notwithstanding, immediately after the defeat suffered by the regular army at Custoza, Garibaldi, with only a few thousand volunteers, occupied Lonato and Desenzano, thus succeeding in defending Brescia and Salò from the advance of the Austrians, while Gen. La Marmora's army withdrew behind the Oglio River. Then, moving from Salò on 3 July, Garibaldi attacked the Austrians to oust them from the occupied territory. On that occasion, he was wounded at the left thigh and was forced to follow the battles on a coach. At dawn of 4 July, he occupied Mount Suello. In the following days, an artillery brigade of the regular troops, with fifteen 12" pieces, commanded by the valiant Major Dogliotti, came to his assistance. So, when the Austrians counterattacked on 6 July, the support of Dogliotti's artillery proved to be crucial and the Austrians were driven back. Immediately thereafter, the Garibaldians attacked and conquered the important Fortress of Ampola.

Garibaldi continued with his technique to take possession of the highlands (*'to do like the eagle'*, as he used to say to his men) in order to keep an eye on his enemy, whose force was overwhelming in all three combat arms (infantry, cavalry and artillery). On 21 July, the battle with the main body of the Austrian army took place in Bezzecca, near Trent. At first, the Austrians got the better of it, but in the end they were put to flight by the Garibaldians, who, though ill-equipped, achieved the only Italian victory in that campaign. Moreover, a Garibaldian detachment, under command of the loyal and valiant General Giacomo Medici, had reached the gates of Trent, since, after their defeat in Bezzecca, the Austrians had evacuated the entire so-called Italian Tyrol, retreating to the Austrian Tyrol.

However, on 8 August 1866, as is written in Garibaldi's Memoirs *"… An order of the supreme command of the army called for retreat and evacuation from Tyrol: I replied: 'I obey!' a word that would trigger the usual complaints of the Mazzinians who, as always, wanted me to proclaim the Republic, marching on Vienna or on Florence … We received some good rifles when the war was over … From Tyrol we retreated to Brescia, whence the volunteers parted, after which I returned to Caprera."*

It is worth highlighting the support given by Garibaldi to

the humanitarian intervention of the then emerging Red Cross organization during warfare, which is documented in one of his letters, dated 26 July 1866.

## From Mentana to Dijon (1867-1871)

In February 1867, Garibaldi took part in the electoral campaign. In September 1867 he left Caprera to attend the *Geneva Peace Conference*, advocating the institution of a confederation of all free democracies, with the aim *"to attain the brotherhood of men and universal peace, after having defeated despotism and oppression."* Kindling a great deal of protest, he also proposed that the decadence of the Papacy and a *'religion universelle de Dieu'* (*universal religion of God*) be proclaimed, identifying the latter with the *"religion of truth,"* as envisaged by great thinkers, like Leibniz, Galileo, and others.

Aside from these strictly political digressions, needless to say, when the third war of independence was over, Garibaldi did not cease to think of how to liberate Rome. Nor had he forgotten the cry *"Either Rome or death!"* that, since their unfortunate attempt of 1862, had always been the battle cry of the Garibaldians. Already in June 1867, the Prefect of Palermo informed the government on the enrollment of Garibaldians in Sicily, with the aim to march on Rome. In September of the same year, Garibaldi went to Sinalunga, near Siena, with the intent to begin the expedition to Rome, setting out from Tuscany, but, on 24 September, he was arrested by the Carabinieri and was taken by the latter to the fortress in Alessandria, then to Genoa and from there brought back to his home in Caprera. The island was surrounded by six (some say nine) war ships, with the clear intent to prevent the General from leaving again.

Apparently, the above deployment was not enough to stop Garibaldi, who, with his proverbial skill, on 15 October 1867, managed to elude surveillance and fled on a tiny schooner, the *Beccaccino*, that had been given to him by his British friends, landing in the northern coast of Sardinia. He then crossed the hilly region of Gallura on horseback, and, two days later, he reached the Sardinia's eastern coast at Porto Prandinga, where his loyal companions-in-arms, Stefano Canzio and Vigiani had brought a fishing boat, to take him to Tuscany. On the night of the 18 October, they landed in the tiny port of Vada, on the Tuscan coast, between Piombino and Livorno. From there, they advanced toward *'genteel Florence'* (as Garibaldi used to

call it), which had been the capital of Italy for two years already, where they arrived on the 20. In Florence, the government had resigned the night before. It was not possible, anyhow, to prevent the population's outbursts of joy upon greeting Garibaldi, regardless of General Cialdini's public announcements, aimed to deter Garibaldi from his intent. On 23 October, Garibaldi finally reached, through Terni, the field of volunteers set up by his son Menotti at Passo Corese and from here, he crossed the border and invaded the Papal States.

The first engagement with the Papal troops took place in Monterotondo, a town situated some twenty kilometers from Rome, which surrendered, after a furious defense, at eleven o'clock on 25 October. The Garibaldians gained two pieces of artillery, in addition to many rifles and munitions. From here, encouraged by news of insurrections in Rome (unfortunately already concluded on 23 October with the sacrifice of the Cairoli brothers at Villa Glori), some Garibaldian detachments had already set out for the eternal city, and had reached Villa Spada. However, upon hearing the news of the failure of the uprising in Rome, Garibaldi ordered the troops to retreat to Monterotondo, notwithstanding the hostility of the population towards them. Other Garibaldian columns had occupied, in the meantime, Tivoli, Velletri and Viterbo. By then, Garibaldi's army could count some six thousand men, on the whole.

However, on 3 November 1867, while all the Garibaldian forces were marching toward the southern provinces, the Papal troops attacked them at Mentana, not far from Monterotondo. The attackers were about to be defeated when the French, led by Gen. De Failly, came to their rescue, armed with the all-new breechloading rifles (*chassepots*), and bringing the opposing force to a total of eleven thousand men. Meanwhile, also the Italian army moved against the Garibaldians. The latter fought against the French until they ran out of munitions, after which, on 8 November 1867, they were forced to retreat toward Passo Corese, leaving, on the Mentana battlefield, one hundred and fifty casualties and nine hundred prisoners. Having failed his enterprise, Garibaldi decided to go back to Caprera and naively took a train to reach the Tyrrhenian coast.

But at the station of Figline, not far from Florence, the train was stopped by the Carabinieri, who had received the order to arrest Garibaldi. The latter refused to follow them spontaneously. His followers were ready to defend

him but, once again, the General said to them that he would have never allowed an armed conflict with Italian soldiers; thus, he simply had the Carabinieri carry him to a coach, which took him once more to the Varignano fortress, only accompanied by his friend the General Stefano Canzio. After three weeks of imprisonment, on the night of 26 November 1867, he was taken to Caprera and left there in internment, under the obligation not to move until the end of the forthcoming month of March.

On 12 December of that year, at the Chamber of Deputies, Agostino Bertani made a courageous speech, commenting the Mentana episode. *"… In Mentana* - he said - *the solidarity up until then enjoyed, if not admitted, between the volunteers and the Monarchy was broken; there, a ditch was dug, which must either be jumped over or filled up …"*

A few years later, Garibaldi had the opportunity to get his revenge for the defeat at Mentana, fighting, in favor of the French, in what was to be the last military enterprise in his life. Precisely, it occurred that, on 19 July 1870, France, under Napoleon III, declared war on Prussia, finding itself, however, fighting against all of Germany and suffering, on 1 September a tremendous defeat at Sedan, where Napoleon III himself was made prisoner and was forced to abdicate. But on 4 September, the French declared the fall of the Monarchy and proclaimed the (third) republic. Garibaldi, summoned by his French republican friends, gave them assistance in fighting against the Prussians, displaying a transnational spirit that was quite uncommon, given the previous hardly amicable experiences with France. On 23 August, shortly before this episode, he wrote to his son Menotti the following prophetic words: *"… No matter what happens, Bonapartism is over; and I hope we can take advantage of this in order to go to Rome …"*

Garibaldi reached Marseilles on 7 October 1870, and in no time he was able to organize, on the occupied territory, near Amanges, a group of almost five thousand men (although, as usual, with very few weapons), with the assistance of his two sons Menotti and Ricciotti, as well as of his son-in-law, Stefano Canzio.

Ironically enough, on 20 September 1870, while Garibaldi was organizing France's defense against the Prussians, the Italian troops - after having denounced the famous *September Convention*, stipulated with France in 1864 - marched into Rome, through the breach opened at Porta Pia and, on 9 October 1870, Rome was proclaimed capital of Italy.

As for Garibaldi, on 10 September 1870, when confronting the Prussians for the first time, he defeated them in Autun, where Ricciotti earned himself the promotion to Major on the battlefield, for his courage, and for having torn the flag of the 61st enemy regiment. A few days later, Garibaldi advanced toward Dijon, flanked by the French troops which, however, furiously attacked by the Prussians, fled, notwithstanding the Garibaldians' attempt to hold them back. On that occasion, a French officer, Captain Farey, said, with tears in his eyes: "*I have lived to see the Italians fight and the French flee!"* On 31 December, Garibaldi, in command of the *Armée des Vosges*, once again put the Prussians to flight in Autun and could thus enter Dijon, where he immediately began to fortify the city, to reorganize the army and to manufacture arms and munitions, expecting the Prussian's counterattack.

Indeed, on 18 January 1871, three Prussian columns headed for Dijon, each one comprised of some ten thousand men. From 21 to 23 January, they attacked the city in several waves, and with great impetus. Garibaldi himself acknowledged the valor of the Prussians, and in his Memoirs he wrote: "*that day* [21 January 1871] *I saw the best enemy soldiers I had ever seen …"* Likewise, the compliment was returned by German General Kettler, who wrote: "*If Garibaldi had been at the head of one of the French armies, the flag of the 61st regiment would not have been the only one lost by us…"* Unfortunately, however, Paris fell into the hands of the Prussians on 28 January, thus making it useless to further strive to defend Dijon.

On 13 February 1871, the constituent assembly, elected during the armistice, met in Bordeaux - the temporary seat of the French government. On 26 February, peace talks with the Prussians began. Garibaldi, who was elected in several constituencies, showed up in Bordeaux on 13 February and, although he was cheered by the crowd, the majority of the assembly (mostly moderate) greeted him with contempt, and even denied him the right to speak. He therefore resigned from it, disbanded the *Armée des Vosges*, and, on 16 February 1871, he once again returned to Caprera. Here, about a month later, precisely on 20 March 1871, he received an invitation by the *Commune* that had just been set up in Paris (which had risen against the moderate government) to take command of the National Guard, that had already acclaimed him as its commander on 13 March. Garibaldi declined the offer, though displaying sympathy and solidar-

ity towards the *Communards*, indicating to them at the same time the need to set up a dictatorship if they intended to face up to the emergency effectively.

## The epilogue (1871-1882)

The sixty-three-year-old General was physically deteriorating in a frightful way, so much so that he was almost paralyzed by arthrosis and could only move in a wheelchair. During the last years of his life, without the imminence of wars for the unity of Italy, he settled his private affairs, wrote various books and took part in some public events and political initiatives. On 14 January 1880, he obtained from the Court of Appeals of Rome the annulment of his marriage with the Marquise Giuseppina Raimondi from Como, which had turned out to be an unhappy union from many points of view. On 26 January of the same year, before the Mayor of Island of Maddalena he married Francesca Armosino, from whom he had two children, Manlio and Clelia, and who assisted him lovingly until his death.

His commitment in political, rather than military battles, gave rise to much perplexity. For instance, his support to the *International*[13], expressed towards the end of 1871, in a letter to his friend Giorgio Pallavicino, was such that it gave the impression that Garibaldi had a very personal understanding of that movement, an understanding that could not be identified either with the stands of Carl Marx, or with the ones of Michail Bakunin, which were in contrast with Marx's. About a year later, in a letter addressed to another friend, Carlo Ceretti, Garibaldi even stated: *"… The International is the sun of the future that dazzles and that obscurantism and privilege would want to plunge into the grave …"*

Garibaldi's simplistic political idea (whence his understanding of the *International* stemmed) clearly surfaced in Rome, between 19 and 20 November of 1872, when, on Garibaldi's own invitation, a political program was approved that was denominated "First Pact of Rome." Garibaldi had invited to gather under one 'fasces' (the 'Roman fasces', as he would often say): Masonry, Workers Societies, Democratic Societies, Rationalists, Mutual Benefit Societies, etc., that all *aim to do good*. Here then is how Garibaldi naively saw the Socialist

[13]The first *Socialist International* (also known under the acronym IWA, which stands for *International Working Association*) was founded in London on 28 September 1864. Carl Marx's monumental work "Das Kapital" began with a first volume which appeared in 1867 and was translated into English in 1886.

International: in his eyes, it too was an association whose *aim was to do good*. Precisely, the aim of the First Pact of Rome was universal suffrage, freedom of conscience, administrative decentralization, compulsory education, progressive income taxation and the abolition of the death penalty. Along the same lines, between 1873 and 1881, Garibaldi gave his support to the creation of a sort of *League of Nations* and an *International Court*, namely supranational bodies, aimed to promote equitable relations among nations worldwide.

Commendable, instead, was the project for the deviation of the course of the Tiber River, that he submitted to Victor Emmanuel II on 30 January 1875, shortly after he was elected deputy in the first constituency of Rome. On 26 May Garibaldi illustrated the project in Parliament, but the law that was drafted following the parliamentary debate, on 6 July 1875, completely twisted (as often happens) the original plan, so much so that Garibaldi defined it a 'swindle.'

In April 1879, Garibaldi was elected President of the Executive Committee of a political group of the extreme left, known as the *Democratic League*, to which, among others, Agostino Bertani, Stefano Canzio, poet Giosuè Carducci, Felice Cavallotti and Aurelio Saffi belonged. On 26 April its program was published, signed by Garibaldi, which traced the one of the *First Pact of Rome* of 1872, also envisaging the secularization of the State and containing various proposals for the implementation of major public works, including the reclamation of the Roman plain, which was attributed to Garibaldi himself. Always in the area of territorial reformation, in 1880 Garibaldi presented a plan for expanding and restructuring the port of Genoa.

In Caprera, Garibaldi was visited by the American millionaire in the tobacco trade, John Anderson, whom he had met in South America in 1844 and who, it was said, had assigned him a pension of five thousand gold franks. Anderson related that he found him, drawn up in his solitude, donning his usual, now worn-out poncho. Although he had nothing on which to live, Garibaldi refused the gift of one hundred thousand lire, deliberated by the Italian government, asserting that if he accepted that money he would not be able to sleep at night, when he would hear news of the government's plundering and of public destitution. Only once the left came to power, in 1876, did Garibaldi decide to accept a pension from the State.

His work as a writer - necessary to earn his living, as he

himself wrote in a preface - was praiseworthy, as regards the narration of his military exploits, such as the re-elaboration of his Memoirs (a first version of which had been published in 1860 by Alexandre Dumas), "The Thousand" (1874) and "The Thousand of Dijon" (which remained in draft version). Of little literary value, instead, were his novels, like "Clelia, or the government of the priests" (1870), "Cantoni the Volunteer" (1870) and the collection of poems, published after his death in 1911, with the title "Autobiographical Poem and Other Verses".

On his last visits to Genoa (to get his son-in-law Stefano Canzio out of jail), to Milan (on the inauguration of the monument to the fallen), in 1880, and to Naples and Palermo (for the anniversary of the Sicilian Vespers), in 1882, shortly before his death, the crowds that had rushed to cheer him, deeply touched by the sight of him as he dragged himself on in such a state of debilitation, just stood in respectful and sorrowful silence.

Garibaldi died in Caprera at 6:22 PM of 2 June 1882, surrounded by his wife Francesca and his children Menotti, Manlio and Clelia, while Ricciotti and his son-in-law Canzio, although notified by telegram, did not arrive in time to see him alive. Although he had left precise instructions to cremate his body according to the Masonic rite (more precisely, to be burned on a bundle of acacia and lentisk wood from his Caprera), a few days after his death, on 8 June, after being embalmed, he was buried according to the Christian rite, once again for *reason of State*. Indeed, burial was accompanied by an official ceremony in the presence of Prince Thomas representing King Umberto I (who sent a touching telegram to Menotti), Ministers Ferrero and Zanardelli on behalf of the government, representatives of the navy and the army, the survived volunteers of the Thousand and of the other Garibaldian enterprises, and a great deal of representatives of cities and associations.

Every year, after his death, both in New York and in Staten Island, on the anniversary of Garibaldi's birth, on 4 July (also the Independence Day of the United States) Americans of every rank and class have rendered homage to the 'great liberator,' Giuseppe Garibaldi, who is also compared to the father of the United States, George Washington. Indeed, a monument to Garibaldi was erected in New York, in 1888, in Washington Square, on initiative of the Italian paper "Il Progresso Italo-Americano." It was a standing statue, set on a marble pedestal, made by the sculptor

Giovanni Turini, representing Garibaldi as he draws his saber from under his poncho. The statue stands on the eastern side of the square, close to the park's exit, and, in summertime, it is almost covered by the leaves of the trees. Many of the people who frequent the area - the well-known Greenwich Village - are Afro-Americans, Puerto Ricans and Chinese. A more worthy place is surely Washington's Capitol, where there stands a bust of Giuseppe Garibaldi, made by the sculptor Mantegani, which was inaugurated on 23 August 1888.

## The man and his personality

Garibaldi was considered by everyone to be a kind and shy man. Nelson H. Gay (see bibl.) mentions his seriousness, determination and integrity, which, together with the unwavering devotion to Italy, earned him the confidence of those that fought by his side as well as of those who stood for liberal ideals worldwide. Gen. Alfonso La Marmora said about him: *"… he speaks little and well: he is very penetrating … it was a big mistake not to use him …"* He spoke French and Spanish fluently, but hardly spoke any English, according to Nelson Gay, just like his friend Antonio Meucci.

As regards his *atheism*, he apparently said to a group of seminarians, who greeted him at Soresina with enthusiasm, in 1862: *"… They must have told you that I hate priests: this is not true. I hate bad priests and the enemies of our country, of the freedom of humanity. You are young, go out and preach the Gospel, which is the religion of Truth, and you shall be loved by everyone …"*

On the other hand, he could not forget that, after Anita's death, as he was being hunted by the Austrians *"the priests from the pulpit and from the confessional urged the ignorant peasant women to play the spy to the major glory of God …"*[14]. It is also worth recalling his fervent letter sent from Montevideo, in 1847, to the 'liberal Pope' Pious IX, in which he offered the service of his Legion for the triumph of the Italian cause. In this letter he wrote, among other things: *"… we know perfectly well that the throne of St. Peter rests on ground that cannot either collapse or confirm human assistance, and that, furthermore, the new order of things relies on many defenders … Grant us the honor of being among them …"* If to this one adds his similar and repeated offers to the Kings of Sardinia, one must conclude that, every time the fate of Italy was at stake, Garibaldi put aside any aversion for Popes and Monarchs. In the Christian

[14]From his Autobiographical Memoirs.

Masonic Temple, Tompkins Lodge, Stapleton, NY

spirit, he forgave those who had given the order to shoot against him at Aspromonte, where he was wounded by the two bullets that were to leave him lame for the rest of his life. After all, he drowned all of his hate in his love for Italy.

There is no doubt that Garibaldi was an outstanding military commander, as has been acknowledged extensively by leading experts in the art of war. However, in battle especially he gave proof of what miracles can be achieved with the courage and determination of men as opposed to their number, which qualities he also acknowledged to his valiant enemies. He was also convinced that the force of a just ideal - as that of fighting to defend the weak against oppressors - was more important than any military discipline, for the latter is imposed from the outside, whereas the former comes from within. Rather than the teachings of war schools, he trusted his own intuition, experience and tenacity. As regards tenacity in battle, with reference to the wars in South America, he wrote as follows: *"When undertaking any battle, one must reflect very carefully beforehand, but once it is under way, one must not give in until one has fought to the end of one's strength, until the last reserves have been brought into action …"* General Pacheco, war minister in Montevideo, said about him: *"… he never wore a uniform different from that of his soldiers … From the outset he lived like his soldiers only feeding on military rations …"* He only drank water, even when his companions-in-arms toasted to the hard-earned victories with a few glasses of wine.

He did not forgive the ineptitude and the hypocrisy of the political class in power in Italy and elsewhere and he opposed himself to compromises of any kind. In regard to the Piedmontese government of 1848 he said: *"… the authorities, with the coldness of an unstable conscience, precluded the simpering and temporizing that have accompanied us, in our country, wherever the negotiators in charge of middle-of-the-road solutions convened, dragged into liberal ruling more out of fear of the people than out of their faith in and own disposition for human improvement …"*

The renowned historian and politician Giovanni Spadolini asserted that Garibaldi *"conceived democracy as love of the Man, as love of all fatherlands,"* echoing the words written on Garibaldi by Victor Hugo: *"Vous avez en vous l'âme des peuples"* (*"The soul of all peoples is in you"*).

In that spirit - but especially for the firm position of the

Freemasonry vis-à-vis the various revolutions for national independence - he joined, as was previously said, that association. He took the first three degrees of the Freemasonry in Tompkinsville's *Tompkins No. 471* lodge[15], during his stay on Staten Island. In 1854 he came into contact with London's lodges and, in 1860, he was made 'Master' in Palermo, where, later, in 1862, he became the head of the *Scottish Supreme Council*. In 1864, he was made 'Grand Master of the Grand Orient of Italy,' the seat of which was in Florence. The title of 'Life Honorary Master' was then conferred on him and, in 1881, he became 'Grand Hierophant' (97th degree) of the *Reformed Rite of Memphis and Misraim*. Also Garibaldi's children and son-in-law joined the Freemasonry. On display at the *Museo del Risorgimento Italiano* in Turin is a copy of the membership of his daughter Teresita, obtained on 20 July 1867. In New York, a Masonic lodge was named after him.

[15]According to research conducted by Roy Bredholt (see bibl.), the files of this lodge prior to 1859 were destroyed in a fire. Moreover, Henry Tyrrell's quotation (see bibl.) that both Giuseppe Garibaldi and Antonio Meucci belonged to the 'Tompkinsville Masonic Lodge no. 410' is wrong because, according to New York's Masonic archives, no lodge with such name ever existed.

From the extensive literature on Giuseppe Garibaldi, we have drawn a few excerpts, less familiar to the reader, taken from works written by American authors; these are preceded by an excerpt from his Autobiographical Memoirs, which refers to his temporary residence in the United States.

## From Garibaldi's "Memorie Autobiografiche"

[G. Garibaldi, *Memorie Autobiografiche*, Edizioni Barbera, Florence, 1888, pp. 247-249]

*"… During the journey to America, I was seized by rheumatic pains that tortured me throughout most of the trip, and I was finally unloaded like a trunk - since I could not move - on Staten Island, at the port of New York.*

*The pains lasted a few months, during which I spent part of the time on Staten Island, and part of the time in New York City, in the house of my dear and precious friend Michele Pastacaldi, where I enjoyed the pleasant company of the illustrious Foresti - one of the Spielberg martyrs. Meanwhile, Carpaneto's project could not be implemented since there were not enough contributors available to join it. He had collected three shares of ten thousand lire each from the Camozzi brothers from Bergamo, and from Piazzoni; but what kind of a ship could be bought in Amer-*

*ica with thirty thousand lire? A small coasting vessel perhaps; but, since I was not an American citizen, I would have been forced to hire a captain from that country, and that was not convenient.*

*But we had to do something. A friend of mine, Antonio Meucci, a Florentine — and a worthy fellow — decided to set up a candle factory, and offered me to help him in that enterprise. I readily accepted. I could not be involved in setting up the business, since I had no money (for the thirty thousand lire hadn't been sufficient to purchase a ship and had remained in Italy); therefore, I adapted myself to the work, proposing to do as much as I could. I worked for a few months with Meucci and, although I was his employee, he treated me like one of the family, with great loving-kindness.*

*One day, however, tired of making candles - and perhaps driven by my natural and usual restlessness - I left the house with the intention of finding another job. I remembered having been a sailor - I spoke a few words of English - and I headed for the coast of the island, where I could see some coasting vessels, loading and unloading goods.*

*I went to the first one and I asked to be embarked as a sailor. Hardly anyone paid any attention to me: everyone on the boat went on with their work. I tried again with another vessel. Same response. Finally, I went to another one where goods were being unloaded and I asked whether I could help out with the work; they answered they didn't need any help. 'But I'm not asking to be paid,' I insisted, to no avail. 'I want to work to shake off the cold' (it was really snowing): still no answer. I was mortified!*

*My mind took me back to the time when I had the honor to be in command of the Montevideo squadron - in command of the combative and immortal army! What was the use of it all? They didn't want me!*

*I rebutted the mortification and went back to work on tallow. Fortunately, I hadn't informed the excellent Meucci of my intention; hence, since no one besides me had been involved in my decision, no unpleasant consequences were entailed. Furthermore, I must admit that my kind employer had done nothing to force me to my untimely decision - he offered me nothing but kindness and friendship, as did Mrs. Meucci, his wife. Therefore, I did not find myself in a lamentable situation, in Meucci's home; it had been a bout of melancholy that had driven me out of that house.*

*In it, I was always free: I could work if I wanted to - and, naturally, I preferred useful*

*work to any other occupation - but I could also go hunting every now and then - and we often went fishing, with the boss himself, and various other friends from Staten Island and New York, who often came to visit. At home there was no luxury - although nothing lacked of life's basic needs, in terms of food as well as lodging.*

*I must also mention Major Bovi - the man who was mutilated in the campaign for the defense of Rome, and who was my brother-in-arms in various campaigns. He had joined me in Tangier in the home of Consul Carpanetto* [Carpenetti, Editor's Note] - *towards the end of my exile there - and when I decided to go to America - as I didn't have the means to take all my companions with me, I left Leggiero and Coccelli* [*Cucelli*, Editor's note] *in Tangier, with good recommendations - and I chose Bovi to be my traveling companion, since he was not fit to work on account of the fact that he had lost his right hand.*

*Coccelli! Why not say something about this young, handsome and valiant companion of mine? Coccelli was still a boy when he joined the Legion of Montevideo and, since he had a talent for music, he played the trumpet in the superb band of the Legion - and the bugle in the famous charges, with which that valiant force earned America's respect for Italy. Coccelli followed the Legion in all its campaigns - and followed our expedition of '48 in Italy. He took part in the campaigns in Lombardy and in Rome as an officer, and came with me, when I was exiled by the Sardinian Government in '49, and sent to Tangier.*

*When I left Tangier for America, I left my rifle and all my hunting equipment to Coccelli. He died a youth, of a heat stroke under the African sun. I was also forced to leave my hunting dog, Castore, in Tangier, in the house of some friends, and that faithful friend died of sorrow for me! …"*

## Excerpts from American papers

[Frank Leslie's Popular Monthly, May, 1882, see bibl.[16]] *"…* [He was] *of middle stature, deep chested and wide shouldered, his frame was cast in an iron mold, combining agility with strength. There was something statuesque in the appearance of his head, with his broad brow, straight features, and long, flowing hair blending with a beard of the same golden hue. His countenance, expressive of resolution, gave character to his features, rather striking than handsome. In his dress he*

[16]Author unknown; quoted in the paper by Daniel Santoro dated August 1950 (see bibl.).

*consulted the picturesque. He wore at that time a cap of scarlet cloth, ornamented with gold lace; a tunic, or blouse with rich red; and besides his sword he carried a dagger in his belt. In his movements Garibaldi displayed ease and grace, mingled with that sober and stately dignity acquired by those who had exercised authority over the descendants of the Spaniards in the Western World …"*

[Henry Vandervoort, Clerk of the New York City Court of Session[17]] *"… the General's demeanor was modest and unassuming, and he spoke in a low voice, his testimony being translated by an interpreter. He used dramatic emphasis at one point only, and that, as I subsequently ascertained, was where he declared «it was cowardly to pitch upon the little fellow se, even though he did manage to defend himself.»* … [On this occasion, he wore] *a sort of blue cloth surtout* [*overcoat*, Editor's note], *with frogs for trimming around the buttonholes. He always wore a large black neckerchief, wound twice around, to cover the scar of an old South American gunshot wound in his neck. His trousers were large and loose, worn sailor-fashion, close-buttoned around the waist …"*

[Roy Bredholt, see bibl.] *"… The forty-three year-old General, despite his lifelong arthritic affliction, was in the prime of physical manhood. With his broad round forehead, straight—almost perpendicular—nose, heavy, brown mustache and beard, and calm blue eyes, Garibaldi cut a striking figure …"*

[Ira K. Morris, renowned historical writer of Staten Island, see bibl.] *"… He was in private intercourse the most gentle and unassuming of men. Children would run to play with him. If in a crowded room, you would have looked around for some one to whom you would have given a wife or sister in charge, you would have singled out General Garibaldi amongst hundreds, there was such a stamp and impress of one of Nature's gentlemen about the man …"*

[Theodore Dwight, see bibl.] *"… To my surprise, I found my thoughts turned, in part, from fields of battle, the siege of Rome, and the sortie of San Marino, to the philosophic principles of the Italian revolution, and the true doctrines of Christianity, perverted by the enemies of liberty. I recollect that I made a silent reflection, as I left his*

[17]From an episode, quoted in Henry Tyrrell's paper (see bibl.), relating to Garibaldi's voluntary appearance in a New York Court of Justice.

*company, that although I had heard men speak eloquently and impressively before, had admired their characters and approved their principles, Garibaldi raised my mind and impressed my heart in a manner altogether new, surprising and indescribable …"*

## Chronology

1805, 22 June - Giuseppe Mazzini is born in Genoa
1807, 4 July - Giuseppe Garibaldi is born in Nice
1815, 9 June - The Treaty of Vienna is signed, which is defined unfair by Mazzini for it assigns Milan, Venetia and Trieste to Austria. Liguria is annexed to the Kingdom of Sardinia, thus comprising Piedmont, Sardinia and Liguria
1820-21 - Unsuccessful revolutionary riots in many Italian cities. Exiled patriots seek refuge in England, Switzerland and the United States
1822 - Garibaldi begins to work as a sailor; he visits Odessa, Rome, Istanbul and Tunis
1830 - Garibaldi joins the Sardinian navy
1833 - After having met the Mazzinian patriot G. B. Cuneo in Taganrog, on the Black Sea, Garibaldi meets Giuseppe Mazzini in Marseilles and joins the *Giovine Italia* (*Young Italy*)
1834, 5 February - Garibaldi takes part in the Genoa revolts. The revolts fail and, on 3 June, in his absence, he is sentenced to death by the Kingdom of Sardinia
1835 - He lives in hiding in Marseilles; then, he joins the privateer fleet of Tunis' bey; in December he sails to South America
1837 - He fights as a privateer for the Rio Grande Republic against Brazil; he is captured and tortured during one of his fights
1839 - He meets Anita Ribeiro and marries her according to the civil rite on board a ship
1840, 16 September - Menotti is born from the marriage of Anita and Garibaldi
1841 - Garibaldi moves to Montevideo with his wife Anita and their little boy Menotti
1841, 3 April - Garibaldi's father dies in Nice
1842, 26 March - Garibaldi marries Anita according to the religious Catholic rite in Montevideo
1842-1847 - He fights in Uruguay for the República de la Plata against Argentina: he sets up the Italian Legion
1843 - The legionnaires don the red shirt for the first time. In Montevideo, a daughter is born, Rosita Garibaldi, named after Garibaldi's mother, Rosa. She would die two years later
1844 - Garibaldi is initiated into the Freemasonry in Montevideo
1845, November - In Montevideo, shortly after the death of Rosita, a daughter is born, Teresita Garibaldi, named after Garibaldi's sister Teresa
1846, 8 February - Victory of San Antonio del Salto. From London, Mazzini praises the Italian Legion
1847 - Anita gives birth to a fourth child, Ricciotti
1848 - Garibaldi leaves South America on 15 April and lands in Nice on 23 June, to join King Charles Albert against the Austrians. Rejected by the Piedmontese government, he fights for Milan's revolutionary government in Luino, Varese and Morazzone, continuing to wage war also after the Salasco armistice. Finally, he finds refuge in Switzerland
1849, 9 February - Mazzini proclaims the *Roman Republic*. The Pope flees to Gaeta. Garibaldi rushes to assist the new republic. On 25 April, a powerful French army lands in Civitavecchia to defend the Pope. Also the Bourbons take action against Roman Republic. Garibaldi beats the French at Porta S. Pancrazio, and then the Bourbons in Palestrina (9 May) and in Velletri (19 May). When the Roman Republic

falls on 4 July, Garibaldi retreats at first towards Tuscany, and then Venetia, taking refuge in the Republic of S. Marino. After an unsuccessful attempt to reach Venice, sieged by the Austrians, he takes refuge in Ravenna where, on 4 August, Anita dies. A few days before, on 28 July, Charles Albert had died in Oporto, Portugal. On 24 August, Venice falls into the hands of the Austrians. Garibaldi manages to reach Liguria on 4 September, but is imprisoned in Genoa, where he is invited to choose a country to be exiled to. After being rejected from Tunis, Gibraltar and Spain, he finds asylum in Tangier, where he is given hospitality for six months by the Sardinian Consul

1850 - In early June Garibaldi sets out for the United States, stopping in Gibraltar and in Liverpool on the way. He reaches New York on 30 July 1850. He spends one week in a hotel on Staten Island (receiving, among others, the visit of the Venezuelan General Paez, also an exile), and is then given hospitality in various homes in New York and its surroundings. Finally, in early October, he moves into Antonio Meucci's home in Clifton, Staten Island. Here, he has the opportunity to rest and he also works in a candle factory with Meucci

1851, Spring - His friend Francesco Carpaneto arrives in New York. Carpaneto had purchased in Genoa a ship, the *San Giorgio* - then sailing from Genoa to Lima - and proposes to Garibaldi, who accepts, to accompany him on business trips throughout Latin America. On 2 April, a pass was issued to Garibaldi by the Mayor of New York, A. C. Kingsland

1851, 28 April - Garibaldi, and Carpaneto embark in New York on the steamer *Prometheus*, bound for Central America. Garibaldi travels under the pseudonym of Giuseppe Pane, which he had already adopted in 1834. They land in Chagres, a port on the Atlantic coast, near one end of the Isthmus of Panama, and they cross the isthmus various times to attend Carpaneto's trading business

1851, 15 August - During the last crossing of the isthmus (with departure from the port of San Juan de Nicaragua, destination Lima) Garibaldi has to stop, having contracted, in a severe form, a deadly tropical fever, from which he is miraculously saved by the loving care of some Italian friends residing in Panama. Still convalescent, Garibaldi embarks on an English steamer bound for Lima, stopping one day in Paita, where he visits Simón Bolívar's life-companion, doña Manuelita de Saenz. When he lands in Lima, still in bad health conditions, he is given hospitality by a family of Italian immigrants, that cures him of the after-effects of the fever contracted in Panama

1852, 10 January - After having fully recovered, Garibaldi meets in Lima a certain Pietro De Negri, who, had made a fortune with Peru's silver mines. The latter puts him in command of a cargo ship, the *Carmen*. With this ship, Garibaldi leaves Lima on 10 January 1852, with a cargo of guano, headed for Canton, in China, where he arrives after 93 days of navigation

1852, 12 April - Garibaldi lands at Canton. Here he loads various goods, after which he heads south towards Australia. After stopping at the Hunter Islands to stock up on water and vegetables, he crosses the Pacific Ocean, to return to Lima, where he lands after hundred days of navigation

1853, 24 January - Garibaldi lands at Lima. Here, he is communicated the painful news of his mother's death, that had occurred on 19 March of the previous year. He then goes to Chile with the *Carmen* to load wool and copper, to be shipped to Boston

1853, 6 September - Garibaldi reaches Boston. He leaves the command of the *Carmen* owing to some quarrels with Pietro De Negri and remains in the United States some four months,

again a guest in Antonio Meucci's home, in Clifton, Staten Island

1854 - On 10 January he definitively leaves the United States, as second-in-command on the merchant ship *Commonwealth*. He lands at London in February. From there he sails to Newcastle to load coal, then reaches Genoa on 10 May and goes to Nice, towards the end of May. Shortly after, he purchases a piece of land on the Island of Caprera

1855 - He joins the Sardinian navy as captain

1859 - After various meetings with Cavour, as well as with King Victor Emmanuel II, he sets up the volunteer corps known as the 'Cacciatori delle Alpi' (the 'Alpine Huntsmen'). In April, the second war of independence against Austria breaks out. Garibaldi defeats the Austrians at Casale (8 May), Varese and San Fermo (24-25 May), he enters Como, then Lecco, Bergamo and Brescia (14 June). He is nominated General of the Sardinian army, but resigns on 11 August, shortly after the Villafranca armistice (11 July). He visits various other cities, and then returns to Caprera, where he arrives on 6 January 1860

1860 - On 7 April, on hearing the news of a revolt in Palermo, Garibaldi organizes the expedition of the 'Thousand.' He weighs anchor in Quarto on 5 May, lands in Marsala on 11 May, proclaims himself dictator of the Two Sicilies, in the name of King Victor Emmanuel (Salemi, 14 May), defeats the Bourbons, with great difficulty, in Calatafimi (15 May) and enters Palermo on 27 May. He reorganizes the Sicilian army and administration, then defeats the Bourbons in Milazzo (20 July) and enters Messina on 28 July. He lands in Calabria on 9 August, reaches Nicastro on 29 August, and enters Salerno; from there, he reaches Naples on 7 September. He defeats the Bourbons in a tasking engagement at the Volturno River (2-3 October). On 21 October, he holds a plebiscite for the union of the former Kingdom of the Two Sicilies to Italy. About a month before, on 11 September, the Piedmontese troops had crossed the border of the Papal States and defeated the papal troops at Castelfidardo (18 September) and Ancona (29 September). On 26 October, Garibaldi and Victor Emmanuel II meet at Teano. On 3 November, the plebiscite becomes official, on 7 November Garibaldi and Victor Emmanuel enter Naples together. On 9 November, Garibaldi returns to Caprera

1861 - On 13 February the Piedmontese troops force the fort of Gaeta, the last Bourbon bulwark, to surrender. On 14 March, the Parliament in Turin proclaims the Kingdom of Italy and on 17 March, Victor Emmanuel II takes the title of *King of Italy*. Garibaldi, elected deputy in the Naples constituency, on 18 April has an open discussion with Count Cavour in Parliament, after which, on 1 May, he returns to Caprera. On 6 June, Cavour dies. On 8 June, Garibaldi receives an invitation from the President of the Unites States, Abraham Lincoln, to join the US federal troops, as Major-General, but he declines, if with regret

1862 - In spring, Garibaldi travels to many Italian cities to promote the seats of the 'Tiro a Segno Nazionale' (National Shooting Range). A planned expedition to Tyrol fails with the arrest of the Garibaldians in Sarnico, on 15 May. On 27 June, Garibaldi leaves Caprera bound for Palermo, where he organizes an expedition for the liberation of Rome. On 23 August, he lands in Calabria. On 29 August, he is attacked by Italian troops at Aspromonte, but he orders his men not to reply to the fire and is severely wounded in the right leg; he is then arrested and imprisoned in the Varignano fortress. On 1 September, he receives a second offer from US President Lincoln, which he is forced to decline, since he is wounded and imprisoned. On 5 October, he is amnestied by the King, on the occasion of the Princess Maria Pia's wedding. On 22 November, his leg is operated

on with success, but he is lamed for the rest of his life. Only in early 1863 can he return to Caprera

1864 - On 7 January, Garibaldi resigns from his post as deputy, followed by some twenty colleagues, as a form of protest against the government's policies. In spring he travels to England, where he is given a triumphant welcome and he meets many celebrities. On this occasion, he reconciles with Mazzini. He returns to Caprera on 22 April. In June-July, in Casamicciola (a town of the Island of Ischia, in the Gulf of Naples), he engages in talks with government officials, who (unsuccessfully) try to pry him away from further ventures in Italy. On 15 September, an agreement between Italy and France is signed (*September Convention*), according to which Italy renounces the annexation of Rome

1865 - In June, the capital of Italy is transferred from Turin to Florence. The French troops are still in Rome, but have agreed to evacuate by September 1866

1866 - Third war of independence. In June, Italy, allied with Prussia, declares war on Austria. On 10 June, Garibaldi is invited to organize volunteer troops. On 24 June, the regular Italian army is defeated at Custoza. Moreover, on 20 July, the Italian fleet is sunk by the Austrians in Lissa. Garibaldi, instead, advances from Salò with his 'Alpine Huntsmen,' successfully attacks the Austrians on 3 July, and is wounded in the left thigh. On 4 July, he occupies Monte Suello; on 16 July, with the help of the Piedmontese artillery he fends off an Austrian attack and occupies the Ampola fortress. In Bezzecca, on 21 July, he wins an important battle. On 26 July, Austria asks Prussia to grant the armistice, which is followed by the *Peace of Prague*, on 23 August. The Armistice with Italy is signed on 12 August. On 8 August, Garibaldi receives the order to suspend military action, replying with a historical *"I obey."* The peace between Austria and Italy is signed in Vienna, on 3 October. With it, Austria gives Venetia to France, as a reward for its neutrality in the conflict with Prussia, and France, in turn, gives it to Italy. Mazzini defines as *shameful* Italy's renunciation of Istria, Friuli and South Tyrol

1867 - In February, Garibaldi participates in the electoral campaign. In June, he prepares a new expedition on Rome. In September, he attends a conference in Geneva. Immediately thereafter he goes to Sinalunga to take part in the expedition to Rome, but is arrested on 24 September and taken back to Caprera under surveillance. On 15 October, he eludes surveillance and on 23 October he reaches Passo Corese, whence he advances against the Papal States. On the same day, the Cairoli brothers fall at Villa Glori, in the attempt to give support to the Roman revolters. Garibaldi conquers Monterotondo on 25 October, but is defeated in Mentana on 3 November by a powerful French army. On 26 November he is arrested by the Italian troops and taken back to Caprera

1868-70 - He lives in Caprera and starts writing his Memoirs and novels

1870 - On 19 July, France declares war on Prussia, but on 1 September it is beaten at Sedan and Napoleon III, made prisoner, abdicates. On 4 September, the Third French Republic is proclaimed and Garibaldi is called on to support it. On 20 September, taking advantage of the difficult French situation, the Italian army enters Rome (without Garibaldi), soon after the Italian government denounced the *September Convention* of 1864 with France. On 9 October, Rome is proclaimed capital of Italy. Meanwhile, Garibaldi reaches Marseilles on 7 October and organizes the *Armée des Vosges* in France. He beats the Prussians twice at Autun (10 and 31 December) then defends Dijon, until the fall of Paris (28 January 1871)

1872 - Garibaldi, elected deputy in France, on 13 February is received with hostility by the Assembly, which

had met in Bordeaux; he therefore returns to Caprera on 16 February. On 13 March, he is acclaimed commander of the national guard of Paris' *Commune* but, though manifesting his solidarity with it, he declines the offer. Between October and November, he supports movements like the *Socialist International* and the so-called *First Pact of Rome*, of which he signs the program
1874-1875 - Deputy in Rome, he presents a project envisaging the deviation of the course of the Tiber river and the reclamation of the Roman Plain
1879 - In April, he signs the manifesto of the *Democratic League*
1880, 14 January - Rome's Court of Appeals annuls Garibaldi's marriage with Marquise Giuseppina Raimondi. On 26 January, Garibaldi marries, before the Mayor of the Island of Maddalena, Francesca Armosino, legitimizing his children Clelia and Manlio
1880 - He goes to Genoa and Milan. He presents a program for restructuring the port of Genoa
1882 - In Palermo he takes part in the celebrations for the sixth centenary of the Sicilian Vespers. He dies in Caprera on 2 June at 6:22 PM

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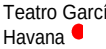
## GARIBALDI IN HAVANA

The analysis that follows was triggered by a request forwarded to the author by the Cuban Ambassador in Rome, Sr. Javier Ardizones Ceballos, aiming at verifying the correctness of the date of Garibaldi's visit to Havana, as reported in a commemorative tablet, affixed to an outside wall of the *Gran Teatro de Tacón*, currently *Teatro Nacional García Lorca* (see photograph below). Incidentally, as per information recently (1997) supplied by Prof. José Altshuler of Havana, the tablet was moved in the meantime to a more convenient place, being now affixed to the wall near the lateral entrance (on Calle del Obispo) of the *Museo de la Ciudad de La Habana*, a place which is daily visited by several hundred tourists.



Tablet in commemoration of Garibaldi's visit to Havana, affixed (in 1990) to an outside wall of the Teatro García Lorca of Havana

This tablet, donated by the city of Rome, bears an inscription that recalls Garibaldi's visit to Havana, as follows: *"Commemoration of the 130th Anniversary of the visit of Italy's liberator to the city of Havana."* The date at the bottom, 2 June 1982--coinciding with the centenary of Garibaldi's death--should imply that Garibaldi's visit occurred on 2 June 1852. However, on the basis of the reconstruction of the relevant events, reported in the following, it appears that the date implied in the above inscription is incorrect, though there is no doubt about Garibaldi's (as well as Mazzini's) open support to Cuba's fights for independence from Spain.

One of the most reliable Cuban historians, Fernando Ortiz, wrote, in a paper of 1941 (see bibl.), that Garibaldi became interested in the Cuban irredentist movements since the very first months following his arrival in New York. Here is an excerpt from his paper (translated from Spanish):

*"... Anderson and his friend Meucci had lived in Havana, and knew the political situation of the Cuban population. We do not know whether some other friend talked to Garibaldi about Cuba's revolutionary ideas, nor whether - as was likely - Garibaldi met at Ventura's place with our 'Lugareño'* [pseudonym of Gaspar Betancourt Cisneros, Editor's note], *or with Cirilo Villaverde; or, simply, that the rumors, which reached all the way to him, of the intense Cuban conspiracy that was stirring in New York at the time, added to the conversations he had with Anderson and Meucci. One thing is certain, and that is that Garibaldi conceived the project of organizing a separatist expedition to Cuba to support the revolutionaries and to lend his iron combative spirit together with the prestige of his glorious red*

*shirt to a new cause of independence. It was even said that, answering an observation about the Cubans not having any arms, the Nice hero exclaimed: 'A brave man can always find a weapon!' … But it is not known to what extent said irredentist-Garibaldian enterprise was carried out …*

*Garibaldi's participation in Cuba's emancipation wars ended up becoming certain. A Spanish historian, certainly not suspect of Cubanophilia, refers that to the famous Giuseppe Garibaldi, who, after his renowned revolutionary feats in Italy, was residing in the North American Republic, the conspirators immigrated from Cuba offered the command of the new expedition which they were preparing against the island, but, at the time, Garibaldi turned down their offer, because of the pending events in his country (Justo Zaragoza, Insurrecciones de Cuba, Madrid, 1873, Vol. 2, p. 613). Havana's 'Diario de la Marina' of 4 August 1850 revealed that Giuseppe Garibaldi would join the expedition that was being prepared by General Narciso López. Similar news was given by various North American newspapers (F. Ortiz, 1938, Vol. XLI, No. 1, p. 129) …"*

It must be remarked that Ventura's restaurant, which was located on Fulton Street, between Broadway and Nassau Street, was quite near to John Anderson's shop, as stated in Roy Bredholt's thesis (see bibl.): "… [at Ventura's] *Garibaldi met John Anderson for the first time, … a rich tobacconist who had his shop in Nassau Street around the corner from the eatery …"* Moreover, the Ventura's was also very near to the Head Office of the newspaper *Commercial Advertiser*, located on Fulton Street and Nassau Street, where the Cuban flag, designed by Narciso López, flew for the first time. This corroborates Ortiz's hypothesis that Ventura's Restaurant was a meeting place where Cuban and Italian irredentists convened, hence, where probably López and Garibaldi met.

Thanks to Prof. José Altshuler of Havana, we could get hold of the passage from Mr. Zaragoza's book (see bibl.), quoted by Ortiz, though we found it in "Vol. 1" of the book, instead of "Vol. 2," as was indicated by Ortiz in his paper. It reads:

"*… In one of those steamers, called 'El Georgia,' at the beginning of December 1850, was sailing, with the purpose of training himself for the command, the famous José Garibaldi, who, after his renowned revolutionary enterprises in Italy, was residing in the nearby American Republic, where the conspirators immigrated from Cuba offered him*

*the command of the new expedition that they were preparing against the island, which offer Garibaldi refused, given the then pending events in his country …"*

As we can see, neither Ortiz nor Zaragoza explicitly mention a visit of Garibaldi's to Havana. As for Garibaldi's refusal to take command of an expedition to Cuba, we should recall that a similar refusal, for the same reasons (pending events in Italy), was given by Garibaldi to President Abraham Lincoln on 8 June 1861, as mentioned in the preceding chapter. In Adolfo Rossi's book (see bibl.), the reason for Garibaldi's refusal to get involved in anything that would distract him from the events in Italy is highlighted as follows: *"... Garibaldi always expected a change in Italy's situation and wanted to live in darkness, forgotten and withdrawn, in order to be ready to immediately respond to any call …"* However, in the case of the expedition to Cuba, there might have been some other reasons for his refusal, as we shall see shortly.

In Mr. Zaragoza's book (published in 1873) it is stated that at the beginning of December 1850 Garibaldi was on board a steamer called *El Georgia*, with the main purpose "of training himself for the command." We know, however, that Garibaldi did not need any training for the command of a vessel, given his long and qualified experience in that job. Perhaps, Zaragoza meant that Garibaldi was training himself for the command of an expedition to Cuba (or, less likely, for the command of a steamer, then requiring different skills than the command of a sailing vessel). Luckily, we have found a more detailed description of Garibaldi's journey on the steamer *Georgia* (though on a different date) in the above quoted Adolfo Rossi's book, which offers another motive for that journey. It reads:

*"… One day, in 1852, Garibaldi suddenly left* [Meucci's house] *without seeing anyone: but two weeks later he returned to the Staten Island. He had gone to Havana*[18] *to gather information 'in person' on the revolutionary movement led by López, whom he was in contact with; but he was so unenthused over it that he returned on board the*

[18]This duration of 'two weeks' for a round-trip New York-Havana-New York (assuming that Garibaldi stopped very briefly in Havana) is consistent with the average sailing speed of ships at the time. For instance, the Meuccis left Havana on 23 April 1850 on board the brig *Norma*, and landed at New York on 1 May 1850, hence, after about a week of navigation. Therefore, there is no wonder that, two years later, the steamer *Georgia* would make the same crossing in much the same time.

*same steamer, the 'Georgia.'*[19] *That city had made a bad impression on him; therefore, he was very happy to return to his friends, in the modest house in Clifton, and to his studies ..."*

Of course, there is a substantial difference between Zaragoza's date (beginning of December 1850) and Rossi's date (one day, in 1852) for Garibaldi's journey on board the *Georgia* (assuming that they were speaking of the same journey), as well as on the purpose of that trip. It also appears that the above Rossi's passage may have been the source for the inscription on the tablet donated to Havana by the City of Rome, as it explicitly mentions Garibaldi's visit to Havana (though with a negative outcome), in the year 1852. As Rossi's book (written in Italian and published in 1899) became very popular and appreciated over all Italy, there is no wonder that the city of Rome got inspiration from it, in preparing said commemorative tablet. We suspect, however, that Rossi's words "one day, in 1852," should read "one day, in 1851," not because of a mistake by Rossi himself, but by a mistake by Antonio Meucci, from whom Rossi obtained such information during a visit he paid to the former in 1881[20]. In fact, it should be taken into account that Antonio Meucci, on several occasions, mistook his (as well Garibaldi's) arrival in New York, saying that it was in 1851 instead of 1850, hence, he was inclined to shift by one year forward all related events.

The above hypothesis is corroborated by the statement in said passage of Rossi's book: *"López, whom he* [Garibaldi] *was in contact with,"* because Narciso López was garroted on 1 September 1851, therefore he could not have been *in contact with* Garibaldi in 1852, but in 1851 (before September, of course). It should also be noted that, in Rossi's book, Garibaldi's visit to Havana is reported after having reported on Mr. Carpaneto's arrival in New York and before reporting on Carpaneto's and Garibaldi's departure from New York, both of which occurred in the Spring of 1851. Therefore, in addition to correcting Rossi's

[19]Sr. Eusebio Leal Spengler, director of the *Museo de la Ciudad de La Habana*, in a conversation with the Author, expressed the opinion that Garibaldi actually remained on board, in order not to risk being captured by the Spanish Police.

[20]We consider Adolfo Rossi (who was, at the time, the Chief Editor of the Italian paper *Il Progresso Italo-Americano* in New York) a very accurate and objective writer, therefore we deeply rely on the information given in his book, as being faithful to his interviews. It is also to be remarked that Rossi's book was published not too long after his visit to Antonio Meucci.

date as "one day, in 1851," we could better specify the same as "one day, in Spring of 1851." This latter date is, of course, nearer to Mr. Zaragoza's date (the beginning of December 1850), than Rossi's original "one day in 1852," even if the motives for Garibaldi's journey on board the *Georgia* were not exactly the same for the two writers. A final confirmation of the mistaking of the year 1852 in Rossi's book, comes from the fact that, as clearly shown in the diagram below, summarizing Garibaldi's moves in the period between 1850 and 1854[21], during about all the year 1852 Garibaldi was engaged in his round trip journey from Lima to China and back, therefore it was impossible for him to have made a round trip from New York to Havana and back at any time in that same year. As for the first two weeks of the year 1852, according to Garibaldi's Memoirs (see an excerpt in the following), he was engaged (in the Lima's area) in preparing the load destined to China.

Garibaldi's moves between 1850 and 1854

We have found another interesting testimony on the same subject, in a paper published in 1907 by Henry Tyrrell (see bibl.), who also visited Antonio Meucci, only a few years after Adolfo Rossi. The reader may find here many analogies with the aforementioned paper by Fernando Ortiz, which, however, was published many years later (1941).

"… *It must have been through the conversations of Anderson and Meucci, both of whom had visited Havana and were intimately acquainted with the political conditions there, that Garibaldi became interested in the idea of a revolution for Cuban independence. Of these conversations, of course, no record remains; however, a statement by Garibaldi that was handed down, appears today as prophetic. Answering an observation, according to which the Cubans in their country were desperately poor and unarmed, he exclaimed: 'A brave man can always find a weapon!'* …

*When, early in the year 1851, Garibaldi and Carpaneto engaged, on board the 'San Giorgio,' a small trading vessel, on what was ostensibly a voyage of commercial speculation in Central America, they sailed first to Havana, where it appears they had important, though mysterious, business. Garibaldi himself, in his posthumous memoirs, tells us that he assumed the name of Giuseppe Pane, an alias which he had previously used when he was affiliated with the Young Italy movement as far back as 1834. Indeed, this*

[21]The dates shown in the diagram are taken from the 'Chronology' in the preceding chapter "Giuseppe Garibaldi."

*Central American voyage of 1851, precise dates and details of which remain in impenetrable obscurity, may not have been a filibustering expedition. If, however, the true relation of Garibaldi to Cuban independence could be made known, it would make more of a story than has ever yet been set forth in cold print …"*

In this passage, Tyrrell mentions a date for Garibaldi's journey to Havana as "early in the year 1851," midway between Zaragoza's "beginning of December 1850" and Rossi's (corrected) "one day, in Spring of 1851." Unfortunately, however, instead of the steamer *Georgia*, Mr. Tyrrell mentions Carpaneto's trading vessel *San Giorgio*, and, instead of a New York-Havana round-trip (lasting two weeks on the whole), as reported by Rossi, Tyrrell wrote "they headed *first* for Havana," implying that the journey to Havana was the first stretch of Carpaneto's many business trips to Central America.

Now, it can be easily demonstrated that the ship mentioned by Tyrrell could not have been the *San Giorgio*, for Garibaldi and Carpaneto (as was announced by the *New York Tribune* of 29 April 1851, and remarked by Nelson H. Gay, see bibl.), left New York on 28 April 1851 (which date may not precisely agree with Tyrrell's date "early in the year 1851"), on board the steamer *Prometheus*, heading for Central America, while the *San Giorgio* was, independently, sailing from Genoa to Lima. In his Autobiographical Memoirs (see bibl. as well as the passage reported below), Garibaldi stated that they first headed for Chagres (currently Nuevo Chagres, near the Atlantic end of the Isthmus of Panama)—not for Havana—and then proceeded, on board several other vessels, to many other cities of Central America, without ever mentioning Havana, nor hinting at the political situation there. Only after those many trips he said that he arrived at Lima, towards the end of 1851, where he saw for the first time the *San Giorgio*, and shortly after he sailed for China on board the ship *Carmen*, under his command. Here is the relevant passage from his Memoirs:

*"… Eventually, my friend Carpaneto arrived in New York. He had started a big business for Central America. The 'San Giorgio,' a ship owned by him, had sailed from Genoa with part of the cargo, whereas he had gone to England to prepare the rest of it and ship it to Gibraltar, where the 'San Giorgio' would pick it up.*

*It was decided that I would accompany him in Central America and we made the preparations for leaving. Thus,*

*in 1851, with Carpaneto, I made a journey* [*from New York*, Editor's note] *to Chagres on board an American steamer* [*the Prometheus*, Editor's note]*, Captain Johnson. From Chagres, on board a yacht of the same nationality, we passed to San Juan del Norte, where we took a pirogue, sailing upstream the same river of San Juan up to the lake of Nicaragua. We crossed the lake and finally we reached Granada, the most important city and trading port of the lake … In Granada, Carpaneto's business operations started and from there we visited, for the same purpose, various parts of Central America, crossing several times the Isthmus of Panama … I accompanied my friend in those excursions more as a traveling companion than as a collaborator in his trading activities, in which I confess to be a novice*[22] *… At the time, I traveled under the name of Giuseppe Pane, which I had already adopted in 1834, to avoid arousing curiosity and being molested by the police ...*

*For the commercial speculations of Carpaneto, the arrival at Lima of the ship 'San Giorgio' was essential and he had planned to go to that city to wait for her. We therefore returned to San Juan del Norte, passed again through Chagres and from there we sailed upstream the Cruz River, to get to Panama*[23]*. In this latter trip I was assailed by terrible endemic fevers* [probably malaria, Editor's note] …

*We boarded the English steamer that was to take us to Lima … At Lima, we found the 'San Giorgio' ... Mr. Pietro De Negri entrusted me with the command of the 'Carmen' and I prepared for a trip to China … My friend Carpaneto sailed from Lima with the 'San Giorgio,' headed for Central America, to pick up the cargo that he had prepared. I was not to see that dearest man again … as he would die of cholera a few years afterwards …*

*I sailed shortly after with the 'Carmen' towards the Chincha Islands to the south of Lima* [*a distance of about a hundred miles*, Editor's note]*, where we took a load of guano destined to China, and I returned to Callao* [*Lima's port*, Editor's note] *for the latest preparations of the long trip*

[22]Perhaps, Mr. Zaragoza's words *"with the purpose of training himself for the command"* could also have been inspired from this passage of Garibaldi's Memoirs, a first version of which had been published in 1860 (by Alexandre Dumas), thirteen years before the publication of Zaragoza's book. However, Garibaldi stated that he was 'a novice' in the trading activities, not in the command of a ship.

[23]We remind the reader that the Panama Canal was built many years later (1904-1914).

…" [the account of his round-trip to China, etc. follows].

In conclusion, from Garibaldi's recount, it appears that he never sailed on board the *San Giorgio*. We, therefore, have a strong feeling that Mr. Tyrrell mistook the *Georgia* (mentioned by both Rossi and Zaragoza) for the *San Giorgio*, being the two names very similar[24]. Moreover, Garibaldi's description of the many places where he and Carpaneto stopped (or whereby they passed) on their way from New York to Central America and from here to Lima is so detailed that one can hardly believe that he forgot to mention his alleged *first* stop in Havana for *mysterious business*, as reported in Mr. Tyrrell's paper.

As a remote possibility, it might be taken into account that the final version of Garibaldi's Autobiographical Memoirs appeared in 1872, when Cuba was still in the very middle of its *Ten Years War* against the insurrectionists led by Carlos Manuel de Céspedes (see the chronology below). Therefore, it could have been possible that Garibaldi had purposely avoided to disclose, in his memoirs, names of persons, places and circumstances that could harm the insurrectionists. However, had this hypothesis been true, and crediting Mr. Tyrrell's mention of Garibaldi's visit to Havana as a *first stop* on his way to Central America, we should assume that the *Prometheus* had stopped in Havana, on her way to Chagres (contrary to what Garibaldi wrote). Accordingly, Garibaldi's visit would have occurred on or about the 6 May 1851 (namely, seven days after his departure from New York), though on board the *Prometheus*, instead of the *Georgia*, and, moreover, without any possibility for him to personally give his feedback to his Cuban friends in New York. This latter circumstance, together with the contrast of this hypothesis with both Rossi's and Zaragoza's (and Garibaldi's) quotations, leads us to opt for our former hypothesis, i.e. that Tyrrell mistook the *San Giorgio* for the *Georgia* and Garibaldi's first stop in Havana on his way to Central America for his round trip New York-Havana and back.

In any case, notwithstanding the (possibly prudent) silence of Garibaldi on the matter, given that both Adolfo Rossi and Henry Tyrrell obtained the information regarding Garibaldi's moves from the lips of Antonio Meucci in much the same epoch (1881-1883), and that both mentioned a visit of Garibaldi's to Ha-

[24]It may be interesting to note that, in Nelson Gay's paper (see bibl.), the author stated that "*Mr. Tyrrell's paper* [of 1907, quoted here] *contains many gross mistakes.*"

vana, 'for gathering information on the revolutionary movement led by López,' according to Rossi, or 'for mysterious businesses' (which may mean the same thing), according to Tyrrell, and assuming that the ship on which Garibaldi traveled was the *Georgia*, mentioned by both Rossi and Zaragoza (as well as by Tyrrell, if we correct his mistake of the *San Giorgio*), it remains to try to resolve the doubts on the precise date for that visit, on the more plausible hypothesis that it was paid during an ad-hoc round trip from New York.

To this end, through the precious help of Mr. John Celardo (see bibl.), of the Northeast Branch of the National Archives, in New York, the records (on microfilm) of all the arrivals[25] in New York of the ship *Georgia*, from December 1850 to May 1851 were examined, and the following information was obtained:

1. The *Georgia* arrived in New York about every month, at about the same day of the month, more precisely at the following dates: 7 December 1850; 6 January, 7 February, 8 March, 8 April, and 6 May 1851.
2. The *Georgia* left from Chagres for all voyages except the one arriving in New York on 8 April 1851, which left from Havana.
3. For unknown reasons, the passenger list of the 8 March 1851 arrival was not on microfilm.
4. In none of the remaining (six) passenger lists of the *Georgia* arriving in New York was found a passenger named either Giuseppe Garibaldi or Giuseppe Pane.

As a consequence of the above, the only possibility for a visit of Garibaldi's to Havana in the aforesaid period, is that he was on board the *Georgia* arriving in New York on 8 April 1851 and that he was using a different alias, other than Giuseppe Pane[26]. Accordingly, he could have left New York for Havana two weeks before, as Mr. Rossi wrote, and, after his return to New York, he could have stayed "with his friends in Clifton" up to the following 28 April, when he left with Carpaneto on board the *Prometheus* for Central America.

This hypothesis also fits quite well with another statement by Mr. Rossi (op. cit.):

[25]Unfortunately, at National Archives and Records Administration, Northeast Region, New York, NY, only the arrivals of ships (of the past century) and the related passenger list are recorded. To obtain information on ship departures, one should peruse the newspapers of the time.

[26]On the other hand, Garibaldi wrote in his Memoirs that he used the alias Giuseppe Pane during his journey with Carpaneto in Central America, not mentioning what else he did in other trips.

*"… as rumors spread of the imminent departure of Garibaldi* [for Central America], *the number of visitors tripled …,"* implying that everybody was afraid that Garibaldi would stay away from New York for a long time. It is, therefore, quite plausible that, following said rumors, the Cuban conspirators urged Garibaldi's help *before his departure for Central America*, and that, to give his feedback in time, he had to make his survey in Havana before his same departure for Central America.

In this respect, it is to be remarked (see the chronology below, summarizing the main events related to Cuba's independence fights) that Narciso López's first attack to Cuba was brought more than two months before Garibaldi's arrival in New York and that it failed, also because the population did not give him any help. It was therefore likely that, since his arrival in New York, Garibaldi was asked by Cuban exiles to either participate in or give his advice for their subsequent expedition. Garibaldi, on his side, wanted to know beforehand the situation in Havana, in much the same way as, in 1849, he wanted to know the situation in Florence, before responding to a similar request for help advanced by Francesco Domenico Guerrazzi (see the preceding chapter). The outcome of both surveys was negative (as for Havana, Rossi wrote: "*that city had made a bad impression on him,"* referring to the apathetic attitude of the population towards the insurrectionists), hence, his advice must have been consistently negative. This notwithstanding, López's second expedition took place, on 12 August 1851 (about three months after Garibaldi's return from Havana), with that tragic outcome that we know of.

### Chronology of the fights for Cuba's independence

1850, 11 May - The Cuban flag, designed by Narciso López, flies for the first time in New York, at the Head Office of the newspaper *Commercial Advertiser*, on Fulton St. and Nassau St.

1850, 19 May - Narciso López organizes a military coup at Cárdenas (150 km east of Havana) where he lands with a legion of volunteers. He is joined by 24 Spanish soldiers and a sergeant, but not by the population of Cárdenas. The town is in his hands for only 48 hours, after which he is forced to sail back to the United States.

1850, 4 August - According to Fernando Ortiz, the *Diario de la Marina* (the most important newspaper of Havana, controlled by the government) revealed that Giuseppe Garibaldi would join the expedition to Cuba that was being prepared by Narciso López.

1850, November - José Gutiérrez de la Concha takes office as Cuba's Governor.

1851, 12 August - Narciso López, setting off once again from New Orleans, LA, lands on the northern coast of Cuba, close to today's Bahía Honda. His expedition also includes

one hundred and fifty Americans, under the command of Col. Crittenden. The Spaniards, however, had received advance warning of this expedition and easily defeate the invaders, executing and mutilating Col. Crittenden and fifty of his men in Havana, at the Castle of Atarés, on 16 August. López is captured on 29 August and garroted three days later. During the same period, other insurrections organized by Cuban non-annexationists take place, but they are all quelled by the Spaniards.

1868 - After many years of scarce irredentist initiatives, a revolution breaks out under the leadership of Carlos Manuel de Céspedes, who frees the slaves on his estates and declares war on Spain, known as the *Ten Years' War*. In 1878, a peace treaty is signed, after which thousands of Cubans emigrate to the United States, where they establish a large colony. A second war of independence begins in 1879 and fails in less than a year.

1895 - The so-called *Necessary War* begins, under the command of José Martí. On 15 February 1898, the United States declare war on Spain after a US cruiser is destroyed in the port of Havana (causing the death of two hundred and eighty-eight American sailors) and land in Santiago de Cuba. On 1 January 1899, a peace treaty is signed with Spain. Under the treaty, the Spaniards leave Cuba, after 407 years of colonial rule.

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[27]This book, although identical, in the main text, with the original Garibaldi's *Autobiographical Memoirs* (in their definitive version of 1872, edited by the Real Commission, and published by Cappelli, Bologna, 1932), contains very many explanations, corrections and additions, that have helped very much this author in clarifying a number of issues, dealt with in this book.

## HISTORY AND INSTITUTIONS OF STATEN ISLAND

### General information - Historical background

Staten Island measures 22.2 km from North to South and 12.6 km from East to West. Its Northern coast is situated some 8 km south of Manhattan. Today, Staten Island has a population of roughly 350,000. It belongs to the State of New York, of which it is the southernmost county, the Richmond County.

| *Year* | *Population* |
|---|---|
| 1661 | 19 |
| 1698 | 727 |
| 1738 | 1,500 |
| 1775 | 3,000 |
| 1791 | 4,274 |
| 1850 | 15,961 |
| 1860 | 26,000 |
| 1886 | 60,000 |
| 1940 | [28]200,000 |
| 1975 | 322,958 |
| 1990 | 378,977 |

Map of Staten Island

The northern part of the island presents a rather hilly landscape. The tallest hill is Todt Hill (altitude: 125 m). Weather tends to be quite rainy (annual rainfall, on average, exceeds 1500 mm), which favors vegetation. The temperature hardly drops below zero. Indeed, here are the average monthly values (in degrees centigrade):

January, 0°; February, 0.6°; March, 5°; April, 11°; May, 16.7°; June, 22.2°; July, 25°; August, 23.9°; September, 20°; October, 15°; November, 8.3°; December, 1.7°.

Giovanni da Verrazzano[29], an Italian, discovered Staten Island in 1524. Around 1630 (sixteen years after the Dutch reached Manhattan[30]), a Michael Paw took over Staten Island (which was inhabited by Algonquian Indians at the time) as well as part of New Jersey. In 1639, the island passed into the hands of a Captain DeVries, who sent some colonists there; the latter, however, were chased away by the Indians. Another attempt was made in 1650, but it failed for the same reason. Following a peace treaty signed with the Indian chiefs in 1660, the following year, 1661, nineteen people, among Dutch and French, could peacefully settle down on Staten Island, in an area close to what is currently South Beach (not far from the present Verrazzano Bridge). In 1664, as is common knowledge, the English took New York (called Nieuw Amsterdam at the time) from the Dutch. In 1670, Governor Thomas Lovelace bought Staten Island from the Indian

[28]This figure was given by Santoro (23 March 1940, see bibl.).

[29]In the United States the name is sometimes shortened to *Verrazano*.

[30]The Island of Manhattan was bought off the Indians in 1626 in exchange of various goods, worth $24 of that time.

chiefs, thus giving way to new colonial settlements on most of the island's coasts. Staten Island returned to the Dutch only for one year (1673), after which it was taken back by the English who, in 1683, named it Richmond County. According to the 1698 census, Staten Island's population amounted to 727, 10% of which consisted of slaves. Around 1738, the number of colonists rose to approximately 1500, mostly farmers and fishermen, of English, French or Dutch origin. There were very few Italians, as Daniel Santoro relates (see hereinafter). The following figures concerning population growth were taken from the publication "Staten Island and its Points of Interest" (see bibl.):

New impetus to the development of the island came later, when the war of independence against the English ended, in 1783, so that, in the 1791 census, the population amounted to 4274. The island, like the entire area of New York, was not involved in the second war against the English (1812-1815), after which the island's activities were transformed from primarily rural to industrial. At the same time, the settlements became veritable villages and, nearby, private houses and buildings of a certain architectural value were erected. The first local newspapers were introduced, some private schools were opened, followed by public ones, companies of volunteer firefighters were set up and a new railroad was designed. This notwithstanding, in 1850, the island's population was slightly below 16,000.

After 1850, immigration from Europe started to reach Staten Island as well, especially on account of the local industries. An unfortunate event connected to immigration was the burning of the Quarantine Buildings - situated between Clifton and Stapleton - in September 1858. The fire was started by the population on account of the diseases supposedly brought to the nearby towns by ill immigrants who were forced to stay at the Quarantine.

The first railroad section, which covered twelve kilometers, was opened on 23 April 1860; this section connected Clifton (where the station was located very close to the Vanderbilt Landing) and Eltingville. A few years later, the railroad was extended by seven kilometers and thus reached Tottenville, at the southernmost tip of the island. On 2 February 1864 - when the close interdependence between land and sea transportation was acknowledged - the ferryboat system was purchased by the *Staten Island Railroad* (currently the *Staten Island Rapid*

*Transit*), thus giving rise to a new company, the *Staten Island Railway Ferry Company*. This company provided a regular service between Manhattan and the three Staten Island landings, from 7:00 AM to 6:00 PM.

In July 1863, while New York was shaken by the riots against the Draft Act, which imposed obligatory draft (during the Civil War), accidents occurred also on Staten Island, causing damages to some property. Many blacks had to leave their homes. Fortunately, however, there was "little" bloodshed. When the Civil War ended, with the surrender of Richmond, VA, on 3 April 1865, an experts committee met to discuss the problem of the island's small population. It came to the conclusion that it was necessary first of all to improve the ferry boat service and to fight malaria. Consequently, transports were reorganized, as was already mentioned, by providing a system of horsecars along all of the northwestern coast of the island.

Plate on the Verrazzano ferry

A Staten Island businessman, Erastus Wiman, built a grand Casino in St. George, which featured a great deal of attractions, including concerts, various types of artistic performances and even a field for the Indian ball game of lacrosse. Towards the end of the 1870s, Wiman hired Buffalo Bill and his *Wild West Show*, who performed in a ring that was built in a town on the northern coast, lit by the all-new voltaic arc lamps. All this undoubtedly contributed to attracting thousands of visitors to the island, some of whom settled down there. In 1886, the island had a population of 60,000. In 1898, Staten Island became one of the boroughs of New York City and, in 1904, a modern seat for the borough was built in St. George. In that same year, *Curtis High School* was opened.

The three large bridges that connect Staten Island to New Jersey — *Outerbridge Crossing*, *Goethals Bridge* and *Bayonne Bridge* — were built between 1928 and 1931. The one that connects Staten Island to Brooklyn, the *Verrazzano Bridge*, was completed in June 1959.

A specific appendix, "The Staten Island Ferry," contains information on the history of the ferry boats as well as of the *Staten Island Railroad* and the *Staten Island Rapid Transit* (SIRT) companies. Here, instead, we provide a short history of three important institutions that played an important role in the research conducted by the Author to write this book: the *Staten Island Historical Society*, the *Staten Island Institute of Arts and Sciences*, and the *Staten Island Italian Historical Society*. For

what concerns the *Garibaldi-Meucci Museum*, always on Staten Island, its history is illustrated at length in the appendix entitled "History of the Forest Cottage."

Current seat of the «Staten Island Historical Society»

## Staten Island Historical Society

The *Staten Island Historical Society* was founded on 8 July 1856; its offices were set up in Castleton and Northfield. The aim of the society was *"to collect and preserve whatever may relate to the History of Staten Island and to establish a Library and Reading Room, and in connection therewith to promote Scientific and other Knowledge by means of Lectures upon Scientific and Literary Subjects."* The society was reorganized on 16 August 1900, in New Dorp; Rev. Wilbur Fiske Wood was elected President and Ira K. Morris, the famous historian from Staten Island and editor of the *Richmond County Standard*, was appointed Secretary. The society was reorganized again on 17 April 1920. On this occasion, Ira K. Morris was elected President and the well-known Cornelius G. Kolff, mentioned in the appendix "The Staten Island Ferry," was elected Secretary. Since Ira K. Morris died on 4 April 1921 (at the age of 74, in his house in West Brighton), Cornelius G. Kolff was appointed President. On 20 April 1922, the society incorporated the *Staten Island Antiquarian Society*. At the meeting that took place on 28 September 1922, the new society elected William T. Davis (see bibl.) as President whereas Cornelius G. Kolff was restored to the position of Secretary. At the same meeting it was decided that the society would be moved to the so-called *old Perine house*, on 1476 Richmond Road, Dongan Hills. On 10 August 1934, the President of the Staten Island borough gave to the *Staten Island Historical Society* permission to use the *Old County Clerk's Office* in Richmond as a Museum (not to be confused with the *Museum of Staten Island* in St. George, which is mentioned hereinafter).

## Staten Island Institute of Arts and Sciences

### Museum of Staten Island

The *Staten Island Institute of Arts and Sciences* originated on 12 November 1881, from the *Natural Science Association of Staten Island*, considered to be the island's most ancient cultural association. Its seat, at the north-east corner of St. Mark's Place and Hyatt Street, no longer exists, for the building was torn down. The aim of the society was to showcase *"a collection especially of Staten Island objects."* The founding members

were eminent men, well-known in the cultural and scientific fields: Nathaniel L. Britton, William T. Davis, Edward C. Delavan Jr., Arthur Hollick and Charles W. Leng. On 10 November 1883, the association began to publish its *Proceedings* and, except for a short period of time (1959-1967), it has continued to do so to the present day.

The official incorporation of the society took place on 19 January 1885. In 1906, the *Natural Science Association of Staten Island* was reincorporated as the *Staten Island Institute of Arts and Sciences.* Thus, patronage of the arts became another objective of the society. In 1907, one year after its reincorporation, a Museum was opened to the public which was temporarily set up on the last floor of the Borough Hall. In September 1918, a building was completed which was to contain the *Museum of Staten Island.* The building had only one floor; other two were added later, one of which was used as an art gallery. Its field of activity focuses on interrelations between Art, Natural Sciences and History, all regarding Staten Island. The Museum is owned and run by the *Staten Island Institute of Arts and Sciences.*

The «Staten Island Institute of Arts and Sciences», today

## Staten Island Italian Historical Society

The date on which the *Staten Island Italian Historical Society* was founded is not precisely known, since we could not find its regular Certificate of Incorporation. In the available literature, we have found controversial dates, although they can be explained to some extent. It is certain that the society was founded by the Italian architect Daniel Santoro, a resident of Staten Island, as of 1907, of whom we provide a short biography in the following.

According to some documents (Santoro, Rallo, 1955, and Santoro, 18 February 1950, see bibl.), the *Staten Island Italian Historical Society* was set up in 1929. Actually, between 1929 and 1930, Santoro founded the *A. Meucci Memorial Association* which, as we shall see, later merged with the *Staten Island Italian Historical Society*. Prior to founding the *A. Meucci Memorial Association,* Santoro is mentioned (see *Il Faro dell'Isola*, 7 and 21 March 1930) as the Secretary of the *Federazione delle Società, Logge e Clubs Italiani di Staten Island* (*The Federation of Italian Societies, Lodges and Clubs of Staten Island*), and, in this capacity, in 1930, he proposed to organize a first celebration in honor of Antonio Meucci, as is written in a

booklet by Santoro, printed in 1935 (see bibl.). Said celebration took place on 12 April 1931, as was written in the issues of *Il Progresso Italo-Americano*, dated 11 and 14 April 1931, which amply describe the initiative of the *A. Meucci Memorial Association*; mentioning a number of societies which took part in the celebration, less the *Staten Island Italian Historical Society*. The following year, 1932, the second celebration in honor of Antonio Meucci took place in the afternoon of 12 April, with a speech by Dr. Francesco Moncada (who has been mentioned several times already), in the presence of the Borough President, John A. Lynch. The event was organized by the *A. Meucci Memorial Association*, with Daniel Santoro mentioned as the honorary Chairman. Some twenty newspaper articles describing the event were collected by the association into a booklet (see bibl.), and none of them mentioned the *Staten Island Italian Historical Society.*

The first official document of the «Staten Island Italian Historical Society»

We found a first mention of the *Staten Island Italian Historical Society* (although its name is not indicated) in a letter written by Santoro to a Mr. Testera, dated 3 January 1935, in which he says, among other things: *"… This society aims to commemorate, around mid-April, the birth of the inventor, like the 'Antonio Meucci Memorial Association' has been doing for several years now; this year, instead, the commemoration will be sponsored by this society, which encompasses all of that which concerns the history of the Italians on Staten Island …"* Some two months later, on 1 March 1935, the name and symbol of the *Staten Island Italian Historical Society* appear for the first time in another letter, addressed by Santoro to the newspaper *Staten Island Advance.* The header of this letter is reproduced below. It is worth noting that the seat of the society is indicated at the *Staten Island Museum, St. George, S.I.*, although at the bottom of the letter the following sentence is written: *"Address Correspondence - 257 Bement Avenue, Staten Island 10, N.Y.,"* which corresponds to the private address of Daniel Santoro (indicated as *Director*, in the header).

Daniel Santoro, in his typescript *A short History of S.I. Italian Historical Society* (see bibl.), related that the first meeting of the *Staten Island Italian Historical Society* took place at the *Staten Island Institute of Arts and Sciences, St. George, S.I.* From this, one can deduce that the two organizations were, at the time, closely connected. In the same note, Santoro stated: *"The 'Antonio Meucci Memorial Association,' organized by Daniel*

*Santoro in 1929 for the purpose of commemorating the birth of Antonio Meucci, the inventor of the telephone, was merged with the Society and carried on the yearly commemorative exercises and research to establish Meucci as the real inventor of the telephone."*

From all the above, it appears that Daniel Santoro conceived the *Staten Island Italian Historical Society* as a continuation and extension of the *Antonio Meucci Memorial Association*, sometimes quoting the date of foundation of the latter as the foundation of the former. In various documents of 1935, 1940, 1946 and 1950, Daniel Santoro is always mentioned as either *Executive Secretary* or *Director* of the society, while Ralph Cerreta is always indicated as President.

We also found, on April 1952, a mention of an *Italian Club of Staten Island*, chaired by an A. Franzonello, who was connected in one way or another to the *Staten Island Italian Historical Society*, since Santoro collaborated with him in writing a paper on Antonio Meucci (see bibl.). Finally, we reproduce hereunder a document written early, in 1950, by Daniel Santoro (see bibl.) on the *Background of the Society*.

## Background of the Society

*The Italian Historical Society was formed in 1932. In 1934 the Antonio Meucci Association founded by Daniel Santoro, merged with this Society.*

*The objectives of the Society are: To preserve and protect buildings and sites of historical interest; to collect and preserve historical data, records, relics, and other objects of historic value; to study Italian historical contributions; to diffuse public knowledge of such contributions to the end that the aims and ideals of Italians in America may be advanced.*

*In the past, commemorations have been held to honor Giuseppe Garibaldi who resided in Rosebank from 1850 to 1853; Antonio Meucci who resided in Staten Island from 1850 to 1889, the time of his death; Giovanni da Verrazzano, the discoverer of Staten Island; and Cristoforo Colombo.*

*In 1936 twelve radio addresses on Italy were given over a network of 27 radio stations. Numerous illustrated lectures on Italian art, history and literature were also given. That same year, 2500 bronze and silver medals were distributed to commemorate the discovery of Staten Island by Verrazzano.*

*The publication and free distribution of pamphlets and literature pertaining to the history of the Italians in America is a regular feature.*

*A complete record of the names of Staten Island men and women of Italian origin who served in World War I has been compiled. A similar compilation for World War II is nearly completed.*

*Research into the early settlers of Staten Island has been made, which determined that Francesco Martino was the first person of Italian origin to come to Staten Island.*

*Educational assistance given to college students preparing thesis on subjects dealing with Italian Historical data.*

Lending credence to Santoro, and on the basis of the documents described above, we might conclude: that the *Staten Island Italian Historical Society* was founded around the end of 1932; that the *'Antonio Meucci Memorial Association'* was founded in 1929 and merged with the *Staten Island Italian Historical Society* at the end of 1934; that the first official celebration of the *Staten Island Italian Historical Society* (in honor of Meucci) took place on 15 April 1935, although the society was mentioned by the press (*Staten Island Advance* of 11 and 13 April 1935) as the *Italian Historical Society*, just like in Santoro's document, illustrated above.

We don't know when the *Staten Island Italian Historical Society* was dissolved. It is possible that it merely survived a few years, after the death of Daniel Santoro, its founder and animator, which occurred in 1955.

## Daniel Santoro

*Biographic notes*

According to a concise autobiographical paper, dated perhaps 1944, which is kept in the archives of the *Staten Island Historical Society*, Daniel Santoro came to Staten Island in 1907 to work as an architect. From this and other considerations it is possible to deduce that he was born around 1886[31].

Thanks to information supplied by Mr. *Hugh Powell* (see bibl.), we read in the *Classified Directory of Staten Island* of 1912: *Santoro, Daniel, Architect; 88 Montgomery Ave. Tompkinsville.* The 1917 *Classified Directory of Staten Island* indicates: *Santoro, Daniel, Architect; 11 Beach Street.* The *Polk's Directory of Staten Island* of 1933-34 indicates: *Santoro, Daniel, Architect, offices at 130 Montgomery Ave. -*

[31]Indeed, having been awarded the lower degree as an architect, he must have been at least 21, that is to say, he must have been born in 1885. In a photograph of 20 April 1936, he seems to be around 50, therefore born in 1886. In another one dated 17 April 1950, he seems to be around 63, therefore born in 1887. Thus, very roughly, we can assume that he was born in 1886.

*Residence 523 Bement Ave., West New Brighton.* According to Santoro's letter to Mr. Testera, dated 3 January 1935, shown above, Santoro's address at the time was *257 Bement Avenue, West Brighton*; and we know that he lived at this address until his death.

Daniel Santoro (ca. 1950)

In the same autobiography it is said that Daniel Santoro married Rosa Martinelli, at Staten Island, and that they had two children, George and Muriel. As for his studies, it is said that he went to college for three years, precisely to Curtis High School in St. George. It is also said that he then (1944?) worked at the Flower Hospital, having brilliantly passed his examinations to become a surgeon, in 1939. Finally, it is said that he is continuing his studies in surgery, and must consequently go to Rome the coming fall (of 1944?).

According to the same note, in addition to organizing the *Staten Island Italian Historical Society*, Daniel Santoro also promoted a large association of Italian voters in 1930 and, ten years before said note (in 1934?), he had organized a movement to oust the Borough President, Lynch, in favor of Rendt[32]. Finally, it is said that in 1944(?) Santoro withdrew from political activism to devote himself entirely to historical research.

The exact date of his death is unknown. However, it seems that it occurred around the beginning of 1955. Indeed, in a publication, "Italians Past and Present" (see bibl.), which originated in 1955 (spring), after his death, and which contains a commemoration that we carry hereunder, his name still appears among the authors, a clear sign that he had contributed to preparing it.

New York, 1955

"*Death has deprived the Staten Island Italian Historical Society of its most energetic leader, but the aims envisioned by the late Mr. Daniel Santoro, and fully approved by the Officers, Trustees and Members, will be carried out.*

*From 1929 when it was organized by Miss Clelia D'Alessandro, Mr. Ralph Cerreta, and the late Santoro, the Staten Island Italian Historical Society has carried out a highly ambitious program. It is needless to recall that this success could not have been achieved without the animating spirit, the inexhaustible energy and the indefatigable efforts of its late Director. At times impetuous in action, somewhat unrestrained in speech, but*

[32]Since Lynch was still President in June 1933 (see Davis, p. 12), the biographical note must have been written after June 1943. Moreover, since in 1934 (10 August, see Davis, p. 13) Joseph A. Palma was president. Therefore, the note must have been written between June 1943 and August 1944.

*always devoted to an ideal, he dedicated his entire life to this work which now forms a bridge to death. His achievements, often against stubborn opposition, are now a civic monument to his memory …"*

Once more, the date of foundation of the *Antonio Meucci Memorial Association* is mistaken for that of the *Staten Island Italian Historical Society.* The last mention of Daniel Santoro while still in life, according to our research, was that of the *Staten Island Advance* of 11 March 1953 (see bibl.), whereas it is certain that at the inauguration of the Garibaldi-Meucci Museum, on 20 May 1956, Santoro is no longer mentioned (see *Il Progresso Italo-Americano* of the same date). Therefore, one must deduce that Daniel Santoro died in 1955, at the age of approximately 67.

We deem it interesting to include a portion of Santoro's monograph dated 23 March 1940, regarding the Italian presence on Staten Island in the period that is of interest to this work. Furthermore, Santoro, in his autobiographical paper that has been mentioned already, states that, on the basis of in-depth research conducted by him, it appears that the first Italian family to reach Staten Island was the Martino family, in 1676.

Santoro, D., *A History of the Italians on Staten Island,* manuscript dated 23 March 1940

*"… The population is ca. 200,000 inhabitants of many nationalities which include about 35,000 of Italian origin* [17.5%, Editor's Note] …

*In 1882 there were a few Italian families on Staten Island, according to directories of the time: Fortunato Barletta of Belair Rd., a clerk, Mrs. Adel Bardella of 60 New York Ave. (now Bay St.) Clifton; Susanna Bartholdi, a dressmaker at 91 Broad St., Stapleton; Franz Battiani at 13 Montgomery Ave. Tompkinsville; Charles, Edward and Eugene Broglie of 183 York Ave., New Brighton; Girolamo Califano, a clerk, 33 Cliff St., Clifton; George Corsi, John La Duce, John Martino, a carpenter, at 27 Montgomery Ave. Tompkinsville; John Martino, a pilot, at 140 St. Paul's Ave. Tompkinsville; Antonio Meucci is also listed at a summer resort; John Credo's Hotel at 204 Bay Street, Tompkinsville; Theodore Rossi at Cherry Lane and Jewett Ave.*

*In 1888, there were Julius Adorno, a clerk, Anthony Bando, George Bertine, Tito Bini, who conducted a saloon at the foot of Cliff St., who later became a partner of Peter Bessi in the Hotel busi-*

*ness, Antonio Meucci, Caesar Nisini, who lived with Meucci, Domenico Nobile, Frank Venditto, tailor. There are only about 20 Italians listed in 1888 …"*

Upon his death, Santoro left eight big boxes of documents (box nos. 274, 275, 277, 280-1, 280-2, 283, 285, 286) and two large collections of photographs and relics to the *Staten Island Historical Society*. The author had the opportunity to consult this huge mass of documents, with the help of the Curator *Maxine Friedman* and of the Vice Curator *Carlotta de Fillo*, finding, among other things, the precious unpublished manuscript by Francesco Moncada.

## Chronology

1524 - Giovanni da Verrazzano discovers the Narrows and Staten Island
1626 - The Dutch buy the Island of Manhattan from the Indians, trading it for goods worth $24 of that time
1630 - Michael Paw takes over Staten Island, which is inhabited by Algonquian Indians, as well as part of New Jersey
1639 - Staten Island passes into the hands of a Captain DeVries, who sends a few colonists there; however, the Indians force them to leave the island
1661 - Thanks to a peace treaty signed with the Indian chiefs, in 1660, nineteen people, among Dutch and French, can peacefully settle down on Staten Island, in an area close to what is currently South Beach
1664 - The English take New York away from the Dutch
1670 - The English Governor, Thomas Lovelace, buys the island off the Indian chiefs, creating new colonial settlements, mainly along the coasts of the island
1673 - Staten Island returns under the Dutch for one year only
1676 - The Martino family, the island's first family of Italian origin, settles down on Staten Island
1683 - Staten Island is named Richmond County
1698 - The population of Staten Island amounts to 727, 10% of which consists of slaves
1738 - The population of Staten Island rises to approximately 1500, the majority of which are farmers and fishermen of English, French and Dutch origin
1755 - The population of Staten Island rises to approximately 3000
1783 - The United States gains independence. The English leave Staten Island as well
1791 - The population of Staten Island rises to 4274
1812-1815 - Second war against the English. Staten Island is not involved
1850 - The population of Staten Island rises to 15,961. Immigration from Europe starts to reach Staten Island also
1856, 8 July - The *Staten Island Historical Society* is founded with seats in Castleton and Northfield
1858, September - The population, exasperated by the contagion supposedly brought by the immigrants, who landed on Staten Island for quarantine, sets fire to the Quarantine Buildings
1860, 23 April - The first railroad section is inaugurated which covers 12 km, from Clifton to Eltingville. A few years later, the railroad is extended to Tottenville
1860 - The population of Staten Island rises to approximately 26,000
1863, July - New York is shaken by the uprisings against the Draft Act which imposes obligatory draft, but on Staten Island incidents are less

serious. Many blacks are forced to leave their homes

1864, 2 February - The ferry boat service is purchased by the *Staten Island Railroad*, which sets up a new company, the *Staten Island Railway Ferry Company*, and improves the service

1865, 3 April - The Civil War ends, with the surrender of Richmond (Virginia). At Staten Island, an experts committee decides to reorganize transport and to promote initiatives to encourage people to move to the island. In the following years, a horsecar service is set up along the North-Western coast of the island

1870-1880 - Erastus Wiman builds a large casino in St. George, featuring many attractions. He then hires Buffalo Bill and his *Wild West Show*, which performs in a ring, lit by voltaic arc lamps. Thousands of visitors flock to the island

1881, 12 November - The *Natural Science Association of Staten Island*, considered to be the island's oldest cultural association, is set up, which will give life to the *Staten Island Institute of Arts and Sciences* and to the *Museum of Staten Island*

1883 - The *Natural Science Association of Staten Island* begins to publish the *Proceedings* which, with the exception of a brief period of time (1959-1967), shall continue to be printed to the present day

1885, 19 January - Official incorporation of the *Natural Science Association of Staten Island*

1886 - The population of Staten Island rises to approximately 60,000

1898 - Staten Island becomes one of the boroughs of New York City

1900, 16 August - The *Staten Island Historical Society* is reorganized at New Dorp

1904 - A modern seat of the Borough is built in St. George. In the same year, *Curtis High School* is founded

1906 - The *Natural Science Association of Staten Island* is reincorporated as the *Staten Island Institute of Arts and Sciences*

1907 - Daniel Santoro comes to the United States to work as an architect

1907 - The *Museum of Staten Island* is opened to the public, on the last floor of the Borough Hall

1918, September - The *Museum of Staten Island* is opened to the public at its new premises

1920, 17 April - The *Staten Island Historical Society* is reorganized for the second time

1921, 4 April - Death of Ira K. Morris, historian from Staten Island, President of the *Staten Island Historical Society* and editor of the *Richmond County Standard*

1922, 20 April - The *Staten Island Antiquarian Society* merges with the *Staten Island Historical Society*

1922, 28 September - The *Staten Island Historical Society* is transferred to the so-called *old Perine House*, at 1476 Richmond Road, Dongan Hills

1928 - Other two floors are assigned to the *Museum of Staten Island* and an art gallery is set up on one of them

1928-1931 - Three large bridges are built which connect Staten Island to New Jersey: the *Outerbridge Crossing*, the *Goethals Bridge* and the *Bayonne Bridge*

1929 - Daniel Santoro sets up the *Antonio Meucci Memorial Association*

1931, 12 April - First celebration in honor of Antonio Meucci, organized by the *A. Meucci Memorial Association*

1932, 12 April - Second celebration in honor of Antonio Meucci, organized by the *A. Meucci Memorial Association*. Speech by Francesco Moncada in the presence of the Borough President, John A. Lynch

1932 (late part of the year) - the *Staten Island Italian Historical Society* is founded

1934, 10 August - The President of the Borough of Staten Island gives the *Staten Island Historical Society* permission to use the *Old County Clerk's Office* in Richmond as a Museum

1935, 3 January - Letter from Santoro to Mr. Testera communicating the existence of a new society, which comprises all of the island's Italian associations, including the *Antonio Meucci Memorial Association*

1935, 1 March - The name and symbol of the *Staten Island Italian Historical Society* appear for the first time in a letter from Santoro to the Editor of the *Staten Island Advance*

1935, 15 April - First celebration in honor of Antonio Meucci organized by the *Staten Island Italian Historical Society*

1955 (beginning of the year?) - Death of Daniel Santoro

1959, June - The *Verrazzano Bridge*, which connects Staten Island to Brooklyn, is completed

1975 - The population of Staten Island rises to 322,958

1990 - The population of Staten Island is of 378,977

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## THE STATEN ISLAND FERRY

In the great bay of New York - strewn with large and tiny islands - various ferry systems were set up, ever since the times when the city was founded by the Dutch under the name of *Nieuw Amsterdam*, that is to say, as of 1625. The first official concession for a regular ferry service between Manhattan and Staten Island dates back to 1712, when the city, renamed *New York*, was under the English rule.

In 1810, a few years after the evacuation of the English from New York (which occurred in 1783), a sixteen-year-old youth, Cornelius Vanderbilt (born on Staten Island on 27 May 1794) organized a regular ferry crossing between Manhattan and Staten Island. He started off with a simple square-sail lighter, teasingly called *'periagua'* (pirogue). The berths were, in Manhattan, at the end of Whitehall Street, and on Staten Island, in Clifton, at the *Quarantine Landing* (or *Quarantine Ground*). This berth was later renamed *Vanderbilt Landing*.

In 1817, Vanderbilt purchased a steam ferry, the *Nautilus*, which was the first steamboat to be used on that route. The service was denominated *Richmond Turnpike Ferry*, and it went by this name until 1845, when it was renamed *Staten Island Ferry*, as it is known today. In 1818, Vanderbilt began to work for Thomas Gibbons' navigation company. As of 1824, taking advantage of a sentence of the Supreme Court in the case *Gibbons vs. Ogden*, which nullified the monopoly granted by the State of New York to Robert Fulton and Robert R. Livingston, Vanderbilt managed to gradually gain control over most of the navigation along the Hudson River.

In 1829, having left his job with Thomas Gibbon, he set up his own company of steamers, with which he also provided a ferry service between New York and Boston, after having won a difficult struggle over prices against his competitors. In 1840, the steamer *Lexington*, built in 1835, tragically exploded on this route, as it was crossing the Long Island Sound, the channel that separates Long Island from the continent. Only four of the hundred-and-fifty passengers survived the disaster.

In 1829, the crossing from Manhattan to Clifton lasted approximately half an hour, thus, not much longer than the current crossing, though Vanderbilt's ferries offered exceptional amenities and comforts. Indeed, a passenger in 1829 wrote as follows (see bibl. Costa et al.):

*"… The bar and Gentleman's cabin contained a variety of eatables and drinkables such as Bologna sausages, hung-beef, biscuits, and all*

*sorts of confectionery; with wines, spirits, oranges, lemons, limes, lemonade, and ice, which is always to be had in this country. My companions partook of a sausage, and a little brandy and water and sugar, mixed by the barkeeper, in small tumblers. I had some lemonade. …We landed at the quarantine ground in about half an hour …"*

In 1829, a one-way ticket cost $12\frac{1}{2}$ cents (equivalent to a little less than $2 of 1990); in 1864 it dropped to only 10 cents, round trip, which is equivalent to $1.50 of 1990; the price was further reduced in the following years, and today (1990) it is only 25 cents.

The first steam ferries of the *Richmond Turnpike Ferry* were driven by two side wheels with blades attached to the driving shaft, and they were single-ended; therefore, the maneuver to exit the pier was difficult owing to the reversal required to be made in the presence of usually strong currents (typically from 2 to 4 knots) in the bay. The *Sylph* (built in 1844) and the *Josephine* (built in 1852) belonged to this type of steamer.

In a few years' time, Vanderbilt was able to gain control of all the ferries operating in the New York area, and, already in 1846, he had earned millions of dollars from this activity. Furthermore, during the famous *gold rush*, in 1849, he introduced a line of transportation between New York and California. Although the journey was for the most part by steamer, some traveling was done on land, across Nicaragua, which made the trip much shorter than by sea. The following year, he also entered into competition with the famous *Cunard Lines* on the transatlantic routes.

An important development in navigation between Manhattan and Staten Island occurred in 1853, when Vanderbilt merged his activities with those of the two competing lines, the *Tomkins & Staples Ferry* and the *Peoples Line*, which connected Manhattan and Staten Island, with berths set up respectively in *Tompkinsville* and *Stapleton*. After the merger - which gave life to the new *Staten Island & New York Stearn Ferry Company* - Vanderbilt could operate on all three Staten Island destinations, which were named respectively *Tompkinsville Landing* (or 1st Landing), *Stapleton Landing* (or 2nd Landing) and *Vanderbilt Landing* (or 3rd Landing). The previously-mentioned *Sylph* and *Josephine* were joined by other steamers, like the *Columbus*, the *Hunchback* and the *Staten Islander*. In January 1856, the *Columbus* was crushed by the pressure exerted by the ice-banks just outside

The "Northfield," which was very similar to the unfortunate "Westfield"

the Battery. Fortunately, all the passengers saved themselves by walking over the ice-banks to Governors Island, some 450 meters from the Battery. It is worth noting that there were many particularly cold winters during which the ferries had trouble sailing - especially on account of ice forming on the blades of the wheels and/or on the transmission mechanism - and were often trapped in large slabs of ice, like in the winter of 1893, when the entire New York bay was frozen over and the *Westfield (II)* was trapped in the ice for over eight hours about a mile off the coast of St. George.

Towards the end of the 1850s, *double-ended* ferries - the ones that are still in use - were introduced. Since these ferries could sail straight from one port to the other without requiring any reversal maneuver, they were safer and the trip was five to ten minutes shorter. The first double-ended ferry was the *Southfield (I)*, built in 1857. It was followed by the *Westfield (I)* and the *Clifton (I)* in 1861 and the *Clifton (II)* in 1862 These, however, were confiscated by the Navy during the Civil War, and the first two were destroyed, to prevent them from falling into the hands of the enemy. Three new ferries were built to replace the old ones: the *Westfield (II)* in 1862, the *Northfield* in 1863 and the *Middletown* in 1863. All were given names of towns[34] of Staten Island. They were built in Jeremiah Simpson's shipyards in Brooklyn and operated regularly almost until the end of the century, except for the *Westfield*, as we will see later.

On 2 February 1864, when the close interdependence between land and sea transportation was acknowledged, the ferry system was purchased by the *Staten Island Railroad* (currently the *Staten Island Rapid Transit*) which gave rise to a new company, the *Staten Island Railway Ferry Company*. This company provided a regular service, from 7:00 AM to 6:00 PM, to the three aforementioned landings on Staten Island. A first railroad section of twelve kilometers had been inaugurated some four years before, on 23 April 1860, between Clifton (the station was adjacent to the Vanderbilt landing) and Eltingville. From here, with a second section, seven kilometers long, the railroad was then extended to Tottenville, at the Southern tip of the island.

In 1871, the *Staten Island Ferry* experienced the greatest disaster in its history: at 1:15 PM on Sunday, 30 July, the *Westfield (II)* was completing her boarding procedures. Many of the four hundred passengers already on board were women

[34]The word *town* implied that it had its own administration.

and children, who were anticipating an afternoon excursion to Staten Island, on that beautiful sunny day. Suddenly, while the chief engineer of the *Westfield* was on land, and the stokers were loading coal into the furnace to raise steam in the ferry's boilers, the latter exploded, destroying the overlying structures, thereby causing the destruction of the ship. Sixty-six people were killed by the explosion and some two hundred were wounded. It was ascertained that the explosion was caused by the steam safety valve. Consequently, studies were undertaken to create a new, more reliable valve. The *Westfield (II)* was then rebuilt and put back into operation the following year, and it remained in service until 1905. However, the *Staten Island Railway Ferry Company* was forced to declare bankruptcy, since it could not cope with the legal proceedings brought against it for the compensation of damages. The line was thus purchased by a George Law, who added a fourth ferry, the *Southfield (II)*, which was not built at the Brooklyn shipyard anymore but in Clifton.

The Clifton Railroad Station, around 1891
Notice the dock of the "Clifton Landing" of the Staten Island Ferry and the telegraph lines that crumbled on account of the snow

Although Vanderbilt was no longer involved in the Staten Island ferries, it may be interesting to follow him in his last ventures, prior to his death, which occurred in 1877. In the 1860s, he began to work in the railroad sector and, after having purchased and incorporated many small companies, in 1875 his *Central Railroad* had taken over most of the lucrative traffic between New York and Chicago. In that same year, Vanderbilt set up the Vanderbilt University. Two years later, precisely on 4 January 1877, Cornelius Vanderbilt died on Staten Island, leaving behind thirteen children and a huge fortune, estimated at one hundred million dollars of that time (equivalent to approximately 1.5 billion dollars of 1990).

Getting back to the Staten Island ferries, towards the beginning of the 1880s it seemed convenient to merge this service with the ferry services that connected Manhattan to the northwestern coast of Staten Island, facing the Kill Van Kull channel. These connections were provided with old-fashioned and slow-moving ferries, like the *Wyoming* and the *Thomas Hunt*, which, however, were very picturesque, for they were all painted white, like cruise ships. The journey from Manhattan to Elm Park lasted an hour and forty-five minutes; furthermore, stops were made at Port Richmond, West Brighton and New Brighton. Although it was effective as a means of transportation, this service was not convenient for commuters. A good solution could be achieved with an integrated

railroad-ferry project, which ensured faster connections between Manhattan and both the northeastern and the northwestern coasts of Staten Island. A well-known Staten Island businessman, Erastus Wiman, together with the man in charge of the northwestern lines, William H. Pendleton, also a Staten Islander, convinced the President of the important railroad company *Baltimore & Ohio Railroad* (known as B&O), Robert Garrett, to adopt such a project, extending the Staten Island Railway from the last station (northbound) of Clifton up to St. George, and from here further northwest, along the Kill Van Kull, so as to further link up with the B&O lines in New Jersey. Hence, on 31 July 1884, the *Staten Island Rapid Transit Railroad Company* was set up, with the aim to merge all of the island's railroad and ferry services. Within the same year, the railroad was extended from Clifton to Tompkinsville and, by 1886, it reached St. George and then Elm Park, on the northwestern coast. In St. George, which is situated on the tip of the island closest to Manhattan, a great ferry and railroad terminal was built, which initially had two reservoirs; it was inaugurated on 8 March 1886.

"Tompkinsville Landing" around 1890
(the ferry that has just moored is probably the "Northfield")

Thus, through the St. George terminal, the lines serving the two coasts of Staten Island facing Manhattan were merged. The event was commented by the newspapers of the island, especially by the *Richmond County Sentinel*, as a historical event, which would break the isolation and provincialism of Staten Island.

Naturally, traffic increased, consequently two new ferries were introduced, the *Robert Garrett* and the *Erastus Wiman*, which were built in 1888 by the *Columbian Iron Works* shipyard in Baltimore. They were definitely better than the other ones from many points of view: they had a riveted steel sheet hull, instead of the traditional wooden one, double-expansion inclined compound engines with more than twice the power (1600 HP approximately), which were very safe and efficient, and, finally, ample spaces for the passengers featuring electric lighting (a novelty at the time) and padded seats. The *Robert Garrett* could carry 4000 passengers. There was one crossing every twenty minutes, as four ferries were in service contemporarily.

Another accident, which occurred at 6:00 PM on Friday, 4 June 1901[35], at the Whitehall Street terminal, paved the way for taking the management of the ferries away from private enterprises and passing it over

[35]The *Flag Day*, i.e. the anniversary of the adoption of the American flag, dating back to 1777.

to the public administration. First of all, it is worth noting that the foregoing terminal was constantly overcrowded with ferries that stopped there, basically due to the fact that, from it, one could (undercover) gain access to Manhattan's four elevated railways. That day, as the *Mauch Chunk*, of the *Jersey Central* line (which also belonged to B&O), approached the Whitehall pier, it rammed the *Northfield*, which was exiting the latter. The *Northfield* sank almost immediately and could not be recovered. Of its 995 passengers, five died; the others were all rescued by a tug that happened to sail nearby and by other small boats. The papers, like the *Staten Islander*, harshly criticized the negligence of the private companies, recalling, in connection to this, also the tragedy of the *Westfield*. It was also stressed that, following the incorporation (occurred in 1898) of the five boroughs of Manhattan, Queens, Bronx, Brooklyn and Staten Island (apparently, the latter had been reluctant to join) into New York City, the Municipality of New York had to take explicit measures to safeguard the traffic to and from the island.

A modern ferry of the "Staten Island Ferry"

Thus, owing to the protest of the public opinion as well as to the pressure put on by the enterprising Cornelius G. Kolff, President of Staten Island's Chamber of Commerce, the Administration of New York City took over the ownership of the ferry as of 25 October 1905, committing itself to revamping the fleet by introducing the modern ferries that featured screw propellers and 3500 HP engines.

As regards the events that followed, which are less relevant to this work, we refer the demanding reader to the bibliography below.

## Chronology

1712 - First concession of a ferry service from Manhattan to Staten Island, under the English rule

1810 - At the age of sixteen, Cornelius Vanderbilt sets up a ferry service from Clifton, Staten Island, to Manhattan (Whitehall Street)

1817 - Vanderbilt introduces the first steam ferry, the *Nautilus*, on the Manhattan-Staten Island route, and calls the service *Richmond Turnpike Ferry*

1840 - Explosion of the ferry *Lexington* in the Long Island Sound, causing the death of 146 passengers

1845 - The service changes its name to *Staten Island Ferry*. Many steam ferries come into service, like the *Sylph* (as of 1844) and the *Josephine* (1852)

1853 - Vanderbilt incorporates the companies sailing to Tompkinsville and Stapleton, and founds the *Staten Island & New York Stearn Ferry Company*, which operates on all three landings on the northwestern coast of Staten Island

1856, January - The ferry *Columbus* is crushed by the ice banks just outside of the Battery; all passengers survive, reaching Governors Island on foot

1857 - The first double-ended ferry, the *Southfield (I)*, goes into service

1860, 23 April - The first 12-km-long railroad section, between Clifton and Eltingville, is opened

1861-1863 - Civil War: three ferries are confiscated and are later replaced with new ones
1864, 2 February - Vanderbilt sells the *Staten Island Ferry* to the *Staten Island Railroad*, which sets up the *Staten Island Railway Ferry Company*
1871, 30 July, Sunday, 1:15 PM. The boiler of the *Westfield*, anchored at the Whitehall Street Terminal, suddenly explodes, killing 66 people and injuring 200. The company declares bankruptcy and the service is taken over by George Law
1877, 4 January - Cornelius Vanderbilt dies on Staten Island, leaving behind thirteen children and a fortune of one million dollars
1884, 31 July - The *Staten Island Rapid Transit Railroad Company* is set up as an affiliated company of the *Baltimore & Ohio Railroad*, the President of which is Robert Garrett, with the aim of merging all ferry and railroad services of the island, including those serving the northwestern coast. By the end of the year, the railroad is extended northward, up to Tompkinsville
1886, 8 March - The railroad is further extended northward, up to St. George, where a great railroad-ferry terminal is inaugurated, to become the pivotal point of all traffic to and from Manhattan. By the end of the year, the railroad is extended up to Elm Park
1888 - Two new modern and powerful ferries come into service, the *Robert Garrett* and the *Erastus Wiman*. The Manhattan-St. George crossing is reduced to twenty minutes
1901, 14 June - The two ferries, *Mauch Chunk* and *Northfield*, crash at the Whitehall Street terminal. Five passengers die, the others are luckily rescued; the *Northfield* sinks. The press and public opinion protest against the private management of the service
1905, 25 October - The New York City administration takes over ownership of the ferry and undertakes the revamping and upgrading of the fleet
1971, 1 July - The New York City administration takes over ownership of the *Staten Island Rapid Transit*, in the framework of the *Metropolitan Transportation Authority*

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LORENZO SALVI

Lorenzo Salvi was born in Ancona in 1810. Still a youth, a tenor pupil of the Maestro Bonaccini, he made his debut as second lead at Naples' Teatro San Carlo in 1830, in the premiere of Donizetti's "Diluvio Universale." Immediately thereafter he sang in Zadar as leading tenor; in the spring of 1831, he moved to the Teatro Valle in Rome. Here, in the summer of 1832, he sang in "Othello" with Mme. Malibran and, in the winter season of 1833, he performed in the premiere of Donizetti's "Furioso." In the spring of 1836, he sang at the Teatro Carlo Felice in Genoa and, in August of that year, at the Teatro Nuovo in Naples, in the premiere of "Betly," another opera by Donizetti. In 1838, Salvi returned to the Carlo Felice and once again performed brilliantly in "Othello," as well as in "Giuramento" by Mercadante, "Lucrezia Borgia" and "Lucia di Lammermoor," in which he interpreted the part of Edgardo, a role that was to become his piece de resistance. In 1839, he was invited to sing at La Scala in Milan, where he made his first appearance in "Duello sotto Richelieu" by F. Ricci; he was then engaged at La Scala until 1842. Particularly memorable was his performance in the premieres of the two operas by Verdi, "Oberto," dated 1839, and "Un giorno di Regno," dated 1840. He also starred in the premiere of "Gianni di Parigi," in 1839, "Adelia" by Donizetti, in 1841 and "La Primadonna" by M. Salvi, in 1843.

While he was on La Scala's permanent cast, Salvi also sang various times in Genoa as well as in Rome; he was also invited to sing in Vienna, in 1839, and at the Teatro Regio in Turin, in 1840, at the local premiere of "Guglielmo Tell." In 1842 and 1843, he sang at the Teatro Nuovo in Padua and, in the fall of 1843, he starred in "Lucia di Lammermoor" at Paris' Théatre Italien and in the local premiere of Donizetti's "Maria di Rohan." In 1845 and in 1848, he sang at the Italian Opera in St. Petersburg; in the spring of 1847, he was at London's Covent Garden, where he sang in "Lucia di Lammermoor," "Ernani" (with the soprano Marietta Alboni) and "Norma," with the soprano Giulietta Grisi, with whom he returned to Covent Garden in 1848 and in 1849, once again performing in "Norma;" he was widely acclaimed everywhere for his remarkable singing skills, and, moreover, he captured the heart of many women with his great charm.

It is interesting the technical comment on Salvi's voice, as reported in the "Enciclopedia dello Spettacolo" (see

bibl.): *"endowed with a voice not very powerful, but extensive, supple, with an attractive tone-color, he was one of the many tenors that drew inspiration from the model of Rubini. His singing stood out for the sweetness of the sounds, the terse and elegant vocalization, the clear-cut melodic line ("Almaviva" and "Nemorino" were among the characters that benefited most from this). Cut out for elegiac expression, for subtle and very delicate hues, Salvi, whose repertoire also included "Roberto il Diavolo," "Profeta," "Muta di Portici," "Norma," was a sort of 'grace' tenor; with a mordent, however, and pathetic and passionate overtures that in "Lucia" (especially at the end of the first act, the "curse" and the epilogue) enthralled the audience and made him, for various years, the most highly acclaimed "Edgardo" after Duprez, Rubini and Moriani."*

At the peak of his success, in the fall of 1849, after his performance at Covent Garden, Salvi sailed overseas, to perform in the Americas. He got his first contract with the Catalan impresario don Francisco Marty y Torrens, for the forthcoming winter season at the Gran Teatro Tacón at Havana (Cuba). Here, in January 1850, he performed with success in "Lucia di Lammermoor" (which was performed as many as nine times), in "Lucrezia Borgia," in the local premiere of "La Favorita" and "Gli Ugonotti." The season ended on 6 March 1850, and, on 23 March, the entire troupe went to the United States, where it performed first in Charleston and then in New York.

According to the "Enciclopedia dello Spettacolo," in the summer of 1850, in his New York performance, Salvi was found to be in decline. Indeed, also *L'Eco d'Italia*, an Italian newspaper of New York, that, thirty years later, would publish the history of Italian opera in New York, in its edition dated 25 February 1883 (see bibl.) wrote as follows: *"… In the summer of 1850, the millionaire impresario of Havana's Teatro Tacón, Marty, brought a second Italian Opera Company to New York; said Company was better than the first one, there had never been one that good, nor would there be ever again. It featured the primedonne Bina Steffenone, Mme. Bosio and Mme. Vietti-Vertlprack; the tenors Salvi, Bettini and Lorini; the baritone Cesare Badiali; the bass singer Ignazio Marini and other likewise distinguished artists. That summer, Castle Garden, where myriad poor immigrants now flock, was the venue where New York's high society gathered. The interior of that fortress had been con-*

*verted into a performance hall, and on those flimsy sets - for indeed the stage was very small - some of the greatest singing celebrities performed, including, in addition to the previously-mentioned artists, Mme. Grisi, Mario, Jenny Lind, Frezzolini and Susini …*

*Among the impresarios who directed the Italian opera in America, the most responsible one was the late Marty of Havana, and precisely because he paid fabulous salaries, he paid "like a banker," and paid his artists even when, as chance would have it, there was not much work around, some of them behaved dishonorably towards him. One was the tenor Salvi, who, in one month, was so bold as to sing only once or twice, and he did so only because he was threatened that legal measures would be taken against him otherwise. Meanwhile, he earned his monthly salary of two thousand dollars, which were paid in advance every fifteen days. Considering that he was a singer on the decline and that he boasted falsettos, the pay was exorbitant …"*

Thus, the comment on Salvi referred by the *L'Eco d'Italia* matches with the one contained in the "Enciclopedia dello Spettacolo." When the summer season ended in New York, Marty's company - denominated *The Havana Opera Company* - returned to Havana and made its debut, on 28 November 1850, with the local premiere of "Maria di Rohan." After having sung in this opera and in "Gli Ugonotti" (13 December), Salvi probably broke away from Marty, and indeed, in the *Diario de La Marina* of 24 December 1850 (see bibl.), it was announced that "*the tenor Bettini shall replace Salvi in the part of Edgardo in Lucia di Lammermoor."* In fact, Salvi sang for the last time with Marty's company on 24 December of that year, while Bettini made his debut on 26 December, therefore two days later, when the season had not yet ended. Much to Salvi's luck, on 8 January 1851, Jenny Lind, the famous solo opera singer, came to Havana. Jenny Lind, also known as the *Swedish nightingale*, was a favorite of the famous millionaire Cornelius Vanderbilt, who had placed a yacht at her disposal, and her agent was the likewise famous P. T. Barnum. She and Salvi immediately became close friends and they decided to go on tour together in the United States and elsewhere. What is stated in the "Enciclopedia dello Spettacolo:" "*Finally, in 1851,* [Salvi] *went on tour with Jenny Lind in various cities of the United States, and disappeared from the scene shortly thereafter"* agrees with what we have reported above, though that the words '*shortly thereafter'* should be intended

as *'after the end of 1854.'* The concert tour with Jenny Lind is also confirmed by Henry Tyrrell (see bibl.), who mentions several performances at the Pavilion Hotel of Staten Island (the same where Garibaldi stayed when he landed in the United States).

The encounter with Garibaldi and Antonio Meucci marked a turning point in Salvi's life, which would lead him a few years later to making his exit from the scene. Indeed, for most of 1851, Salvi worked with Garibaldi and Meucci at the candle factory which was set up with a substantial financial contribution from his part. In particular, Salvi purchased, on 10 September 1851, the land on which the candle factory was built and, on 12 May 1852, together with Antonio Meucci, he bought the land on which there stood the house where the Meuccis, Garibaldi and his aide-de-camp, Major Bovi Campeggi (and, every now and then, Salvi himself) lived. However, shortly thereafter, Salvi went back to singing, with the Austrian impresario Max Maretzek, who had put together a company, called *The Mexican Opera Company*, for a tour at Mexico City's Teatro Nacional, the second most important in the Americas, after Havana's Teatro Tacón[36]. On his return to New York with said company, in early March 1853, Maretzek organized a series of performances at Niblo's Garden for the spring season and at the Castle Garden for the summer season. At Niblo's the following operas were featured: "Don Pasquale" (27 March) featuring Alboni, Salvi, Marini and Beneventano, followed by: "La Favorita," "Norma," "Lucrezia Borgia," "Cenerentola," "La Gazza Ladra," and, to wrap up (6 May), "Don Giovanni." The summer season at the Castle Garden was inaugurated on 11 June with "Lucia di Lammermoor," featuring Henrietta Sontag, Salvi, Badiali and Rosi. "I Puritani" followed (18 August 1853[37]),

[36]It is worth highlighting that, at the time, the opera was just starting to gain popularity in the United States and that the first important theater in New York, the *Academy of Music*, was inaugurated in 1854, followed by the famous *Metropolitan Opera House*, the building of which was begun in 1858 but was actually completed in 1876.

[37]Maretzek (see bibl., p. 9) gives instead the date of 17 August 1855. This is an obvious mistake, for he himself says, on p. 11, that, after having sung at the Castle Garden on that date, Mme. Sontag went to Mexico and died shortly thereafter, on 17 June 1854, at the age of 49. Further evidence supporting the fact that it was 1853 and not 1855 consists in the fact that Maretzek says that on that date he met Garibaldi, together with Salvi and Meucci; now, this could have happened in 1853, but not in 1855, since in January 1854 Garibaldi definitively left the United States. Finally, as on 3 August 1855, the

with the same singers, in which Mme. Sontag replaced Bina Steffenone, who was unwell.

Max Maretzek (see bibl.) reports an amusing story about when he went to visit Salvi at the candle factory on Staten Island, with the aim to get him to help convince Mme. Sontag (who was the wife of Count Rossi) to replace Mme. Steffenone, since women were still amenable to his charms. At the time, Salvi's secretary was the classical guitar player Domenico Mariani, who administered his assets, and a young factotum assistant who (as Maretzek relates in his aforementioned book "Sharps and Flats") "*good-humoredly carried the bundles for Signor Salvi to the theater, carried messages, brushed his clothes, and shined his boots. Giovanni often came to ask for boxes or seats for Salvi, and usually begged for a pass to the gallery for himself …*"

The *Giovanni* mentioned by Maretzek was actually Giovanni B. Morosini, who was to become one of the wealthiest American bankers (five times millionaire, at the value of the dollar at the time) and whom Garibaldi - who simply called him *Nanni* - hired as his cabin-boy on the Commonwealth, the ship that was to take him back to Europe in January 1854.

Although on 1 July 1853, Salvi had purchased with Meucci another piece of land adjacent to the other two in order to expand the candle factory, a few months later, precisely before Garibaldi's departure for Europe (January 1854), it was agreed - with the mediation of Garibaldi himself - that Salvi was to give his share of the property to Meucci for a certain sum that Salvi himself had received from Meucci's wife in 1850, at Havana. The deed of transfer is dated 1 May 1854, although Salvi validated it on 18 January 1855, before the Consul of the United States at Havana, where Salvi was staying at the time, probably on account of his work. In said deed, of May 1854, Salvi is mentioned as being resident of New York, but *temporarily residing in Mexico City.* From this one can deduce that, at the time, Salvi was still with Maretzek's company.

Meanwhile, on 2 October 1854, the Academy of Music opened in New York, featuring Giulietta Grisi and the tenor Mario (pseudonym of the Count of Candia) in Bellini's "Norma." The season ended on 29 December under the direction of a Hackett, without much success, owing to the fact that the cast was not on a par with Mme. Grisi and

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Castle Garden stopped operating as a theater and was transformed into an immigration center, there couldn't have been any performance on 17 August of that year.

Mario, and also on account of the bad acoustics of the huge hall. The following year, precisely on 15 March 1855, the tenor Brignoli made his debut at the Academy of Music in "Lucia di Lammermoor," featuring Maretzek as orchestra conductor. Brignoli, the new rising star, denominated *the silver voice*, was to take fame away from Salvi. Maretzek engaged Brignoli in his company, which he took on tour to the Havana in the winter seasons of 1856-57 and 1857-58. Maretzek then lists, without providing the exact dates, Salvi's performances with Bina Steffenone, Bosio, Tedesco, Bettini, Marini and Badiali, at the Howard Athenaeum and Federal Street Theater in Boston, a city of which he praises the enthusiasm and musical taste, unparalleled with respect to other cities in the United States. Finally, still without indicating the exact period in time, Maretzek states that Salvi returned to Europe.

We have, however, some important information, contained in a letter written by Antonio Meucci to Garibaldi, dated 26 December 1859 (see the full text in the appendix "Letters written or received by A. Meucci until 1870"), in which Meucci wrote, among other things:

*"… I was pleased to hear that you went to Bologna to see our friend Salvi, who told Negretti that he wrote to me, although, unfortunately, I have not received any letter. I am happy because at least Salvi is in Italy with his family, while I am in a foreign country, where I have been living in misery since three years …"*

From this one can deduce that Lorenzo Salvi returned to Bologna before December 1859. He died in that city in January 1879 at the age of 69. At the foot of his portrait, on display at the *Museo Teatrale Alla Scala* in Milan (reproduced on p. 329 of Vol. 1 of this book) the following words appear: *"Singer of Chamber and Chapel of H. R. M. the King of Sardinia, Member of the S. Cecilia Academy in Rome, Bergamo etc. etc."*

## Chronology

1810 - Lorenzo Salvi is born in Ancona

1830 - Salvi makes his debut at the Teatro San Carlo in Naples, as second lead, in Donizetti's "Diluvio Universale"

1831-1833 - Salvi moves to the Teatro Valle in Rome, where he performs in "Othello," with Mme. Malibran, and in the premiere of Donizetti's "Furioso"

1836 - In the spring, Salvi sings at the Teatro Carlo Felice in Genoa, and, in August, at the Teatro Nuovo in Naples

1838 - Salvi achieves great success at the Carlo Felice, performing in "Othello," "Lucrezia Borgia" and "Lucia di Lammermoor;" the latter opera is to become his piece de resistance

1839-1842 - Salvi is on the permanent cast of Milan's La Scala and performs in many operas, including five premieres. He also sings in Genoa, Rome, Turin and Vienna
1842-1849 - Salvi performs at the Teatro Nuovo in Padua, at the Théatre Italien in Paris, at the Opera Italiana in St. Petersburg and, in the last three years, at Covent Garden in London. In the fall of 1849, he leaves for Cuba, where he is engaged by don Francisco Marty y Torrens
1850 - During the theatrical season of the Havana - from 12 January to 6 March - Salvi performs successfully in "Lucia di Lammermoor," "Lucrezia Borgia," "La Favorita" and "Gli Ugonotti." On 23 March he goes to the United States with Marty's company, performing in Charleston and then in New York
1850, summer - Salvi performs at the Castle Garden in New York, but is judged to be in decline
1850, fall/winter - Marty's company returns to Havana; Salvi sings in "Maria di Rohan" on 28 November and in "Gli Ugonotti" on 13 December; he then separates from Marty, who replaces him with the tenor Bettini in the part of Edgardo in "Lucia di Lammermoor," a role that was very dear to him. Salvi performs with Marty's company for the last time on 24 December 1850, and immediately thereafter, on 26 December 1850, Bettini makes his debut
1851, 8 January - The Swedish nightingale, Jenny Lind, arrives at the Havana. She and Salvi will go on a concert tour in the United States
1851 - September 10 - Salvi buys a piece of land in Clifton, where Meucci's candle factory is set up. He works there himself for two-three months, except for the periods in which he is away on account of his concerts with Jenny Lind
1852, 12 May - Salvi and Meucci buy a second piece of land in Clifton, where Meucci's cottage stands. Towards the end of the year, Salvi leaves with Max Maretzek's *Mexican Opera Company* on a tour in Mexico
1853 - Still with Maretzek, Salvi performs in New York at Niblo's Garden in the spring season (from 27 March to 6 May) and at the Castle Garden in the summer season (from 11 June to 17 August)
1853, 1 July - Salvi and Meucci buy a third piece of land in Clifton in order to expand the candle factory
1853, fall - Maretzek organizes an opera season at Niblo's Garden, with Salvi and others, from 29 September to 18 December
1854, 1 May - Salvi, temporarily residing in Mexico City, transfers his share of the three pieces of land to Antonio Meucci. On 18 January of the following year he is in Havana, where he signs the deed of transfer before the US Consul
1854, 2 October - The Academy of Music opens with Bellini's "Norma," featuring Mme. Grisi and the tenor Mario
1855 - August 3 - The *Castle Garden* is leased out to the State of New York, and is transformed into an immigration center
1857-58? - Salvi performs at the *Howard Athenaeum* and *Federal Street Theater* in Boston. He then makes his exit from the scene and returns to Europe
1859 - Salvi has returned to Italy and, in December, he is mentioned in a letter written by Meucci to Garibaldi
1879 - January - Salvi dies in Bologna, at the age of 69

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## ARTIFICIAL LIGHTING

### From the origins to the Middle Ages

The most ancient form of artificial lighting - that is to say lighting that replaces natural light, as provided by the sun or the moon - was the one produced by the fires of tribal camps or by torches made of rush (sometimes soaked in animal grease) or resinous tree branches. Although the torches provided good light, they produced much smoke, which was particularly bothersome in closed spaces. Presumably, still in prehistoric times, torches were replaced by the first rudimentary lanterns, made of hollow stones or shells filled with oil or grease (vegetable or animal) in which the flame was generated by a wick made of vegetable fiber. About one hundred such lanterns, of various forms, which date back some 15,000 years, were found in caves. Although they produced less smoke, they generated a foul smell (for the present days' tastes).

It is believed that the first candles, made of beeswax and with a wick of vegetable fiber, appeared around the year 3000 BC, among the Egyptians and Cretans.

Medieval workshop for candle manufacturing

Around the thirteenth century, candles made of tallow (animal fat) were introduced, which were cheaper than beeswax candles, but produced more smoke. They were made by dipping braids of vegetable fiber in molten tallow several times and letting each time the block that was thus obtained to dry in free air. To save time, a number of wicks, previously cut to size, were tied and hung to a rod so as to form, by subsequent immersions, up to a dozen candles simultaneously. The candles thus obtained were called *dipped candles*. Later on, when molds came into use, the candles thereby obtained were called *molded candles.*

The candles had to be snuffed periodically, that is to say the burnt tip of the wick had to be cut off in order to prevent the flame from going out. An alternative way of making beeswax candles, in the same period, was that of keeping the wick taut, vertically, and then repeatedly pouring along it the molten wax, letting the block dry each time. There were craftsmen who were specialized in beeswax candles and others who were specialized in tallow candles. According to Bruno di Melfi (see bibl.), the first tallow candles were made by the Tartars (*"… so says Calistus, Carthusian monk… after having taken example from those made of wax …"*). At any rate, there is no doubt that beeswax candles came into use much earlier than tallow candles. The latter, however, were used extensively for almost five centu-

ries afterwards, that is to say until the mid-nineteenth century, when they were replaced by stearic candles. The latter survived until today, as they are used on special occasions (Christmas, birthdays, intimate dinners, banquets, etc.).

After sunset, in addition to being used to allow people to go on with their indoor activities, artificial lighting was also used in the streets of villages, for safety reasons. However, in many towns, public lighting did not exist up until the end of the eighteenth century. The streets were not safe and one, therefore, lived *from sunrise to sunset*. If one had to go out at night, he/she had to carry a lantern; coaches had to attach one under the platform, to indicate their presence. The rich would send forward a host of servants, some carrying lanterns to lit the way. As Fossombroni relates, towards the mid-eighteenth century, in Europe it was ruled that public lighting should furnish an illumination equivalent to moonlight. This was determined by comparison, looking at the two lights through greaseproof paper. Towards the end of the eighteenth century, public lighting was introduced in all big cities, generally using vegetable oil lamps. In Paris, vegetable oil lamps for public lighting were introduced as of 1785. In other towns, citizens were to install an oil lamp, at least every two blocks, that had to be 'protected from wind and rain.'

Some improvements were introduced in the early oil lamps of the Middle Ages. For instance, the oil tank was closed off with a cap. One or two side burners were added, each with its own wick, dipping in the oil tank. Between 1760 and 1770, the first oil lamp with a flat wick coming out of a metal guide was invented. In 1792, the Swiss Aimé Argand introduced an important improvement in oil lamps, using a tubular wick with underlying air outlets, with a view to improving combustion, and adding a glass tube, designed both to protect the flame and to further improve combustion, which provided a conduit for exhaust gases. Of interest in this regard is Antonio Meucci's American patent no. 36,192 of 1862, 'Improvement in Kerosene Lamps,' according to which the glass tube could be eliminated from oil lamps by using *"… two metallic points, which developing the electricity in contact with the flame, rendered it clear and without smoke …"* [Meucci's Deposition, Answer no. 401].

## The industrial revolution

In 1823, important progress was made in candle manufacturing, thanks to the Frenchman Michel Eugène Chevreul,

who elaborated the theory of saponification, that rendered possible to separate glycerin from tallow. In 1825, Joseph Louis Gay Lussac patented an industrial method that allowed to obtain stearin as an end product. The candles produced with stearin were called *stearic candles*, which were definitely better than tallow candles. Other improvements were introduced many years later by the use of additional base materials other than tallow, such as spermaceti (liquid matter contained in the cephalic and dorsal cavities of some cetaceans, which turns solid when in contact with air), paraffin wax, microcrystalline wax, and other petroleum-derived waxes.

The first candle molding machine - to which all subsequent machines were inspired - was invented in 1834 and used vertical molds, equipped with pistons for the expulsion of candles, while the wicks were unwound by reels positioned beneath the molds, and ran inside the molds themselves (see the next appendix, entitled "The stearic industry"). The wicks, made of cotton or linen, were previously soaked in special substances (today, they are soaked in a mixed solution of borax and potassium nitrate or chlorate) to facilitate combustion, thereby avoiding snuffing.

The foregoing stearic candle- manufacturing process is still in use today, only with some slight modifications. The most important modification was introduced already at the end of the previous century: instead of stearin, another mix was used (a high percentage of paraffin, up to 97%, and little stearin), featuring substantial cost savings. The candles so obtained were currently called *paraffin candles.* Antonio Meucci was a pioneer in the industry of paraffin candles, for which he obtained two patents (in 1859 and in 1860), and that were produced by the *New York Paraffine Candle Co.*, of which he was the Superintendent.

It is worth noting that, although they were produced by means of industrial methods, candles nonetheless remained a rather expensive item, especially with respect to oil lamps. However, candles represented a status symbol and were therefore used to decorate the great chandeliers of the rich and of public venues, such as theaters and fashionable meeting places. In this regard, it is worth recalling the famous saying: *"The game's not worth the candle,"* which originated from the demand on the part of the owners of gambling houses to make the players *"pay for the candle,"* given its high price.

Therefore, oil lamps were used much more extensively than candles. Whale oil was prevalently used in the oil lamps of the first decades of the nineteenth century, until approximately 1850, but other oils were also used, derived both from vegetable and animal sources (especially fish), as well as solid fats, such as pork fat.

In 1850, James Young patented a procedure whereby to obtain kerosene (also known as *paraffin oil* or *coal oil*) by means of the fractionated distillation of coal, and five years later he began its industrial production. However, a few years later, the Young process, which allowed to obtain excellent oil for lamps at a good price, was outplayed by others, based on the fractionated distillation of petroleum, by which kerosene was obtained as an intermediate product between gasoline and gas oil. However, we must remind that crude oil (well-known ever since ancient times), used for distillation in Young's days, was still extracted from superficial outcrops.

On 27 August 1859 (a memorable date in the history of energy production), the situation changed drastically: indeed, in the course of drillings aimed to detect mineral oil fields, the American Edwin L. Drake found in Titusville, Pennsylvania, a 21-meter-deep petroleum deposit, which issued 4 tons of petroleum a day. This gave way to systematic drillings, thanks to which, in a few decades, huge amounts of the precious fluid were available on the market for all industrial purposes.

The rack feed wick was used in kerosene lamps, which was replaced, towards the end of the nineteenth century, by the *Welsbach mantle*, invented in 1855 by the Austrian baron Karl Auer von Welsbach. Said mantle, made of gauze or cotton fabric soaked in thorium oxide with 1% cerium oxide, becoming incandescent with the heat of the flame, generated a strong and brilliant light. Shortly before 1870, hand pressurization was introduced in kerosene lamps, whereby air was forced into the tank with the aim to push the oil through a coil, in which it was vaporized before burning, thus obtaining greater combustion efficiency.

As of the mid-nineteenth century, kerosene lamps not only began to take the place of candles and oil lamps, but beat the competition with gas lighting, introduced almost in the same period. This was thanks to the fact that kerosene was easier to transport and produced more brilliant light with respect to that of lighting gas.

Experiments on gas lighting were run in Europe at the be-

ginning of the nineteenth century. Previously, in the last decade of the eighteenth century, Alessandro Volta, followed by the Frenchman Philippe Lebon, and then by the English engineer William Murdock, had shown that it was possible to use for lighting purposes the gas obtained in the process of wood or coal distillation, aimed at tar production. Lebon died while trying to purify the gas obtained from wood and to utilize the liquid and tar products (1804). Murdock, instead, in collaboration with Winsor and Clegg, quickly solved the problem of the depuration of coal gas. In 1792, he had already used gas lighting to light his house in Cornwall, and then, in 1807, he installed nine hundred gas burners in a large cotton factory in Manchester, with the aim to carry on production during night, proving that it was thus possible to save £2350 per year compared to the previous use of candles.

In 1812, in the wake of Murdock's patent, the first lighting gas production company was set up in London, known as the *London Gas Light and Coke Company*. In 1813, Westminster Bridge was lit with gas lamps; three years later (1816), London already boasted forty-two kilometers of gas-lit roads, and some houses were lit as well. In the same period, in Milan, gas lighting was adopted at the Galleria de Cristoforis, the Teatro Carcano, and some houses. In 1816 and 1823, the United States followed suit, with the *Baltimore Gas Company* and the *New York Gas Light Company* respectively. An American writer, Philip Hone (see bibl.) reports that, in 1836, also some high-class houses in New York used gas lighting, which he defined *handsome*. The theaters that adopted gas lighting included the Teatro della Pergola in Florence (1837) and the Gran Teatro de Tacón in Havana (1846). The first nozzles consisted of simple openings in the (iron or brass) gas pipes; later, steatite, treated to withstand high temperatures, was adopted. Finally, at the end of the century, the previously-mentioned Welsbach mantle was used also for gas lighting, in addition to kerosene lamps, as said before.

It is worth noting that the introduction of the Welsbach mantle entailed a deep transformation in the gas industry. Indeed, prior to Welsbach's invention, gas used for lighting purposes had to have a heavy hydrocarbons content not lower than a certain limit, for the brightness of the gas lamp depended on the incandescence of the carbon particles released by such hydrocarbons. This was not at all required, after the introduction of the

Welsbach mantle, which, in addition, allowed to obtain brightness over one hundred times greater, with the same amount of gas. Finally, the amount of light radiated by the incandescent mantle was no longer depended on the luminous power of the gas, but only on its heating value, hence, the distillation could take place at a much higher temperature—obtaining greater gas yields—without worrying about the decomposition of the heavy hydrocarbons, which were no longer necessary for the brightness of the flame (see Meneghini in bibl.).

In regard to lighting produced with other gases, it is worth mentioning acetylene lamps and liquefied petroleum gas (or LPG) lamps. Acetylene was discovered by Edmund Davy in 1836, and it was later obtained by Wöhler in 1862, by means of water acting on calcium carbide, and finally it was prepared industrially by Ferdinand Moissan in 1892. Today, acetylene is obtained more cheaply from methane.

## Electric lighting

Modern lighting systems based on electricity exploit rather diverse phenomena. In 1808, sir Humphry Davy, a physicist, was the first to obtain intense lighting from the voltaic arc between two carbon rods fed by a set of batteries. The first type of arc lamp was patented by Wright in 1845, but, although improved several times, this type of lighting did not come into use before 1858. The main problem with it was the advancement and consumption of the electrodes, in addition to its high energy consumption. Experiments on this subject had been made in Paris ever since the mid nineteenth century, but it was only in 1876, with the invention of Jablochkoff's candle, that the arc lamp was greatly simplified and became practical. In the same year, one of the great attractions at the Philadelphia Exposition (where A. G. Bell's telephone was on display) was indeed electric arc lighting. The first major installation of electric arc lighting was done in Paris on the occasion of the 1878 Universal Exposition, along the Avenue de l'Opéra, where it remained for many years, extending to some squares nearby, as well as at the Paris Hippodrome, in the same year. At the beginning of 1888, two streets and some theaters in Havana were lit by means of electric arc light.

Meanwhile, the first electric power stations were set up as a consequence of the increasing demand of electric lighting. The first one, which was to supply energy for electric lighting, was the one in Appleton, Wisconsin, in 1881. This plant provided direct current. However, the production

of alternating-current, with high-voltage transmission and subsequent voltage reduction with static transformers, proved to be more economical. In the 1890s, alternating-current power plants began to spread, and the first three-phase alternating-current plants were set up. In Italy, in 1892, thanks to G. Mengarini, the Aniene Falls in Tivoli (near Rome) were used to drive a hydroelectric plant of approximately 1500 kilowatts; the electric energy was then conveyed to Rome by means of a 5000-volt three-phase transmission line.

Incandescent lamps, patented by Thomas Edison in 1879, were definitely superior with respect to electric arc lamps. Many experiments aimed to reach the same result had been made in the 1840s. It appears that the first electric incandescent lamp dates back to 1854, thanks to Heinrich Göbel, a German clock-maker, emigrated to the United States; he had created such a lamp, using a carbonized bamboo fiber as a filament, without, however, worrying about getting a patent for it. A fourth of a century later, both the American Thomas Edison and the English sir Joseph Wilson Swan obtained patents on an incandescent lamp, almost identical to Göbel's. There were proceedings at law, as happened for the invention of the telephone, in order to determine the priority of the invention. In one of these (Beacon Vacuum Pump and Electric Co. vs. Edison Electric Light Co.) Göbel's moral priority was acknowledged.

Thanks to his tenacity and intelligence, Thomas Edison obtained excellent results, after having experimented a great deal of solutions, with the aim to increase the luminous surface (by changing the configuration of the filament) as well as the lifetime and reliability of his lamp. His 1879 prototype worked continuously for forty hours. Furthermore, Edison developed a complete plant to supply electric energy to his lamps. In 1882, with his Pearl Street plant, in Manhattan, he began to cater fifty-nine users, with over one thousand lamps, in the Wall Street area. With a similar plant, Edison's lamps were introduced in Milan the following year, 1883.

Luminescent lamps are a more recent invention. They are also known as *cold light* lamps for light is given out at temperatures at which a black body would not give off perceptible visible radiation. Their efficiency (light emitted per unit of electric power consumed, measured in lumen/watts) is more than twice that of incandescent lamps. The first studies were conducted by Georges Claude at the beginning of our century.

Thanks to them the first neon lights were created, followed by others using other noble gases. The atoms of such gases, hit by electrons that are carried by the electric current, change their quantum state, giving out light corresponding to the energy gap between the two states (the *normal* and the *excited* state).

A particular class of luminescent lamps is that of *fluorescent lamps*, in which the tube where the discharge occurs is internally coated with a material that, when hit by luminous radiation, re-emits it on a longer wavelength. They were on display at the Chicago Centennial Exposition in 1933, and came into common use in 1939. As of the 1950s, they became widespread, to the point that today they have replaced incandescent lamps to a considerable extent.

## Chronology

Prehistory - Fires, torches made of rush, possibly soaked in animal fat, or resinous tree branches are used for lighting

c15,000 BC - Oil or grease lamps, with wick made of vegetable fiber, are used

c3000 BC - Beeswax candles appear in Egypt and Crete

> 1200 - First tallow candles are made by the Tartars. Oil lamps are improved, adding side burners and using closed tanks

1691 - J. Clayton obtains a gas rich in carbon from the distillation of coal

1760÷1770 - First oil lamp with flat central wick is introduced

1785 - In Paris, extensive public and private lighting comes into use, employing vegetable oil lamps. Other towns follow suit

1785 - J.P. Minkelers lights a hall at the Louvain University with the gas obtained from the distillation of coal

1792 - The Swiss Aimé Argand introduces in oil lamps the glass tube and tubular wick with air outlets

1792 - William Murdock lights his house in Cornwall with gas

1807 - Murdock lights a cotton factory in Manchester with nine hundred gas burners and, shortly thereafter, he provides lighting for a street in London

1808 - Humphry Davy obtains intense light from the voltaic arc fed with batteries

1812 - In the wake of Murdock's patent, the first lighting gas production company is set up, the *London Gas Light and Coke Company*. Four years later, London boasts 42 km of gas-lit streets

1816 - The first American gas company, the *Baltimore Gas Company*, is set up in the United States, based on Murdock's patent

1823 - The *New York Gas Light Company* is set up in New York

1823 - Michel Eugène Chevreul elaborates the theory of saponification, whereby glycerin can be separated from tallow

1825 - Joseph Louis Gay Lussac patents the stearic candle

1834 - The first molding machine for stearic candles appears in France

1836 - Edmund Davis discovers acetylene, which, however, will be industrially produced only twenty-five years later

1845 - Wright patents a first type of voltaic arc lamp which, however, will be utilized only in 1858

1850 - James Young patents a procedure to obtain kerosene from the distillation of coal

1854 - Heinrich Göbel, a German clock-maker who emigrated to the United States, creates the first incan-

descent lamp, but does not apply for a patent
1859, 27 August - The American Edwin L. Drake drills in Pennsylvania the first oil deposit 21-meter deep
1859-1860 - Antonio Meucci obtains two patents on paraffin candles and sets up the *New York Paraffine Candle Co*
1862 - Whöler produces acetylene by means of the action of water on calcium carbide
1862 - Antonio Meucci patents a kerosene lamp that does not require the glass tube and that generates a very bright flame, thanks to two platinum points
1860-70 - Drillings multiply in the United States. Kerosene is now produced by means of the distillation of petroleum. Kerosene lamps replace other lighting devices. Hand pressurization is introduced in them in order to allow kerosene to evaporate and increase the combustion efficiency
1876 - With the invention of the Jablochkoff's candle, the voltaic arc lamp is greatly simplified and becomes practical. In the same year, it is on display at the Philadelphia Exposition
1878 - Electric arc lighting is adopted in Paris, on the occasion of the Universal Exposition, along the Avenue de l'Opéra
1879 - Thomas Alva Edison obtains the first patent on an incandescent lamp, almost at the same time as sir Joseph Wilson Swan
1881 - The first direct-current power plant is inaugurated in Appleton, Wisconsin
1882 - In Manhattan, by means of his Pearl Street power plant, Edison caters 59 users, with over one thousand lamps
1885 - The Austrian baron Karl Auer von Welsbach invents the *Welsbach mantle*, used in the small gas lighting burners as well as in kerosene lamps
1892 - Ferdinand Moissan begins the industrial production of acetylene
1890-1900 - Alternating-current power plants become widespread
1892 - In Italy, thanks to G. Mengarini, the Aniene Falls in Tivoli are used to produce hydroelectric power of approximately 1500 kW, conveyed to Rome by means of a three-phase 5000-volt line
1900s (early) Georges Claude conducts the first studies on gas discharge lamps
1933 - Fluorescent lamps are on display at the Chicago Centennial Exposition. They will come into common use at the end of the decade and, as of the fifties, they will start to replace incandescent lamps

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## THE STEARIC INDUSTRY

### Historical background

We start with a brief résumé of what we have said in the preceding appendix about candle types and manufacturing.

From their origin (3000 BC) up to the Middle Ages, candles were made of beeswax. According to Bruno di Melfi, it was only in the thirteenth century that, for the first time, the Tartars began to make candles out of tallow, being it definitely cheaper than beeswax. Their manufacturing procedure was the same as that used for wax candles. Precisely, they soaked a braid of vegetable fiber (a rudimentary wick) in a bath of melted tallow; then they extracted the braid saturated with tallow and let it dry out in the open for a few seconds; they then soaked it in the melted tallow again, and so on, until a suitably large block of solid tallow was formed around the wick.

This procedure was adopted, practically unaltered, until 1825, when the stearic industry was started by Gay Lussac's patent, thanks to which it was possible to manufacture candles with a product derived from tallow, stearin, instead of either wax or tallow. The candles thus manufactured are known as *stearic candles*. Let us begin by remarking that stearin constitutes the noble part of tallow. Indeed, unlike tallow, when it burns it does not give out unpleasant smell nor does it produce smoke. Furthermore, its color is white and it is thicker and firmer than tallow. To obtain stearin from tallow - and, consequently, to make stearic candles from the former - it is necessary to eliminate from tallow, by means of a chemical process, both glycerin and oleine, which are liquid at room temperature[38].

Prior to the introduction of stearic candles, tallow candles could give acceptable results, provided they were manufactured with care, particularly using fine cotton wicks and very pure tallow. In this way, it was possible to alleviate the inconveniences stemming from the fact that, since the glycerin contained in the tallow cannot be converted into volatile gases, it stuck to the wick, which carbonized and therefore had to be cut every now and then (snuffing). On the contrary, since stearin does not contain glycerin, when it burns it is entirely converted into volatile gases. Therefore, stearic candles did not need any snuffing.

The fact that animal fats are composed of fatty acids (like

[38]Notice that we have used and will continue to use the term 'stearin' in the meaning of commercial jargon, not in the strictly chemical meaning of the word (see the glossary at the end of this appendix).

Some of the tools used for candle manufacturing in the Middle Ages

stearin), in addition to glycerin, was demonstrated for the first time by the Frenchman Michel Eugène Chevreul (a pupil of the famous research chemist L. N. Vauquelin), in 1823. More precisely, in that year, Chevreul published the results of his many years' research in a book entitled "*Recherches chimiques sur les corps gras d'origine animale.*" Before Chevreul, Henri Braconnot had already noticed that animal fats could be broken down into a solid part and a liquid part. Incidentally, it is worth highlighting that, in 1826, Chevreul succeeded J. L. Proust in the Chemical Section of the Académie des Sciences, and that he lived longer than any other research chemist; indeed, he passed away at the venerable age of 103.

The work conducted by Chevreul and Gay Lussac (even before the patent issued to the latter) provided Jean Jacques Cambacères with all the elements needed to set up, in Paris, the first stearic candle industry known, in 1824. However, his initiative was not very successful, both for the chemical-physical process adopted, as we shall see, and because the wick, which he had previously treated in a bath of sulfuric acid, turned out to be fragile and was quickly destroyed, consequently causing the flame to quickly go out. On the other hand, Cambacères must be credited for having introduced, in 1824, the braided cotton wick that is still in use, and that will be described in detail ahead.

Six years after Gay Lussac's patent, that is, in 1831, two young physicians, De Milly and Motard, set up a small stearin factory in Paris, near Place de l'Étoile. They called their candles *'bougies de l'Étoile,'* a brand that soon became famous. On 10 September 1831, they obtained a patent for the manufacture of stearic candles, which was taken as a reference by most stearic industries, from that time up until today. One of the many innovative ideas introduced by De Milly and Motard was that of performing saponification, using lime instead of potash or soda[39] (as Cambacères did). With *lime saponification*, also called *calcareous saponification*, it was possible to achieve great savings, for lime was cheaper and also because it was much easier to dispose of the residues (calcium sulfate) by means of sulfuric acid, as we will see shortly. Furthermore, De Milly introduced *autoclave saponifi-*

[39]We recall that the production of soda originated in France, first thanks to Malerbe and de la Matherie (1775), then to N. Leblanc (1791), who remarkably improved the process, bringing it to the industrial level. This process was imported to England by J. Muspratt, who, around 1824, managed to outdo the French industry.

*cation*, which allowed to reduce the amount of lime required from the theoretical value of 12% in proportion to the weight of the fats to be saponified, to 3% approximately.

In 1834, the first candle molding machines appeared, though the first 'continuous' molding machine was developed in England, in 1836. The latter was further perfected and introduced in France by Benoît Droux, in 1847. A big stearic industry took off in France as of 1840, thanks to De Milly and Motard, as well as to Petit and Lemoull, to Benoît Droux and Léon Droux. In the rest of world, this did not happen until after 1850. For instance, the first stearic factory in the United States seems to have been the one set up by Antonio Meucci towards the end of 1850 in Clifton, Staten Island.

Around 1845, *sulfuric saponification* was introduced by chemists Frémy, Dubrunfaut and others. This method, however, presented the inconvenience that the fatty acids so produced must be subsequently distilled, to eliminate the tar and carbon residues built up during the first stage of the process. The stearin that was thus obtained was called *distillation stearin*, and, as we shall see later, the process proved to be convenient only for the saponification of solid vegetable oils, like palm oil.

It was only in 1850 that Heintz proved that the so-called commercial stearin contained stearic acid and palmitic acid (not margaric acid, as hypothesized by Chevreul) in almost equal amounts. In 1854, Malsens, Berthelot and Tilghmann succeeded (always in France) to break down fatty substances with water at high temperature and high pressure (*aqueous decomposition*). The three methods of *lime* (or *calcareous*) *saponification*, *sulfuric saponification* and *aqueous decomposition* were the most popular methods for production of stearin, although many others were also experimented. Hereinafter, we shall refer to *calcareous saponification*, which was preferred by far with respect to the other two methods for many years, including the time (1850) when Antonio Meucci set up his stearic candle factory in the United States.

From the above, it is clear that, in 1850, the stearic industry was in its infancy and was exclusively concentrated in the country where it had originated, namely France, the first application in the United States being dated 1854, as already mentioned (p. 55). At the same time, bibliographic information was practically non-existent, aside from Chevreul's basic work on saponification. In the excellent work by Ettore

Marazza, "L'Industria Stearica," dated 1893, the author says: *"In Italy, I believe, does not exist any publication on the stearic industry, an industry that is still young since it originated in France in the early half of this century and developed in other countries only during the second half of it …"* The oldest bibliographic reference mentioned by Marazza is, in fact, the book by H. Perutz: "Die Indutrie der Fette und Gele" (Springer, Berlin), which was published in 1866. It was followed, only in 1869, by a chapter in the 'Encyclopédie Roret,' Paris, while the other books quoted by Marazza were all published after 1880.

Other historical information will be given in the following, when we will describe the industrial processes for the manufacture of stearic candles.

## The manufacture of stearic candles

The block diagram on next page synthetically shows all the steps and elements involved in the manufacture of stearic candles, according to the calcareous saponification in autoclave (De Milly's method). For the time being, we shall illustrate it briefly, for we shall discuss the individual steps in greater detail hereafter. Most of the information is drawn from Marazza's book, which also has the advantage of referring to the historical period dealt with in this work.

Prior to being saponified, tallow is minced and melted, generally on a raw flame. It is then poured with the milk of lime into the autoclave, where saponification takes place. When the latter is completed, two superimposed layers are formed inside the autoclave: the lower one consists of glycerinous waters, the upper one of so-called calcareous soap. The calcareous soap is siphoned into a tank or vat, where it is treated with sulfuric acid to obtain fatty acids, namely a mix of stearin and oleine (a process called "decomposition"); the glycerinous waters, instead, are poured into another vat and treated separately.

To separate stearin from said mix of fatty acids, it is further necessary to eliminate oleine, as was already mentioned. This is done by pouring the mix of fatty acids into trays and letting it rest there until it crystallizes in cakes. These are then wrapped in napkins made of thick material and pressed, first at room temperature, then at a high temperature, in order to eliminate almost all of the oleine. Since in the process of pressing the edges of the cakes become saturated with the outpouring oleine, they are cut and re-processed, so as to obtain as much stearin as possible

from them. Crude solid stearin is thus obtained which, as was previously mentioned, consists of stearic acid and palmitic acid, in almost equal proportions.

Block diagram of the manufacture of stearic candles

However, before stearin can be molded into candles, it has to undergo *clarification*. Furthermore, the wicks must be prepared separately; they are very important in view of the final quality of the candles. The production of wicks requires various delicate and complex steps. After stearin is clarified, it is melted and poured into a series of vertical cylinder-shaped molds, at the center of which the wick is positioned. This operation is called *molding*; and it is performed by special molding machines, which will be described later. The molds are then cooled, and the candles are expelled upwards by means of pistons, which, at the same time, drag the wicks from the bottom into position, ready for the next cast. Before moving on to final processing (sawing, stamping, washing, cleaning, packaging and shipping) the candles must first undergo *bleaching*, which is generally done in the outdoors.

According to the foregoing description, the manufacture of stearic candles from tallow envisages two chemical processes, namely, *saponification* (i.e. the elimination of glycerin from tallow) and *decomposition* (i.e. the extraction of stearin and oleine from the calcareous soap). These are followed by various mechanical steps, that is to say: *casting and crystallization of fatty acids in cakes*, *pressing of the cakes* (i.e. separation of oleine), *clarification of stearin* and, lastly, *candle molding* and *final processing of candles.* Furthermore, throughout the entire process, *washing* must be performed several times with water (either pure or containing more or less diluted sulfuric acid). The washing steps are indicated in the diagram by an oval with the letter *W*. For this reason, the plant must be equipped with a system of drain pipes, whereby to dispose of the water used for washing (waste waters).

Let us now take a closer look at the foregoing steps, as they were performed in the past century.

### *a) Melting of tallow*

If tallow that is already cast (or melted) is not available, as it is the case in large stearin factories, it is first of all necessary to melt the crude tallow (for instance, the one that was provided by butchers once or twice a week). First, the tallow is chopped up, using a two-cylinder machine with cone-shaped teeth. It is then cleared of impurities, after which it is put inside a boiler made of copper (to withstand the corro-

sive action of the fatty acids) and is heated on a raw flame. The mass is stirred, keeping it at a temperature of 60÷65 °C. The melted tallow, released by the membranes or vesicles that contain it, floats to the top and is collected with cups or by decantation. It is then left to rest or to sediment in a vat, whence, after it has cooled at a temperature slightly above its melting point, it is poured into rectangular containers or into barrels, where it will reach room temperature and harden, to be used later or to be sold as such.

The membranes emptied of the tallow should be pressed (or treated with solvents) to squeeze out all the tallow they may still contain; indeed, this way it is possible to recover a good 10% of tallow. The residues are then pressed into cakes and used to feed swine. If, as suggested by Darcet, water solution in the amount of 20% in proportion to the weight of the tallow, containing 0.5% of sulfuric acid concentrated at 66 °Bé (see glossary), is added to the heated crude tallow, disaggregation is more complete, thus, it would not be necessary to press the membranes. Also, in this case, more clarified (of a less yellowy color), and less malodorous, melted tallow is obtained.

### *b) Calcareous saponification*

In calcareous saponification, tallow (more generally, animal fat) is made to react with lime, in order to extract glycerin from the former according to the following formula:

fat + lime → calcareous soap + glycerin

Stearin is subsequently obtained by the decomposition of the so-called *calcareous soap*. Ever since it was first introduced by De Milly and Motard's patent in 1831, calcareous saponification was performed in an autoclave, under steam pressure and with small amounts of lime. Still today, it represents the most important and widespread industrial saponification process, for stearin production.

The autoclave (of copper at the time, now of stainless steel) consisted of a vertical cylinder (see the picture on next page) with hemispherical top and bottom lids; it measured 1÷1.20 m in diameter and 6÷8 m in height[40]. It was heated on a raw flame. The fat substances and the milk of lime (obtained separately by extinguishing quicklime with water), were

[40]It is estimated that a capacity of some 2 cubic meters per ton of fat to be processed is required. In this book the word *ton* is intended as *metric ton*, i. e. equivalent to 1000 kg.

slowly introduced through the top lid, in the desired proportions[41]. The mass was then constantly stirred with an agitator (consisting of a wooden cross with a stem, which protruded from the top lid and was kept in motion vertically). In addition to solid fats, also thick oils (such as palm oil, movrah or illipe oil, and similar substances) or liquid fats could be introduced inside the autoclave, as all these substances react with lime in the same way as solid fats. The temperature was then raised to 136 °C, and steam was introduced at a pressure of 3.25 atmospheres[42], by means of an inner tube that reached all the way down to the bottom of the cylinder (see figure). Along with the fats and lime, water was added in the amount of 50 liters per 100 kg of fat, so that, when the reaction was completed, the glycerinous waters had a glycerin content not greater than 10÷15%. After 7÷8 hours, saponification was completed (by 96÷98%).

Autoclave for calcareous saponification

At this point, no more steam was introduced and the mix was left to rest. Thus, the content of the autoclave separated into two layers, a bottom one consisting of glycerinous water and a top one consisting of calcareous soap in addition to a residue of 2÷3% of fats, not yet saponified. Exploiting the internal pressure of the autoclave as well as the tube used to insufflate steam, the content of the autoclave was transferred into two large wooden vats coated with lead, one for the glycerinous water and the other one for the calcareous soap, as said before. The glycerinous water was separately processed to obtain commercial crude glycerin (to be marketed at 28 °Bé).

To bypass De Milly and Motard's patent, *open-vat saponification* was adopted, as suggested by Duriez, in 1839. This, however, required an amount of lime five times greater (approximately 15% of the weight of the fat, against 2÷3%, as required by autoclave saponification). Nevertheless, this method competed with the Étoile factory, to the point that De Milly and Motard were forced to abandon their autoclave saponification method although, in the long run, the latter won the battle and was the only one to be used. Indeed, at the end of the nineteenth century, open-vat saponification was only used in

[41]Today, lime is used in the proportion of 2÷3% of the weight of the fat to be saponified. In their patent, De Milly and Motard spoke of 'sufficient' amount, namely an amount empirically determined.

[42]Today, steam at 5÷10 atmospheres is used, so as to bring and maintain the temperature at 170-180 °C. Furthermore, letting a bit of steam out of the top of the autoclave, it is possible to maintain the mass vigorously agitated, instead of using a mechanical stirrer.

small factories, far away from the industrial centers. According to this process, the tallow was mixed with water (in the same proportion as the autoclave method) and boiled by injecting steam at 3÷4 atmospheres into a large cylinder-shaped vat[43]. In another vat, placed somewhat above the first one, the milk of lime was prepared, with some 280 kg of slaked lime diluted in two thousand liters of water. The milk of lime was poured on the melted tallow in several turns, vigorously stirring the mass, using a perforated wooden disc with many large holes. After boiling for 4÷6 hours, the calcareous soap precipitated to the bottom of the vat in the shape of grayish-yellowish pebbles. The water on top contained glycerin in solution, which could be collected by concentrating it at up to 28 °Bé to obtain marketable crude glycerin. One of the many inconveniences of this procedure was that, before moving on to the next stage (*decomposition*), the calcareous pebbles had to be crushed.

Before illustrating the second stage, namely *decomposition*, we must highlight that the first two stages, *saponification* and *decomposition*, could be reduced to one, should decomposition in water be adopted; the latter, however, required for the fats to be heated at 250 °C, at very high pressure, in order to allow the following transformation to take place:

fat + water → glycerin + fatty acids

We shall skip over this method, as well as other modern saponification processes, such as the Twitchell process, also known as the *catalytic process*, and that of *enzymatic saponification*, since they are of little relevance to the historical period considered.

### *c) Decomposition of calcareous soap*

The decomposition of calcareous soap is achieved by letting the calcareous soap, obtained during the saponification stage, react with sulfuric acid, in order to extract from it fatty acids (stearin plus oleine), obtaining calcium sulfate, as a by-product, according to the following formula:

calcareous soap + sulfuric acid → stearin + oleine + calcium sulfate

By effect of the pressure inside the saponification autoclave, the melted calcareous soap, obtained from the saponification process, is pro-

[43]For instance, to process two tons (2000 kg) of tallow at a time, a vat with a capacity of 8 cubic meters (diameter 2.60 m, height 1.5 m) was used.

jected through a suitable pipe against the internal wall of a sort of overturned half barrel, suspended above the decomposition vat, from which it falls, in the form of large spongy flakes, into the vat, containing diluted sulfuric acid. This form greatly favors the intimate contact of the calcareous soap with the sulfuric acid, hence its decomposition. Better yet, positioning the decomposition vat to a little lower level, the spongy flakes, falling in free air, burst and are pulverized by the time they reach the sulfuric acid solution.

The decomposition vat is coated with sturdy lead slabs. It also contains a riddled lead coil, through which a strong current of steam is injected, to make the mass boil, thus facilitating the decomposition of the calcareous soap. Stearin and oleine so produced, float to the surface of the solution, in which calcium sulfate is also contained. When boiling is over, the calcium sulfate precipitates to the bottom of the vat, in the form of a white and crystalline powder.

As regards the duration of the decomposition process, a few hours are sufficient to treat up to three tons of animal fat[44]. However, the mass must be then left to rest so that the calcium sulfate can sediment at the bottom of the vat. The amount of sulfuric acid required is proportional to the amount of lime used in the preceding saponification stage. In theory, 175 kg of sulfuric acid at 66 °Bé per ton of lime are required. In practice, however, approximately 200 kg are needed.

The calcium sulfate, precipitated in a compact mass to the bottom of the decomposition vat, is then washed, in other basins, to recover (at least in part) the particles of fatty acid that it inevitably dragged along.

### *d) Washing of fatty acids*

When the decomposition of calcareous soap is completed, the obtained fatty acids (stearin and oleine), that float in the decomposition vat, are sent, by means of a tap situated about halfway up the side wall of the vat, into another vat, generally placed at a lower level with respect to the former, to facilitate the down flow. This second vat is also coated with lead and furnished with a riddled coil whereby to inject steam. This is where the fatty acids are washed with diluted sulfuric acid, at approximately 15 °Bé. The height of the tap must be so adjusted that the last layer

[44]With the previously-mentioned method of open-vat calcareous saponification (using 15% of lime), decomposition lasted much longer and, furthermore, the boiling mass had to be continuously stirred with paddles, to allow the sulfuric acid to come into close contact with the mass.

of fatty acids, which are in contact with the calcium sulfate solution, does not flow into the washing vat, as only the purest fatty acids must be sent into it.

Washing is performed by boiling the diluted sulfuric acid solution for two hours, in order to separate the last traces of lime from the fatty acids and to prepare the latter for the following stage, the *crystallization*. Indeed, this latter operation may turn out unsuccessful, if the fatty acids were not sufficiently long boiled in sulfuric acid.

Great care must be taken when disposing of the acid waters, which contain significant amounts of sulfuric acid. Indeed, it is common knowledge that said acid waters cause great damage to land (which they can reach still warm) and to cattle, should the latter drink water polluted with it. Therefore, these waste waters must be sent only where they cannot cause damage or they must be neutralized prior to being poured into channels, rivers, etc. At the time when there were no special laws or any supervision on the part of the Authorities, many factories poured these acid waters directly out of the washing vats into the sewers or industrial irrigation channels. On the contrary, stearin washing waters were always sent into purification tanks, where stearin carried in emulsion by said waters could be recovered and collected after the waters cooled.

### *e) Casting and crystallization of fatty acids*

The mix of fatty acids, regardless of how it is obtained, is composed of a solid part (at room temperature), called *saponification stearin*, and a liquid part (at room temperature), called *saponification oleine*, which latter must be eliminated. However, before obtaining the elimination of oleine, the mix must be cast into cakes, where it will slowly crystallize.

The fatty acids mix is cast when its temperature drops to around 70 °C; at this point, the melted mass is poured into trays (called *cabarets*), which were tinned iron basins (today made of aluminum) with a trapezoid-shaped section, 5÷6 cm high, and a rectangular bottom of 50x36 cm. After cooling, these trays furnished ca 40 mm-thick cakes of crystallized fatty acids. The cakes were then cold-pressed to expel the oleine. Their size was therefore compatible with that of the press' plates (today's plates are larger, ca 50x55 cm).

To easily and cheaply fill the trays, Binet conceived the so-called 'frame method.' According to this method, the trays were placed on a scaffolding that could hold up to thirty trays per column, stag-

Scheme of stearin production up to the crystallization of the cakes

gered according to the direction of their length (see figure on next page). On one of their two short sides, the trays had four holes or spillways, the purpose of which was to allow the melted material to flow out when the tray was full, letting it fall into the under-tray, and from this down to the next, and so on, down to the last tray. Using many frames, set one next to the other, they could be fed in parallel by means of a system of small wooden channels that ran on top of the frames, towards which the melted material from the last washing vat was channeled. The flow was interrupted when the bottom trays of each frame were filled up.

Crystallization is a long-lasting procedure. The first phase, during which the melted material solidifies, may last between twelve hours (in the winter) and twenty-four hours (in the summer). After this, the cakes were left to rest for one week, so that the solid part may take on the desired crystalline structure. Draughts and sudden changes in temperature must be avoided (a basement was the ideal place where to store the cakes). One could tell when the cakes had crystallized by testing their consistency with a finger. It is important that crystallization be perfect in order to extract oleine completely during the subsequent pressing stage.

The figure on next page schematically shows a layout of all the processes described heretofore.

### *f) Oleine separation (pressing of the cakes)*

Decomposing the mix of fatty acids into crude stearin (solid) and crude oleine (liquid), requires two subsequent steps in which the cakes of crystallized fatty acid are pressed: a *cold-pressing* phase, in which a modest amount of oleine is squeezed out of the cakes, and a *hot-pressing* phase, in which almost all of the remaining oleine is squeezed out. Following the latter step, the main product obtained is the so-called *crude stearin*, while *crude oleine* is the by-product.

More in detail, the cakes of fatty acids removed from the trays are wrapped up in square napkins, each side measuring about one meter, which are folded to cover the cakes entirely. Initially, these napkins were made of thick wool material, known as malfil; later on (after 1890), a dark, heavy cloth made of wool, goat fur and horsehair was used, weighing about one kilogram. The cakes of fatty acids, wrapped in said napkins, were cold-pressed with a vertical hydraulic press at 150÷200 atmospheres; iron plates were put between cakes. A hydraulic press, designed to hold six

cakes at a time and able to generate pressure at 250 atmospheres, could weigh some ten tons.

The cakes were then passed into the hot-press, where they were pressed for about ten minutes at approximately 300 atmospheres, at a temperature of some 70 °C. Hot-pressing was performed with horizontal presses, which were very cumbersome and expensive; the most modern machines of the previous century featured plates that were heated by steam, which circulated in coils contained inside the plates themselves. The thick liquids that were obtained by hot-pressing, called *red residues*, owing to the reddish color of the iron salts and of other impurities contained in the expelled oleine, were reprocessed to recover the stearin contained in them.

When the wrapped cakes of fatty acids are extracted from the hot-presses, they are unfolded and the napkins are removed and used to wrap other cakes. The obtained stearin cake appears now thinner, about one-centimeter thick, as opposed to the initial four centimeters. It looks like a lamina composed of white, diaphanous lamellae, strongly adherent one to another. However, since the edges of this stearin lamina appear soft and often colored, on account of the oleine that has seeped out of the napkins during pressing, they are cut and re-compacted into cakes, two-and-a-half centimeters thick, which are subjected to a second hot-pressing.

Sometimes, after removing the edges to be re-processed, also the crude stearin lamina was chopped into pieces, clarified by washing it in an aqueous solution of sulfuric acid (see hereinafter), and then cast and left to crystallize again in trays (where only 25-mm-thick cakes were formed, this time), after which the cakes were hot-pressed. It was thus possible to obtain whiter, harder, more compact stearin, known as *triple pressure stearin*. Although the latter featured lighting power only 3% greater with respect to that of normal stearin, it had a more attractive appearance. Very often, however, its market price did not compensate for its higher manufacturing costs.

By resorting to the methods of either Tresca and Eboli (1860) or Hartwick and Fisch (1890), it was possible to eliminate hot-pressing. Precisely, in 1860, Tresca and Eboli obtained a patent whereby they eliminated the hot-pressing of fatty acids, by chopping the cakes obtained from the cold-press into shavings, exposing them to the open air for a certain period of time, and finally subjecting them to cold-pressing once

more. In 1870, Wilson suggested to utilize centrifugal force in order to separate solid fatty acids (stearin) from liquid ones (oleine), thus eliminating presses altogether. No industrial applications of this method were made until 1890, when, in Vienna, Hartwick and Fisch obtained a patent, according to which fatty acids, previously pulverized, were placed in a centrifuge that was gradually brought from 1000 rpm (revolutions per minute) to 2500 rpm, as in hydro-extractors. This way, oleic acid was completely, and cost-effectively, expelled, without taking any stearin along with it.

The oleine obtained from the various pressings described above always contained a certain amount (about 20%) of solid fatty acids at room temperature that, with time, tend to separate. This separation can be facilitated by keeping the crude oleine at a temperature of 5÷10 °C for sufficiently long time and then filtering it at a low temperature. This operation is mandatory for the oleine to be sold to the textile industry, which has to be as clear as possible of solid fatty acids. On the contrary, oleine obtained from pressing of cakes can be used as such for the manufacture of hard soaps (the ones made with soda), which Antonio Meucci also produced.

### *g) Clarification of stearin*

The crude stearin that is obtained from the hot-presses is not yet ready to be cast into candles, as it often presents iron oxide stains or is mixed with horsehair, hairs etc., shed by the napkins. Furthermore, the stearin that comes from calcareous saponification always contains residues of lime, which were not completely eliminated from washing in sulfuric acid solution. Such residues are the more consistent, the more the sulfuric acid used in the decomposition of calcareous soap was diluted. The presence of lime is also rather harmful, for it renders stearin fragile. Moreover, since its combustion does not yield volatile products, it will obstruct the wick of the candles obtained, causing combustion problems.

From all the above, it stems that crude stearin has to be purified. The process of purification is known as *clarification*. It comprises two steps, both of which require boiling. In the first step stearin is boiled in highly diluted sulfuric acid (at 5 °Bé) in a lead-coated vat containing a riddled coil, for steam-heating. The stearin melts and, if boiling is protracted for about an hour, the residual lime is eliminated, as it combines with sulfuric acid to form calcium sulfate, which precipitates to the bottom. Boiling in sulfuric acid also

serves to destroy the organic matter from the napkins as well as to convert iron oxide, which gives stearin a reddish color, into soluble iron sulfate. After this first step, the mass is left to rest for a few hours, after which the melted stearin, which floats at the top of the vat, is cleared by means of a tap situated at some convenient height from the bottom, letting it flow down into another vat, identical to the first one and filled with pure water.

The second step, ebullition in water, takes place in this second vat. Here the stearin is boiled for one hour, so that the water may completely dissolve any traces of sulfuric acid contained in the stearin. The mass is then left to rest for many hours, until the water solution containing the impurities separates from stearin. Many factories repeat this procedure a second time to ensure that the sulfuric acid is completely eliminated, as its presence in stearin to be molded into candles is harmful. In fact, when candles burn, it would turn into sulfurous acid, which would give off suffocating gases.

The various regions of the flame of a candle

Always in order to eliminate all traces of foreign matter that, if present, would not allow proper burning of candles, in many factories egg whites (or albumin) were thrown into the melted mass, in the amount of six egg whites per ton of stearin. The coagulation of albumin agglutinates the foreign matter, which then falls to the bottom. Since in some areas water may contain considerable amounts of calcareous salts in solution, it is advisable to also add a small amount of oxalic acid during this last operation.

Finally, melted stearin is left to rest for six to twelve hours, depending on its mass, before being used for molding candles.

### *h) Characteristics and preparation of the wick*

Before moving on to the molding phase, it is worth taking a look at the features of the wick and at how it is prepared. It is also opportune to begin with an overview of the mechanisms of combustion and generation of light in the flame of a candle, in order to understand the importance of the role and the consequent structure of the wick itself.

In modern candles, a three-strand wick is used, which, during combustion, takes the form of a quarter of a circle (as shown in the figure), bending towards the edge of the flame and completely burning only near its tip, at the edge of the flame, where it comes into full contact with air. As we shall see hereafter, this remarkably improves the characteristics of the flame. On the contrary, the wicks used from the ancient

origins of candles up until the year 1824 (Cambacères' invention), consisted of threads simply placed parallel to each other or slightly twisted together (to form a long helix); they therefore kept in the vertical position during combustion, thus carbonizing inside the flame (away from air). As a consequence, especially when the candle was put out, they produced smoke and unpleasant smells, owing to the great amount of unburned gases they withheld.

In 1824, Cambacères introduced the idea of using wicks made with a three-strand braid. Each strand comprises several cotton threads, as better specified hereafter, which bend as soon as the candle is lit, owing to the different tension that is exerted on them, until the tip positions itself so as to be in contact with the air, at the edge of the flame, where it burns completely, as we have said. When the candle is put out, the wick is rapidly extinguished, since only the extreme tip is ignited, therefore combustion stops without subsequently generating smoke or any unpleasant smell.

More in detail, the combustion mechanism is the following: when the vegetable substance of which the wick's strands are made (cotton or linen) is ignited, a combustible gas is released which combines with the oxygen in the air and thus generates the flame. In turn, the heat of the flame melts the material with which the candle is made (stearin), which rises along the wick by capillarity (the more porous the wick, the more the amount of stearin that will rise) and is then decomposed by effect of the heat of the flame and converted into gases (hydrogen carbides); the latter likewise burn, combining with the oxygen in the air, which diffuses from the outside environment toward the inside of the flame[45]. The heat released during combustion is sufficient to melt another portion of stearin and thus the process goes on until the candle runs out or is extinguished.

The flame of a candle comprises four regions (see figure above):

- an outside envelope *'a b c'* that is thin, hot and rather pale. This envelope is very hot, since the combustion of the gases in it is complete, being the flame entirely surrounded by air, which supplies the oxygen necessary for combustion. The products of the combustion of hydrogen carbides, generated by the decomposition of fatty acids - namely carbonic acid and steam - are both colorless (hence the pale color of the envelope) and im-

[45]For this reason, the flame of the candle is known as a "diffusion flame."

mediately spread to the outside environment;
- a blue base *'d.'* Its bluish color is caused by the fact that here carbon monoxide prevails, which cannot burn, owing to the low temperature. Notice that most of the free wick lies in this region;
- a middle part *'e,'* which is wide, white and luminous. It contains the gases released by the combustion of stearin. Air cannot penetrate it entirely, therefore the hydrogen carbides cannot burn completely. In fact, the oxygen that penetrates the flame combines first with hydrogen, which, being more combustible, burns immediately, leaving carbon suspended in the flame. Light of a yellowy color is given off, owing to such solid particles of unburned carbon, which become incandescent, but that, once they cool, subsequently produce smoke. It is to be remarked that the bending of the wick contributes to increasing the volume of the flame, and, consequently, its luminosity;
- a central part *'f,'* which is dark, where combustion cannot occur in any way, since the oxygen in the air cannot penetrate it at all.

To facilitate the combustion of stearin, as was previously mentioned, it is necessary for the wick to be as porous and uniform as possible, in addition to being made of substances that are easily burned and volatile. In particular, the wick should be made of pure cotton, which burns without producing ashes, and, in addition, it must be accurately spun, i.e. it must not contain impurities or hairs of any sort. If, as often happens (since the wick is rarely made with 100% pure cotton threads), ashes remain (which may also be due to foreign substances absorbed during transportation or storage, in addition to spinning), these will fall into the melted stearin, which, rising along the wick, will drag them along, so that, consequently, they will obstruct the wick. For all of these reasons, the wick must be stored with great care in closed containers, to protect it from dust and any other foreign matter.

As for stearin, it too must be free of non-meltable or non-volatile substances, as they would prevent the melted material from rising along the wick. Unfortunately, as was previously said, stearin always contains traces of lime, which, recombining with the candle's fatty acids, forms soaps that prevent the melted material rising along the wick.

In 1836, De Milly analyzed in depth the mechanisms according to which said impurities acted and he came up with a brilliant idea for eliminating the inconveniences. His idea basically consisted in soaking

the wick in a specific solution which would saturate it with certain substances that, when in contact with lime and other impurities mentioned above, would form easily meltable salts, that would therefore rise along the wick. These salts would then be eliminated in the form of tiny beads, conveyed to the burning tip of the wick itself, whence they would fall off the candle, thanks to the bending of the wick. When the candle is put out, the substances saturating the wick will cool and solidify, thereby accelerating the extinguishing of the candle. The method devised by De Milly differed from that of Cambacères, previously mentioned, who tended to control the combustion phase of the wick, and for this reason he used to soak the wick in a hot solution of sulfuric acid or other diluted mineral acid.

More specifically, De Milly's method consisted in soaking the wicks for about three hours in a solution with 2% boric acid in distilled water[46]. After this, the wicks were twisted, in order to eliminate the excess liquid and finally dried in a stove. The wicks were then subjected to a second treatment, keeping them for about one hour in a solution with 0.3% sulfuric acid in distilled water, to eliminate the cotton's impurities. The wicks were then dried and placed for about three hours in another bath containing a solution of 3% boric acid and 0.3‰ sulfuric acid, always in distilled water, at a temperature of approximately 100 °C. De Milly also indicated alternative baths, for example one using ammonium sulfate in place of sulfuric acid. With this latter method, similar to the one used today, the wicks were soaked for 24 hours in a solution containing 1% ammonium phosphate and 2.5% ammonium sulfate.

To ensure that the wick hanks were completely soaked in either one of the above-mentioned baths, a frame of white wood (namely non-processed and non-resinous wood) was introduced in the tank where the bath was prepared, with weights placed on it in order to hold down and submerge the wick hanks. After having soaked for 24 hours, the wicks were removed, and were uniformly twisted by hand, by attaching the hank on a fixed hook and introducing a wooden peg in the other end of the hank, to help in twisting it thoroughly. Having thus eliminated the excess solution, the wick hanks were placed in a dryer at a temperature of approximately 30 °C, and there they were left to dry for an-

[46]The use of distilled water is justified by the need to reduce the amount of impurities to the lowest possible degree.

other 24 hours, hanged on sticks of white wood. To avoid that the lower end of the hanks would contain more impregnating substance than the higher end, from which they were suspended, instead of hanging them on sticks, they were placed, during drying, on slowly turning devices.

After the wick hanks were completely dry, they were spread out and examined with great care. The knots were undone, macroscopic cotton filaments were removed and, finally, the wick hanks were rapidly passed over an alcohol flame (*flambage*) to destroy any smaller cotton filaments. The wick was then wound up on small spools, designed to be mounted on the molding machines, which will be described in the next paragraph. The wounding was performed, at the time, by means of a small portable winding machine that could be fastened to the edge of a work table.

As was previously mentioned, a wick is composed of three strands of carefully spun cotton threads. The number of threads contained in each strand can vary between eight and forty, depending on the diameter of the candle to be molded, as well as on the melting point of the substance (stearin) used to mold the candles. In fact, if the wick is too large in diameter, the flame generated is too big and will therefore produce smoke, since too much melted stearin rises along the wick, especially if it has a low melting point. Moreover, the candles will burn in an irregular fashion, for, while the stearin in the central part of the candle melts and rises, the one at the edges does not get enough heat to melt; a small cavity is thus formed in the candle which becomes deeper and deeper, whereas stearin ramifications form at the edges, that subsequently fall off the candle. If, on the contrary, the wick is too small in diameter, the stearin melted by the heat of the flame does not rise in a sufficient amount, and, instead of rising along the wick, it drips along the sides of the candle. There are tables that indicate the wicks to be used for each candle diameter. For instance, a candle that measures 13 mm in diameter requires a wick with 3x8=24 threads; one that measures 20 mm in diameter requires a wick with 3x19=57 threads; one that is 34 mm in diameter requires a wick with 3x40=120 threads.

As regards the material with which the wick is made, it is worth highlighting that preparing the cotton braid for the wicks required expensive machines, which, moreover, yielded a very limited production. For instance, according to Marazza (op. cit.) a machine capable of producing mere

three kilograms a day of 69÷75-thread wicks would cost, in the second half of the nineteenth century, around six hundred lire, equivalent to some 120 dollars of the time[47] or $1800 in 1990. Therefore, whenever possible, the wicks were purchased already spun and treated, but making sure that the supplier had produced them with great care. In fact, most of the sold candles, that did not burn well, did so on account of the wick. Even in the same box of sold candles one would find candles that burned well and others that did not, although they belonged to the same lot. A very renowned wick factory of the past century was A. Duparquet, from Lyon, France. They produced in large amounts, and exported worldwide, perfectly and uniformly treated wicks, featuring instantaneous extinction and high quality at all times.

*i) Candle molding*

The melted stearin that is extracted from the last clarification basin, when cooling, tends to crystallize again. Therefore, if it were to be poured directly into the molds used to cast the candles, it would crystallize in the molds themselves, yielding fragile, unattractive candles.

To prevent stearin from crystallizing, the initial idea had been to add to it either arsenious acid (which, however, had the inconvenience of being poisonous) or wax, which was expensive and, with the passing of time, gave the candles a yellowish color. In the end, a simpler solution was adopted, namely that of preventing stearin from crystallizing by continuously and vigorously stirring it, then pouring it into the molds when it took on a milky appearance, which happened when it was as cool as possible, though not yet crystallized. In order to do that, hot stearin was first poured into wooden tubs, through the tap of the last clarification basin. Here, it was continuously stirred with white wooden sticks. The milky state could be reached faster, by introducing pieces of solid stearin into the hot stearin and constantly removing from the sides of the tub the stearin that stuck there and solidified.

Once stearin reached the milky state, it was poured into molds to cast the candles, or, if requested, in the molds to cast the stearin cakes, to be sold as such. The molds - yesterday as well as today - must first be heated at a temperature slightly higher than that at which stearin melts (around 55 °C), so as to prevent it from sticking to the walls (thus hindering the ejection of the freshly-cast

[47]Except for the period of the Civil War, the dollar/Italian lira exchange rate remained stable, from 1850 to 1900, at 5 Italian lire per dollar.

Molds and utensils used in the casting of candles in mid-nineteenth century 1 - Container used to pour stearin into candle molds; 2 - Tub containing a quantity of stearin sufficient for various castings; 3 - Container used to pour stearin into cake molds

candles), and also to prevent wrinkles or cavities from forming on the surface of the candle, which occur when stearin would solidify too quickly.

When the stearic industry first started out, the equipment of a candle molding mill merely consisted of isolated tin molds of various sizes, the top end of which (base of the candle) terminated with a cup-shaped cavity. It is to be remarked that the candles are molded with the (conical-shaped) head down and the base up. The cup was so designed as to contain some excess stearin, called *crop*, to prevent holes or cavities from forming at the base of the candle, when stearin retreated as a consequence of cooling. As is shown in the picture on next page, the molds could be placed in mold blocks (from six in number, like in the picture, to one hundred or even more). In that case, all the stearin crops flowed into a common basin, whence all the molds were simultaneously filled. Very large candles (up to 450 mm in length and 20.4 mm in diameter), like torches, church candles, etc., were cast in isolated molds or in mold blocks containing few molds, from which they were manually ejected.

In the past (and still today, in the case of isolated molds), a long needle was used to pass the wick through a hole at the bottom of the mold; the wick was introduced from the bottom and was blocked on top with a wooden peg. It was then fastened with a knot to a little rectangular plate with a hole in the middle, which was set over a tinned iron ring, placed on the bottom of the terminal cup of the mold, designed to contain the crop. In 1842, Cahouet introduced a tiny tap at the bottom of each mold, through which the wick passed; by turning the tap by 90 degrees, it blocked the wick and, at the same time, it cut it.

Before candle molding machines were available, the molds were individually introduced in a case featuring on its lid an equal number of holes as the molds. Each mold thus penetrated into the case up to the level of the cup, which, being larger in diameter than the holes in the lid, served to halt the mold. Steam was then introduced into the case to heat the molds, until a suitable temperature was reached. At this point, the milky stearin was poured inside each mold, and, as soon as all the molds were filled, the steam was put out, and the molds were either let to cool in free air or through cold air introduced into the case. After sufficient cooling, before extracting the candles, a sharp blade was used to cut off the crops, passing it between the metal plate, to which the wick

Machine for molding candles

was fastened, and the base of the candle, after which each mold was extracted from the case, turned upside down, and the molded candle let down.

When mold blocks, instead of individual molds, were used, the procedure did not differ much with respect to the one just described. The mold blocks were first warmed up in a stove, suspending them over appropriate frames. Then, after having poured stearin in them, they were brought out into the open air to allow them to cool, after which the candles were extracted, in much the same way as illustrated above.

The above described method for molding candles required rather lengthy and complex operations. Although machines to facilitate some of the above operations were manufactured as of 1834 (Grolier, see bibl.), it was only in 1846 that, according to Marazza (op. cit.), a certain Newton (we ignore his first name) was able to create a machine, in England, in which the wick was automatically introduced into the molds, at the same time as the candles of the previous casting were extracted. Said machine was perfected and introduced in France by Benoît Droux, in 1847. Further improvements were later introduced by Cahouet, Morane, Binet and Fournier in France; by Wünschmann and Rost in Germany and, in Italy (see the picture above), by E. Süffert & Co. of Milan.

A typical candle-molding machine, as that shown in the picture, was made up as follows:

*1.* The molds, one hundred in number in the Süffert machine[48], are arranged vertically in four rows, of twenty-five units each, inside a cast-iron case made of two pieces, that are watertight sealed by means of a gasket, screws and bolts. This case features taps whereby hot or cold water is introduced (to heat or cool the molds), a spillway and a discharge faucet. The vertical walls of the case extend above the base of the molds, so as to form, together with some longitudinal ribs, small basins that allow stearin crops to form above the base of each mold.

*2.* As shown in the figure on page 387, the height of the molds used in the molding machine is slightly greater than that of the case. Each mold consists of a tube open at both ends, slightly tapered toward the bottom end, in order to facilitate the ejection of the candles, that is always done upward. The candles are ejected from the molds by means of vertically moving pistons (generally made of tin), with their head initially positioned towards the bottom of the

[48]Modern molding machines can hold up to eight-hundred molds.

mold, and having the same (conical) shape as the head of the candles. By varying the height at which the pistons are initially set, it is possible, with the same machine, to manufacture candles of different length. The bottom of the pistons is perforated and rigidly connected to a long metal tube, inside which passes the wick. The piston and the metal tube (with related screws and trimmings) together constitute the so-called *expeller*.

*3.* Above the case that contains the molds various devices (that differ according to the manufacturers) are mounted, the purpose of which is to collect the candles when they are ejected from the molds, keeping them in the vertical position, so that the wicks remain taught along the axis of the molds below. To this end, the candle exiting the mold is guided by a clamp placed above the mold itself, until it comes completely out of the mold.

*4.* The wicks, wounded around spools, are situated in the lower part of the molding machine, and the spools are same in number as the molds contained in the machine. All the spools are kept inside a wooden box which protects them from dust and impurities. The wicks come out of the top of said box, through holes furnished with a tiny bone collar; they then pass inside the iron tubes of the expellers, go through the pistons, run along the vertical axis of the molds, and are then fastened on top of the case, in the way that was previously described, thus being ready for the first casting. When the candles are ejected from the molds, they drag the wicks that will be used in the next casting, unwinding them from the spools, until the latter run out.

*5.* All the iron tubes of the expellers are clamped at the bottom to a horizontal frame, initially placed some centimeters above the wooden box that contains the wick spools. This horizontal frame, otherwise known as *expeller-holder*, can be raised or lowered, for an amount equal to the height of the molds, by means of a simple rack-pinion mechanism. In this way, after the candles are molded and cooled, by lifting the expeller-holder, they are all simultaneously ejected from the molds.

The casting of candles by means of a molding machine, like the one illustrated above, is performed as follows. First, hot water is introduced into the cast-iron case, through its tap, to heat the molds. Milky stearin is then poured into the upper basins until they are filled up to a given level. The hot water is then let out of the case and the latter is filled with cold water. At this point the machine must be left to rest for

Mold for molding candles

some time, until the stearin has cooled. Meanwhile, the worker can operate another machine. One can tell when the stearin has hardened by simply pressing a finger on the surface of the crops. The latter are then cut off with a sharp blade which is run over the top of the cast-iron case, thus freeing the bases of the candles. If it was a first casting, the tiny plates used to center the wicks are removed. Raising then the expeller-holder frame, all the candles are expelled from the molds and are gently introduced into the cylindrical clamps above the molds, until the tips of the candle heads reach slightly above the level normally reached by the stearin crops . The expeller-holder frame is then lowered, letting the expellers back down, ready for the next casting, while the freshly molded candles are kept in place by the clamps.

We recall that, when the expeller frame is raised, the expelled candles drag the wicks upward, unwinding them from their spools, so that they will be correctly positioned along the axis of the molds, for the next casting. However, in order for the wicks to be perfectly centered, little iron bars, called ‘centering bars,’ are placed in the basins at a height just over the crops. On one side of these bars a notch is cut, corresponding to the center of the mouth of the molds. The wicks will then be guided into these notches so that they will remain perfectly centered.

After the centering bars are in place, the machine is ready for the second casting. It is, therefore, heated once again with hot water, milky stearin is poured in and cold water is introduced, after the warm one is disposed of. The stearin is then left to cool until the crops have hardened to the right point. Only then are the wicks cut (with scissors) between the crops and the head of the candles of the previous casting, so that the latter are now free and can be removed from the machine, to be sent to “spreading,” as we shall see in the following. Before ejecting the candles of the second casting, the centering bars are removed, and the crops of the second casting are cut with a sharp blade. The ejection of the candles then proceeds as described above.

It is to be remarked that, following the above procedure, the candle molding machines worked continuously and were only stopped every now and then to replace the spools when the wicks run out.

Although today’s candles are manufactured with a mix of stearin and paraffin (in which paraffin prevails, in the proportion of 85÷97%), the molding process as well as, to a certain extent, the molding machines do not differ much

with respect to the ones described heretofore, though, of course, they are more automated.

### *l) Final processing of candles*

The candles produced by the molding machines were tidily stored in portable wood cases or in wood trolleys, which consisted of a case measuring 1.00 x 0.60 x 0.60 meters, with wheels underneath. The size of the trolley was such as to allow a woman worker to easily push it when it was filled up with candles. The candles were left in these cases for a certain period of time, until they had completely cooled and consolidated. They were then carried to the compartments where they will be submitted to final processing.

The final processing of candles requires great care (just like molding does), and, therefore, women workers were preferably assigned this task. Final processing included six consecutive steps, namely: bleaching, sawing, stamping, washing, cleaning, packaging and shipping.

### *m) Bleaching*

No matter what method was used to prepare stearin with which the candles are made, and regardless of its pureness, freshly-cast candles always come out of a yellowish color. This is caused by the saponification process as well as by the oleine that was not completely eliminated. If the latter cause prevails, the candles are also soft, greasy and unattractive. In this case, the yellowish color is due to impurities of iron salts contained in the oleine. Even if all production steps were carefully performed, a yellowish (however slight) color - hardly appreciated on the market - is inevitable. To obtain perfectly white candles, they must be bleached.

Tresca came up with a solution to eliminate the yellowish color of candles, according to which, during the clarification of stearin, a substance of a complementary color was added, namely, a very small amount of Prussian blue. This way, however, coloring (mass coloring) could rarely yield a perfect color compensation, because it was not possible to evaluate the exact amount of complementary color substance to be added to yield white. Thus, the substance was added in a slightly excessive amount, so that the candles came out light blue, which color was preferred on the market, rather than yellowy. However, this method was abandoned.

The method generally adopted - which proved more effective and cheaper - was that of bleaching candles outdoors, in open air, exposing them to the sunlight. The freshly-cast candles were left

out in the open for a certain period of time, where they also enjoyed the beneficial action of dew, similar to the natural bleaching of canvas, which, in the past, was obtained by just spreading out the latter in the fields. Naturally, to bleach candles, it was necessary to choose a place far from chimneys (especially those of factories), to prevent them from being soiled by the carbon dust carried by the exhaust gases of the same. Although it was also possible to perform bleaching in terraces protected by glass windows, open air was preferred, also because this way the candles lost their (inevitable) unpleasant smell.

To be bleached, the candles were vertically placed, top up, inside cages composed of two horizontal rectangular frames, joined by rods half the height of the candles to be bleached. The lower frame was situated at a height of about one meter from the ground. On this frame a (galvanized) metal small-mesh net was placed, the purpose of which was to support the candles, letting the air through. Instead, on the upper frame a (galvanized) metal large-mesh net was placed so that a candle could pass through every mesh. These cages were about one-meter wide, so that a woman worker, standing always from the same side, could spread out the candles (indeed, this process was known as *spreading*) and then collect them. Instead, the length of the cages could vary at one's will, according to the space available. Between one row of cages and the next enough space was left for the trolleys to move through. The trolleys carried the candles from the molding compartments to the field where they were spread as well as the bleached candles from the field to the compartments where they would undergo the next operations.

### *n) Sawing*

When, in the molding machine, the crops were cut with a blade, one couldn't expect the candles to all come out the same length, nor that the cut would be perfect. The molded candles featured different lengths also for other reasons. For all that, after bleaching, they went through sawing, which allowed to obtain candles of uniform weight and length. The sawing machine consisted of a drum grooved along its generatrices, where the candles to be sawed were placed. The latter were then positioned, in turn, against a small disk-saw that was slightly heated by two corks, which were more or less pressed against the disk, to produce more or less heat by friction. The speed of the saw and that of the drum had to be such that no streaks would be

left on the candles and that segments of stearin would not come off the section where the candle was cut. Furthermore, the saw had to be very sharp, so that the wick would be cut clean off: if the saw was heated to the right degree, the partial fusion of the stearin contributed to making the cut clean.

In the case of limited production or of short candles, the base of the candles was manually smoothed, using simpler tools.

*o) Stamping*

After the candles were all sawed to the same length, the following step was 'stamping,' which was performed on the external surface of the candle, slightly above the base. The stamp consisted of a piece of silver, set on the work table, on which the trademark was stamped in negative. It was heated at the bottom by a small alcohol lamp or by a suitable steam current. Since the temperature of the stamp had to be kept constant, the flow of steam or the intensity of the flame of the alcohol lamp had to be adjusted accordingly.

The candles were individually stamped, by placing them one at a time on the groove of a wooden, rectangular-shaped, plate, on the bottom of which there was an opening that was fairly larger than the silver stamp, so that by introducing the candle in the groove and pressing it slightly, the wooden plate would lower, the candle was stamped and then lifted by means of springs, as soon as the pressure exerted on it was relinquished. The wooden plate also featured a stop against which the base of the candle was pushed, in order to always stamp the candle at the same height from the base.

*p) Washing, cleaning and polishing*

From the preceding steps, the candles exited rather dirty on account of the impurities that stuck to their surface, during spreading, sawing and stamping, such as carbon, stearin dust, etc. They therefore had to be cleaned and, to this end, they were washed in very alkaline water and then rinsed. This operation was done by either introducing the candles in suitable basins or washing them in abundant running water. This washing did not harm the wick at all, as might be feared. When the candles were well washed, they were dried by rolling them on sheets of canvas that were laid out on large tables.

At this stage, the candles were white, but they were not yet ready to be marketed. They must be cleaned and polished. This was done by rubbing each candle with a woolen cloth, slightly soaked in alcohol, so that the candles came out

shiny, smooth and free from all impurities.

*q) Packaging and shipping*

Once the cleaning operations were completed, the candles were packaged. They were assembled in groups of either five, six, eight, twelve or twenty-four candles and packaged in either cardboard wrappers or wood boxes. The size of these receptacles were such that, when collected together, they could form standard-size parcels or crates. Major stearin factories only sold candles in crates of either five or ten kilos.

## Plant considerations

As we have seen, many stages in the manufacture of candles required the use of steam. Therefore, the plant must be equipped with a steam generator and a steam distribution network. One must bear in mind that, practically up until the end of last century, steam generators were quite rudimentary. Actually, they worked with direct heating (or raw flame) and were also very dangerous. They basically consisted of a vertical cylinder-shaped tank (boiler), measuring 60÷70 cm in diameter, with an external hearth and a smokestack for the exhaust gases. The flame and the hot gases (fumes), generated by the combustion inside the furnace, licked the walls of the boiler for two thirds of its height, namely up to the level above which steam was formed, after which they were discharged through the stack. At the beginning of the past century, James Watt devised a special system according to which the fumes would travel around the sides of the boiler (which was then placed horizontally) with the aim to improve the efficiency through the transfer of heat from the fumes to the water of the boiler. In the wake of Watt's idea, so-called 'smoke-pipe boilers' were introduced, in which the fumes passed through multiple pipes, submerged in the tank's water (therefore, *inside* rather than *outside* the boiler) and thus gave out heat prior to being discharged into the chimney. This type of boiler was widely used in factories during the period which this book deals with, as well as in steam locomotives, steam ships and steam fire-engines.

In the last decades of the same century, so-called 'water-pipe boilers' were introduced. They were defined as 'explosion-safe,' for the flames and fumes were not in contact with either the walls of the boiler or the pipes inside it, but with pipes outside the boiler, through which water flowed and from which the boiling water passed into the tank. Evidently, since these pipes, in

addition to being distant from the boiler, could be designed as thicker as desired, to make them as resistant and safe as possible, the danger of explosion was considerably averted.

For all the foregoing reasons, the steam boilers used in the first three fourths of the past century, had to be kept under close supervision, and required an intelligent and expert worker to ensure their correct use as well as to clean them thoroughly on a periodic basis and to care for their maintenance.

In addition to at least one steam generator, a steam engine was also necessary in about any plant, at the time, if anything, to drive the machines used for the maintenance of the equipment. Therefore, a stearin candle factory was always furnished with such a machine.

Another important remark, as regards a plant such as the one described above, is that, owing to the corrosive action of the fatty acids (though contained in watery solutions), lead coatings had to be extensively used. Said coatings were considerably thick and had to be well soldered[49] (or nailed), so as not to leave any gaps which the acids could seep into, causing the wood or masonry to rot. The lead coatings had to be often examined and replaced or repaired, if necessary, since they inevitably wore out or broke.

Also the vats where the candles were washed in water alone were coated with lead. Furthermore, since the vats used in the different processes were set at different heights (to facilitate the inflow or the outflow of liquids), the masonry pillars that supported them were also coated with a thick plate of lead, beneath the vats, to protect the masonry from corrosion caused by the acid liquids.

The drainage channels whereby the washing waters (and, sometimes, oleine) were disposed of, which, on the whole, constituted a considerable network, were dug in the floor of the stearin factory, coated with lead, covered with wood tables at the level of the floor, and directed towards the purification tanks. With such an arrangement, they were easy to inspect and did not cause pollution to the manufacturing operations.

The plant at issue also featured other two pipe networks: one for the distribution of water and the other for the distribution of steam to the various processing compartments. They ran lengthwise above all the vats, each of which was served by appropriate branches. For the distribution

[49] As known, lead was soldered with the oxyhydrogen torch, by autogenous welding, owing to its low melting point.

of water, a suitable water tower was also required.

## Economic considerations

In the considerations that follow it is assumed that stearin factories also engaged in the processing of glycerin and oleine, to make them marketable and to sell them, in addition to stearic products. The income from the sales of stearin, oleine and glycerin of a stearin factory, can be evaluated on the basis of the market prices (commercial rates) of the time, and of the yields of tallow processing. This income was called 'gross product' (though it should have better been called 'gross income'). The yields, however, varied according to the saponification method adopted. The table hereunder indicates that, in practice, only the glycerin yield could considerably vary with the method employed. More precisely, in the case of the most widely used method - the high-pressure autoclave saponification - the glycerin yield reached the value of 10%, i.e. 10 kg of concentrated glycerin (at 28 °Bé) per quintal of tallow processed. The yield halved (5%) in the case of medium-pressure autoclave saponification and was only one fourth, or 2.5%, in the case of open-vat saponification.

**Yields of the various saponification methods***

| Saponification method | Stearin | Oleine | Glycerin at 28 °Bé |
|---|---|---|---|
| a) in open vats | 46.5% | 46.5% | 2.5% |
| b) in an autoclave at medium pressure | 47.0% | 46.5% | 5% |
| c) in an autoclave at high pressure | 47.5-52.4% | 46.5-40.7% | 10% |

*As a percentage, in weight, of the tallow to be processed

Rates of stearic products (1871-1892)

The diagram on the next page, which was elaborated from the data reported in Marazza's book, shows the yearly averages of the international prices (rates on Paris' market) of tallow, stearin, oleine and glycerin, in the period from 1871 to 1892. These rates, indicated by Marazza in current Italian Lire per quintal of product, are also reported in the graph in current dollars per quintal, assuming the average exchange rate of the time at 5 Lire per dollar. The 'gross product' reported in the graph, refers to the case of high-pressure autoclave saponification, with an average yield of 50% stearin, 42% oleine and 10% glycerin, and is also reported in Lire, or dollars, per quintal of processed tallow.

From this diagram we see that the prices of tallow, stearin

and oleine followed the same general (downward) trend, and, therefore, the prices of the processed materials followed the trend of the price of the raw material (tallow). The constant drop in the price of tallow (almost halved in twenty years) was caused by the constant increase in meat consumption throughout all of the western world, which entailed an increased production of tallow. Therefore, as the supply of tallow on the market grew, its price could only drop. The fall in the price of tallow was accelerated by the growing supply of vegetable oils (coming from tropical forests, particularly from Africa) that could often be bought at a lower price than that of tallow, and which yielded (by means of sulfuric saponification and distillation) stearin that was more pure with respect to the one obtained from tallow. The diagram also shows that the price of glycerin followed a very irregular trend. For instance, in only three years (from 1878 to 1881), its price grew almost four-fold, rising from $10 to $36 per quintal. Evidently, given the many different industrial uses of glycerin (explosives, plastic materials, foodstuffs, cosmetics, etc.), huge demand (of explosives, for instance) overlapped periodically, causing prices to surge.

The difference between the so-called ‘gross product’ and the price of tallow should at least correspond to the sum of the manufacturing costs and the company’s profit, only considering the production of stearin, oleine and glycerin, i.e. without taking into account the processing of stearin into candles. The diagram shows that said sum reached its absolute peak in 1871 (Lire 33 per quintal of tallow), after which it gradually dropped down to a minimum of Lire 18 per quintal, in 1882; it then resumed its upward trend and reached a maximum of Lire 28 per quintal in 1885, after which it plummeted in 1888 to Lire 13 per quintal, the lowest value ever. It is clear that, with such fluctuations (almost from one to three), the only factories that survived were the ones that were able to curb manufacturing costs as much as possible.

## Materials and labor costs, per quintal of processed tallow

| *Labor cost for stearin preparation* | | Cost[*] |
|---|---|---|
| - Melting, saponification, decomposition and washing (operations carried out by a team of workers) | L/q | 0.24 |
| - Crystallization of fatty acids and cold-pressing of cakes (operations carried out by a second team of workers) | L/q | 0.57 |
| - Stokers and machinists | L/q | 0.14 |
| Total labor cost for saponification and crystallization: | **L/q** | **0.95** |

| *Labor cost for stearin processing into candles* | | | Cost |
|---|---|---|---|
| - Stearin clarification | | | L/q 0.10 |
| - Preparation of wicks and molding of candles (on average) | | | L/q 0.30 |
| - Final processing of stearic candles | | Cost | |
| - Spreading candles on terraces | L/q | 0.15 | |
| - Sawing, stamping | L/q | 0.07 | |
| - Hand cleaning and polishing (on average) | L/q | 0.28 | |
| - Assembling into boxes | L/q | 0.16 | |
| - Packaging | L/q | 0.09 | |
| Subtotal, Final processing | L/q | 0.75 | L/q 0.75 |
| - Storage and shipping | | | L/q 0.35 |
| - Stokers and machinists | | | L/q 0.05 |
| Total labor cost for candle molding and final processing | | | L/q **1.55** |
| **Total labor costs:**[50] | | | L/q **2.50** |

| *Materials costs, for calcareous saponification (excluding the cost of tallow)*[51] | *Quantity (kg/q)* | *Unit cost (L/kg)* | *Total cost (L/q)* |
|---|---|---|---|
| - Lime | 3 | 0.025 | L/q 0.075 |
| - Sulfuric acid at 53 °Bé | 9 | 0.068 | L/q 0.612 |
| - Coal | 26 | 0.035 | L/q 0.910 |
| **Total cost of materials for calcareous saponification** | | | **L/q 1.60** |

[*]All costs are in Lire per quintal (L/q) of processed crude tallow, except the unit costs of materials for saponification, which are in Lire per kilogram (L/kg) of each material.

[50]For completeness, it would be opportune to add labor costs for the machine and plant maintenance, which Marazza estimates at an additional 0.3-0.5 L/q.

[51]The figures given here refer to high-pressure saponification (requiring 3% of lime). For medium-pressure saponification, the costs of materials doubled, whereas they increased four-fold with open-vat saponification.

Ettore Marazza provides an analysis of such costs, referred to one quintal of processed tallow, so as to compare them to the available sum for production costs plus profit, as dictated by the market, also plotted in our graph above.

The figures given by Marazza, and reported in the table above, refer to an Italian factory of the end of the nineteenth century, that was capable of treating (using high-pressure calcareous saponification in autoclave) approximately 100 quintals of tallow a day, thus producing some 5,000 kg per day of candles, which were packed in crates of 5 and 10 kg. However, many stearic factories of the time only processed 20 quintals of tallow a day, which corresponded to a production of some 900 kg of candles, hence, ca 10,000 medium size candles (with diameter of 2 cm, height 26 cm, weight 90 g). The large factories, instead, processed between 150 and 180 quintals of tallow each day. However, one must bear into account that what had the greatest impact on production costs was the saponification process adopted, although, evidently, large stearin factories could also offset fixed costs (administrative, etc.) with their larger production.

It is worth highlighting that, while the figures given in the table above for labor costs are fairly complete (except for administrative costs, which were neglected), the ones concerning materials cost should be integrated with the cost of wicks (either bought from outside suppliers or produced within the candle factory). Probably, these latter figures would not substantially influence the total cost indicated in the table. Likewise, the cost of large amounts of water, used in the various processing stages as well as in the production of steam, were neglected by Marazza, since, at the time, water was quite inexpensive.

The table shows that the total labor costs of stearin candle making was of 2.50 Lire per quintal of tallow processed, whereas the total cost of materials, for calcareous saponification, was of 1.60 Lire per quintal of tallow processed, in which case, the total manufacturing cost would be of 4.10 Lire per quintal of tallow processed.

Marazza also reports an evaluation of the investment costs, which were quite high. He states that, for a typical plant, they exceeded Lire 150,000 (equivalent to approximately 30,000 dollars of the time). As an example, Marazza indicates the price of a horizontal cylindrical autoclave made of red copper, capable to treat 20 quintals of tallow, which was of Lire 12,000 (2,400 dollars of the

time), while an autoclave with a capacity of 30 quintals would cost Lire 16,000 (3,200 dollars of the time).

Marazza also evaluated the labor costs per week (see the table below), instead of per quintal of processed tallow. His outline is interesting, since from it one can also deduce, if very roughly, the salaries of the various workers at the time (late nineteenth century).

The table refers to a factory capable of processing 700 quintals of tallow per week (which is equivalent to 100 quintals per day, only if it is assumed that there were seven working days a week). It can be easily calculated, from the total cost of labor per week, given in the table, i.e. Lire 1,784.50, divided by the 700 quintals of processed tallow, the cost of labor per quintal of tallow processed, which results of 2.55 Lire per quintal, very close to the 2.50 Lire per quintal, indicated in the preceding table.

As for the salaries, it would seems that the workers earned around 15 Lire per week, the hands around 11 Lire per week, the women workers around 9 Lire per week, while the chiefs were paid also according to the number of their employees, their salary ranging from 40 to 60 Lire per week.

For what concerns the personnel, from the table below it turns out that the stearin factory considered by Marazza in his example employed a total 138 people, without considering the administration staff.

The space occupation in the same factory is also analyzed in detail by Marazza. Here we shall merely indicate that the total surface covered, on one only level, of the factory considered above, was of about 4,500 square meters.

**Cost of labor per week (ca 700 quintals of processed tallow)**

| | | (*)*Cost* |
|---|---|---|
| - Men in charge of steam boilers (3 workers and one chief, night and day) | L/w | 84.00 |
| - Men in charge of: autoclave, decomposition, washing, glycerin concentration (6 workers and one chief, night and day) | L/w | 116.00 |
| - Men in charge of fatty acid crystallization and pressing (34 workers and two chiefs, night and day) | L/w | 520.00 |
| - Men in charge of stearin clarification (3 workers, only daytime) | L/w | 52.50 |
| - Workers in charge of candle molding (18 women, paid by the job and a chief, only daytime) | L/w | 212.00 |
| - Workers in charge of final processing (coordinated by one chief): | | |
| - Candle spreading, sawing and stamping (15 women, paid by the job, only daytime) | L/w | 130.00 |
| - Washing and cleaning (22 women, paid by the job, only daytime) | L/w | 190.00 |
| - Packaging (24 women and 3 men, paid by the job, only daytime) | L/w | 200.00 |
| - Machinists, blacksmiths and carpenters for maintenance (12 men and 5 hands, paid by the job) | L/w | 280.00 |
| | | ====== |
| Total cost of labor per week (5 chiefs, 49 men, 79 women paid by the job, 5 hands) | **L/w** | **1784.50** |

(*) All costs are in Lire per week (L/w)

We shall conclude with a few observations on the fierce competition that broke out between stearin factories, as of the last decades of the past century, essentially as a consequence of the advent of high-pressure autoclave saponification, which rapidly kicked out of the market the stearin factories that operated with medium-pressure autoclaves or even with open-vats. The economic comparison between the two methods, shown in the table below, indicates the unquestioned superiority of the high-pressure autoclave method. High-pressure saponification cost less, first of all because it only required 3% of lime, instead of the 10% or 15% of the other two methods, and also because the process was faster and required less labor, as has already been pointed out. Finally, also without taking into account the greater stearin yield, high-pressure autoclave saponification provided a glycerin yield two or four times greater than that of the other two methods. In the table, in order to calculate the loss incurred by the other two methods with respect to high-pressure saponification, the price of glycerin was assumed at Lire 63 per quintal (not a high value), recorded in the year 1871.

**Economic comparison between the three methods of calcareous saponifcation**

| *Saponification method* | *Cost* L/q | *Glycerine yield* kg/q | *Loss* L/q* |
|---|---|---|---|
| In open vat | 9.7 | 2.5 | 11.0 |
| In (iron) autoclave at medium pressure | 6.8 | 5.0 | 6.1 |
| In (copper) autoclave at high pressure | 3.9** | 10.0 | 0 |

* Assuming the price of glycerin in 1871, which was only of 63 L/q.
** It must be remarked that, from the table on p. 393, the total cost per quintal of processed tallow results in Lire 4.10, instead of the 3.9 L/q assumed here by Marazza for his economic comparison with the other two methods of saponification. However, this does not substantially change his conclusions.

From this table we can infer that a stearin factory that processed 20 quintals of tallow a day, using medium-pressure saponification, would have incurred a loss of 122 Lire a day, i.e. of about Lire 36,600 a year (assuming 300 working days per year). If it adopted open-vat saponification, it would have incurred a loss of 220 Lire a day, i.e. of Lire 66,000 a year, which would have forced it to either shut down immediately, or to convert to high-pressure autoclave saponification, as the relevant investment costs would readily be recovered. In fact, according to Stas (quoted by Marazza): *"The industrial enterprises that* [in 1862] *continue to manufacture* [candles] *according to ancient saponification methods must modify their equipment if they do not want to be forced to close down their factories on account of the competition."*

It is, however, to be remarked that this sort of problems did not exist in 1850, when Antonio Meucci set up a factory of stearic candles in Clifton, first of all because, in that year, the stearic industry did not yet exist in the United States, and then because the imported stearic candles (mostly manufactured in France), were subjected to heavy customs duties in the United States (as well as elsewhere).

## Glossary

°*Bé* or *Bé* or *degree Baumé*.— An ancient unit of measurement, introduced by Antoine Baumé in 1768, indicating the concentration of a substance in a water solution, especially when the substance was denser than water, as, for example, sulfuric acid. Antoine Baumé devised an improved hydrometer the scale of which was marked, on the surfacing level, at 0 °Bé with pure water (at a temperature of 12.5 °C). After dissolving in it common salt in the amount of 15% of the weight of water, the hydrometer was marked at 15 °Bé, on the new surfacing level. The fifteenth part of the interval between the two markings

was called *degree Baumé* (°Bé). Today, the density or the concentration values are used directly, hence, instead of speaking of 'sulfuric acid at 66° Bé' one prefers to say 'sulfuric acid at (a concentration of) 98%.'

*Oleine.*— In chemistry, *oleine* is an ester of glycerin (or glyceride) with oleic acid. In the commercial jargon, *oleine* is used (if incorrectly) to mean *oleic acid.* At room temperature, oleine is liquid (it melts at 14 °C). It is extensively used in the wool industry.

*Paraffin.*— It consists of a combination of solid hydrocarbons obtained from the distillation of some paraffinic mineral oils (with 0.1 to 5% paraffin content) as well as from the distillation of tar, obtained from bituminous lignites. Paraffin is one of the most commonly used waxes, although, sometimes, it is mixed with other substances to either improve its appearance or make it harder. For the manufacture of candles, hard paraffins are used, mixed with stearin, which are available on the market in the form of cakes[52]. Soft (or microcrystalline) paraffins also exist, which have a solidification point below 70 °C.

*Saponification.*— It is the conversion of a fatty substance into soap. In particular, if a fatty substance is made to react with an alkaline hydrate (soda, for instance), glycerin and common soap are obtained. If, instead, a fatty substance is made to react with an alkaline-earth hydrate (lime, for instance), glycerin and calcareous soap are obtained; the latter, reacting with sulfuric acid, yields calcium sulfate and a mix of solid (stearin) and liquid (oleine) fatty acids. Oleine can subsequently be eliminated by pressing.

[52]These cakes are hot-refined with sulfuric acid, then neutralized and bleached with active earths and carbons.

*Stearin.*— In chemistry, stearin is an ester of glycerin (or glyceride) with stearic acid. In the commercial jargon, *stearin* indicates (if incorrectly) a mix of solid fatty acids (prevalently *stearic acid* and *palmitic acid*, almost in equal amounts). Stearin is obtained from animal fats - mainly from ox or mutton tallow - after having removed glycerin from it by means of saponification and, subsequently, the more liquid part at room temperature, namely oleine, by means of pressing. At room temperature, stearin is solid. It melts between 59.9 °C and 69.2 °C, depending on how much stearic acid is contained with respect to other fatty acids, such as, for instance, palmitic acid, which melts at 62.6 °C.

*Tallow.*— Tallow is a fat that accumulates in various parts of the body of bovines (ox tallow), sheep (mutton fat), swine (lard) and horses (horse fat). Ox tallow is the most demanded. It is essentially composed of glycerides of the oleic acid (45%), of the stearic acid (29%), and of the palmitic acid (26%). The major producers of tallow are: Argentina (*Plata tallow*), Australia and the United States. Only mutton tallow contains more stearin than ox tallow. The tallow of other animals contains less than half the amount of stearin contained in ox tallow.

*Wax.*— Natural waxes are substances of vegetable, animal or mineral origin. They are similar to fats, but are essentially composed of esters of superior fatty acids with superior monovalent alcohols (such as cetyl alcohol). The fat of sperm whales, spermaceti, which contains the cetyl ester of palmitic acid, should therefore be considered a wax rather than a fat. Waxes are also found as protective layers of animal skin, hairs and feathers, or on leaves and fruits of trees.

*Animal waxes.* The most known animal wax is beeswax, that can be obtained by melting the honeycomb. It is used, still today, to make church

candles. Beeswax is produced in the abdominal glands of bees and is of a dark yellow color; consequently, it requires bleaching. In addition to being used for candles, beeswax is also used for many other industrial applications, like shoe polish, ointments, creams, adhesives, etc.

*Vegetable waxes* include carnauba wax, obtained from the leaves of South American carnauba.

*Mineral waxes* include: *paraffin*, made of a combination of solid (saturated) hydrocarbons, that is currently obtained from the distillation of petroleum (which is to be considered a fossil product, hence a *mineral*); *mountain wax*, which is a mixture of paraffin and heavy organic acids and is obtained (by means of solvents) from bituminous lignites; *ozocerites*, of which there are natural reserves (bituminous schists) from which it is easily extracted. Some rank paraffin among *artificial waxes*, for it is not obtained by means of a simple process of separation from the raw mineral material.

There are also a great deal of *synthetic waxes*, but their composition is very different with respect to that of natural waxes, although they are similar to the latter in their appearance and features. Their chemical structure is generally that of polymers.

## Chronology

c3000 BC - Candles made of beeswax are manufactured in Egypt and in Crete
c1200 - The Tartars make the first tallow candles
1775 - In France, Messrs. Malerbe and de la Matherie are the first to produce soda
1791 - In France, N. Leblanc transforms the production of soda into an industrial process, which is named after him
1795 - Joseph Bramah, an Englishman, invents the hydraulic press
1823 - Michel Eugène Chevreul elaborates the theory of saponification
1824 - J. Muspratt applies Leblanc method for soda production to England, and manages to outdo the French industry
1824 - In Paris, statesman Jean Jacques Cambacères sets up the first stearic candle factory and introduces the braided wick, though inadequately chemically treated.
1825 - Joseph Louis Gay Lussac patents a process using solid fatty acids (stearin) for the production of candles, to replace tallow and wax.
1830-1840 - The Englishman William G. Armstrong (the future Baron of Craigside) invents the hydraulic accumulator for presses
1830 - Karl von Reichenbach, a philosopher and industrial entrepreneur, obtains solid paraffin wax from petroleum
1831, 10 December - De Milly and Motard obtain a patent on the manufacture of stearic candles and set up in Paris the first factory of stearic candles, using autoclave lime saponification
1834 - In France, the first candle molding machines are introduced
1836 - De Milly develops the combustion theory of the flame of stearic candles and devises various methods to prepare wicks
1839 - Duriez introduces open-vat saponification, initially creating problems to the factories that adopt autoclave saponification
1840 - The stearic industry takes off in France. In the rest of the world this will happen decades later
1842 - Cahouet introduces the mold frames featuring taps, which block and cut the wick at the bottom of the mold
1845 - Frémy, Dubrunfaut and others introduce sulfuric saponification
1846 - The Englishman Newton designs the first continuous molding machine
1847 - Benoît Droux perfects Newton's continuous molding machine and brings it to France

1850 - Heinz proves that stearin is essentially composed of stearic acid and palmitic acid

1850, fall-winter - Antonio Meucci sets up what is believed to be the first stearic candle factory in the United States

1854 - In Cincinnati, Ohio, James Proctor of the Proctor & Gamble, sets up a (second) stearic candle manufacture in the USA (see Haynes in bibl.)

1854 - Melsens, Berthelot and Tilghmann introduce the decomposition of fats with water at high temperature and pressure

1859-1860 - Antonio Meucci obtains two patents on paraffin candles and sets up the *New York Paraffine Candle Co*., the first of the kind in the United States

1860 - Tresca and Eboli obtain a patent to replace hot-pressing of fatty acids with a second cold-pressing stage, after the cakes obtained by cold-pressing are minced and exposed to the air

1866 - The first text book on the stearic industry, *Die Industrie der Fette und Gele* (Springer, Berlin) by H. Perutz, is published

1870 - Wilson suggests to exploit centrifugal force to separate stearin from oleine, thus eliminating presses

1890 - Hartwick and Fisch, from Vienna, implement Wilson's idea, obtaining a patent to eliminate oleine by means of centrifugation

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## HISTORY OF «FOREST COTTAGE»

### Locations, transfers of title and legal actions

*Forest Cottage* was a country home located on Forest Street (currently Ditson Street) in Clifton, Staten Island. However, according to the land registry papers, Forest Cottage also comprised the entire lot on which the house stood; it is indicated as lot no. 2 in the map hereunder, in which feet (') and inches (") are used as units of length, according to the original deeds of sales.

Map indicating the various lots and the three subsequent locations (2, 2' and 4) of Forest Cottage

This cottage and the lot on which it stood were initially - precisely as of 13 September 1847 - owned by William B. Townsend and his wife, Susan, who resided in Clifton. However, the couple lived in another house, a few hundred meters east of Forest Street, towards the docks, and they rented out the cottage. The first to rent it was probably the Austrian theater manager, Max Maretzek, who used it as his summer residence for one or two years. After him, at the beginning of October 1850, the Meuccis rented the place, where they went to live with Garibaldi and his aide-de-camp Paolo Bovi Campeggi.

Area surrounding Forest Cottage, in Clifton (Beers Atlas 1887)

The position of the house was very convenient, since, back then, the main landing of the ferries connecting Staten Island and Manhattan was in Clifton. Furthermore, the Staten Island Railroad (currently the Staten Island Rapid Transit or S.I.R.T.) was going to be built, which was to connect Clifton (the main station) to Tottenville, at the southernmost tip of the island, situated opposite the town of Perth Amboy, in New Jersey. As is shown in the map here above, the distance between Forest Cottage and Clifton's landing, called *Vanderbilt Landing*, (or the adjacent railroad station) was a little less than one kilometer. From the piers, one had to walk five hundred meters down New York Avenue (currently Bay Street, see map above), then turn right on Willow Avenue, walk another five hundred meters and there was Forest Street. As the author verified for himself, it was a thirteen-minute walk, at a normal pace.

As we have said, Antonio Meucci, together with the tenor Lorenzo Salvi, set up a stearic candle factory in the original location of Forest Cottage, namely on lot no. 2 in the map on page 400, but they soon realized that, for this business, they needed much more space[53]. Therefore, they later purchased from the Townsends the lot indicated as no. 1 on the

[53]Lot no. 2 only measured 28.75 x 33.5 meters, i.e. less than 1000 square meters (exactly, 963.13 square meters).

foregoing map. The lot was purchased in Lorenzo Salvi's name, on 10 September 1851, and, as Meucci stated at the Bell/Globe trial (Answer no. 16) *"immediately there was built by the two partners a building for the manufacture of candles of my invention."* This building is indicated on the map with the letter *F* (Factory). As we shall see, later it was also used as a piano factory and as a brewery. The small lot no. 2, where the cottage stood, was purchased later (initially, it was only rented), precisely on 12 May 1852, in the name of Antonio Meucci and Lorenzo Salvi. Finally, on 1 July 1853, lot no. 3 (probably needed for the spreading of candles) was purchased, also in the name of Antonio Meucci and Lorenzo Salvi.

About a year later, Lorenzo Salvi pulled out of the candle business and consequently sold his shares of lots nos. 1, 2 and 3 to Antonio Meucci, on 1 May 1854, for the nominal sum of $5, given that he was in debt with Esther Meucci, as said in the main text. Therefore, as of this date, Antonio Meucci became the sole owner of all three lots as well as of the cottage and of building *F* of the factory.

At the end of this appendix, we transcribed all the above deeds of sale, as well the following ones, from 1854 to the present day, for we believe they make interesting reading, and also because the original manuscripts are barely legible.

Unfortunately, the candle business failed, according to the following statements by Antonio Meucci at the Bell/Globe trial: (Answer no. 16) *"After about one year the candle business went wrong, and I decided to start a lager beer brewery …;"* (Answer no. 321) *"About six months after Salvi had left it to me …;"* (Answer no. 323) *"I sold all I had to raise money, and I started the brewery. This was the time when Mr. Samanno took the mortgage."* On the basis said statements, we can deduce that Meucci wound up his candle manufacturing business around spring/summer of 1855, and that, after that date, he sold the related equipment. The mortgage mentioned in Answer no. 323 above, was of 3,000 dollars and was raised on lots nos. 1 and 2 in favor of Augustus A. Samanos (called *Mr. Samanno* by Meucci), with deed signed by Antonio and Esther Meucci on 1 May 1856. This was done in order to come up with the funds needed for setting up a brewery, called *Clifton Brewery*, in place of the candle factory.

The reasons why he closed down the candle business and tried some other activities are explained by Meucci himself in a letter he wrote to his brother Giuseppe, on 14 No-

vember 1855: *"I am penniless and all that I have left now is the house, the land and the candle factory. But it is useless to speak of the latter, they cannot be sold. Now, I have started building pianos."* The piano business was only a transitory stage between the candle factory and the brewery. It probably only lasted the winter of 1855-1856. Indeed, Domenico Mariani, who stated at the Bell/Globe trial that he had stayed with Meucci up to the end of 1855, also declared (Answer no. 60): *"… he made experiments on pianos with glass; he made them at night; he made a piano of five-octaves. I gave the tone with the guitar,"* and (Answer 61) *"No; I didn't see it finished; but all the notes I gave myself with the guitar. I saw some small ones, but the one of five octaves I didn't see finished…"* and finally (Answer 62) *"This was in the time that the candle factory was in decadence, and in the evening we had nothing else to do, and so we made these things of glass to spend the time and make experiments."* Mariani thus indicated that, in addition to regular pianos, Meucci also manufactured celestas, instruments made with crystal bars that are struck by hammers.

In early 1856, Meucci set up the brewery in the same building *F*, on lot no. 1, where the candle factory had been (see Meucci's deposition, Answers nos. 310 to 329). However, also this business was unsuccessful, as he himself declared (Answer no. 320): *"I think I kept it up for a little more than a year …"* Yet, the failure of this enterprise was not determined by the market, but by the swindles of a certain Jim Mason, whom Meucci had met in Santiago de Cuba and had entrusted with the management of the brewery. First of all, on the pretext of having to pay the suppliers of the equipment and raw materials, on 28 August 1856, Mason cheated the Meuccis into giving him lot no. 3 (see transcript of the deed ahead), which was no longer used either for the spreading of the candles or for the brewery. Later on, precisely on 14 January 1857, Mason made Meucci sign a private deed whereby he was given the right to manage the brewery at his entire will. In agreement with some accomplices, Mason then incurred several false debts, which he asked Antonio Meucci to pay. The Meuccis perceived the risk of losing all their property, on account of Mason's greed and bad faith, and thus, on 22 September 1856, they decided to sell everything to a certain William W. Badger, who sold it back to Esther two days later ( 24 September; see the transcript of the deeds of sale hereinafter). This way, the

creditors of the brewery could not stake any claims on the property, for it no longer belonged to Antonio Meucci but to his wife instead, who could prove (and this is confirmed in the deeds of sale) that the money with which the land was bought all came from her own income (earned in Havana) and not from her husband's.

Notwithstanding, events took a turn for the worse in the following, unfortunate month of February 1857, swooping down over Meucci with the violence of a hurricane. On 9 February, Jim Mason started subpoenaing Antonio Meucci for an alleged debt of over two thousand dollars (subpoena filed on 16 February). Other nine subpoenas followed (see the appendix "Summary and transcription of court proceedings," in the following), in a few weeks' time, presented by Delos D. Pier, William A. Parker & Solomon Sanders (or Saunders) Jr. (three subpoenas), Hermann Batjer, Louis W. Viollier, Delos D. Pier (one subpoena each), and also Jim Mason (other two subpoenas), all of which were resolved with sentences that, overall, inflicted on Antonio Meucci the payment to the plaintiffs of penalties totaling to $6194.53, as indicated in the table below. Note that the sentences were issued in the period between March and July 1857, except in the Mason vs. Meucci-Fells case, that was settled later on.

This latter case originated from the fact that Antonio Meucci, in the attempt to save what he could from the hands of the treacherous Jim Mason, on 15 February 1857, rented the *Clifton Brewery* to a friend of his from New York, one Joseph Fells, who immediately ousted Mason from the brewery. But, five days later, precisely on 20 February 1857, Mason, availing himself of the private deed signed by Antonio Meucci, subpoenaed Meucci and Fells on the charge of breach of contract and scheming against him. Joseph Fells, in turn, on 9 March of the same year, passed his lease contract for a period of 9 years, 11 months over to a Frenchman by the name of Louis Gros, who ran a beer saloon in New York. The Supreme Court, however, with judgment issued on 4 April 1850, decided in favor of Mason, decreeing the bankruptcy liquidation of *Clifton Brewery* and the payment by Meucci and Fells to Mason of the expenses by him incurred in this action, amounting to $173.19. The case was closed on 26 November 1859, when the Receiver appointed by the Court concluded his work.

At this point, I feel my duty to stress that, without the patient research work and reconstruction of events of my fel-

low-countryman, Dr. Francesco Moncada, who, in 1932, spent many weeks scrutinizing the files of the Richmond County Court, today we would not be able to keep track of the many intricate legal proceedings in which the Meuccis were mired during said unfortunate period. Moreover, some documents, discovered and described in Moncada's unpublished typescript (see bibl.), were lost.

The Richmond County Court, on Castleton Avenue, Staten Island

At the onset of the aforesaid nine trials, Antonio Meucci was advised by a friend of his, Maestro Theodore Peressoni, a theater musician of New York, to entrust his defense to a lawyer by the name of Henry H. Morange, also from New York. Since Antonio Meucci didn't have much money, he paid the lawyer only $50 in advance for his fees, but he agreed to raise a mortgage of $500 on what remained of his (now Esther's) property in favor of Morange himself. The mortgage deed was signed on 20 February 1857.

**The nine judgments against Antonio Meucci (1857-1859)**

| **Subpoena** (date*) | **Judgment** (date) | **Penalty** ($) | **Parties involved** |
|---|---|---|---|
| 1857, 16 Feb. | 1857, 25 Nov. | $2623.10 | J. Mason vs. A. Meucci |
| date unknown | 1857, 11 June | $307.86 | J. Mason vs. A. Meucci (Marine Court) |
| 1857, 21 May (#3 subpoenas) | 1857, 11 June | $1212.98 | D. D. Pier, W. A. Parker and S. Sanders Jr. vs. A. Meucci, J. Mason (Marine Court) |
| 1857, 17 Feb. | 1857, 26 June | $798.56 | H. Batjer vs. A. Meucci |
| 1857, 17 Feb. | 1857, 26 June | $675.74 | L. W. Viollier vs. A. Meucci |
| date unknown | 1857, 17 July | $403.10 | D. D. Pier vs. Antonio & Esther Meucci** |
| 1857, 20 Feb. | 1859, 4 April | $173.19 | J. Mason vs. A. Meucci and J. Fells |
| | **Total due** | **$6,194.53** | |

* Filing date
** Reported by Francesco Moncada (documentation not found)

About a month later, as soon as it was felt that the pending suits were coming to a defeat, lawyer Morange advised Esther Meucci to sell all her belongings, land, buildings, furniture, furnishing, etc., to a friend of theirs, a Captain John Bennis from Brooklyn. Antonio Meucci countersigned the relevant deeds of transfer, to avoid future disputes. The deeds were dated, respectively, 18 March 1857, for the sale of lots no. 1 and 2; 14 May 1857, for the sale of furniture and furnishings of the brewery; 20 June 1857, for the sale of rights of lease of the brewery (see transcripts in the following appendix "Transcription of the deeds of transfer"). According to the deeds, Captain Bennis paid Esther a total sum of $8,501, in cash, and also shouldered the two preexisting

mortgages (the one in favor of Augustus Samanos and the one in favor of Henry Morange), amounting to a total of $3,500. Bennis also (verbally) promised to sell everything back to Esther as soon as the litigations were settled.

This solution turned out to be effective since when the Richmond County Sheriff turned up at the Meuccis' home to collect the sums set by the foregoing sentences[54], he had to acknowledge that the Meuccis were propertyless, and was therefore forced to return the related outstanding collect orders to the court. We know from the trial deeds that this occurred on 20 February 1858, as regards the credits of $2,623.10 and of $307.86 in favor of Mason, as well as the credits of $798.56 in favor of Batjer and of $675.74 in favor of Viollier. Instead, as regards the credits of $1,212.98 and $403.10 in favor of Pier and associates, the Sheriff's visit (and subsequent restitution of the orders to the court) must have occurred prior to the foregoing date. This stems from the fact that, already as of 27 June 1857, the plaintiffs Delos D. Pier, William A. Parker and Solomon Sanders Jr.,- following the lacked recovery of their dues on the part of the Sheriff, filed another lawsuit, bringing charges against not only Antonio Meucci but also Esther Meucci, William W. Badger, John Bennis, The People of the State of New York and Henry H. Morange. Antonio Meucci, Esther Meucci, William W. Badger and John Bennis were accused of conspiring against the plaintiffs, having made fraudulent transfers of property with the purpose of saving the latter from confiscation, and therefore the plaintiffs asked that said property transfers be declared invalid by the court. Likewise, they asked that the mortgage raised by Esther Meucci in favor of lawyer Henry H. Morange be declared invalid, also on account of the fact that the transferor (Esther) was not an American citizen and therefore did not have the right to own - nor, consequently, to transfer - real estate in the State of New York. Finally, the State of New York was sued in order for the Court to prevent it from confiscating the property concerned (appropriation by so-called *escheat*) should the owners prove illegitimate.

The action undertaken by Pier et al. was individually followed a few months later, precisely on 25 February 1858, by James Mason, Hermann Batjer and Louis W. Viollier, who filed three suits similar to

[54]Save, probably, the legal cost of the trial Mason/Meucci-Fells, of $173.19, which was probably paid in cash to the County Clerk by the Receiver appointed by the court.

the ones of Pier et al. against the same defendants, with the same requests.

As shown in the table below, the judgments - all in favor of Antonio Meucci and of the other defendants - were issued, as regards the action brought by Pier et al. on 28 March 1859, and, as regards the other three cases, on 19 March 1861 (all three on the same date). Indeed, as of 20 August 1858, the Court had decided to join the three cases brought by Mason, Batjer and Viollier respectively, as they were started on the same day and were based on the same motivations. However, it is worth noting that while the plaintiffs Mason, Batjer and Viollier were sentenced to the payment of trial expenses to Antonio Meucci and to the heirs of John Bennis (who had died in the meantime), the two parties involved in the Pier et al. vs. Meucci et al. case had not to pay anything to each other. Moreover, all the transfer deeds mentioned in the subpoena were judged valid by the Court.

**Judgments in favor of Antonio Meucci (1858-1861)**

| **Subpoena** (date) | **Judgment** (date) | **Penalty** ($) | **Parties involved** |
|---|---|---|---|
| 1857, 27 June | 1859, 28 March | none | D. D. Pier, W. A. Parker, S. Sanders Jr. vs. A. Meucci et al.* |
| 1858, 25 Feb. | 1861, 19 March | ** | J. Mason vs. A. Meucci et al. |
| 1858, 25 Feb. | 1861, 19 March | ** | H. Batjer vs. A. Meucci et al. |
| 1858, 25 Feb. | 1861, 19 March | ** | L. W. Viollier vs. A. Meucci et al. |

* The expression “et al.” corresponds to: Esther Meucci, William W. Badger, John Bennis, the People of the State of New York, and Henry H. Morange.
** The plaintiffs are sentenced to the payment of trial expenses to Antonio Meucci and to the heirs of John Bennis.

The judges of these trials, by confirming the validity of the property transfers, deprived the alleged creditors of the power to recover the belongings and fixed assets of the Meuccis, thus dismissing the maneuvers of Jim Mason and his accomplices, aimed to strip the unprepared Antonio Meucci of all his belongings through invoices and fake bills of exchange. In this regard, Moncada relates, in his unpublished typescript (see bibl.), that the plaintiffs James Mason, Hermann Batjer and Louis W. Viollier were defined “fraudulent creditors” by the Court and that the sentences were all issued (or filed) on 12 June 1858, except the one relative to the case Mason vs. Meucci et al., which he states was issued on 21 March (instead of 19 March) 1861. We believe that the date 12 June 1858 was confused by Mon-

cada with that of another sentence, related to the Morange vs. Esther Meucci et al. case, of which we will speak shortly hereafter (or, perhaps, with the date of an intermediate hearing). As for the epithet of "fraudulent creditors" (which, besides, is implicit in the above judgments), Moncada must have taken it from documents which we were not able to trace.

Ironically enough, the property that was saved by the judges of the Supreme Court was lost in a subsequent legal action, brought precisely by lawyer Morange, who had defended Antonio Meucci in the first nine trials, which all ended with a judgment against Meucci himself. Precisely, it occurred that on 30 July 1857 - that is, before the beginning of the last four lawsuits described above, but after all the previous cases (except the Mason vs. Meucci-Fells case, still underway) were closed - lawyer Morange brought action against Esther Meucci, Antonio Meucci, John Bennis, Delos D. Pier, William A. Parker, Solomon Sanders Jr., James Mason, Hermann Batjer and Louis W. Viollier. The Meuccis were accused of not having paid interest on the $500 mortgage raised in his favor on lots nos. 1 and 2, for the past five months, amounting to $14.57. He therefore claimed, in accordance with the deed of mortgage, the payment of the mortgage through the sale of property by public auction. John Bennis was sued by virtue of his having been the last owner of said property. Finally, Morange asked the Court to inhibit the other defendants, creditors of Meucci, from claiming said property, in order to recover their credits, until his mortgage was paid. Antonio Meucci replied to the subpoena that he had already paid Morange the sum of $100, that he considered adequate to the services rendered by the latter. It is to be remarked that the Meuccis, having been abandoned (or rather, accused) by their lawyer Morange, were forced to avail themselves of another lawyer, William I. Street, not only to be defended against Morange himself, but also for the other four lawsuits still pending[55].

The lawsuit with lawyer Morange went on for five years. On 12 June 1858, the sentence was read at the first degree trial, which accepted Morange's requests, ordering the Sheriff to sell lots 1 and 2 at a public auction and to pay lawyer Morange the mortgage raised in his favor plus interest and court expenses. Following said sentence, lawyer Street filed an appeal, on 23 July

[55]For a short period, before lawyer Street was hired, the Meuccis were defended by lawyer George Catlin.

1858, and, on 23 February 1859, he obtained from the Supreme Court the reversion of the first degree judgment and the start of a new trial. The judgment of the second trial was issued on 15 January 1861, but confirmed the first degree judgment. Lawyer Street made another appeal on 9 March 1861, but, at the hearing of 10 September 1861, he did not show up in Court and the Supreme Court confirmed and rendered executory the previous judgment.

The auction of lots 1 and 2 was organized by the Richmond County Sheriff, Isaac M. Marsh, and was held at Siegert's Hotel in Clifton on 13 November 1861. It was won by Stephen A. Samanos (son of the already mentioned Augustus A. Samanos, who held a mortgage of $3,000 on the auctioned property), who bought the property for $3,286. In his unpublished typescript (see bibl.), Francesco Moncada stated that the auction was rigged in favor of Stephen Samanos and that the Sheriff, bribed by Samanos, *"failed to comply with his duty to publish on a local paper, for six weeks (once a week), an announcement of the auction and, breaching the law, he did not post the auction notification in three different public places in town … And, since no-one turned up,* [Stephen] *Samanos, as had been agreed, purchased the property for $3,286 …"* We have not found direct evidence to back up Moncada's statements, although we have no reason to doubt them, given the in-depth research conducted on site and for a long time by Moncada himself. Moreover, his account is supported by Antonio Meucci's testimony at the Bell/Globe trial (Answer no. 325: *"Samanos foreclosed the mortgage and sold the property at public auction."* and (Answer no. 326): *"He bought it himself and then sold it to Meyer & Bachman …"* and still (Answer no. 327): "… [Augustus] *Samanos said verbally, as a friend, that he would have taken care of my wife's interests, and would have reserved the house where we lived. But at Samano's death the son didn't want to keep the father's word."* In this regard we must highlight that we weren't able to get hold of an important document, cited in Moncada's bibliography, namely a deed drawn up by Augustus Samanos on 27 October 1862 (about one year after the auction sale) in favor of Antonio Meucci. It appears that with said deed Samanos made some kind of commitment towards Antonio Meucci in relation to the foregoing property, and one cannot imagine what other commitment it could possibly be if not that of keeping Bennis' verbal promise to sell back the prop-

erty to the Meuccis as soon as more favorable conditions came up and to allow them, in the meantime, to continue to live in the cottage for free.

Getting back to the period immediately following the auction, Sheriff Marsh, after deducting his fees ($90.49) and paying the mortgage with interests ($729.50) plus the trial expenses ($318.16) to Morange, deposited the surplus money, amounting to $2147.85, in the office of the Clerk of Richmond County. Another trial took then place for the allocation of said surplus money. This trial lasted several months from the date in which the Sheriff filed his report, namely, 28 December 1861.

Before reporting on this last trial, it is necessary to highlight that, on 6 October 1860, therefore just over a year prior to the auction sale of the property in question, the legitimate owner of the time, Capt. John Bennis, died. On 8 November 1861, that is to say a few days before the property was auctioned, John Bennis' executrices, Nina and Anita Citcovich, transferred said property to a Chancey L. Brown. In his turn, on 3 December 1861, Mr. Brown transferred the property to a lawyer by the name of John Moody, who, a few days later, turned to the Court, claiming the entire surplus money amounting to $2147.85. Lawyer Street, to whom the Meuccis owed $1000 for their defense, as well as Esther Meucci, who claimed to hold a credit towards the deceased John Bennis amounting to $800, also turned to the Court. Furthermore, Esther Meucci brought action (documents not found) against John Moody, probably contesting his unconditional right of property over the assets concerned and thus claiming the entire surplus money from the auction. While awaiting for the settlement of the litigation between Esther Meucci and John Moody, on 3 February 1862, the Supreme Court ordered the payment in advance of $800 plus interest to John Moody. Some two months later, precisely on 7 April 1862, the Supreme Court assigned the entire surplus of $2147.85 to John Moody, thus closing the case once and for all.

The five years, from the beginning of 1857 until the end of 1862, were very sad indeed for the Meuccis, who saw all their wealth, which they had accumulated in fifteen years of work in Havana, vanish into thin air, and were left without a penny and without a home. William Rider, who met Antonio Meucci for the first time in 1858, testified as follows at the Bell/Globe trial (affidavit dated 20 April 1886): "*In the year 1858 I became acquainted with Antonio Meucci … he was*

*in very embarrassed circumstances. He lived at Clifton, Staten Island, in a small house, and had owned a small brewery there, and a public garden; but the property was mortgaged, and there were law suits going on at the time about it, and it was going to be sold by judicial proceedings …"*

When, at the Bell/Globe trial, the lawyers asked Meucci what he had done after the brewery was closed down he answered (Answer no. 328): *"I went walking, because I had no money."* This means that the money received from Capt. John Bennis (which actually only amounted to $900, as Bennis himself testified[56]) were barely sufficient to pay his debts and the lawyers' fees. On 16 April 1863, Antonio Meucci wrote to his brother Giuseppe as follows: *"… as for my litigation, as I mentioned to you, I lost it … so, the Brewery and the house, all was lost, but as I said I am a fatalist and a philosopher …"*

After, at the end of 1861, all of the Meuccis' property was in the hands of Samanos, the latter, at least at first, claimed to be their friend and allowed them to live in the cottage without paying the rent. However, a few years later, precisely in 1866, Stephen Samanos secretly sold part of the property (probably, lot no. 1) to a certain Bernard Stirn, who, in turn, on 29 July 1868, sold it to the brewer David Mayer, one of the two owners of *Mayer & Bachmann Brewery* (the former *Clifton Brewery*), which stood adjacent to the Meuccis' cottage. In October 1879, Stephen Samanos sold the rest of the property (lot no. 2, probably) for $1,200 to *Mayer & Bachmann Brewery*, owned by David Mayer and his business associate Frederick Bachmann. The owners notified the Meuccis to leave the cottage, since they needed the land to expand the brewery. Esther Meucci turned to lawyer Morange, subpoenaing *Mayer & Bachmann Brewery,* as well as Stephen Samanos, and demanding to return in possession of the cottage that she had been cheated out of. An agreement was reached, which was drafted by notary Angelo Bertolino, by which the Meuccis agreed to move the cottage to the other side of Forest Street, on the condition that they could live there for free for all their life and with a compensation to Esther of $400. Here is what Antonio Meucci testified in this regard at the Bell/Globe trial (Answer no.

[56]In his reply to the subpoena filed by Louis W. Viollier, John Bennis stated that he had paid out some $900 *"to meet the necessary expenses of said Esterre Meucci and Antonio Meucci,"* thereby denying that the Meuccis had ever transferred capital and fixed assets to him receiving nothing in return, as maintained by the plaintiff.

324): *"I transferred it* [lot no. 2, Editor's note] *to the brewery of Meyer & Bachmann, and the house was transferred to the other side of the street on condition of being allowed to live in the house for my lifetime. Said contract was drawn by the notary, Mr. Bertolino; Messrs. Meyer & Bachmann paid to my wife $400 as a compensation …"* and (Answer no. 327) *"… Then, in 1880, Mr. Bennett took my part, and asked lawyer Morange to enter a suit against the son Samanos to compel him to keep the promise of keeping the house to my wife. This was the time in which Mr. Bertolino made an arrangement with Messrs. Meyer & Bachmann to transfer the house on the other side of the street in order to enlarge the brewery, with the recompense of $400."*

More precisely, on 28 November 1880 - shortly after *Mayer & Bachmann Brewery* was dissolved and Frederick Bachmann took over the business - the latter declared his intention to reach an agreement with the Meuccis. Informed of this, judge Erastus Cooke closed the proceedings at law in view of an agreement between the parties. As is indicated in the deed subsequently signed by Frederick Bachmann on 1 July 1882 (see transcript ahead), said agreement was reached in March 1881, and it settled that the cottage would be leased to the Meuccis for life, on the condition that Esther dropped charges and that the cottage be moved to the opposite side of the street, precisely to lot no. 2', indicated on the map shown on p. 400, offering Esther the previously-mentioned compensation of $400.

According to the *Richmond County Gazette* of 16 March 1881, the cottage was moved in the preceding days (14 and 15 March 1881) while Esther - always combative notwithstanding the miserable conditions in which they lived and her age - refused to exit the house, not even for the time required to move it across the street. As refers the *Richmond County Gazette* , she stated: *"If it tumbles down I shall die with it."* The paper then refers that the house was moved *"Mrs. Meucci and her household goods not having been disturbed*." This was confirmed by *L'Eco d'Italia* of 9-10 April 1882, which wrote as follows: *"the house was moved with the tenants inside, and this was providential for, otherwise, shortly thereafter, it would have burned down in the fire that destroyed the brewery last year* [1881 - Editor's note] *and would have destroyed it as well, had the firefighters of the Company of which Garibaldi is an honorary member not saved it with superhuman efforts …"*

As regards the fire mentioned in the paper, which devastated some of the buildings of Bachmann's Brewery a few months after Meucci's cottage was moved, as well as the carelessness with which the transferring of the cottage was performed, here is what Antonio Meucci stated at the Bell/Globe trial (Answer no. 68): *"… about the year 1880, after arrangements I made with Messrs. Meyer and Bachman, conveying to them the ground where the house was erected, I transferred the house to the other side of the street, just opposite. All that was in the basement was lost, or at least the greater part of it, as instruments, utensils, tools, newspapers, etc., which were in several boxes to be transported. Moreover, several years after* [actually it was less than a year, Editor's note], *all the brewery in front was burned down. Several friends, during the fire, took my effects out in the yard, and so all that was outside of the house was destroyed and lost on account of the water from the engines …"* From Meucci's account we gather that only the upper part of the cottage, above the basement, was moved, though with all the household goods and Esther inside. This was inevitable, since the basement was almost certainly made of brickwork. Thus, another basement (more or less identical to the former) should first have been built in the new location and then the upper part of the cottage must have been dragged over it. Antonio Meucci had also to abandon the small laboratory that he had set up in a bower next to the cottage (that we will better describe in the following), and carry the lathe and the steam boiler that he kept there to the basement of the cottage, in the new location. In fact, as appears from the map on p. 400, there was not enough land, on the new site (2'), to set up another bower.

The two locations of Forest Cottage, before (on lot no. 2) and after (on lot no. 2') its transfer, are confirmed by the deeds (see the appendix "Transcription of the deeds of transfer"), drafted before and after Bachmann's deed of lease for life of the cottage, of 1 July 1882. In fact, in the following deed (transfer of the cottage to curators), the cottage is said to be positioned on the *easterly side* of Forest Street, while in previous deeds it was always indicated as being on the *westerly side*.

It also seems evident that the cottage was moved along a straight line (by some thirty meters), from one side to the other of Forest Street, therefore keeping its orientation unchanged. This can be confirmed by comparing the appearance of the front of the

house (overlooking the street) as shown in the drawing by Nestore Corradi on p. 111, dated 1857 (therefore, prior to the transfer), with the photograph on p. 413 taken in 1884, after the transfer. In the former we note, at the center of the attic floor, a rectangular window surmounted by a porthole, whereas the latter shows, in the same position, only one window with a semicircular top. This detail of the window(s) at the center of the attic floor is the only one that allows to distinguish the back and front façade one from the other, as clearly shown in the drawings on p. 438. Now, it is evident that, after linearly moving the cottage from one side to the other of Forest Street, the back façade became the front façade and vice versa. Incidentally, after the displacement of the cottage, the orientation of Garibaldi's room, which faced northeast, remained unchanged.

As we will see more in detail in the following, the cottage underwent another displacement, some years after Antonio Meucci's death, reaching its present location (lot no. 4, in the map on p. 400) on Townsend Avenue, currently Tompkins Avenue. To help the reader better understand what orientation took the cottage in this second displacement, we have marked on the map on p. 400, inside the black boxes indicating the cottage in its subsequent locations (2, 2' and 4), a white *L*, which corresponds to the position of the two flights of steps that lead from the ground floor to the top floor. Said flights of steps represent one of the few asymmetric elements in the interior of the cottage, apart from the aforementioned (external) asymmetry in the window(s) at the center of the top floor. We can therefore see from the orientation of the *L* that, in lot no. 4, though it was maintained the same street front as in lot 2', the orientation was reversed. In particular, Garibaldi's room now faces southwest, whereas, prior to the last transfer, it faced northeast.

Getting back to the period in which the house was moved for the first time (1881), the Meuccis stayed in the new location (which was surrounded by a very small garden, as is shown in the map on page 400) until their death, which occurred on 21 December 1884 for Esther and on 18 October 1889 for Antonio. Their great friend, Giuseppe Garibaldi, died before them, on 2 June 1882, shortly after the displacement of the cottage. Nine days after the death of the General, on Sunday, 11 June 1882, a huge procession of Italians (several thousands of people) went on a pilgrimage to the cottage, in its new loca-

tion (2'), to pay a tribute to the illustrious deceased hero, who had lived there from the end of 1850 to the beginning of 1854. On that occasion, Frederick Bachmann publicly declared that he would donate the cottage to the Italian Nation, to preserve the memory of the great hero, on the condition that the Meuccis could continue to live there for free for the rest of their lives. Immediately following the applause of the crowd, Carlo Barsotti, the editor of the daily paper *Il Progresso Italo-Americano*, introduced by the editor-in-chief of the same paper, Dario Papa, donated to Frederick Bachmann a precious Italian flag with the coat of arms of the Savoy House embroidered on it by hand. According to the papers of that time, the ceremony was most touching.

Marble tablet at the Meucci's cottage, in memory of the dwelling of Giuseppe Garibaldi

The deed whereby the cottage was donated, which was entrusted by Frederick Bachmann to three curators, Carlo Barsotti, Antonio Lazzari (the owner of the homonymous restaurant and of the Hotel Caprera in Clifton), whom we will speak of hereinafter, and Vincenzo Polidori (editor and owner of the paper-pamphlet *Cristoforo Colombo*), was signed on the following day, 12 June 1882. The echo of said donation reached Italy, where the Municipality of Civitavecchia conferred upon Frederick Bachmann the honorary citizenship.

Less than two years later, precisely on Sunday, 9 March 1884, a marble tablet (see the picture below) was unveiled, which had been affixed the previous day over the front entrance of the cottage, in memory of Garibaldi's dwelling. The following words are carved on the tablet: *"Here dwelled, exiled, from 1851 to 1854 - Giuseppe Garibaldi, The Hero of the Two Worlds - 8 March 1884 - Placed by a few friends."* It must be reported, however, that Domenico Mariani stated at the Bell/Globe trial, that the tablet had already been put up in 1882, shortly after Garibaldi's death.

In the photograph of that event, shown hereunder - which, as far as we know, is the oldest photograph that exists of Meucci's cottage - the following people appear, according to the note written on the back of the photograph, kept at the Staten Island Historical Society, though not specifying the order in which they stand: A. Meucci, C. Bertolino, L. Bistolfi, G. Secchi de Casali, H. C. Wood, A. Lazzari, F. Bachmann, C. Paladini, A. Dondero, A. Bertolino, M. Lemmi, P. Ludovitz, Dr. Bettini, H. Meyer, A. Oldrini and O. Bogarini. The names of other five are not given.

After Antonio Meucci died, the cottage was vacated (its custodian and Meucci's friend Cesare Nisini, who had assisted Antonio Meucci with loving care till the end, was ousted the day after) and taken over by the three curators Carlo Barsotti, Antonio Lazzari and Vincenzo Polidori. The Italian General Consul in New York, Giovanni Paolo Nobile Riva (urged by a telegram from the Italian Prime Minister, Francesco Crispi, dated 6 November 1889) made an attempt to place the cottage under the direct supervision of the Italian government, which failed on account of the strong opposition of the three curators.

The oldest photograph of the cottage, taken on 9 March 1884

The latter, however, were immediately faced with the problem of how to cover maintenance expenses and public taxes, which had already accumulated in the amount of $322 by the end of 1889 (see the *New York Staats Zeitung* and *The New York Sun* of 14 February 1890). *Il Progresso Italo-Americano*, joined (in the summer of 1898) by *Il Bollettino della Sera*, both of New York, opened subscriptions to cover the most urgent expenses.

On Monday, 20 April 1891, the belongings left behind by Antonio Meucci, including Garibaldi's many mementos, were auctioned at the cottage itself[57]. Notice of the sale was given in the *Staten Islander* of 11 April 1891, while an account of it was published on the *Richmond County Standard* of 25 April 1891.

In 1903, other subscriptions were made to save the cottage from severe deterioration.

At the beginning of January 1905, Frederick Bachmann died and the land on which the cottage stood passed into the hands of his legal heirs. These asked the aforementioned curators to have the cottage removed from their land, since the donation of the deceased Frederick Bachmann only concerned the cottage, not the land, and also because they needed the latter to further expand the brewery. Pursuant to such a request, the *Società Garibaldi* of Staten Island offered the sum to purchase another piece of land, in order to move the cottage. This property was found (lot no. 4 on the map on page 400) on the corner of Chestnut Avenue and Tompkins Avenue. On 17 June 1905, this lot was sold by Aaron H. and Margaret D. Wellington, for the sum of $2700, to a society - the *Society for the Preservation of the Dwelling House of the Late Giuseppe Garibaldi at Clifton, S. I. New York* - that had been specifically set up, on 27 April 1905. The latter, with the con-

[57]Initially, the auction was scheduled for the previous Monday, 13 April.

sent of the curators, raised the funds necessary to transfer the cottage to the new piece of land and to build a monumental 'pantheon' that would enclose the cottage itself. All Italian societies in New York gave their financial contribution.

On 2 June 1906 (the anniversary of Garibaldi's death), the first stone of said 'pantheon' was laid down and, on 4 July 1907, on the centenary of Garibaldi's birth, the building was completed and ten thousand Italians inaugurated the monumental construction dedicated to Garibaldi, on the new piece of land, which displayed the heading: *Garibaldi Memorial*. The building (see the photograph below) imitated the style of the Roman Pantheon, featuring a colonnade made of wood and plaster. In debatable taste, the cottage was placed inside the pantheon, which concealed the view of it to a considerable extent. The commemoration of the hero of the two worlds, held on 4 July 1907, was the first important one to be celebrated in the United States. A large procession gathered at Washington Square, before the statue of Garibaldi, and from there headed for Staten Island. Representatives of the Greek and German communities were also present, as well as thirty-two Garibaldians donning red shirts, who carried an Italian flag that had survived the heroic exploits of the Thousand.

Unfortunately, only two years later, namely at the 4 July 1909 celebration, the pantheon and the cottage inside it were in pitiful conditions, to the extent that, according to Henry Tyrrell (see bibl. 1909), *"… goats graze around the gaunt, lonesome-looking structure, and seek refuge beneath its classic portico …"* Indeed, the organizations that had raised the funds to purchase the land and to build the pantheon had not taken into account the cost of the enclosure, nor the costs of surveillance, maintenance and taxes, therefore the administration of that property rapidly registered losses. Furthermore, a debt of $6,000 still had to be paid back to the builder of the pantheon, who obtained a sentence from the court according to which the building was to be put up for auction and sold to recover his credit. This was done on 7 January 1914, but the Court granted a short time frame to redeem the property.

The initiative to raise funds with which to pay off the debt was taken by another Italian paper of New York, *Il Giornale Italiano*, which, by means of a huge campaign launched on 10 January 1914, was able to raise the funds needed to redeem the property by 1 May 1914. The transfer of the prop-

The "Garibaldi Memorial," inaugurated on 4 July 1907

erty, however, was recorded later on.

Unfortunately, a few days afterwards, precisely on 8 May 1914, some vandals tried to set fire to the pantheon. The *Staten Island World* of 9 May highlighted the fact that the building lacked protection, and presented itself "*… with doors unfastened, windows broken and easily accessible to any vandal …*" After that incident, the *Tiro a Segno Nazionale* of New York[58] (which planned to set up a shooting range in the vicinity of the pantheon) was entrusted with the surveillance of the pantheon and was put in charge of organizing the celebrations of the coming 4 July 1914. This event, however, which was to begin at 3 PM, could not take place for, as *Il Giornale Italiano* of 5 July 1914 wrote, "*The Industrial Workers of the World, led by Peppino* [the hero's nephew, Editor's note] *and Ricciotti* [the hero's son, Editor's note] *Garibaldi invaded the Garibaldian Pantheon, knocking down or climbing over the fence, tearing the Italian and American flags that had been put up and replacing them with the red flag, and occupied the site for the entire afternoon, until well after the time set for the commemoration …*" Note that *Il Giornale Italiano* was a right-wing paper, whereas the other daily newspaper, *Il Progresso Italo-Americano*, was rather left-wing.

The version of an independent paper, the *Staten Island World* of 11 July 1914 was: "*… on the afternoon of the Fourth of July … 300 Italians, headed by anarchists and I. W. W.* [*Industrial Workers of the World*, Editor's note] *leaders took possession of the structure by force … Shortly after one p.m. the invaders appeared wearing red cardboard armbands inscribed "Popular Garibaldi Committee." A large red flag, furled and draped in black was carried at the front by invaders. They broke through the gate, breaking down the iron fence in some places. Then they swarmed into the structure, tearing down the United States and Italian flags. A telephone message to Stapleton brought out a squad of 25 policemen. One of the leaders of the invaders was Carl Tresca, the Patterson, New Jersey anarchist who was the leader in the serious strike troubles there last winter and was then sent to jail. The police dispersed the anarchists before the projected 3 PM arrival of the Italian Societies from New York …*"

As one can see, neither Peppino nor Ricciotti Garibaldi

[58]Francesco Moncada (see bibl.) refers that the "Tiro a Segno Nazionale" (National Shooting Range) was set up in the United States in August 1888 and that it achieved many victories in shooting competitions, both national and international.

are mentioned. Furthermore, the *Staten Island World* wrote that a policeman that was hauling down the red flag raised by the demonstrators was hit by one of them with a stone and that the Italian Consul, who arrived at the site shortly before 3 PM, decided to call off the celebration. It was a pity, because the purpose of the event was also to raise money to cover the future running expenses of the property. To this end (see *Il Giornale Italiano* of 7 July 1914), tickets to the event were to be sold for 25 cents (the price included a souvenir token), a price that the anarchists refused to pay, claiming they had the right to organize a parallel celebration. Also *The Order Sons of Italy in America*, a Freemasonry organization, had notified, through the press, that it was against the initiative of the *Tiro a Segno Nazionale* and that it would not take part in the event. After the failure of that celebration, the *Tiro a Segno Nazionale*, in its session of 16 July expelled its honorary President, Peppino Garibaldi, for unworthiness.

On 13 January 1915, the property was transferred to the *Supreme Lodge Order of Sons of Italy in America*, for the symbolic sum of one dollar (see transcription of the deed ahead). On 30 October 1917, the *Supreme Lodge Order of Sons of Italy in America*, in turn, handed the property over to the *Italian-American Historical and Patriotic Society Inc.*, seated in Manhattan, always for the nominal sum of one dollar (see transcription of the deed ahead). But after about eleven years, precisely on 24 July 1928, the property returned in the hands of the *Supreme Lodge Order Sons of Italy in America*, which purchased it back for one dollar (see transcription of the deed ahead). From then on, up until today, the latter has looked after its preservation and maintenance.

It is worth highlighting that, a few years before, namely on 16 September 1923, a monument to Antonio Meucci was inaugurated in the yard, in front of the pantheon. The initiative was taken by Capt. A. Cuomo Cerulli and by the Italian community residing in the United States, but the monument was built in Italy, thanks to Gen. Emilio Guglielmotti, who collected contributions from various public and private bodies. The monument was sculpted in Italy by Ettore Ferrari, in marble and bronze. The marble was offered by the Rome Municipality and the bronze, coming from the Austrian cannons captured by the Italian Army in Vittorio Veneto, was offered by the Italian Ministry of War. The monument was then shipped from Italy to New York and from

Monument to Antonio Meucci, at the "Garibaldi-Meucci Museum"

here to Staten Island. Here, Antonio Meucci's ashes were placed in an urn beneath the bust, as shown in the picture below.

The 4 July anniversary was celebrated uninterruptedly from 1915 until a second unfortunate event, that took place in 1932, when Fascists and anti-Fascists came to blows in front of the pantheon. After that, the Garibaldian celebrations were suspended for very many years. Also on the preceding 4 July 1925 (see *La Follia di New York* of 27 June 1926) opposite political factions brawled, after one of the many critical moments of the administration, which was behind in its payment of the land and aqueduct taxes by as much as $1756.75 (see *La Follia di New York* of 28 March 1926). Roy Bredholt (see bibl.) relates that, finally, in 1949, the *Staten Island Italian Historical Society* attempted to get the Italo-Americans interested in organizing the celebrations again, but the latter showed little enthusiasm, especially for the fear of other disorders. This was confirmed in a paper by Daniel Santoro "Garibaldi" (see bibl.), written in 1950, in which he condemned the fact that the pantheon was practically in a state of abandonment, to the shame of the Italian community.

Finally, in 1952, the superstructure that contained the cottage, in a pitiful state by then, was torn down and the cottage was restructured; many of the belongings of Garibaldi and Meucci (or reconstructions thereof) were collected and sorted there. On the afternoon of Sunday, 20 May 1956, the cottage, perfectly restructured, was inaugurated under the name of *"Garibaldi and Meucci Memorial Museum"* (see the *Staten Island Advance* of 21 May 1959 and *Il Progresso Italo-Americano* of 20 and 21 May 1959). The Italian Ambassador in Washington, H. E. Manlio Brosio, cut the three-colored ribbon tied on the front door, shortly after the ceremony began, at 4 PM. Many eminent men were present, including the Supreme Venerable of the *Order Sons of Italy in America*, Mr. George Spatuzza from Chicago, chairman of the ceremony, the General Consul of Italy, Dr. Carlo De Ferraris Salzano, a historian of the Italian Risorgimento, Prof. Vittorio Ferraris, the President of the Borough of Staten Island, Maniscalco, a niece of Giuseppe Garibaldi, who resided in Connecticut, Giuseppina Ziluca Garibaldi, Prof. Howard Marraro of Columbia University, Prof. Edward D. Re, and many others, in addition to thousands of Italians, who came together for the occasion. The historian Giovanni Schiavo, who was writing his famous book "An-

tonio Meucci Inventor of the Telephone," was also present. The Cultural Division of the Italian Embassy set up the Museum section, entrusting the painter Lino S. Lipinsky with the historical and artistic supervision.

On 13 September 1966, the *Garibaldi-Meucci Museum* was declared a Landmark Site of New York City, and in April of 1980, it was declared National Monument of the United States of America and of the State of New York (see *OSIA News* of April 1986). Consequently, the *New York State Council on the Arts* and the *Office of the Borough President of Staten Island* donated funds that, in the years between 1985 and 1986, made it possible to make further improvements and to collect more mementos, as well as to hire a full-time professional staff for the Museum.

The cottage, renamed "Garibaldi-Meucci Museum" as it appears today

## «Clifton Brewery»

It was not easy to determine the exact date on which Antonio Meucci set up the brewery called *Clifton Brewery* - the first of its kind on Staten Island. Indeed, both H. McMillen (1969, see bibl.) and the *Webbs Consolidated Directory* (1882-83) reported (incorrectly, as regards the date) that Giuseppe Garibaldi and Antonio Meucci founded the first lager brewery on Staten Island in 1851. Here is what H. McMillen says: "… *Staten Island first lager beer brewery was started, according to our histories, not, alas, by a German, but by two Italians, and the two most famous on the Island at that time, none other than Giuseppe Garibaldi and Antonio Meucci - in 1851 at the junction of Maple Avenue (now Lindhurst*[59] *Avenue) and Forest (now Ditson Street) in Clifton. Later it was known as the Clifton Brewery and then for many years as the Bachmann's. An A&P supermarket now occupies the site near the Tompkins Avenue overpass over the S.I.R.T. railroad tracks … After the candle making failure, Meucci established a brewery in the cellar of his house. Then, according to Daniel Santoro in a booklet published in 1935: 'Handicapped by a complete lack of the English language, he entrusted the venture to a Jim Mason whom he had met in Santiago, Cuba … Mason … left Meucci close to bankruptcy' …"* McMillen added that, after winning the first prize at the *Centennial Philadelphia Exposition* of 1876, Bachmann's beer was given the name *Centennial Lager Beer*.

Aside from the dates, McMillen's paper is important because it confirms that Clifton

[59]The correct name is *Lynhurst Avenue*.

Brewery was located on the corner of Forest Street and Maple Avenue, therefore on lot no. 1 on our map on p. 400, exactly where the candle factory previously stood. Evidence of this is also provided by an old lithograph by Nestore Corradi, shown below, also reproduced by Charles L. Sachs in his book 'Made on Staten Island' (see bibl. p. 48) with the following caption: *"Clifton Brewery, lithograph by N. Corradi printed by A. Weingartner, New York City, ca. 1851; Founded in 1851, Staten Island's first lager beer brewery, later known as Bachman's is believed to have been established by Italian immigrant Antonio Meucci with the assistance of exiled compatriot Giuseppe Garibaldi. The Clifton Brewery was located near the intersection of Lyndhurst* [*Lynhurst,* Editor's note] *Avenue and Ditson Street, Clifton."* Aside from the mistake as regards the year (1851) and the presence of Garibaldi, the indication of the location is important. Indeed, the small Clifton Brewery is shown to the left of Meucci's cottage (easily recognizable by the shape and position of the windows, the shape of the roof, the number and position of the chimneys and by the porch with the steps), at the intersection between old Maple Avenue (currently Lynhurst Avenue) and Forest Street (currently Ditson Street). Note the numerous chimneys of the brewery, the three large barrels to the left of the raised floor, and, to the far left, the engine with hydraulic wheel; above the latter, in a raised terrace, one can see the merry customers of the beer garden toasting with the frothy beverage.

«Clifton Brewery» on the corner of Forest Street and Maple Avenue (to the left)

Many years before McMillen's paper, the authoritative *Webbs Consolidated Directory of North and South Shore of Staten Island 1882-1883* reported as follows: *"Frederick Bachmann's Clifton Brewery.— This establishment was founded in 1851 by that distinguished patriot, Giuseppe Garibaldi and his partner, Antonio Meucci, the latter of whom is proprietor of a summer resort near by. Since their day it has passed through the proprietorship of Louis Gross* [*Gros,* Editor's Note], *Christian Tretz, Gabriel Mayer and Mayer & Bachmann."* Therefore, also according to *Webbs Consolidated Directory,* the 'Frederick Bachmann's Clifton Brewery' was founded in 1851 by the illustrious patriot Giuseppe Garibaldi and his associate Antonio Meucci: the mistake repeats itself.

In the aforementioned article, McMillen included an interesting *bird's eye view* of the Bachmann's Brewery, dated 1900, which we reproduced here. It clearly shows:

Meucci's cottage (obviously after it was moved across Forest Street), Bachmann's great stables on Maple Avenue, separated from Meucci's cottage by a large building, the residence of the Bachmann family[60]; almost the entire view of Maple Avenue and, in the foreground, the SIRT railroad (*Staten Island Rapid Transit*), which had a station for goods service, called *Bachmann Station*, in the vicinity. Incidentally, H. Tyrrell (see bibl.) called Bachmann's brewery the *"big red brick brewery."*

Unlike the two references mentioned above, *L'Eco d'Italia* of 9-10 April 1882 correctly reported: *"… The stearic factory was where the brewery now stands, and the brewery itself was set up by Meucci, when he abandoned the candle industry, after Garibaldi and Salvi left for Italy …"* This statement matches with our version, as illustrated below. To establish the exact date when Clifton Brewery was founded, we must take into account the following considerations:

—that the mortgage raised in favor of Augustus Samanos in order to buy machines for the brewery is dated 1 May 1856;

—that, in the letter to his brother Giuseppe dated 14 November 1855, Antonio Meucci mentions to have set up a piano factory but not a brewery;

—that the sale to Jim Mason of lot no. 3 (to reimburse the costs advanced by him to set up the brewery) took place on 28 August 1856;

—that Mason himself, in his subpoena against Meucci (see summary and transcriptions of the case hereinafter) claimed the restitution of sums that he allegedly paid in advance on behalf of the brewery in the period between 24 March and 16 September 1856;

—that Hermann Batjer, in his subpoena against Meucci, stated that he had delivered a great quantity of beer bottles to Clifton Brewery for a value amounting to around $700, in the summer of 1856 and that Meucci signed a promissory note for that supply on 12 September 1856;

—that Louis W. Viollier in his subpoena against Meucci claimed the restitution of sums that he allegedly paid in advance on behalf of the brewery in the period from 2 October to 3 December 1856;

—that Delos D. Pier, William A. Parker and Solomon Sanders Jr. in their subpoena against Meucci stated that during the summer of 1856 (in the months of July, August and up to 22 September) they delivered a great deal of malt for a value of $1140.90;

—that the warning signs of the brewery's lawsuits date back to

[60]Indeed, in his affidavit, Frederick Bachmann stated that he was Meucci's next door neighbor.

22 and 24 September 1856, when lots nos. 1 and 2, comprehensive of buildings, fixtures and furnishings, were transferred to William W. Badger and from the latter to Esther Meucci;
—that the brewery passed under the management of Joseph Fells on 15 February 1857;
—that, in the deed of transfer to John Bennis, dated 14 May 1857, a *"certain cottage and brewery situated at Clifton"* are mentioned and the equipment (such as vats for sedimentation and fermentation) is described in detail, which means that the brewery already existed on that date;
—that the affidavit of John Sidell includes the sentence: *"… Antonio Meucci, Clifton Brewery, Staten Island. July 30th, 1858 …,"* which means that on that date (30 July 1858) Meucci still carried out some activity at the brewery;
—that in the sentence of the case J. Mason vs. A. Meucci & J. Fells of 4 April 1859, the judge officially dissolved the partnership between Meucci and Mason and decreed the discharge of bankruptcy of *Clifton Brewery* (the denomination used in the sentence), which became effective as of 26 November 1859;

All this leads to conclude:
—that the brewery, almost immediately denominated *Clifton Brewery*, was founded by Antonio Meucci in the early months (February-March) of 1856, and not in 1851, as McMillen, Sachs and the Webbs Consolidated Directory stated;
—that it had to account for a rather substantial production, if, in the summer of 1856, it used a quantity of bottles for the value of at least $700 and large amounts of malt for at least $1140.90[61];
—that Antonio Meucci passed the management over to Joseph Fells on 15 February 1857, but that he probably continued to work for the various tenants of the brewery until around the end of 1858, when, having met Mr. William Rider, he began his paraffin candle manufacturing business (the first patent of which was filed on 15 November 1858).

Finally, we call the attention of the reader on an excerpt of the deed of transfer to Capt. John Bennis, dated 14 May 1857 (fully transcribed ahead), which provides an inventory of the items contained in the cottage as well as in the brewery, where we have evidenced the ones that refer to the brewery: *"… center table with marble top, forty chairs, … one hundred tin boxes, sixty yards fine linen, sixty yards of canvass, seven trunks, … seventy yards oil cloth, ten brass lamps, three lanterns, two casters, …*

«Bachmann's Clifton Brewery» around 1900

[61]It should be borne in mind that, at the time, the retail price for a pint of beer was around 10 cents.

*one scale, one pump, four tin cans, one copper kettle, … one working bench, one small turning lathe and tools, one dice, three hundred and sixty tin pans, two hand barrows, twelve square tables, eighteen round oak tables, seventy two arm chairs, seventy two common chairs, one hundred glasses, twelve pitchers, … seventy two plates, … seventy two knives and forks, six casters, one ice preserver, forty yards of oil cloth, one counter and shelves, tin fermentation tops, twenty two beer casks each contains one hundred and sixty gallons of beer, five sixty gallon casks, one thirty gallon cask, eight oak water pails, three wall tops, one copper force pump, one brewing kettle, two beer coolers, cooper's tools, three wooden covers, ten pipes, three brass taps, two iron kettles, one iron press, one hundred beer kegs …"*

## Style, structure, maps and views of the cottage

As was mentioned at the beginning of this appendix, it is likely that the Townsends themselves built the cottage in question on lot no. 2, shortly after they had purchased the land, and called it *Forest Cottage*. Evidence of this lies in the fact that the gothic revival style of the cottage was very much in vogue precisely around the mid-eighteen hundreds, both in Europe and in the United States. The popularity of cottages built in gothic revival style, primarily made of wood and stucco, was gradually entailed by the following publications: "Cottage Residences" by Andrew Jackson Downing (who created the style of the American cottage), of 1842, and "The Architecture of Country Houses" of 1850. Downing also indicated simple layouts and building methods, that could be implemented by any good carpenter. Our hypothesis as to when Forest Cottage was built is shared by the *Garibaldi-Meucci Museum*, which, in the pamphlet illustrating the building, indicates that it was built *"in the mid-eighteen-forties in gothic revival style."*

Max Maretzek, the famous theater impresario and orchestra conductor, who had rented Forest Cottage before Meucci and Garibaldi did, owned a cottage built in the same style, located on the southern coast of Staten Island[62].

We have already said that the oldest photograph we have of the cottage carries the date 9 March 1884, and that it was taken when the tablet com-

[62]In his book entitled "Sharps and Flats," Maretzek says he had a house at Prince's Bay. However, the *Staten Island Advance* of 1935 (see bibl.) shows a picture of his house in Pleasant Plains, on 97, Bloomingdale Road, which is about one kilometer away from Prince's Bay.

Drawing of Forest Cottage (Frank Leslie's Illustrated Newspaper, 1882)

memorating Garibaldi's residence in the cottage was put up. However, a couple of years before, drawings of the cottage were published in relation to Garibaldi's residence there. Two drawings, which are reproduced below, were respectively published on 10 April 1882, on *L'Eco d'Italia*, and on 3 June 1882, on *Frank Leslie's Illustrated Newspaper*, both near in time to Garibaldi's death (2 June 1882). However, whereas the drawing published on *L'Eco d'Italia* is very similar to the photograph of 1884 (and therefore accurate), the one on *Frank Leslie's Illustrated Newspaper* seems much too fancy and inaccurate, especially for what regards the small patio (which is wrongly depicted as entirely covered) and the central window on the top floor, which does not correspond to either the one on the façade or the one on the back of the cottage. Furthermore, the statement on the paper itself: *"… the old wooden house at Clifton … has been standing for over one hundred years …"* (which implies that the cottage was built prior to 1782) appears inaccurate, in the light of what was previously said. One of the positive aspects of this drawing is that it shows the two tiny windows of the basement, where Antonio Meucci had set up his laboratory[63].

*L'Eco d'Italia* of 10 April 1882 describes the cottage as *"a wooden little house, painted white, a common sight in the American country."*

The cottage appears today almost identical to how it appeared in the photograph taken in 1884, except for the fence along the street. Actually, some changes were introduced in its current location: first of all, as was already said, the windows of the basement were walled in, and today they can only be seen from inside the basement. Furthermore, the back porch was suppressed, although it certainly existed. This is clearly proven by both the drawing of *L'Eco d'Italia* and another photograph kept at the Garibaldi-Meucci Museum, that we will reproduce hereinafter. A third confirmation is provided by the affidavit of Leonard D. Cunningham, sworn on 10 October 1885, stating: *"During the year 1873 or 4 … His* [Meucci's, Editor's note] *house then stood where the ice house of the Brewery now is. His house was a plain frame house with a gable roof, piazza in front and rear …"* A final confirmation comes from a sketch by Daniel Santoro (see page 435) that

[63]These windows were walled in and incorporated in the basement, after the cottage was moved to its present location.

Forest Cottage in 1890

clearly shows the two verandas. Another difference lies in the front steps, which were limited to the central part of the façade, as the 1884 photograph shows, whereas today (see, for instance the photograph on page 418) they extend over the whole front of the cottage.

We have no drawings or photographs that show the cottage in its original position (when it was situated at the center of lot no. 2), that is to say prior to 16 March 1881, except the already quoted drawing by Nestore Corradi. The deed of transfer that followed the moving of the cottage to lot no. 2' says *"now situate on the Easterly side of Forest Street, about one hundred and fifty feet Southerly of Willow Avenue."* As the cottage was simply translated from one side to the other of Forest Street, this means that it stood 150 feet (about 46 meters) from Willow Avenue, thus about halfway down Forest Street, which is about 88 meters long.

A photograph of the cottage of 1887 and a drawing of the same of 1882

Another attractive photograph of the cottage, taken only one year after the death of Antonio Meucci is reproduced in the following. It shows what little land was left around the cottage by Mr. Bachmann. In the same picture, one can see, to the right of the cottage, the left corner of Bachmann's house.

Let us now attempt, with the help of various documents that we were able to get hold of, to reconstruct the plan of the cottage.

### *a) External laboratory*

This laboratory (indicated with an *L* on the map on page 426) was set up on lot no. 2, where the cottage initially stood. It was mentioned by Antonio Meucci in his Answer no. 63 at the Bell/Globe trial as follows: *"A. Drawing* [reproduced here on page 427] *showing the body of the house on the right-hand side; No. 1, small workshop, where I kept a turning lathe and a small steam boiler for the motor; No. 2, side of the house; No. 3, battery in the basement; No. 4, conducting wires, passing to the exterior of the house and penetrating, by the window, in the room called of Garibaldi, on the third floor; No. 5, ground separating the house from the workshop; No. 6, window of the room in the third story where my wife stayed, and adjoining the room of Garibaldi; No. 7, window of Garibaldi's room, in which the conducting wires coming from the battery entered; No. 8, window in the basement, from which the wire going from the battery to window No. 7, came out; No. 9, rope, which placed the third story in communication with the laboratory when*

*the bell rang, with which my wife used to call me."*

In his Answer no. 35 Antonio Meucci specifies the epoch to which the above description refers: *"… From the battery, in this time, about 1854 or 1855, I brought them* [the electrical wires, Editor's note] *to the third floor, through the exterior of the house; and from the window, through two screws, they entered the room called the Garibaldi room, where my wife from her room, she being sick with rheumatism, used to enter the Garibaldi room …"*

Location of the cottage and the external laboratory (L) until March 1881

From these two answers and from the drawing (his Fig. 12) of Meucci's deposition, many things can be deduced: firstly, that the years in question were 1854-55 and that the laboratory (1) was separated from the rest of the house (he specifically said: *"No. 5, ground separating the house from the workshop"*); furthermore, that the laboratory was located on the *right-hand side* of the house (evidently looking at the house from the street), which is the same side where the (adjacent) rooms of Garibaldi and of Esther were situated. Now, since Garibaldi's room was unmistakably (see ahead) on the northeast corner of the cottage, indicated on our map below with the letter *A*, the position of the laboratory *L*, indicated on the same map, is correct.

Drawing by Antonio Meucci showing the external laboratory (1)

As to its dimensions, Meucci says: *"a small laboratory where I kept a lathe and a steam boiler for the engine."* Furthermore, in his Fig. 12, he draws it in a rectangular shape (notice the shape of the roof), with the shorter side almost as long as Garibaldi's room, namely around four meters, therefore, large enough to contain a lathe and a steam boiler.

The distance between the laboratory and the main building, according to Meucci's Fig. 12, seems to be about two and a half times the width of the laboratory, hence around ten meters; consequently, said laboratory could be located close to the northern boundary of lot no. 2, just as is indicated on the map below.

Other important evidence of the fact that this laboratory existed outside of the cottage is contained in the testimony of Domenico Mariani at the Bell/Globe trial, mainly in his Answer no. 15: *"I was in the basement, and he was in his office which was on the opposite side of the yard …"* and in his affidavit, where he stated: *"There was a workshop in the yard."* Additional confirmations come from Mariani's following Answers: (Answer no. 13) *"In 1852 I went in Meucci's office and I saw him working with a box … A little after he told me to go in the basement, that he would come*

*soon … In fact he came … and put in my hands this box, and told me to put it to my ear, and be attentive if I could hear something, after he had gone in his office …;"* (Answer no. 28): *"… I have seen him at work in his office … I speak of 1856 and 1857 …;"* (Answer no. 30): [I talked with Meucci] *from the basement. Sometimes he would tell me … 'Bring me that paper that is in my bureau' …;"* (Answer no. 31): *"Meucci was in his workshop, and I in the basement."* From all these answers, it appears that, in the period 1852-58, he and Meucci communicated by telephone from Meucci's office or workshop to the basement, thus confirming that the two places were distant and that the laboratory outside was used at least until 1858. Notice that Mariani used the words *laboratory*, *workshop*, *workroom* and *office* (and, sometimes, *study*) indifferently to indicate the laboratory *L* in question.

We have another testimony on Meucci's external laboratory, contained in an affidavit, exhibited at the US/Bell trial, sworn by Mrs. Matilda Ciucci (see bibl.), who had worked for the Meucci family from 22 October 1875 till about the beginning of 1880. In her affidavit Mrs. Ciucci stated: *"… He* [Meucci] *also had wires sometimes running from the basement into the yard, the distance was as far as across Broadway. These wires reached the entire width of the lot …"* Thus, from Mrs. Ciucci's affidavit we gather two things: the first, that the distance between the external laboratory *L* was equivalent to the width of Broadway, the second, that it covered the entire width of the lot, being therefore near to its boundary, thus confirming our reconstruction illustrated above.

Later on we shall see that Meucci also used, as a laboratory, part of the basement, as well as a tiny room at the attic floor, which faces a flight of steps and has a window that currently overlooks the back of the cottage, whereas until 1881 it looked out on the front, towards Forest Street.

### *b) Furnace and boiler for the candle factory*

The furnace and the boiler with which tallow was melted is the only part of the candle factory that has survived, at least in part, to the present day. Henry Tyrrell, who visited Meucci around 1884[64], accompanied by a watercolorist, Walton Roberts, relates that: *"… the ruined brick furnace and caldron, all that remained of the old candle-making plant … stood then in the yard of the* [Bachmann's] *brewery, across*

[64]It was surely before Esther's death, for he speaks of her as if she were alive.

*the street from the Meucci domicile; but shortly afterward it was removed to the adjoining grounds of Lazzari's «Hotel and Garden of Caprera» for some years a much frequented suburban resort. Lazzari's is no more, but there, on its site, still stands «Garibaldi's kettle,» as the people of the neighborhood call it … "* and more: *"… the boiling-vat, the remains of which are still to be seen on the grounds of the old Lazzari place …"*

This account, like many others quoting locations of various places, cannot be fully understood if one does not bear in mind the topography (and its changes) of the area surrounding Clifton Brewery, where the furnace originally stood. We therefore consulted the maps of that area, pertaining to various years, precisely the *Beers Atlas* of 1874 and of 1887, the *Robinson Atlas* of 1907, and the *Bromley Atlas* of 1917[65], reaching the following conclusions:

Location of the Caprera Hotel in 1887 (Beers Atlas, 1887)

i) In 1874, neither Mr. Lazzari nor his Caprera Hotel are mentioned. Bachmann's brewery occupies the whole block between Maple Avenue, Forest Street, Willow Avenue and Tompkins Avenue, therefore, practically all lots nos. 1, 2 and 3 that once belonged to Meucci. Furthermore, at the time, SIRT's *Beach Branch* railroad line did not exist; the latter cut through Maple Avenue (with viaducts) and its parallel roads north of Forest Street.

ii) In 1887 (see the map here above) the Caprera Hotel appears as located on Chestnut Avenue, to the left of the SIRT *Beach Branch* line (vertically indicated on the map), which was built some years before. On this map, The *"F. Bachmann Clifton Brewery"* appears to be enlarged, as it now extends to the block across Forest Street, but not across Maple Avenue yet. Behind the *Caprera Hotel*, on Dunns Lane, we notice the house of *"M. A. Lazzari."* This is consistent with the fact that, in June 1882, Antonio Lazzari was one of the curators of the cottage, following Bachmann's donation. We can also deduce that Antonio Lazzari came to dwell in Clifton sometime between 1874 and 1882.

iii) In 1907 (see the map below) the *Bachmann Brewing Co.* extends to half the block on the other side of Maple Avenue, having considerably increased its premises. Furthermore, *Bachmann Station*, on the SIRT *Beach Branch* and the newly inaugurated *Garibaldi Memorial* are clearly indicated. According to this map, the *"A. Lazzari Caprera*

[65]These are rather detailed topographic maps, with scales from 1:5,000 to 1:10,000, in which even individual houses, shops or industrial premises are marked, along with the name of the owners.

Location of the Caprera Hotel, the Siegle Co. and the Garibaldi Memorial in 1907 (Robinson Atlas, 1907)

*Hotel"* was moved, though remaining on *Chestnut Avenue*, to the other side of the *Beach Branch* of the SIRT railroad, while the large complex of the *G. Siegle Co. Color Works* appears in its place. What Henry Tyrrell meant by *"the old Lazzari place"* is now clear.

iv) In 1917, things do not appear to have changed with respect to 1907. We were able to get a photograph of *"Lazzari's Restaurant in Chestnut Avenue"* from the Staten Island Historical Society. The picture, shown in the following, is not dated, although it should refer to the second location of the restaurant, especially as its previous name was *Caprera Hotel* (or *Caprera Garden*, or *Giardino Caprera*), as is also shown in three other photos (not included here), taken of Meucci with a group of friends, in September 1887, on the occasion of one of the commemorations of Garibaldi's entrance in Naples[66].

Lazzari's Restaurant, after its relocation in Chestnut Avenue

At this point, we can go back to the furnace and its location. Around 1884, Mr. Tyrrell found it still in its original place, namely in the enclosure of the old candle factory (then of the *Bachmann Brewery*), near the corner of Maple Avenue and Forest Street, and this is how the watercolorist Walton Roberts depicted it (see picture on the next page). The fencing that is seen behind the furnace apparently flanked Maple Avenue, as can also be deduced from Mr. Corradi's drawing (see page 111), where three steps leading to a masonry construction, which can be interpreted as the furnace in question, can be seen at the far left of the fencing.

In 1887 the furnace was not yet moved to the *Caprera Garden*, since the *Richmond County Gazette* of 8 June 1887 reported: *"… Part of the factory in which Garibaldi and Meucci carried out the* [candle] *business is still standing …"* And there it remained during the last years in the life of Antonio Meucci, as is proven by a photograph (reproduced at the top of p. 432), which can be dated between 1888 and 1889, given that Meucci, who died in 1889, appears in it (to the left, standing on a chair) in his late years. Comparing it with Roberts' watercolor, it seems clear that, although the viewpoint is different, Mr. Roberts drew somewhat free inspiration from it. In this photograph, it is possible to see (half covered by the fourth person standing, to the left) the pillar at the corner of the fencing between Maple Avenue and Forest Street. Note the 'igloo-like' shape of the furnace, as was defined by Fran-

[66]In the identification label, the following sentence is written on the back of one of them, which is kept at the Staten Island Historical Society: *"Caprera Garden, later Lazzari's Restaurant."*

The furnace and boiler for the candle factory (watercolor by W. Roberts, dated ca. 1884)

ces Winwar in her paper (see bibl.).

Many years later, around 1895, a photograph was taken (reproduced at the bottom of p. 432) of what remained of the furnace, which evidently was left to ruin after Antonio Meucci's death. It shows much more clearly than the other pictures that the furnace was located almost at the corner between Maple Avenue (to the right in the photograph) and Forest Street (to the left) and was a bit more distant from Forest Street than from Maple Avenue, in agreement with the previously-mentioned drawing by Mr. Corradi.

Ruins of the furnace and boiler for the candle factory (ca. 1887) . 1887)7;

The remains of the furnace must have been moved from their original location, in the enclosure of *Bachmann's Brewery*, to the enclosure of the *Caprera Garden*, early in 1901. This is confirmed by an article published by the *Sunday Journal* on 2 June 1901, according to which the furnace *"stands in a quiet corner of the grounds of an Italian restaurant at Rosebank …"* The article also reported that, after the restoration work conducted by Mr. Lazzari, *"it has served as a sort of shrine at which countless Italians have paid homage to the hero who liberated their Motherland …"*

The furnace, rebuilt in a peaceful corner of Lazzari's Restaurant (Sunday Journal, 1901)

Antonio Meucci by the furnace (standing on the chair to the left)

Judging from the photograph published with the article of the *Sunday Journal*, and reproduced here above, Antonio Lazzari had the furnace thoroughly restored and thus transformed into a real monument. The following inscription was placed on it: *"This Boiler was erected and used by Garibaldi and Meucci, Exiles and Patriots, 1850-1853."* The *Sunday Journal* also confirms that *"the present owner of the restaurant, Signor Lazzari, conceived the happy idea of converting the old boiler into a monument to the two patriots and caused the inscription to be placed on it."* In the same paper (see its full transcription ahead) it was said that the furnace-boiler was used to melt tallow and that Meucci's cottage was *a stone's throw* away from the site where the furnace was taken (although it must have been a rather strong man throwing that stone, since, according to our calculations, the distance covered over hundred meters).

When Antonio Lazzari, shortly before 1907, moved his restaurant further up north on Chestnut Avenue, the furnace-monument remained where it was, although the land on which it stood was now owned by a German company, the *Siegle Color Works* (as quoted in the maps), which evidently accepted to keep the monument within its premises. However, in 1918, when the goods of the *Siegle Color Works* were about to be confiscated, as they belonged to

German citizens (Germany having lost the war), to prevent the furnace from being demolished by any future owners, the *Italian-American Historical and Patriotic Society* decided to move it to the back of the *Garibaldi Memorial* (which it owned at the time) on the corner of Chestnut Avenue and Tompkins Avenue.

In this regard, the following short letter was found in the archives of the Staten Island Historical Society:

*"Sept. 25, 1918*

*G. Siegle Company,*

*Kindly permit the bearer, Rev. Carmelo DiSano, to remove the Garibaldi Furnace, with the understanding that any damage done in such removal, is to be properly repaired."*

The furnace and boiler, as they appear today in the back yard of the Garibaldi-Meucci Museum

The writer Frances Winwar (see bibl. and transcript hereinafter) gave a detailed account of how an old Garibaldian by the name of Giuseppe Genovese, who had become the curator of the *Garibaldi Memorial* during World War I, had informed the *Order Sons of Italy in America* on the need to recover the furnace, and that it was then moved to the back of the *Garibaldi Memorial*, where it currently stands. Incidentally, it was Mr. Genovese himself who saved the urn that contained the ashes of Antonio Meucci from the repeated assaults of vandals, taking it home with him.

However, in the photograph on the left, taken by the author in October 1990, one can see that the furnace has been embedded in a concrete casting, and that it is much smaller than it originally was, so that it merely serves as a symbol. The boiler, which is now invisible, must have been made of copper, in order not to be corroded by the acids, as we have highlighted in the appendix "The stearic industry." Indeed, when describing the work carried out in Meucci's candle factory, Mrs. Winwar wrote: "*… carting barrels of tallow from the dock, staking the* copper *furnace built like an igloo, near the house …*" and, referring to the situation following Meucci's death: "*… the* copper *furnace to which the weeds soon gave the look of a ruin …*"

Finally, it is worth highlighting that Antonio Lazzari's brother, J. B. Lazzari, set up a funerary monument on the tomb of Esther Meucci, who, unlike her husband, was buried according to the Christian rite in *Woodlawn* (currently *Woodland*) *Cemetery*, at Grymes Hill, some ten kilometers west of Clifton. The inscription on this stele reads: "*Here lies the Free Thinker and Patriot Esterre Meucci born in Italy in 1815* [1810, Editor's note]. *She left this life on December 21,*

Plan of the ground floor and top floor of the cottage, as drawn by Daniel Santoro (referred to 1895)

Esther's tomb

*1884, S. I."* and, on the pedestal, under *"MEUCCI:" "J. B. Lazzari, Woodlawn, N.Y."* This tomb also was transferred to the Garibaldi-Meucci Museum (see photograph above), where it currently stands, a few meters from the monument to Antonio Meucci.

### *c) Plan of the cottage*

The analysis that follows is aimed at justifying our reconstruction of the plan of the cottage, as given on p. 438, for what concerns its current location (as the *Garibaldi-Meucci Museum*), and on p. 442, for what concerns its original location, on the westerly side of Forest Street.

We shall begin with an important manuscript of Daniel Santoro, dated 9 July 1936 (see bibl.), which contains the text of an interview he conducted with one Minthorn T. Gordon, regarding some events that occurred in 1895, when Frederick Bachmann hired the latter to install the electric system in the brewery as well as in the adjoining buildings. On that occasion, Mr. Gordon had the opportunity to visit the cottage where Antonio Meucci lived. During this interview, Mr. Santoro made a sketch of the plan of the cottage's ground floor and top floor, that is reproduced here below. In another sketch, not reproduced here, Santoro indicated Bachmann's stables on the northern corner of Maple Avenue and Forest Street.

Several interesting observations can be obtained from Santoro's sketch. First of all, it is confirmed that the cottage had two porches, a front one and a back one. Furthermore, while on the right side of the hall in the ground floor there were two rooms, the dining room (D.R.) and the kitchen (K), on the left side there was only one large room, the living room (L.R.), with a fireplace at the center of the left wall. The upper floor was accessed from a staircase beginning at the end of the hall (notice the arrow near the word *UP*), which perfectly corresponds with the orientation of the house, as we deduced on the basis of the photograph of the façade (shown on p. 413), taken in 1884 on the same site. A detail that is not clear from Santoro's plan of the ground floor compared with his plan of the attic floor, is that, presently (as well as, we presume, at all times), there are two flights of steps to take from the ground floor to the attic: the first one, leaning against the left wall of the hall, the second one leaning against the right wall of the hall. In Santoro's sketch, both flights are shown as leaning to the left wall. It could be, however, that Mr. Santoro did not pay attention to this detail, as he was more concerned with other aspects.

It is also interesting to note that, while today the basement is accessed through a trap door which is located under the aforesaid first flight of steps and hidden under a rug (see the two pictures below), back then the basement was closed off, more elegantly, by a wall with a regular door (clearly indicated by Santoro next to the door of the dining room), leading to a staircase that went down to the basement. Said staircase, we presume, must have been much larger and more comfortable than the current one (as shown by the two pictures below) also because, as we shall see, the basement, at the time, was much more intensely utilized than today.

Access to the basement of the cottage, today: on the left, as seen from the ground floor; on the right, as seen from the basement

Dr. Luigi Roversi, nephew of Col. Paolo Bovi Campeggi, who visited Antonio Meucci in March 1885, thus describes the room where he was received (translation from Italian, see bibl.): *"… in that dining room, communicating with the kitchen, a fire was burning in the fireplace and a large 'carcel' lamp shone …"* The reader should be reminded that Esther had died four months before Dr. Roversi's visit, and that Antonio Meucci, now alone, probably no longer used the living room, but only the dining room and the kitchen, where, evidently, there was another fireplace (surely there was another chimney). Meucci himself, referring to the time when Garibaldi was still living with him, stated at the Bell/Globe trial (Answer no. 64): *"… Before Garibaldi sailed for Italy, and when he occupied yet the room, the electric conductor was placed in the parlor on the first floor …"* This would confirm Santoro's plan, that is to say that the parlor (i.e. the living room) was on the same side as Garibaldi's room, since, after Garibaldi's departure, Meucci extended the conductor towards his room[67].

At this point in our description, the reader can refer to the complete views and plans, reconstructed by the author on the basis of the testimonies mentioned herein and of the various photographs and drawings available (most of which appear in this work), as well as on the basis of surveys performed on site by the author, in 1990.

Let us first make an observation, based on the already quoted affidavit by Mrs. Matilda Ciucci, where she stated: *"… He* [Meucci] *used the basement as a workshop, he also had the little room next to the Garibaldi room in which* [were] *the wires and jars, and*

[67]Both Garibaldi's room and the outside laboratory must be imagined at the left of Santoro's sketch (after the moving of the cottage), the same side where, before the moving of the cottage, was established the telephone line from the outside laboratory towards Garibaldi's room.

*a box with lots of wire on it was a long thing with wire wound around it* [an electromagnet, Editor's note] …" From Mrs. Ciucci's mention of *the little room next to the Garibaldi room*, we deduce that Garibaldi's room could only be *A* or *B* on the plan of the top floor (reconstructed on page 442), whereas *the little room*, or closet, is undoubtedly the one indicated with an *E*. Now, since, with reference to Fig. 12 of his deposition (see p. 427), Meucci stated that, looking from the outside to the right wall of the cottage, Garibaldi's room was the one to the left and that Esther's room was the one to the right, we deduce that Garibaldi's room could only be *A*, and Esther's could only be *D*.

A confirmation of the location of Garibaldi's room comes from the statements quoted in the following, which all indicate that Garibaldi's room was situated in the northernmost or northeast corner of the house. As a consequence of that, we deduce that, before the cottage was transferred to the other side of Forest street, rooms *A* - *E* - *B* overlooked Forest Street.

Views and plans of Forest Cottage (now Garibaldi-Meucci Museum) in its current orientation

The fact that Esther's room was the one indicated by us with the letter *D* is confirmed by the deposition of Domenico Mariani at the Bell/Globe trial (Answer no. 18): *"… I returned in 1856. I went to Meucci's; we exchanged greetings, and he told me that his wife was very sick. I asked him where she was, and he told me she was up on the third floor in the room near Garibaldi's room …"* and (Answer no. 20): *"Mrs. Meucci was in the room adjoining Garibaldi's room on the third floor."*

As to other testimonies on Garibaldi's room, we must take into account that, after Garibaldi left for Italy (January 1854), Antonio Meucci occupied his room, as he himself stated at the Bell/Globe trial (Answer no. 64): *"… After the departure of the General for Italy, I occupied his room, as I occupy it at present, and then the conducting wire was put from the exterior of the house up to said Garibaldi's room, where there was the rope ringing the bell with which my wife used to call Mariani in the basement to talk with the telephone."* It is then relevant the affidavit sworn on 23 September 1885 by John Fleming, also exhibited at the Bell/Globe trial, where he stated: *"… I went to his* [Meucci's] *house in 1871, when he was sick from the effects of his injury by the explosion of ferry boat Westfield. I went to his house the day he was brought home; he then was in bed. His room was on the third floor, north part of the house; I remember the room he was in; they called it the Garibaldi room …"* Thus, John Fleming confirms that

Antonio Meucci moved into Garibaldi's room and that the latter was in the *north part of the house*[68], and that, therefore, the street front of the house, prior to its moving, i.e. prior to 1881, was along the rooms *A - E - B.*

Another confirmation comes from a paper published by *L'Eco d'Italia* on 9-10 April 1882 (about one year after the cottage was moved to the opposite side of Forest Street), which reads: *"… the one* [room] *where General Garibaldi stayed is at the north-east corner …"* This also confirms the fact that the cottage was transported parallel to itself, as only this way could the orientation of Garibaldi's room remain unchanged. A similar statement was made by Henry Tyrrell in his already mentioned paper (see bibl.), when recalling his visit to Antonio Meucci, paid around 1884 (i.e. after the moving of the cottage): *"… An up-stairs room, with low ceiling and small windows at the northeast corner of the house, looking out toward New York harbor, had been Garibaldi's …"* Indeed, the window (the large one) in Garibaldi's room must have offered a splendid view of the New York Bay, which those who looked out of it could behold to the right. On the wall to its right there was also a tiny window (that measured some 50 x 80 cm) placed at approximately a half meter from the floor, which overlooked Forest Street, but certainly did not offer a view.

To conclude with the arrangement of the rooms at the top floor, let us go back to the article by Dr. Luigi Roversi (already mentioned), in which he speaks of his visit of 1885 to Antonio Meucci as follows (translation from Italian): *"… I accepted the offer to spend the night under the roof of the Garibaldi Homestead. 'You will sleep' Meucci said with a smile 'in the bedroom where for two and a half years your uncle the Colonel slept (the room next to that of the General) and this will bring you good luck' …"* From this account we can deduce that Col. Paolo Bovi Campeggi's room was the one labeled *B* in the map of p. 442, which was next to Garibaldi's, only ignoring the closet *E*, that separated them.

When, in 1907, Meucci's cottage was moved again (dismounted, this time) from Forest Street and was remounted on Tompkins Avenue in lot no. 4 (see map on p. 400), the main façade of the house, overlooking Tompkins Ave-

[68]The exact orientation would be north-northeast, since the north direction forms an angle of about 24° with the diagonal of the room (see map on page 400). It is therefore understandable that some said that the orientation was 'north' whereas some other said it was 'northeast.'

nue, remained the same that had previously overlooked Forest Street, that is to say the one where, in 1884, the commemorative tablet of Garibaldi's dwelling had been set. Note that the opposite façade (the back one) differs from the front one not only owing to the absence of the tablet but also because of the different shape of the large window at the center of the top floor. Indeed, the window that is on the front is semi-circular at the top, while the corresponding one that is at the back is rectangular in shape and, moreover, it is surmounted by a porthole. Comparing the photograph of the cottage taken on 9 March 1884 (p. 413) and the one taken in 1990 (p. 418), one can verify that the façade overlooking the street is the same (both for the presence of the tablet as well as for the shape of said window). As a consequence of this, the cottage changed its orientation by 180° with respect to its preceding location and, therefore, Garibaldi's room, today, looks southwest instead of northeast, as it did until the year 1907.

It is also worth highlighting that, during all the time that the cottage was situated on the westerly side of Forest Street, i.e. until the year 1881, the façade overlooking Forest Street was the one that is currently the back façade, that is to say the one without the tablet and with the rectangular-shaped window on the top floor with a porthole over it (as in the photograph on p. 51). This stems from the fact that the cottage was moved from one side to the other of Forest Street in a parallel manner.

We offer now a few considerations on the basement, with reference to the cottage's original orientation and street front, that existed from 1850 until 1881, as shown in the plans of p. 442[69].

From the plan of the basement, on p. 442, it appears that light came into the basement from four rectangular-shaped windows (50 x 80 cm in size) arranged in sets of two on each side of the house. One immediately sees that the window below Garibaldi's room (room *A*, in the plan of the ground floor, above, on the same page), i.e. the one closest to the northeast corner of the house, is that from which the wires exited, to connect with Garibaldi's room and to the external laboratory *L*. Hence, the batteries must have been located underneath it, also according to Fig. 12 of Meucci's deposition (reproduced on p.

[69]It may be noticed that, with respect to the sketch by Daniel Santoro, referring to the cottage's second location, we have interchanged the kitchen and the dining room, for we believe that it would have been more convenient to always have the dining room, not the kitchen, directly accessible from the entrance hall.

427) and to his previously quoted Answer no. 63: *"… No. 3, battery in the basement."*

Also the rope, which made a bell ring either in the basement or in the external laboratory *L* or in Garibaldi's room, passed through that window. Indeed, here is what Antonio Meucci said at the Bell/Globe trial (Answer no. 35): *"… From the battery, in this time, about 1854 or 1855, I brought them* [the electrical wires] *to the third floor, through the exterior of the house; and from the window, through two screws, they entered the room called the Garibaldi room, where my wife from her room, she being sick with rheumatism, used to enter the Garibaldi room, and ring a bell in the basement. This was the signal that she wanted to speak to me or Mariani …"* And still, (Answer no. 64): *"… Garibaldi's room, where there was the rope ringing the bell with which my wife used to call Mariani in the basement to talk with the telephone."* The fact that the rope proceeded towards the outside laboratory, in addition to being clearly indicated by Meucci in his aforesaid Fig. 12, was explicitly stated by Meucci himself in his Answer no. 63: *"… No. 9, rope, which placed the third story in communication with the laboratory when the bell rang, with which my wife used to call me …"*

On the same subject, Domenico Mariani stated (Answer no. 18): *"… I returned in 1856 … he made me go down to the basement with him, and made me pull a bellrope. Near the other window, near which there was the kitchen table, there was the vase with wires* [the battery, Editor's note]*; the box was on the table. Meucci made me ring the bell and put the box to my ear …"* An additional element surfaces here, that is to say that by the *other window* of the basement (it is clear here that the *other window* was that on the same wall) there was a kitchen table. Surely it was the kitchen, since the girl that worked for the Meuccis from about 1862 to 1872, whose name was Maria Gregory, released an affidavit, sworn on 7 October 1885, in which she stated, among other things: *"… I went to live with the Meucci family about the first years of the War. I lived with them, nine or ten years. Mr. Meucci's house had a basement, a ground floor and attic, making the house three stories in height. The kitchen where I did my work was in the basement. Mr. Meucci had a workshop in the basement adjoining the kitchen. There were wires running from his workshop up to the attic, and into Mrs. Meucci's room. This room was called the Giribaldi* [*Garibaldi*, Editor's note] *Room. In the shop Mr. Meucci*

Plan of the ground floor and of the top floor, according to the cottage's orientation from 1850 to 1881

Plan of the basement, according to the cottage's orientation from 1850 to 1881

View of the corner of the basement where Meucci probably kept his lathe

*had a number of boxes something larger than a tea cup. ... In the corner of the shop were jars* [*Bunsen batteries*, Editor's note] *about the size of small fruit jars. They had wires coming out of the top of them and went up into the attic ...*"

Another confirmation of the fact that there were a kitchen and a workshop in the basement is confirmed by the affidavit of Leonard D. Cunningham, sworn on 10 October 1885, which reads as follows: "*... During the year 1873 or 1874, I cannot fix the year exact but I know it is not later than 1874, I saw his apparatus at his house in Staten Island. His house then stood where the ice house of the Brewery now is. His house was a plain frame house with a gable roof, piazza in front and rear; The house had a basement, one portion semmed* [*fitted up*, Editor's note] *like a kitchen and the other part like a workshop*; *also a ground floor and an attic. What I mean by the apparatus is that two wires ran from the Garibaldi room in attic on the outside of the building and into the basement or workshop. There in the basement, he had the same wires connected with a battery, this I know for I traced the wires from attic to basement ...*"

To complete the description of the equipment and fixtures in the basement, we may quote a passage from William E. Rider's deposition at the Bell/Globe trial, that reads: (Answer no. 8) "*At the time* [*1858-1859*, Editor's note] *... I found that Meucci had a cellar or basement of his house fitted up as a shop or experimental room, and in that shop was a boiler and lathe and some other tools ...*" That is why, in the plan on page 443, we have indicated, against the opposite wall of the basement, a lathe and a boiler, together with a coal cellar to stoke the furnace of the boiler. We remind on this subject that a steam generator (or boiler) was indispensable at the time, to run a lathe or any other big machinery. From what we have said in the foregoing, it appears that Meucci owned two lathes and two boilers, as he kept one of each in his laboratory outdoors.

EXCERPTS FROM ARTICLES AND BOOKS

**Moving the Garibaldi House**
[Richmond County Gazette, 16 March 1881]

*"Sometime ago Mayer and Bachmann, the Clifton brewers, purchased the ground adjoining their property on which stood the house where Garibaldi lived when on the Island. For many years the house has been occupied by Mrs. Meucci, who is very much attached to it. Last week, when asked to move by the firm, Mrs. Meucci positively refused to leave the house, even for the time required to move it to another location. 'If it tumbles down I shall die with it,' was her reply. The house did not fall, however, but was successfully moved across the road, Mrs. Meucci and her household goods not having been disturbed."*

**The Garibaldi House**
[L'Eco d'Italia, 9-10 April 1882, Translation from Italian]

*"A five-minute walk away from Clifton landing, in nearby Staten Island, a stone's throw away from the railroad, on the short street* [Forest Street, Editor's note] *that divides into two the land that is now owned by Mr. Bachmann the brewer, almost at the center of the north side there stands the cottage that the islanders call Garibaldi's or Meucci's cottage, a drawing of which is illustrated herein* [see page 424]. *The drawing was made specially for our newspaper by Mr. G. Ciani from Florence …*

*It is a wooden cottage, painted white, like many others in the American countryside, presenting the traditional façade with a porch and the gate to keep strangers out. From the outside it looks smaller than it actually is, inasmuch as on the ground floor there are four rather large rooms and a comfortable staircase leading up to the bedrooms, among which the one where General Garibaldi stayed is at the north-east corner and is kept just as he left it, with the same furnishings and in perfect order, as if he still lived in it.*

*The basement of the cottage was used for producing salami and stearic candles, businesses set up by Garibaldi and Meucci with a view to relieving from idleness their friends and comrades, who were accepted as guests.*

*A few months ago* [thirteen months, Editor's note] *the cottage was situated on the opposite side of the same street, but it had to be moved on account of the expansion of the brewery, whose owners took over its property. The house was moved with the tenants inside, and this was providential for, otherwise, shortly thereafter, it would have burned down in the fire*

*that destroyed the brewery last year and would have destroyed it as well, had the firefighters of the Company of which Garibaldi is an honorary member not saved it with superhuman efforts*[70].

*The cottage belonged to orchestra director and impresario Max Maretzek, who first rented it to Garibaldi and Meucci and then sold it together with the surrounding land to Meucci and the tenor Salvi, partners in the candle manufacturing business. The stearic factory was where the brewery now stands, and the brewery itself was set up by Meucci, when he abandoned the candle industry, after Garibaldi and Salvi left for Italy…"*

**Garibaldi's Old Home**

[Richmond County Gazette, 8 June 1887]

*"The old house where Garibaldi lived when in this country is still standing at Clifton. It was formerly owned by Frederick Bachmann, a brewer, whose brewery stands opposite the house, but was presented by him to the 'Legione Garibaldi,' an Italian beneficial society of this city. It is occupied by an old Italian, Antonio Meucci by name, who was the partner of Garibaldi in the paraffine* [*stearic*, Editor's note] *candle manufacturing business. Part of the factory in which Garibaldi and Meucci carried out the business is still standing. It is held sacred by all Italians in this city. The bedroom of Garibaldi is in the same condition that he left it when he went back to Italy. The bed, which is the old-fashioned manufacture, is covered with garlands of flowers. Everything in the room is the same as he left; even the water had been standing in the pitcher on the washstand since he left the house.*

*Every anniversary of his birth, death, and of every battle he took part in is observed by his countrymen, who flock in this house by hundred from all over the country. They bring flowers and emblems of all kinds with which they decorate the interior and the exterior of the house. Over the entrance to the house is placed a large slab of marble, on which is inscribed Garibaldi's name, the date of his birth and of his death.*

*A large picture of Garibaldi greets one's eye as he enters the door, and alongside of it is one of Meucci. A few months after Mr. Bachmann presented the house to the Italian society he was surprised one day by a large number of Italian resi-*

[70]Indeed, *L'Eco d'Italia* of 16 June 1865, reported: *"… The «Hook and Ladder» Fire Brigade of Staten Island recently elected Garibaldi honorary member and sent him the medal of the Fire-fighting Corps. It is to this that Garibaldi refers in the letter that we publish hereinafter …"*

*dents of this city, who were the escorts of two army officers of Italy, who presented Mr. Bachmann the freedom of the City of Naples. Mr. Bachmann had this testimonial enclosed in a glass case, and he values it very highly."*

**Shrine of Garibaldi**
**at Scene of His Toil**

*Monument to Garibaldi - Boiler where the Exile Earned his Bread is Now Marked*
[The Sunday Journal, 2 June 1901]

*"Among all the monuments to the memory of heroes erected in all ages the one which stands in a quiet corner of the grounds of an Italian restaurant at Rosebank, S. I., is conspicuous and unique.*

*It consists of a bulky column of rough brick, with two square apertures, evidently the doors of a furnace and an ash pit; and bears this simple inscription: «This Boiler was erected and used by Garibaldi and Meucci, Exiles and Patriots, 1852-1853».*

*It was while engaged in his humble toil at this boiler, in which the exile melted the fat which he molded into candles, that Garibaldi received the summons that called him, somewhat as Cincinnatus of old was called, to win immortal fame as the Liberator of Italy.*

*Within a stone's throw of the enclosure in which the boiler stands is the little white frame cottage in which Garibaldi and his hardly less illustrious compatriot, Meucci, spent the years of their exile and earned a meagre livelihood by making candles.*

*The present owner of the restaurant, Signor Lazzari, conceived the happy idea of converting the old boiler into a monument to the two patriots and caused the inscription to be placed on it. Since then it has served as a sort of shrine at which countless Italians have paid homage to the hero who liberated their Motherland. On fete days the old boiler is always decorated with flowers."*

**Relics of Garibaldi**
**Under Hammer**
[Richmond County Standard, 25 April 1891]

*"The mementoes of Garibaldi that for many years made the little house that he occupied and that is located on Cross street* [Forest Street, Editor's note], *Clifton, a shrine to which Italian liberals made pilgrimages are now, with few and unimportant exceptions, scattered among dealers in antiques and curios in New York. An auction of the effects of the late Antonio Meucci was held at the old house on Monday* [20 April, Editor's note] *and they brought all told $325. Among them was a rustic eight octave piano which Mr.*

*Meucci made and which went for $17; chairs of Garibaldi's own workmanship, his iron bed-stead, dresser, wardrobe, rare Coburg ware, pictures and bric-a-brac. Seventeen colored candles made by Garibaldi when he ran the New York Paraffine Company* [mistaken, Editor's note], *more than forty years since, were knocked down for $6.75. Frederick Bachmann bought for $10 the books and experimental instruments that Meucci used in constructing the telephone he claimed to have invented. The secretary to the Italian Consul General made a few purchases. The homestead will probably be bought by the Italian Government or some of the wealthier members of the Italian Colony in New York."*

**Garibaldi in New York**,
by **H. Tyrrell**
[The Century Illustrated Monthly Magazine, New York, May-October 1907, pp. 174-84]

*"In an obscure little street of Clifton, Staten Island, — now incorporate as Richmond Borough in the 'Greater' City of New York, — stands a dingy and deserted frame dwelling, marked with a marble slab, once white … This shabby-looking house, facing the big red brick brewery, has been for half a century past a shrine cherished by patriotic Italians, and the object of pilgrimages innumerable … the boiling-vat, the remains of which are still to be seen on the grounds of the old Lazzari place … A year or two after Garibaldi's death, which occurred on June 2, 1882, the present writer accompanied a young English artist, Mr. Walton Roberts, upon a pilgrimage to the home of Antonio Meucci, at Clifton, Staten Island. The old man received us with simple cordiality, showed us his treasured souvenirs, and entertained us with his reminiscences during the greater part of an entire afternoon … An up-stairs room, with low ceiling and small windows, at the north-east corner of the house, looking out toward New York harbor, had been Garibaldi's … Roberts made the water-color sketch, herewith reproduced, of the ruined brick furnace and caldron, all that remained of the old candle-making plant. It stood then in the yard of the brewery, across the street from the Meucci domicile; but shortly afterward it was removed to the adjoining grounds of Lazzari's 'Hotel and Garden of Caprera,' for some years a much frequented suburban resort … Lazzari's is no more, but there, on its site, still stands 'Garibaldi's kettle,' as the people of the neighborhood call it … "*

**The Monument in Staten Island: Meucci, Garibaldi and the Telephone**
by *Frances Winwar*
[E. Clemente & Sons Editors, Chicago, IL, 1957]

*"… Although he* [Garibaldi] *called Meucci principale, he lived in the household as an honored guest … Whenever there was work to be done he pitched in with the rest, carting barrels of tallow from the dock, staking the copper furnace built like an igloo, near the house … The candle-making venture … finally expired, leaving as an accusing reminder the copper furnace to which the weeds soon gave the look of a ruin …*

*In 1905 the heirs of Frederick Bachmann found themselves inconvenienced by a monument which they did not want and by an expanding brewery for which they needed room. There was only one solution. The Garibaldi Society of Staten Island raised enough money to buy a parcel of land, and the Clifton house was transported to nearby Rosebank, where it now stands. Over it the 'Tira a Segno' and other Italian organizations eventually erected the classical shell that was to shelter it for some four decades. During the First World War it was taken in charge by the Order of the Sons of Italy.*

*An ancient Garibaldino, Giuseppe Genovese, became its curator, exhibiting to visitors the tricolor candles molded by Garibaldi's own hands, the portrait inscribed to his dear principale, the bed he slept in, the two rustic chairs he had made from the tough stocks of a grapevine. He showed also a few Meucci relics, lingering over them affectionately. For while he had revered the spirit of Garibaldi, he had adored Meucci.*

*When Genovese heard, in 1918, that the dye plant of G. Siegle and Co. was about to be confiscated by the Government as the property of enemy aliens, he saw to it that the Order of the Sons of Italy recovered Meucci's candle furnace which, despite the many changes of hands, had remained in its original site.*

*Several months later, at a lodge meeting, the subject of Meucci's ashes came up and a discussion arose as to their eventual disposal. A tin container was produced and handed round. The size and weight of it aroused suspicion. When the tin was opened the men found to their consternation that it held an odd assortment of objects, but not Meucci's ashes.*

*The mystery was cleared by Genovese in a written confession from the tempietto, as he fondly called the memorial. It was he who had stolen the ashes. He made no apology for his act, but justified it by ex-*

*plaining that he had been shocked to see how those relics were periodically utilized for the personal glory of certain lodge members, and then put back to molder in a damp cellar. 'Such, alas, has been the fate of the ashes of poor Antonio Meucci, honor and glory of the Italian people. They are now in my keeping — rather, they occupy a small space in the room where he breathed his last.'*

*Genovese kept jealous watch over them, for it was not until several years later that they were discovered, wrapped up in the Italian flag, in the rafters of the Garibaldi room. In September of 1923, in a solemn dedication, they were deposited in the Meucci monument which was then unveiled.*

*By that time, however, the changes in Italian political life had been making themselves felt among the Italians in America. Genovese, an intransigent anti-fascist, lost his position at the Garibaldi Memorial, then in the hands of Mussolini sympathizers. He was immediately given employment as caretaker of the evening art school, the Leonardo da Vinci, newly founded in the St. Marks Memorial Building, at 10th Street and Avenue A, in New York …"*

**Made on Staten Island**,
by *Charles L. Sachs*
[Staten Island Historical Society, Richmondtown Restoration, Staten Island, NY, 1988]

***The Breweries***

*"… In 1851 the Clifton Brewery (later known as Bachmann's) was established, according to tradition by Antonio Meucci and Italian liberator Giuseppe Garibaldi …"*

***Beer Gardens and Resorts***

*"… the breweries acquired real estate holdings and developed close ties with the restaurant, recreation, and tourism businesses. The major breweries owned operated, and rented saloons, taverns, beer gardens, hotels, and even resort complexes.*

*As early as 1860, the J. H. French gazetteer of New York State noted that Staten Island 'has of late become a Sabbath day resort of the German population of New York City, thousands of whom repair every Sunday to the saloons and gardens attached to the breweries' …"*

## TRANSCRIPTION OF THE DEEDS OF TRANSFER

### *Transfer of lot. no. 1 from the Townsends to L. Salvi*

*(10 September 1851, for $1800)*

Liber 24, pp. 190-193.

Recorded, Richmond County, the following Deed for Lorenzo Salvi the twenty fourth day of September 1851 at 9. A.m.

Joseph Egbert, Clerk

This indenture made the tenth day of September one thousand eight hundred and fifty one, Between William B. Townsend of Clifton in the town of Southfield County of Richmond and State of New York, Gentleman, and Susan B. Townsend his wife parties of the first part, and Lorenzo Salvi of the city county and State of New York of the second part. Witnesseth, That the said parties of the first part, for and in consideration of the sum of one thousand eight hundred Dollars lawful money of the United States to [them] in hand paid by the said party of the second part, at or before the ensealing and delivery of these presents, the receipt whereof is hereby acknowledged, and the said party of the second part, his heirs, executors, and administrators, for ever released and discharged from the same by these presents, hath granted, bargained, sold, aliened, remised, released, conveyed and confirmed and by these presents doth grant, bargain, sell, alien remise release convey and confirm unto the said party of the second part and to his heirs and assigns forever.

All that certain piece or parcel of land situate lying and being in Clifton in the town of Southfield county of Richmond and State of New York, and bounded and described as follows Beginning at a point where the westerly side of Forest street intersects the northerly side of Maple avenue, thence running northerly on the westerly side of Forest street ninety nine (99) feet to plot number 48, thence westerly along the line of plot 48, and parallel with Maple avenue, one hundred and ten (110) feet, thence northerly and parallel with Forest street forty six (46) feet to plot number 52, thence westerly and parallel with Maple avenue, one hundred and ten (110) feet, thence southerly and parallel with Forest street and through lot 209, one hundred and forty five (145) feet to Maple avenue, and thence easterly along the northerly line of Maple avenue two hundred and twenty (220) feet to the place of beginning embracing all the plot marked N° 47, containing lots No. 184.185.186. and 187. a part of lot 197 and all of lots N° 198.199. and 200. contained in plot N° 51 and a part of lot no. 209. in plot no. 54 as laid

down on a map entitled "a Map of Lots at Clifton, Staten Island belonging to W^m^ B. Townsend Esqr." made by George M. Root, City Surveyor, and filed in the office of the Clerk of Richmond County, State of New York aforesaid on the thirteenth day of September 1847.

Together with all and singular the tenements, hereditaments, and appurtenances thereunto belonging or in any wise appertaining, and the revision and reversions, remainder and remainders, rents issues and profits thereof. And also all the estate, right, title, interest, dower and right of dower, property, possession, claim and demand whatsoever, as well in law as in equity of the said parties of the first part, of, in and to the same and every part and parcel thereof, with the appurtenances. To Have and to Hold the above granted, bargained and described premises, with the appurtenances, unto the said party of the second part, his heirs and assigns, to his and their own proper use, benefit and behoof for ever. And the said party of the second part for himself, his heirs, executors, administrators and assigns, doth hereby covenant, grant, and agree to and with the said parties of the first part hereto in consideration of the conveyance of the premises hereinbefore described, that he or they shall not build erect or cause to be built or erected any house building or other structure upon the above described premises within twenty feet of the front of said premises to wit, within twenty feet of said Forest street or said Willow avenue[71]. And the said William B. Townsend for himself, his heirs, executors, and administrators, doth hereby covenant, grant and agree to and with the said party of the second part, his heirs and assigns, that the said William B. Townsend at the time of the sealing and delivery of these presents, is lawfully seised in his own right of a good, absolute and indefeasible estate of inheritance in fee simple, of, and in all and singular the above granted and described premises, with the appurtenances and has good right full power and lawful authority to grant, bargain, sell, and convey the same in the manner aforesaid. And that the said party of the second part, his heirs and assigns, shall and may, at all times hereafter, peaceably and quietly have, hold, use, occupy, possess and enjoy the above granted premises, and every part and parcel thereof,

[71]It was probably meant to say 'said Maple Avenue', not 'said Willow Avenue' (which was never mentioned before), because it was prevented to erect any building 20 feet (= 6 meters) back from the edge of the road, hence from Maple Avenue and from Forest Street.

with the appurtenances, without any let, suit, trouble molestation, eviction or disturbance of the same parties of the first part, their heirs or assigns, or of any other person or persons lawfully claiming or to claim the same; And that the same now are free, clear, discharged, and unencumbered of and from all former and other grants, titles, charges, estates, judgements, taxes, assessments and encumbrances of what nature or kind soever. And also, that the said parties of the first part, and their heirs and all and every person or persons whomsoever, lawfully or equitably deriving any estate, right, title, or interest, of in or to the herein before granted premises, by, from, under or in trust for them, shall and will, at any time or times hereafter, upon the reasonable request, and at the proper costs and charges in the law of the said party of the second part, his heirs and assigns, make, do and execute, or cause to be made, done and executed, all and every such further and other lawful and reasonable acts, conveyances and assurances in the law, for the better and more effectually vesting and confirming the premises hereby granted, or so intended to be, in and to the said party of the second part, his heirs and assigns for ever, as by the said party of the second part, his heirs or assigns or their counsel learned in the law, shall be reasonably advised or required. And the said William B. Townsend his heirs, the above described and hereby granted, and released premises, and every part and parcel thereof, with the appurtenances, unto said party of the second part, his heirs and assigns, against the said party of the first part, and their heirs, and against all and every person and persons whomsoever, lawfully claiming or to claim the same, shall and will Warrant and by these presents for ever Defend.

In Witness whereof, the parties to these presents have hereunto interchangeably set their hands and seals the day and year first above written.

*W^m B. Townsend L.S.*
*Susan B. Townsend L.S.*
*Lorenzo Salvi L.S.*

Sealed and delivered in the presence of Henry D. Townsend, Commissioner of Deeds 37 Wall street, City, County and State of New York; (William and Susan B. Townsend signed on September 11, 1851; Lorenzo Salvi signed on September 20, 1851).

### *Transfer of lot no. 2 from the Townsends to L. Salvi and A. Meucci*

*(12 May 1852, for $2500, plus a previous mortgage of $1500)*

Liber 26, pp. 109-112

Recorded, Richmond County, the following deed for Lorenzo Salvi & Antonio Meucci the twenty fifth day of May 1852 at 1. P.M. Joseph Egbert, Clerk

This indenture made the twelfth day of May one thousand eight hundred and fifty two Between William B. Townsend of the town of Southfield county of Richmond and State of New York, Gentleman and Susan B. his wife parties of the first part - and Lorenzo Salvi - of the city county and State of New York and Antonio Meucci of the town of Southfield county of Richmond and state of New York of the second part, witnesseth, That the said parties of the first part, for and in consideration of the sum of two thousand five hundred Dollars lawful money of the United States to them in hand paid by the said parties of the second part, at or before the ensealing and delivery of these presents, the receipt of which is hereby acknowledged, and the said parties of the second part, their heirs, executors, and administrators, for ever released and discharged from the same by these presents, have granted, bargained, sold, aliened, remised, released, conveyed and confirmed and by these presents Do grant, bargain, sell, alien remise release convey and confirm unto the said parties of the second part and to his heirs and assigns forever. All that certain piece of land known as Forest cottage, situated on the westerly side of Forest street, commencing ninety nine feet from the corner of Maple avenue and Forest street, thence running westerly and parallel with Maple avenue, one hundred and ten feet, thence northerly and parallel with Forest street, ninety four feet, three inches, thence easterly and parallel with Maple avenue one hundred and ten feet to Forest street, and thence along the westerly side of Forest street, ninety four feet, three inches to the place of beginning. Being a part of a plot known as number forty eight described on a certain map of lots at Clifton, Staten Island, belonging to William B. Townsend, made by George M. Root city surveyor and filed in Richmond County Clerk’s office September 13th 1847.

Together with all and singular the tenements, hereditaments, and appurtenances thereunto belonging or in any wise appertaining, and the revision and reversions, remainder and remainders, rents issues and profits therof. And also all the estate, right, title, interest, dower and right of dower, property, possession, claim and demand whatsoever, as well in law as in equity of the said parties of the first part, of, in and to the same and every part and parcel thereof,

with the appurtenances. To Have and to Hold the above granted, bargained and described premises, with the appurtenances, unto the said part of the second, heirs and assigns, to their own proper use, benefit and behoof for ever. Subject to a certain mortgage for fifteen hundred dollars recorded in the Richmond County Clerk's office in Liber 12 of Mortgages, pages 544&c, recorded 17th. April 1851, given by William B. Townsend & Susan his wife to John Simmons, dated 28th. February 1851. And the said William B. Townsend for himself, his heirs, executors, and administrators, doth hereby covenant, grant, agree to and with the said parties of the second part, their heirs and assigns, that the said William B. Townsend at the time of the sealing and delivery of these presents, is lawful seised in his own right of a good, absolute and indefeasible estate of inheritance in fee simple, of, and in all and singular the above granted and described premises, with the appurtenances and has good right full power and lawful authority to grant, bargain, sell, and convey the same in the manner aforesaid. And that the said parties of the second part, their heirs and assigns, shall and may, at all times hereafter, peaceably and quietly have, hold, use, occupy, possess and enjoy the above granted premises, and every part and parcel thereof with the appurtenances, without any let, suit, trouble molestation, eviction or disturbance of the said first part, their heirs or assigns, or of any other person or persons lawfully claiming or to claim the same. And that the same now are free clear discharged and unencumbered of and from all former and other grants, titles, charges, estates, judgements, taxes, assessments and encumbrances of what nature or kind soever, except as above.

And also, that the said parties of the first part, and their heirs and all and every person or persons whom ever lawfully or equitably deriving any estate, right title or interest, of, in, or to the herein before granted premises, by from under or in trust for them, shall and will, at any time or times hereafter, upon the reasonable request, and at the proper costs and charges in the law of the said parties of the second part, their heirs and assigns, make, do, execute, or cause to be made, done and executed, all and every such further and other lawful and reasonable acts, conveyances and assurances in the law, for the better and more effectually vesting and confirming the premises hereby granted, or so intended to be, in and to the said parties of the second part, their heirs and assigns for ever, as by the said parties of the second part,

their heirs or assigns or their counsel learned in the law, shall be reasonably advised or required. And the said William B. Townsend his heirs the above described and hereby granted and released premises, and every part and parcel thereof, with the appurtenances, unto said parties of the second part, their heirs and assigns, against the said parties of the first part, and their heirs and against all and every person and persons whomsoever, lawfully claiming or to claim the same, shall and will Warrant and by these presents for ever Defend.

In Witness whereof, the parties to these presents have hereunto interchangeably set their hands and seals the day and year first above written.

*Wm. B. Townsend L.S.*
*Susan B. Townsend L.S.*

Sealed and delivered in the presence of Henry D. Townsend, Commissioner of Deeds 37 Wall, City, County and State of New York.

### *Transfer of lot no. 3 from the Townsends to L. Salvi and A. Meucci*

*(1 July 1853, for $4,800*
*Mortgage for $3,800 recorded in another deed on the same date)*

Liber 31, pp. 120-123.

Recorded, Richmond County, the following Deed for Lorenzo Salvi and Antonio Meucci, July 16th 1853 at 3hs 40 min P.M.

Joseph Egbert, Clerk

This indenture made the first day of July in the year one thousand Eight hundred and fifty three Between William B. Townsend of Clifton Town of Southfield County of Richmond N Y, Gentleman and Susan B. his wife parties of the first part - *And* Lorenzo Salvi of the City County and State of New York and Antonio Meucci of Clifton Richmond County N. Y. of the second part Witnesseth that the said parties of the first part, for and in Consideration of the sum of Forty Eight hundred dollars lawful money of the United States to them in hand paid by the said parties of the second part, at or before the Ensealing and delivery of these presents, the receipt of which is hereby acknowledged, and the said parties of the second part, their heirs, Executors, and administrators, for ever released and discharged from the same by these presents, have granted bargained sold aliened remised released Conveyed and Confirmed and by these presents do grant bargain sell alien remise release Convey and Confirm unto the said parties of the second part and to their heirs and assigns forever.

All that certain piece or parcel of Land situate lying and being in Clifton in the

Town of Southfield County of Richmond State of New York bounded and described as follows Beginning at a point where the Easterly side of Townsend Avenue intersects the Northerly side of Maple Avenue, thence running Northerly on the Easterly side of Townsend Avenue Two hundred and Eighty nine feet more or less to the point where the said Easterly line of Townsend Avenue intersects with the Southerly line of Willow Avenue, thence running Easterly along the Southerly side of Willow Avenue Two hundred and three feet six inches more or less to a point in said Southerly line of Willow Avenue distant from the Westerly line of Forest Street, Two hundred and twenty feet, thence running Southerly and parallel with Townsend Avenue Two hundred and Eighty nine feet more or less to a point in the Northerly line of Maple Avenue distant two hundred and twenty feet from the Westerly line of Forest Street, thence running Westerly along said Maple Avenue Two hundred and three feet six inches more or less to the point of beginning Embracing all of the Plots marked N° 57. & N.° 58 Containing Lots N.os 221,222,223.224, 225,226.227.228.229.230 Also Lots Nos. 210,211,212. and part of Lot N°. 209, in plot No. 54, and Lots Nos. 214,215,216. and a part of lot N°. 213. in Plot No. 55 as laid down on Map Entitled “A map of lots at Clifton, Staten Island, belonging to William B. Townsend Esq. made by Geo M. Root, City Surveyor and filed in Office of the Clerk of Richmond County N. Y. on thirteen day of September 1847 by William B. Townsend.

Together with all and Singular the tenements hereditaments and appurtenances thereunto belonging or in any wise appertaining, and the reversion and reversions remainder and remainders rents issues and profits therof. And also all the Estate right titles interest dower & right of dower property possession claim and demand whatsoever, as well in Law as in Equity of the said parties of the first part of in and to the same and every part and parcel thereof with the appurtenances. To have and to hold the above granted, bargained and described premises with the appurtenances unto the said parties of the second part, their heirs and assigns, to their own proper use, benefit and behoof for ever. And the said William B. Townsend for himself his heirs Executors and administrators doth hereby Covenant grant and agree to and with the said partys of the second part, their heirs and assigns, that the said William B. Townsend at the time of the sealing and delivery of these

presents, is lawfully seized in his own right of a good absolute and indefeasible Estate of Inheritance in fee Simple, of and in all and Singular the above granted and described premises, with the appurtenances and has good right full power and lawful authority to grant bargain sell and Convey the same in manner aforesaid. And that the said parties of the second part, their heirs and assigns shall and may at all times hereafter, peaceably and quietly have hold use occupy possess and Enjoy the above granted premises, and Every part and parcel thereof, with the appurtenances, without any let suit trouble molestation Eviction or disturbance of the said parties of the first part, their heirs or assigns, or of any other person or persons lawfully claiming or to claim the same. And that the same now are free clear discharged and unencumbered of and from all former and other grants titles charges Estates Judgements taxes assessments and Encumbrances of what nature or kind soever. And also, that the said parties of the first part, and their heirs and all and Every person or persons whomsoever lawfully or Equitably deriving any Estate right title or interest of in or to the herein before granted premises by from under or in trust for them, shall and will at any time or times hereafter upon the reasonable request and at the proper costs and Charges in the Law of the said parties of the second part, their heirs and assigns, make do and Execute, or cause to be made done and Executed, all and Every such further and other lawful and reasonable acts Conveyances and assurances in the Law, for the better and more Effectually vesting and Confirming the premises hereby granted or so intended to be, in and to the said party of the second part, his heirs and assigns for ever, as by the said partys of the second part, their heirs and assigns or their Counsel learned in the law, shall be reasonably advised or required. And the said William B. Townsend his heirs, the above described and hereby granted and released premises and every part and parcel thereof, with the appurtenances, unto the said parties of the second part, their heirs and assigns against the said party of the first part and their heirs and against all and Every person and persons whomsoever lawfully claiming or to claim the same shall and will Warrant and by these presents for ever Defend. In Witness whereof, the parties to these presents have hereunto interchangeably set their hands and Seals the day and year first above written.

*W^m^ B. Townsend L.S.*
*Susan B. Townsend L.S.*

Sealed and delivered in the presence of (…) H. D. Townsend, Commissioner of Deeds 37 Wall street, City, County and State of New York.

### Mortgage on lot no. 3 from A. Meucci and L. Salvi to W. B. Townsend

*(1 July 1853, for $3,800)*

Liber 19, pp. 180-183.

Recorded, Richmond County, the following Mortgage for William B. Townsend July 15th. 1853 at 9. Am.

*Cancelled April 3 1863*

(Signed A. C. Clerk)

This indenture made the first day of July in the year one thousand eight hundred and fifty three Between Lorenzo Salvi of the City and County and State of New York and Antonio Meucci of Clifton County of Richmond NY of the first part and William B. Townsend of Clifton Richmond County NY. of the second part Whereas the said Lorenzo Salvi and Antonio Meucci are justly indebted to the said party of the second part in the sum of Three Thousand Eight hundred dollars lawful money of the United States of America secured to be paid by their certain bond or obligation bearing even date with these presents in the penal sum of Seven Thousand six hundred dollars lawful money as aforesaid conditioned for the payment of the said first mentioned sum of Three Thousand Eight hundred Dollars on the first day of July 1856 with interest thereon to be computed from the first day of July 1853 at seven per Cent per annum[72] to be paid semi annually to wit on the first day of [January and July] or any part thereof on any day whereon the same is made payable as above expressed and should the same remain unpaid and in arrear for the space of thirty days that then and from thenceforth that is to say after the lapse of the said thirty days the aforesaid principal sum of Three Thousand Eight Hundred Dollars with all arrearage of interest thereon shall at the option of the said party of the second part his legal representatives become and be due and payable immediately thereafter although the time limited for the payment thereof may not then have expired anything in the said bond contained to the contrary thereof in any wise notwithstanding as by the said bond or obligation and the condition thereof reference being thereunto had may more fully appear Now this indenture witnessed that the said parties of the first part for the better securing the payment of the said sum of money mentioned in the condition of the said bond or obligation with interest

[72]Instead, interests calculated in legal proceedings were of 5.3% a year.

thereon according to the true intent and meaning thereof and also for and in consideration of the sum of one dollar to them in hand paid by the said party of the second part at or before the ensealing and delivery of these presents the receipt whereof is hereby acknowledged have granted bargained sold aliened released conveyed and confirmed and by these presents do grant bargain sell alien release convey and confirm unto the said party of the second part and to his heirs and assigns for ever

All that certain piece or parcel of land situate lying and being in Clifton in the Town of Southfield County of Richmond State of New York Bounded and described as follows Beginning at a point where the Easterly side of Townsend Avenue intersects the Northerly side of Maple Avenue thence running Northerly on the Easterly side of Townsend avenue Two hundred and Eighty nine feet more or less to the point where the said Easterly line of Townsend avenue intersects with the Southerly line of Willow avenue Thence running Easterly along the Southerly side of Willow avenue avenue Two hundred and Three feet six inches more or less to a point in said Southerly line of Willow avenue distant from the Westerly line of Forest Street Two hundred and Twenty feet thence running Southerly and parallel with Townsend Avenue Two hundred and Eighty nine feet more or less to a point in the Northerly line of Maple Avenue distant two hundred and twenty feet from the Westerly line of Forest Street thence running Westerly along said Maple Avenue Two hundred and Three feet six inches more or less to the point of beginning Embracing all of the plots marked No. 57 and N.° 58 Containing Lots N.os 221. 222. 223. 224. 225. 226. 227. 228. 229. 230 Also Lots Nos. 210. 211. 212. and part of Lot N°. 209. in Plot No. 54, also Lots Nos. 214. 215. 216. and a part of lot N°. 213. in Plot No. 55 as laid down on Map entitled a Map of Lots at Clifton, Staten Island, belonging to William B. Townsend Esq. made by Geo M. Root, City Surveyor and filed in the office of the Clerk of Richmond County N. Y. on thirteenth of September 1847 by William B. Townsend Being the same premises Conveyed by William B. Townsend party hereto to the parties of the first part by Deed bearing even date herewith this Entrustment of Mortgage being given to secure the payment of a part of the Consideration money in said Deed named

Together with all and singular the tenements hereditaments and appurtenances

thereunto belonging or in any wise appertaining and the reversion and reversions remainder and remainders rents issues and profits thereof. And also all the estate right titles interest property possession claim and demand whatsoever as well in law as in equity of the said parties of the first part of in and to the same and every part and parcel thereof with the appurtenances

To have and To hold the above granted and described premises with the appurtenances unto the said parties of the second part his heirs and assigns to his and their own proper use benefit and behoof for ever.

Provided always and these presents are upon this express condition that if the said parties of the first part their heirs executors or administrators shall well and truly pay unto the said party of the second part his executors administrators or assigns the … … …
[no continuation pages received from Richmond County Files, Editor's note]

*Transfer of lots no. 1, 2 and 3 from L. Salvi to A. Meucci*

*(1 May 1854, for $5)*

Liber 36, pp. 57-59

Recorded, Richmond County, the following deed for Antonio Meucci the twenty third day of March 1855 at 10 o.'c A.m.

Joseph Egbert, Clerk

This indenture made the first day of May one thousand eight hundred and fifty four Between Lorenzo Salvi of the City of New York at present residing temporarily in the City of Mexico party of the first part and Antonio Meucci of Clifton Richmond county and State of New York party of the second part. Witnesseth, that the said party of the first part for and in consideration of the sum of Five dollars lawful money of the United States of America to him in hand paid by the said party of the second part, at or before the ensealing and delivery of these presents the receipt whereof is hereby acknowledged hath granted bargained sold aliened remised released conveyed and confirmed and by these presents doth grant bargain, sell alien remise release convey and confirm unto the said party of the second part and to his heirs and assigns forever. All that certain piece or parcel of land situate lying and being in Clifton in the town of Southfield county of Richmond and State of New York and bounded and described as follows: Beginning at a point where the westerly side of Forest street intersects the northerly side of Maple avenue, thence running northerly on the

westerly side of Forest street ninety nine (99) feet to plot number 48 thence westerly along the line of Plot 48 and parallel with Maple avenue one hundred and ten (110) feet, thence northerly and parallel with Forest street forty six (46) feet to plot number 52 thence westerly and parallel with Maple avenue one hundred and ten (110) feet, Thence southerly and parallel with Forest street and through Lot 209 one hundred and forty five (145) feet to Maple avenue, and thence Easterly along the northerly line of Maple avenue two hundred and twenty (220) feet to the place of beginning embracing all of plot marked number 47. containing lots Nos. 184.185.186. and 187 a part of 197 and all of lots 198.199. and 200. contained in plot No 51 and a part of lot No. 209 in plot No. 54 as laid down on a map entitled "A Map of Lots at Clifton, Staten Island belonging to William B. Townsend Esq." made by George M. Root, city surveyor, and filed in the office of the Clerk of Richmond County, State of New York aforesaid on the thirteenth day of September 1847 being the same premises conveyed by William B. Townsend and Susan B. his wife to the said party hereto of the first part by deed bearing date the tenth day of September one thousand eight hundred and fifty one and recorded in Liber No. 24 of Deeds p. 190&c. the 24th day of September 1851.

Also all that certain piece of Land known as Forest Cottage situated on the westerly side of Forest street, commencing ninety nine feet from the corner of Maple avenue and Forest street; thence running westerly and parallel with Maple avenue one hundred and ten feet, thence northerly and parallel with Forest street ninety four feet three inches, thence Easterly and parallel with Maple avenue one hundred and ten feet to Forest street and thence along the westerly side of Forest street ninety four feet three inches to the place of beginning, being a part of a Plot known as Number Forty Eight described on a certain Map of Lots at Clifton, Staten Island belonging to William B. Townsend made by George M. Root, city surveyor and filed in Richmond County Clerk's office September 13th 1847 and also being the same premises conveyed by the said William B. Townsend and Susan B. his wife to the said parties hereto of the first and second parts by deed bearing date the Twentieth day of May one thousand eight hundred and fifty two in the Office of the Clerk of Richmond county aforesaid.

And also all that certain piece or parcel of land situate lying and being in Clifton in the town of Southfield county

of Richmond, State of New York bounded and described as follows. Beginning at a point where the easterly side of Townsend avenue intersects the northerly side of Maple avenue thence running northerly on the easterly side of Townsend avenue two hundred and eighty nine feet more or less to the point where the said easterly line of Townsend avenue intersects with southerly line of Willow avenue thence running easterly along the southerly side of Willow avenue two hundred and three feet six inches more or less to a point in said southerly line of Willow avenue distant from the westerly line of Forest street two hundred and twenty feet thence running southerly and parallel with Townsend avenue two hundred and eighty nine feet more or less to a point in the northerly line of Maple avenue distant Two hundred and twenty feet from the westerly line of Forest street thence running westerly along said Maple avenue two hundred and three feet six inches more or less to the point of beginning: embracing all the plots marked Nº. 57 and N° 58. containing lots Nos. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. Also lots Nos. 210. 211. 212. and part of lot No. 209. in plot Nº. 54, and lots Nos. 214. 215. 216. and a part of lot No. 213. in Plot Nº. 55 as laid down on Map entitled “A map of lots at Clifton, Staten Island, belonging to William B. Townsend Esq. made by George M. Root, city surveyor and filed in Office of the Clerk of Richmond county New York on the thirteen day of September one thousand eight hundred and forty seven by William B. Townsend being the same premises conveyed by the said William B. Townsend and Susan B. his wife to said parties hereto of the first and second parts by deed bearing date the first day of July one thousand eight hundred and fifty three and recorded in the Liber N° 31 of Deeds pages 120&c. the sixteenth day of July one thousand eight hundred and fifty three.

Together with all and singular the tenements hereditaments and appurtenances thereunto belonging or in any wise appertaining, and the reversion and reversions remainder and remainders rents issues and profits therof. And also all the estate right title interest property possession claim and demand whatsoever, as well in law as in equity of the said party of the first part of in or to the above described premises and every part and parcel thereof with the appurtenances. To have and to hold all and singular the above mentioned and described premises, together with the appurtenances, unto the said party of the sec-

ond part, his heirs and assigns, forever. In Witness whereof the said parties to these presents have hereunto set their hands and seals the day and year above written.

*Lorenzo Salvi L.S.*

L.S. Sealed and delivered in the presence of Giovanni Jaurin, Amhave Roncaz Consulate of the United States, Havana Cuba. On the day of the date hereof before me William H. Robertson, acting Consul of United States of America for the city of Havana and its dependencies personally came and appeared Lorenzo Salvi, to me personally known as the person described and who executed foregoing instrument in writing, and he acknowledged to me that he has signed, sealed, and delivered said instrument on the day of the date therein mentioned as his voluntary act and deed. In Testimony wherof I hereunto set my hand and seal of my Office at Havana this eighteenth day of January A. D. Eighteen hundred and fifty five.

*L. S. Wm. H. Robertson*

*Mortgage on lots no. 1 and 2 from A. and E. Meucci to A. A. Samanos*

*(May 1, 1856, for $3,000)*

Liber 25, pp. 323-326.

Recorded, Richmond County, May 22d. 1856 at 2 o'clock PM.

*Cancelled December 26, 1864* (Signed A. C. Clerk)[73]

This Indenture, made the First day of May in the year one thousand eight hundred and fifty six *Between* Antonio Meucci of Clifton in the County of Richmond and State of New York and Hester his Wife parties of the first part and Augustus A. Samanos of the City of New York Merchant party of the second part Whereas the said Antonio Meucci is justly indebted to the said party of the second part in the sum of Three Thousand Dollars lawful money of the United States of America secured to be paid by their certain bond or obligation bearing even date with these presents in the penal sum of Six Thousand Dollars lawful money as aforesaid conditioned for the payment of the said first mentioned sum of Three Thousand dollars on the first day of May one thousand eight hundred and sixty one with interest thereon to be computed from the date hereof and after the rate of seven per cent per annum payable semi annually in the first days of November and

[73]In the document obtained from the Richmond County archives, the date of cancellation is hardly visible. Therefore, we give the one indicated by Dr. Moncada in his unpublished typescript (see bibl.).

May in each and every year which said bond also contains an agreement that should any default be made in the payment of the said interest or any part thereof, on any day whereon the same is made payable as above expressed and should the same remain unpaid and in arrear for the space of thirty days that then and from thenceforth that is to say after the lapse of the said thirty days the aforesaid principal sum of Three Thousand dollars with all arrearage of interest thereon shall at the option of the said party of the second part his legal representatives become and be due and payable immediately thereafter although the time limited for the payment thereof may not then have expired anything in the said bond contained to the contrary thereof in any wise notwithstanding as by the said bond or obligation and the condition thereof, and the said agreement thereon continued reference being there unto had may more fully appear Now this indenture *Witnessed* that the said parties of the first part, for the better securing the payment of the said sum of money mentioned in the condition of the said bond or obligation with interest thereon according to the true intent and meaning thereof and also for and in consideration of the sum of one dollar to them in hand paid by the said party of the second part at or before the ensealing and delivery of these presents the receipt whereof is hereby acknowledged have granted bargained sold aliened released conveyed and confirmed and by these presents do grant bargain sell alien release convey and confirm unto the said party of the second part and to his heirs and assigns for ever.

*All* that certain piece or parcel of Land situated lying and being at Clifton in the Town of Southfield County of Richmond and Bounded and described as follows[74] Beginning at a point where the Westerly side of Forrest Street intersects the Northerly side of Maple Avenue, thence running Northwardly on the Westerly side of Forrest Street one hundred and ninety nine feet and three inches thence Westwardly parallel with Maple Avenue one hundred and ten feet thence Southwardly and parallel with Forrest Street forty seven feet and two inches thence Westwardly and parallel with Maple Avenue Ninety feet thence Southwardly parallel with Forrest Street one hundred and forty five feet to Maple Avenue and thence Eastwardly along the Northerly line of

[74]For unknown reasons, some measurements of length given below are slightly shorter than the corresponding ones in the previous deeds of transfer of the same lots. More precisely, “a part of lot 209” is missing, in this deed.

Maple Avenue two hundred feet to the place of beginning Embracing Plots 47 (forty seven) and 48 (forty eight) and Lots 197 (one hundred and ninety seven) 198 (one hundred and ninety eight) 199 (one hundred and ninety nine) and 200 (two hundred) of plot 51, as laid down on a Map of Lots at Clifton, Staten Island belonging to William B. Townsend Esqr. made by George M. Root, City Surveyor, June 22nd 1847 filed in the office of the Clerk of County of Richmond September 13. 1847

*Together* with all and singular the tenements hereditaments and appurtenances thereunto belonging or in any wise appertaining and the reversion and reversions remainder and remainders rents issues and profits thereof. And also all the estate right titles interest dower right of dower property possession claim and demand whatsoever as well in law as in equity of the said parties of the first part of in and to the same and every part and parcel thereof with the appurtenances To have and To hold the above granted and described premises with the appurtenances unto the said parties of the second part his heirs and assigns to his and their own proper use benefit and behoof for ever. Provided always and these presents are upon this express condition that if the said parties of the first part their heirs executors or administrators shall well and truly pay unto the said party of the second part his executors administrators or assigns the said sum of money mentioned in the condition of the same bond or obligation and the interest thereon at the time and in the manner mentioned in the said condition according to the true intent and meaning thereof that then these presents and the estate hereby granted shall cease determine and be void And the said Antonio Meucci for himself his heirs executors and administrators doth covenant and agree to pay unto the said party of the second part his executors administrators or assigns the said sum of money with interest as mentioned above and expressed in the condition of the same bond And if default shall be made in the payment of this said sum of money above mentioned or the interest that may grow due thereon or of any part thereof that then and from thenceforth it shall be lawful for the said party of the second part his executors administrators assigns to enter into and upon all and singular the premises hereby granted or intended to be and to sell and dispose of the same and all benefit and equity of redemption of this said party of the first part their heirs executors administrators or assigns therein at public auction ac-

cording to the act in such case made and provided And as the attorney of the said part of the first part for that purpose by these presents duly authorized constituted and appointed to make and deliver to the purchaser or purchasers thereof a good and sufficient deed or deeds of conveyance in the law for the same in fee simple and out of the money arising from such sale to retain the principal and interest which shall then be due on the said bond or obligation together with the costs and charges of advertisement and sale of the said premises rendering the surplus of the purchase money (if any there shall be) unto the said Antonio Meucci one of the parties of the first part his heirs executors administrators or assigns which sale so to be made shall forever be a perpetual bar both in law and in equity against the said parties of the first part their heirs and assigns and all other persons claiming or to claim the premises or any part thereof by from or under them or either of them And the said Antonio Meucci further covenant for himself, his heirs and assigns that he will during all the time until the said money secured by these presents shall be fully paid and satisfied keep the buildings erected on the said lot of land insured in and by some incorporated Company of good [standing?] against loss or damage by fire in at least the sum of Three Thousand dollars and will assign the policy or policies of such insurance to the said party of the second part or his legal representatives so and in such manner and form that he and they shall at all time and times until the full payment of the said money have and hold the said policy or policies as a collateral and further security for the payment thereof And in default of so doing that the said party of the second part or his legal representatives may make such insurance from year to year in a sum not exceeding Three thousand Dollars for the purposes aforesaid and pay the premium or premiums therefor which premium or premiums thus paid and the interest thereon from the time of payment the said Antonio Meucci covenants as aforesaid to pay to the said party of the second part or his legal representatives on demand and that the same shall be deemed to be secured by these presents and shall be collectable thereupon and thereby in like manner as the said moneys mentioned in the said bond or obligation.

In Witness Whereof, the parties to these presents have hereunto set their hands and seals the day and year first [above written].

*Antonio Meucci*
*Hester [Meucci]*

Sealed and delivered in the presence of William Allen, Justice of Peace, State of New York.

*Transfer of lot no. 3 from A. and E. Meucci to J. Mason*

*(28 August 1856, for $3,300, plus previous mortgage of $3,300 and interests)*

Liber 40, pp. 16-17.

Recorded, Richmond County, November 11, 1856 at 2 Hours P. M. Joseph Egbert Clerk.

*This Indenture*, made the Twenty Eight of August in the year of our Lord one thousand eight hundred and fifty six *Between* Antonio Meucci of Clifton in the County of Richmond and State of New York and Hester his wife parties of the first part and James Mason of the same place, party of the second part, *Witnesseth*, that the said part as of the first part, for and in consideration of the sum of Three Thousand Three Hundred Dollars, lawful money of the United States to them in hand paid, by the said party of the second part, at or before the ensealing and delivery of these presents, the receipt whereof is hereby acknowledged, and the said party of the second part, his heirs, executors, and administrators, for ever released and discharged from the same by these presents, have granted, bargained, sold, aliened, remised, released, conveyed and confirmed and by these presents do grant, bargain, sell, alien remise release convey and confirm unto the said party of the second part and to his heirs and assigns forever, *All* that certain piece or parcel of Land being in Clifton Town of Southfield County of Richmond and State of New York Beginning at a point where the Easterly side of Townsend Avenue intersects the northerly side of Maple Avenue, thence running northerly on the Easterly side of Townsend Avenue Two hundred and eighty nine feet more or less to the point where the said Easterly line of Townsend Avenue intersects the southerly side of Willow Avenue, thence running Easterly along the southerly side of Willow Avenue Two hundred and three feet six inches more or less to a point in said Southerly side of Willow Avenue distant from the westerly side of Forest Street about Two hundred and twenty feet, thence running Southerly and parallel with Townsend Avenue, two hundred and eighty nine feet more or less to a point on the Northerly line of Maple Avenue distant Two hundred and twenty feet from the Westerly line of Forest Street, thence running westerly along said Maple Avenue Two hundred and three feet six inches more or less to the point of beginning. *Embracing all of*

*the Plots marked* Numbers 57.58. Containing Lots Numbers 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. Also Lots numbers 210.211.212. to a part of Lot number 209. Plot number 54. Also Lots numbers 214.215.216. and a part of Lot number 213. in Plot number 55. as laid down on Map Entitled "A map of lots at Clifton, Staten Island, belonging to W. B. Townsend Esq. made by George M. Root, City Surveyor and filed in Office of the Clerk of Richmond County N. Y. 30th [13th, Editor's note] September 1847."

*Together* with all and singular the tenements hereditaments and appurtenances thereunto belonging or in any wise appertaining, and the reversion and reversions remainder and remainders rents issues and profits therof. *And* also all the estate, right, title, interest, dower, right of dower, property, possession, claim and demand whatsoever, as well in law as in equity of the said parties of the first part, of, in, and to the same, and every part and parcel thereof, with the appurtenances. *To have and to hold* the above granted, bargained and described premises with the appurtenances, unto the said party of the second part, his heirs and assigns, to his & their own proper use, benefit and behoof for ever. Subject however to a Mortgage dated the first day of July 1853 given by Lorenzo Salvi and Antonio Meucci to William B. Townsend Recorded in the office of the Clerk of the County of Richmond in Liber 2 of Mortgages page 180 on the 15th day of July 1853 on which there is now due the sum of Three thousand three hundred Dollar and interest and which said mortgage and interest form the consideration of these presents. And the said party of the second part has assumed and hereby agrees with said Antonio Meucci his executors, administrators and assigns to pay the same.

*And* the said Antonio Meucci for himself, his heirs, executors, and administrators, doth hereby covenant, grant and agree to and with the said party of the second part, his heirs and assigns, that the said Antonio Meucci at the time of the sealing and delivery of these presents, is lawfully seized in his own right of a good, absolute and indefeasible estate of inheritance, in fee simple, of, and in all and singular the above granted and described premises, with the appurtenances subject as aforesaid and hath good right, full power, and lawful authority, to grant, bargain, sell, and convey the same, in manner aforesaid; *And* that the said party of the second part, his heirs and assigns, shall and may, at all times hereafter, peaceably and quietly have, hold, use, oc-

cupy, possess and enjoy the above granted premises, and every part and parcel thereof, with the appurtenances, without any let, suit, trouble, molestation, eviction or disturbance of the same parties of the first part, their heirs or assigns, or of any other person or persons lawfully claiming or to claim the same; *And* that the same now are free, clear, discharged, and unencumbered, of and from all former and other grants, titles, charges, estates, judgements, taxes, assessments and encumbrances of what nature or kind soever except as aforesaid. *And* also, that the said parties of the first part, and their heirs and all and every person or persons whomsoever, lawfully or equitably deriving any estate, right, title or interest, of, in, or to the herein before granted premises, by, from, under, or in trust for them, shall and will, at any time or times hereafter, upon the reasonable request, and at the proper costs and charges in the law, of the said party of the second part, his heirs and assigns, make, do, and execute, or cause to be made, done, and executed, all and every such further and other lawful and reasonable acts, conveyances, and assurances in the law, for the better and more effectually vesting and confirming the premises hereby granted, or so intended to be, in and to the said party of the second part, his heirs, and assigns for ever, as by the said party of the second part, his heirs or assigns or his counsel learned in the law, shall be reasonably advised, or acquired. *And* the said Antonio Meucci and his heirs, the above described and hereby granted and released premises, and every part and parcel thereof, with the appurtenances unto the said party of the second part, and his heirs and assigns, against the said parties of the first part, and their heirs, and against all and every person and persons whomsoever, lawfully claiming or to claim the same, shall and will *Warrant* and by these presents for ever *Defend*.

*In Witness Whereof*, the said parties to these presents have hereunto set their hands and seals the day and year first above written.

*Antonio Meucci L.S.*

her
*Hester + Meucci L.S.*
mark

Sealed and delivered in the presence of Wm Allen, Justice of Peace.

*Transfer of lots no. 1 and 2 with premises, fixtures and furniture, from A. and E. Meucci to W. W. Badger*

*(22 September 1856, for $1.00)*

Liber 39, pp. 320-322.

Recorded, Richmond County, September 24th, at $12\frac{1}{2}$ o' clock A. M., 1856

Joseph Egbert Clerk.

This Indenture, made the twenty second day of September in the year one thousand eight hundred and fifty six Between Antonio Meucci and Esterre his wife of the first part and William W. Badger of the City of New York of the second part, Witnesseth, that the said parties of the first part, for and in consideration of the sum of one Dollar, lawful money of the United States of America to them in hand paid by the said party of the second part, at or before the ensealing and delivery of these presents, the receipt whereof is hereby acknowledged, have granted bargained sold aliened remised released conveyed and confirmed and by these presents do grant bargain sell alien remise release convey and confirm unto the said party of the second part and to him and his assigns for ever, *All that* certain piece or parcel of land situate lying and being in Clifton in the Town of Southfield County of Richmond and State of New York and bounded and described as follows Beginning at a point where the westerly side of Forest street intersects the northerly side of Maple Avenue, running thence northerly on the westerly side of Forest Street one hundred and ninety three feet and three inches thence running westerly and parallel with Maple Avenue one hundred and ten feet (110 ft) thence Southerly and parallel with Forest street forty eight feet three inches (48 ft) 3 in thence westerly and parallel with Maple Avenue one hundred and ten feet (110 ft) thence southerly and parallel with Forest Street one hundred and forty five feet (145 ft) to Maple Avenue thence Easterly along the northerly line of Maple Avenue two hundred and twenty feet (220 ft) to the place of Beginning being the same premises conveyed by Lorenzo Salvi to Antonio Meucci by Deed bearing date the first day of May 1854 and recorded in Richmond County Clerk's Office March twenty third 1855 at 10 A. m. and therein further described as embracing all the plot marked number 47, containing lots No. 184,185,186,187, a part of lot number 197 and all of lots 198,199, and 200, contained in plot 51, and a part of lot 209, in plot number 54 as laid down on a Map Entitled A Map of Lots at Clifton, Staten Island belonging to William B. Townsend Esqr." made by George M. Root, City Surveyor, June twenty second 1847 filed in the office of the Clerk of County of Richmond September thirteenth 1847 and likewise embracing a part of plot marked 48 on said Map

and also all the fixtures and furniture now on or attached to said premises for the purpose of carrying on the business in said premises or otherwise together with all and singular the tenements hereditaments and appurtenances thereunto belonging or in any wise appertaining, and the reversion and reversions remainder and remainders rents issues and profits therof. And also all the estate, right, title, interest, dower and right of dower, property, possession, claim and demand whatsoever, as well in law as in equity of the said parties of the first part, of, in, or to the above described premises, and every part and parcel thereof, with the appurtenances. To have and to hold all and singular the above mentioned and described premises together with the appurtenances, unto the said party of the second part, himself and assigns, in fee simple, in thrust nevertheless for the uses and purposes following that is to say to grant bargain sell and convey the said premises with the appurtenances and every part and parcel thereof and said fixtures and furniture unto the said Esterre Meucci her heirs and assigns for ever upon the said Esterre Meucci giving to the said party of the second part full receipt and acquittances for the sum of nine thousand dollars a part of the amount which the said Antonio Meucci has had of the said Esterre Meucci out of her sole and separate estate and invested in said premises furniture and fixtures subject nevertheless to any specific liens by way of Mortgage or otherwise that may now be upon the premises herein conveyed In witness thereof the parties hereunto have set their hands and seals the day and year first above written.

*Antonio Meucci L.S.*

her

*Esterre* **X** *Meucci L.S.*

mark

Sealed and delivered in the presence of Philpot Wolfe, Justice of Peace.

*Transfer of lots no. 1 and 2 with premises, fixtures and furniture from W. W. Badger to Esther Meucci*

*(24 September 1856, for $1)*

Liber 39, pp. 322-324.

Recorded, Richmond County, September 25th, 2 o' clock P. M., 1856

Joseph Egbert Clerk.

This Indenture, made and entered the twenty fourth day of September one thousand eight hundred and Fifty six Between William W. Badger of the City of New York party of the first part and Esterre Meucci wife of Antonio Meucci party of the second part, whereas Antonio Meucci and Esterre Meucci did in and

by a certain Indenture sealed the twenty second day of September one thousand eight hundred and fifty six grant bargain sell alien remise release convey and confirm unto William W. Badger certain premises hereinafter fully set forth and subscribed upon the trust nevertheless that the said William W. Badger should grant bargain sell and convey the same premises with the appurtenances and every part and parcel thereof and the fixtures and furniture mentioned therein unto the said Esterre Meucci her heirs and assigns for ever upon the said Esterre Meucci giving to the said party of the second part full receipt and acquittance for the sum of Nine thousand Dollars a part of the amount which the said Antonio Meucci has had of said Esterre Meucci out of her sole and separate estate and invested in said premises furniture and fixtures subject nevertheless to any specific liens by way of Mortgage or otherwise that may now be upon the premises herein conveyed And whereas the said Esterre Meucci has given to the said William W. Badger the said receipt and acquittances in said trust mentioned and has discharged the said Antonio Meucci from any [liability? Ed.] on account of said nine thousand dollars now therefore this Indenture Witnesseth that the party of the first part for and in consideration of the premise and of one dollar to him in hand paid by the party of the second part, at or before the ensealing and delivery of these presents, the receipt whereof is hereby acknowledged has granted bargained sold aliened remised released conveyed and confirmed and by these presents does grant bargain sell alien remise release convey and confirm unto the said party of the second part and to her heirs and assigns forever *All that certain* lot piece or parcel of land situate lying and being in the Town of Southfield County of Richmond and State of New York and bounded and described as follows Beginning at a point where the westerly side of Forest Street intersects the Northerly side of Maple Avenue, running thence northerly on the westerly side of Forest Street one hundred and ninety three feet and three inches (193 feet and 3 inches) thence running westerly and parallel with Maple Avenue one hundred and ten feet (110 ft) thence Southerly and parallel with Forest Street forty eight feet and three inches (48 feet & 3 inches) thence Westerly and parallel with Maple Avenue one hundred and ten feet (110 feet) thence Southerly and parallel with Forest Street one hundred and forty five feet (145) to Maple Avenue thence Easterly along the Northerly

line of Maple Avenue Two hundred and twenty feet (220 feet) to the place of beginning being the same premises conveyed by Lorenzo Salvi to Antonio Meucci by deed bearing date the first day of May one thousand eight hundred and fifty four and recorded in Richmond County Clerk's Office March Twenty third one thousand eight hundred and Fifty five at 10 o'clock A. M. and therein further described as embracing all the plot marked numbered (47) containing lots number 184 185 186 187 a part of lot number 197 and all of lots 198,199, and 200 contained in plot 51 and a part of lot 209 in plot number 54 as laid down on a map entitled a map of lots at Clifton Staten Island belonging to W$^{m}$ B. Townsend Esqr made by George M. Root, City Surveyor, June 23$^{d}$ 1847 and filed in the Office of the Clerk of the County of Richmond September 13th, 1847 and likewise embracing a part of plot marked 48 on said Map and also all the fixtures and furniture now on or attached to said premises for the purpose of carrying on the business in said premises or otherwise together with all and singular the Tenements hereditaments and appurtenances thereunto belonging or in any wise appertaining, and the reversion and reversions remainder and remainders rents issues and profits therof. And also all the estate right title interest property possession claim and demand whatsoever as well in law as in equity of the said parties of the first part of in or to the above described premises and every part and parcel thereof with the appurtenances. To have and to hold all and singular the above mentioned and described premises together with the appurtenances, unto the said party of the second part her heirs and assigns forever In witness thereof the parties to these presents have hereunto set their hands and seals the day and year first above written.

*William, W. Badger, L.S.*

Sealed and delivered in the presence of Abr.$^{m}$ Underhill, Commissioner of Deeds, City, County and State of New York.

### *Promise by Joseph Fells to cancel the lease of lots no. 1 and no. 2 upon request of Antonio and Esther Meucci*

*(19 February 1857)*

Liber 41, p. 21-22

Recorded April 4th 2 PM 1857, Richmond County, Joseph Egbert Clerk

It is understood that at any time here after upon the demand of M$^{me}$ E. Meucci or Mr. A. Meucci or her or his attorney I will cancel the lease made to me of the premises

known as Clifton Brewery & the house & residence of the said Meucci & wife Embracing all the plot marked 47. & lots 198, 199, & 200. in plot 51, a part of lot 209 in plot number 54.— [and?] a part of plot 48 as laid down on map of lots at Clifton belonging to W. B. Townsend and filed September 13th 1847 in Clerk's office in County of Richmond by said Meucci and wife and also the bill of sale made by said Meucci and wife to me of the Brewery and its utensils & the fixtures. The same having been executed to me without any consideration having been paid there-for by me.

*Joseph Fells (L. S.)*

Witness
Henry H Morange February 19, 1857
Theodor Preston

[Follows certification by W. H. Sansbury, Commissioner of Deeds, New York City, and Richard B. Connolly, Clerk of the Supreme Court, New York City]

*Mortgage on lots no. 1 and 2 raised by E. and A. Meucci in favor of H. H. Morange*

*(20 February 1857, for $500)*

Liber 26, pp. 463-466.

Recorded, Richmond County, March 6, 1857 at 2. Pm., J. W. Van Cleef, Clerk

This Indenture made the twentieth day of February in the year one thousand eight hundred and fifty seven Between Esterre Meucci of the County of Richmond and State of New York wife of Antonio Meucci and the said Antonio Meucci of the first part and Henry H. Morange of the City and County of New York Counsellor at law of the second part. Whereas the said Esterre Meucci and Antonio Meucci are justly indebted to the said party of the second part in the sum of Five Hundred Dollars lawful money of the United States of America secured to be paid by them certain bond or obligation, bearing even date with these presents in the penal sum of one thousand Dollars lawful money as aforesaid conditioned for the payment of the said first mentioned sum of Five hundred Dollars, on the twentieth day of February one thousand Eight hundred and fifty Eight together with the interest thereon to be computed from the day of the date of these presents at and after the rate of seven per cent per annum and to be paid monthly and it is thereby Expressly agreed that should any default be made in the payment of the said interest or of any part thereof on any day whereon the same is made payable as above expressed and should the same remain unpaid and in arrear for the space of ten days then and from thenceforth that is to say after the lapse of the

said ten days the aforesaid principal sum of Five hundred dollars with all arrearage of interest thereon shall at the option of the said party of the second part his executors administrators or assigns become and be due and payable immediately thereafter although the period above limited for the payment thereof may not then have expired anything therein before contained to the contrary thereof in any wise notwithstanding. As by the said bond or obligation and the condition thereof reference being thereunto had may more fully appear. Now this Indenture witnesseth that the said parties of the first part for the better securing the payment of the said sum of money mentioned in the condition of the said bond or obligation with interest thereon according to the true intent and meaning thereof and also for and in consideration of the sum of one dollar to them in hand paid by the said part of the second part at or before the ensealing and delivery of these presents the receipt whereof is hereby acknowledged have granted bargained sold aliened released conveyed and confirmed and by these presents do grant bargain sell alien release convey and confirm unto the said party of the second part and to her heirs and assigns for Ever. *ALL that certain* lot piece or parcel of land situate lying and being in the Town of Southfield County of Richmond and State of New York and bounded and described as follows. Beginning at a point where the westerly side of Forrest Street intersects the Northerly side of Maple Avenue, running thence northerly on the westerly side of Forest Street one hundred and ninety three feet and three inches (193 feet and 3 inches) thence running westerly and parallel with Maple Avenue one hundred and ten feet (110 feet) thence Southerly and parallel with Forrest Street forty Eight feet and three inches (48 feet & 3 inches) thence westerly and parallel with Maple avenue one hundred and ten feet (110 feet) thence southerly and parallel with Forrest Street one hundred and forty five feet (145 feet) to Maple avenue thence Easterly along the northerly line of Maple Avenue two hundred and twenty feet (220 feet) to the place of beginning being the same premises conveyed by Lorenzo Salvi to Antonio Meucci by and bearing the date the first day of May One Thousand Eight hundred and fifty four and recorded in Richmond County Clerk’s office March 23, 1855 at 10.00 am and therein further described as embracing all the plot marked Numbered 47 containing lots number 184, 185, 186, 187 a part of lot number 197 and all

of lots 198, 199 and 200 contained in plot 57 and a part of lot 209 in plot number 54 as laid down on a Map entitled A map of lots at Clifton, Staten Island belonging to W$^{m}$ B. Townsend Esqr. made by George M. Root, City surveyor, June 22$^{nd}$ 1847 & filed in the office of the Clerk of the County of Richmond September 13, 1847 and as likewise embracing a part of plot marked as [48?] on said Map, together with all and singular the tenements hereditaments and appurtenances thereunto belonging or in any wise appertaining and the reversion and reversions remainder and remainders rents issues and profits thereof and also all the estate right titles interest Curtesy & Right of curtesy property possession claim and demand whatsoever as well in law as in equity of the said parts of the first part of in and to the same and every part and parcel thereof with the appurtenances to have & to hold the above granted and described premises with the appurtenances unto the said party of the second part his heirs and assigns to his and their own proper use benefit and behoof for ever provided always and these presents are upon this express condition that if the said parties of the first part their heirs executors or administrators shall well and truly pay unto the said party of the second part his executors administrators or assigns the said sum of money mentioned in the condition of the same bond or obligation and the interest thereon at the time and in the manner mentioned in the said condition according to the true intent and meaning thereof that then these presents and the estate hereby granted shall cease determine and be void And the said Esterre Meucci and Antonio Meucci for themselves and their heirs executors and administrators do covenant and agree to pay unto the said party of the second part his executors administrators or assigns the said sum of money and interest as mentioned above and expressed in the condition of the same bond And if default shall be made in the payment of the said sum of money above mentioned or the interest that may grow due thereon or of any part thereof that then and from thenceforth it shall be lawful for the said party of the second part, executors administrators or assigns to enter into and upon all and singular the premises hereby granted or intended so to be and to sell and dispose of the same and all benefit and Equity of redemption of the said parties of the first part their heirs executors administrators or assigns therein at public auction according to the act in such [case, Editor’s note] made and provided And as the

attorney of the said parties of the first part for that purpose by these presents duly authorized constituted and appointed to make and deliver to the purchaser or purchasers thereof a good and sufficient deed or deeds of conveyance in the law for the same in fee simple and out of the money arising from such sale to retain the principal and interest which shall then be due on the said bond or obligation together with the costs and charges of advertisement and sale of the said premises rendering the overplus of the purchase money (if any there shall be) unto the said Antonio Meucci and wife of the first part their heirs executors administrators or assigns which sale so to be made shall forever be a perpetual bar both in law and in equity against the said parts of the first part heirs and assigns and all other persons claiming or to claim the premises or any part thereof by from or under them or either of them and it is also agreed by and between the parties to these presents that the said parties of the first part shall and will keep the buildings erected or to be erected upon the lands above conveyed insured against loss or damage by fire by insures and in an amount approved by the said party of the second part and assign the policy and certificate thereof to the said party of the second part and in default thereof it shall be lawful for the said party of the second part to affect such insurance and the premium and premiums paid for affecting the same shall be a lien on the said mortgaged premises added to the amount of the said bond or obligation and secured by these presents and payable on demand with interest at the rate of seven per cent per annum. In witness whereof, the parties to these presents have hereunto set their hands and seals the day and year first above written.

her
*Esterre* **X** *Meucci* *L.S.*
mark
*Antonio Meucci (L. S.)*

Sealed and delivered in presence of Philpot Wolfe

*Lease of lots no. 1 and 2 with building and fixtures, from J. Fells to L. Gros*

*(9 March 1857, for 9 years and 11 months, at $1,000 a year).*

Liber 41, pp. 60-62.

Recorded, Richmond County, April 11th, $8\frac{1}{2}$ am 1857

Joseph Egbert Clerk.

This Indenture, made the Ninth day of March one thousand eight hundred and fifty seven Between Joseph Fells of the City County and State of New York party of the first part and Louis Gross of the same place party of the second

part witnesseth That the said party of the first part hath letten and by these presents doth grant demise and to farm let unto said party of the second part All that certain lot piece or parcel of land Situate lying and being in Clifton Town of Southfield in the County of Richmond and State of New York and Bounded and described as follows Beginning at a point where the westerly side of First Street[75] intersects the Northerly side of Maple Avenue, running thence northerly on the westerly side of Forist Street one Hundred and ninety three (193) feet and three (3) inches thence running westerly and parallel with Maple Avenue one Hundred and ten (110) feet thence Southerly and parallel with Forest Street Forty eight (48) feet and three (3) inches thence Westerly and parallel with Maple Avenue One Hundred and ten (110) feet thence Southerly and parallel with Forest Street One Hundred and forty five (145) feet to Maple Avenue thence Easterly along the Northerly line of Maple Avenue Two Hundred and twenty (220) feet to the place of beginning and embracing all the plot marked number (47) Containing lots numbers (184) (185) (186) and part of lot (197) and all of lot 198, 199, and 200 Contained in plot 51 and a part of lot (209) in plot number (54) as laid down on a map of lots at Clifton Staten Island belonging to William B. Townsend and made by George M. Root, June 22 1847 and filed in the Clerk's Office of Richmond County September 13, 1847 and likewise embracing a part of plot marked 48 on said map and the building and fixtures thereon with the appurtenances for the term of Nine Years and Eleven months from the ninth day of March one thousand eight hundred and fifty seven at the yearly rent or sum of One Thousand Dollars to be paid in equal half yearly payments And it is agreed that if any rent shall be due and unpaid or if default shall be made in any of the covenants herein contained then it shall be lawful for the Said party of the first part to reenter the said premises and to remove all persons therefrom And the same party of the second part doth hereby covenant to pay to the said party of the first part the said yearly rent as herein specified and also to pay the taxes that may be assessed on said premises and that at the expiration of the said term the said party of the second part will quit and surrender the premises hereby described in a good state and condition as reasonable use and wear thereof will permit damages by the elements excepted And the said party of the first part doth covenant that the said party of

[75]Read *Forest Street*

the second part on paying the said yearly rent and performing the covenants aforesaid shall and may peaceably and quietly have hold and enjoy the said demised premises for the term aforesaid In witness whereof the said parties hereto have set their hands and Seals to these presents the day and year first above written.

*Joseph Fells L. S.*

Sealed and delivered in the presence of Jacob Hof. Charles E. Patterson, Commissioner of Deeds, City and County of New York.

*Transfer of lots no. 1 and 2. with premises and fixtures from Esther and Antonio Meucci to John Bennis*

*(18 March 1857, for $6,500, plus two previously existing mortgages totaling $3,500)*

Liber 41, pp. 62-64.

Recorded, Richmond County, April 11th, 1 P. M. 1857

Joseph Egbert Clerk.

This Indenture made the 18th day of March in the year one thousand eight hundred and fifty seven Between Esterre Meucci of Clifton Richmond County and State of New York and Antonio Meucci her husband of the first part and John Bennis of the City of Brooklyn of the second part witnesseth That the said parties of the first part for and in consideration of the sum of Six thousand five Hundred Dollars lawful money of the United States to them in hand paid by the said party of the second part at or before the ensealing and delivery of these presents the receipt whereof is hereby acknowledged and the said party of the second part his heirs executors and administrators for ever released and discharged from the same by these presents have granted bargained sold aliened remised released conveyed and confirmed and by these presents Do grant bargain sell alien remise release convey and confirm unto the said party of the second part and to his heirs and assigns forever All that certain lot piece or parcel of land situate lying and being in Clifton in the Town of Southfield County of Richmond and State of New York and bounded and described as follows Beginning at a point where the westerly side of Forest street intersects the northerly side of Maple Avenue, running thence northerly on the westerly side of Forest Street one hundred and ninety three feet and three inches thence running westerly and parallel with Maple Avenue one hundred and ten feet thence southerly and parallel with Forest Street forty Eight feet and three inches 48 feet 3 in thence westerly and parallel with Maple avenue one hun-

dred and ten feet thence Southerly and parallel with Forest Street one hundred and forty five feet to Maple Avenue thence easterly along the northerly line of Maple Avenue two hundred and twenty feet to the place of Beginning being the same premises conveyed by Antonio Meucci above named and Esterre Meucci his wife to William Badger by deed dated the 22d day of September 1856 and recorded in Richmond County Clerk's Office in Liber 39 of Deeds pages 320&c September 24, 1856 at $12\frac{1}{2}$ hours at noon Together with all and Singular the tenements hereditaments and appurtenances thereunto belonging or in any wise appertaining, and the reversion and reversions remainder and remainders rents issues and profits therof and also all the estate right title interest [centsy ?] and right of [centesy ?] property possession claim and demand whatsoever as well in law as in equity of the said parties of the first part of in and to the same and every part and parcel thereof with the appurtenances. To have and to hold the above granted bargained and described premises with the appurtenances, unto the said party of the second part his heirs and assigns to their own proper use benefit and behoof for ever Subject nevertheless to the payment of two Several Mortgages Amounting in the whole to the sum of Three thousand five hundred Dollars & which said sum constitutes and forms a part of the consideration money hereinbefore repressed &c and the said Antonio Meucci for himself his heirs executors and administrators doth covenant grant and agree to and with the said party of the second part his heirs and assigns that the said Esterre Meucci was at the time of the sealing and delivery of these presents lawfully seised in her own right of a good absolute and indefeasible estate of inheritance in fee simple of and in all and singular the above granted and described premises with the appurtenances and hath good right full power and lawful authority to grant bargain sell and convey the same in manner aforesaid And that the said party of the second part by heirs and assigns shall and may at all times hereafter peaceably and quietly have hold use occupy possess and enjoy the above granted premises and every part and parcel thereof with the appurtenances without any let suit trouble molestation eviction or disturbance of the said parties of the first part heirs or assigns or of any other person or persons lawfully claiming or to claim the same and that the same now are free clear discharged and unencumbered of and from all former and other grants ti-

tles charges estates judgements taxes assessments and encumbrances of what nature or kind soever except as aforesaid and also that the said parties of the first part, and their heirs and all and every person or persons whomsoever lawfully or equitably deriving any estate right title or interest of in or to the herein before granted premises by from under or in trust for them shall and will at any time hereafter upon the reasonable request and at the proper costs and charges in the law of the said part of the second part heirs and assigns make do and execute or cause to be made done and executed all and every such further and other lawful and reasonable acts conveyances and assurances in the law for the better and more effectually vesting and confirming the premises hereby granted or so intended to be in and to the said party of the second part by heirs or assigns for ever as by the said party of the second part his heirs or assigns or his or their Counsel learned in the law shall be reasonably advised or required And the said Antonio Meucci his heirs the above described and hereby granted and released premises and every part and parcel thereof with the appurtenances unto said parties of the second part his heirs and assigns against the said parties of the first part and their heirs and against all and every person and persons whomsoever lawfully claiming or to claim the same shall and will warrant and by these presents for ever Defend. In witness whereof the parties to these presents have hereunto interchangeably set their hands and Seals the day and year first above written.

*Esterre* **X** *Meucci L.S.*
*Anto. Meucci L.S.*

Sealed and delivered in the presence of Philpot Wolfe, Justice of Peace.

### *Transfer from Joseph Fells to Esther Meucci of lease of land and buildings*

*(30 March 1857, for $452)*
Liber 41, pp. 269-270

Recorded Richmond County June 26, 1857 at 9 1/2 Hours Am

*Know all men by these presents* that I Joseph Fells within named in consideration of Four hundred and fifty two dollars to me in hand paid at or before the ensealing & delivery of these presents do for myself my executors and administrators bargain sell surrender yield up from the day of the date hereof unto the within named Esterre Meucci wife of Antonio Meucci and her heirs executors administrators as well as the within Indenture of Lease as the lands & premises therein mentioned and the term

of years therein yet to come. I [unexpend ?] with all my right title and interest thereto and I do hereby covenant that the same are now free and clear of and from all encumbrances of whatever nature or kind soever, at any time by me or by my purely Consent or procurement done permitted or suffered. In Witness thereof I have hereunto set my hand and seal this 30 day of March One thousand eight hundred and fifty seven.

*Joseph Fells (L. S.)*

Sealed and delivered in the presence of Louis Gross

[Note on margin] *See Liber 39 of Deeds page 628*

*Transfer of personal property and furniture (of the cottage and of Clifton Brewery) from E. and A. Meucci to J. Bennis (14 May 1857, for $2,000)*

Liber 41, pp. 152-154.

Recorded, Richmond County, May 15, 1857, $1\frac{1}{2}$ Hours P. M. Joseph Egbert Clerk.

Know all men by these presents. That Anton Meucci and Esterre Meucci of Clifton Forest Staten Island State of New York of the first part for and in consideration of the sum of Two Thousand Dollars lawful money of the United States to them in hand paid at or before the insealing and delivery of these presents by Captain John Bennis of Brooklyn and State of New York aforesaid of the second part the receipt thereof is hereby acknowledged have bargained and sold and by these presents do grant and convey unto the said party of the second part his executors administrators and assigns the following goods and chattels situate in a certain cottage and Brewery situate at Clifton aforesaid. Two mahogany Beaurás and looking glasses on top Two wash stands and fixtures Center table with marble top forty Chairs, four Bedsteads and bedding Matrasses & c, one piece of Carpet, one round table Four Common wooden tables, three small looking glasses three opera glasses Four Candle sticks, one Bell, one Hammock one hundred tin boxes Sixty yards fine linen sixty yards of Canvass Seven trunks four rocking Chairs nine arm Chairs one small round table, one small Piano Forte, one Music Box, two fancy Boxes, one small clock and wooden case, one small clock Brass case, one Cubbard [Cupboard?] seventy yards oil cloth, then [ten ?] brass lamps three lanterns two Casters, four Crystal Bottles, four dozen crystal wine glasses, six dozen knives and forks three dozen spoons silver plated, one Revolving gun, one double barrel gun with fixtures, one Rifle two pistols, three meerschaum pipes with

silver covers, two rocking chairs one writing desk, one large Clock, double Barometer, two Common wooden tables, one ash Box, eight dozen plates, Copying machine, three Covers for plates, one dozen iron pots, one scale, one pump. Four tin cans one copper Kettle, one hundred and sixty gallons of Wine all in bottles one working bench, one small turning lathe and tools, one Dice three hundred and sixty tin pans two hand barrows, twelve square tables Eighteen Round oak tables, seventy two arm chairs Seventy two common chairs one hundred glasses, twelve Pitchers one oil Painting, one clock, Seventy two plates, one lamp, one Sigar case, Seventy two knives and forks six Casters one ice preserver Forty yards of oil cloth, one counter and Shelves, tin fermentation tops twenty two Beer casks each contains one hundred and sixty Gallons of Beer, Five sixty gallon casks, one thirty gallon cask, Eight oak water pails three wal [wall?] tops, one Copper force pump, one Brewing kettle two Beer coolers Coopers tools three wooden covers Ten pipes, three Brass taps two iron Kettles, one iron press, one hundred beer kegs.

To have and to hold the same unto the said party of the second part his executors administrators and assigns for ever. And we do for ourselves our heirs executors and administrators covenant and again to and with the said party of the second part, to warrant and defend the sale of the said goods and chattels hereby sold unto the said party of the second part his executors administrators and assigns against all and every person and persons whatsoever. In witness whereof we have hereunto set our hands and seals the fourteenth day of May in the year one thousand eight hundred and fifty seven.

*Antonio Meucci L.S.*

her

*Esterre* **X** *Meucci L.S.*

mark

Sealed and delivered in the presence of Philpot Wolfe, Justice of Peace.

### *Transfer of letting rights from E. Meucci to J. Bennis*

*(20 June 1857, for $1.00)*

Liber 41, p. 270-271

Recorded, Richmond County, June 26, 1857 at $9\frac{1}{2}$ Hours AM

Joseph Egbert Clerk.

Known all men by these presents that I Esterre Meucci in consideration of one dollar to me in hand paid by John Bennis & of the sale & conveyance of the premises in the annexed lease described to him by deed of Conveyance dated the 18th day of March do

hereby bargain sell surrender and yield up unto the said John Bennis and to his heirs Executors and administrators as said the annexed Indenture of Lease as the lands and premises therein mentioned and the term of years yet to come and unexpired with all my right title interest thereto. In witness whereof I have hereunto set my hand & seal this twentieth day of June A. D. 1857.

her

*Esterre* **X** *Meucci L.S.*

mark

Sealed and delivered in the presence of Philpot Wolfe, Justice of Peace.

*Lease for life of the cottage from F. Bachmann to A. and E. Meucci*

*(1 July 1882, for $1.00 and dropping of the legal suit)*

Liber 143, p. 368-370

Recorded, Richmond County, July 11th, 1882 at 9 Hours A.m. C. A. Hart Clerk.

Lease for Life, from Frederick Backmann to Antonio Meucci and Esther Meucci his wife.

[Seal] Whereas previous to the year 1880, the firm Mayer & Backmann, Brewers, purchased all right, title and interest of one Samanos in and to the property situate lying and being in the village of Clifton, County of Richmond (Staten Island) State of New York, now called Clifton Brewery, and formerly owned by one Salvi and one Esther Meucci, and Whereas said Esther Meucci had a certain estate in said property, and Whereas in or about the end of 1880, a suit was begun by said Esther Meucci against firm Mayer & Backmann to recover said Estate, and Whereas a settlement and compromise was entered into on or about the month of March 1881, by and between the said parties to said suit, in which among other things it was agreed, by the said Mayer & Backmann that they would in consideration of a settlement of said suit, and the abandonment thereof, give and grant unto Antonio Meucci and said Ester Meucci his wife an Estate in said property for the life and lives of said Antonio Meucci and Esther Meucci his wife, and Whereas the said firm Mayer & Backmann has been since that time dissolved, and the said F. Backmann is now seized and possessed of all the right, title and interest of which the said Mayer was seized and possessed,

Now this Indenture made this first day of July in the year one thousand eight hundred and eighty two, between Frederick Backmann of the village of Clifton, County of Richmond, State of New York, party of the first part, and Antonio Meucci & Esther Meucci his wife, of the same place, parties of the second part, Wit-

nessed, that the said party of the first part, in consideration of the settlement and abandonment of said suit and of other good and lawful considerations to said party of the first part moving, and also the sum of one dollar legal money of the United States in hand paid to him by the said parties of the second part, the receipt of which is hereby acknowledged, has letten, and by these presents does grant, demise and to farm let, unto the said parties of the second part,

All that certain parcel of land, with the building thereon, situated in the Village of Clifton aforesaid, called and known as Garibaldi's Cottage, and lying between Maple and Willow Avenues, and fronting Forest Street,

with the appurtenances, from this day for the term of the natural lives of each of said parties of the second part. And the said party of the first part does covenant and agree that he will pay all taxes assessed upon said premises, and that the said parties of the second part shall not be required nor obliged to pay any sum or sums thereof, and that they may peaceably and quietly have hold and enjoy the said demised premises for the term aforesaid.

In Witness Whereof, the said party of the first part, has hereunto set his hand and seal to these presents the … day of July A. D. eighteen hundred and eighty two.

*Fred Bachmann L.S.*

In presence of David Rothschild, Angelo Bertolino, Notary Public.

### *Transfer of the cottage from F. Bachmann to C. Barsotti, A. Lazzari and V. Polidori, trustees*

*(12 June 1882, for $1.00)*

Liber 142, pp. 584-585

Recorded, Richmond County, July 18th, 1882 at 9 Hours A.m. C. A. Hart Clerk.

Know all men by these Presents that I, Frederick Bachmann of the town of Southfield, County of Richmond and State of New York, of the first part, for, and in consideration of the sum or one dollar lawful money of the United States to me in hand paid at or before the ensealing and delivery or these presents, by Carlo Barsotti, Antonio Lazzari and Vincenzo Polidori, Trustees, and their successors and associates in trust for the sole use, benefit and behoof of the Italian Nation, parties of the second part, the receipt whereof is hereby acknowledged, have bargained and sold, and by these presents do grant and convey unto said parties of the second part, their successors and associates

All that certain building or dwelling house which is now situate on the Easterly side of Forrest Street, about one hun-

dred and fifty feet Southerly of Willow Avenue, in the town or Southfield, County of Richmond and State of New York, which was at one time the residence of Giussepe Garibaldi, Subject however, to the lease interest that Antonio Meucci and Esterra his wife have and hold into the aforesaid building or dwelling house.

To have and to hold the same unto the said parties of the second part, and their successors and associates for ever. And I do, for myself and my heirs, executors and administrators, covenant and agree to and with the said parties of the second part to warrant and defend the sale of the said building or dwelling house hereby sold unto the said parties of the second part, and their successors and associates against all and every person and persons whomsoever.

In witness whereof, I have hereunto set my hand and seal the twelfth day of June in the year one thousand eight hundred and eighty two.

*Fred. Bachmann L.S.*

Sealed and delivered in the presence of David Rothschild, Wm. M. Wermerskirsch, Notary Public in Richmond County.

### *Incorporation of the Society for the preservation of the cottage*

*(27 April 1905)*

Liber 2, pp. 580-583

Recorded, Richmond County, May 9, 1905 at 2,22 o'clock PM; C. L. Bostwick Clerk.

*Certificate of Incorporation*.

We; the undersigned all being persons of full age, and Citizens of the United States and all being residents of the State of New York, desiring to form a membership corporation pursuant to the provisions of the Membership corporations Law of the State of New York, do hereby make, sign and acknowledge and file this certificate for that purpose as follows to wit:

*First*:— The principal objects for which the corporation is to be formed are as follows viz.: —

First. To remove from its present site the dwelling house formerly occupied by the late Guiseppi Garibaldi at Clifton Staten Island, N. Y. and to reerect same on a new site to be acquired by said corporation.

Second:— To preserve said dwelling house as a memorial to perpetuate the memory of said Guiseppi Garibaldi among the Italian Colony of the United States of America.

*Second*:— The name of the proposed corporation is Society for the Preservation of the Dwelling House of the late Guiseppe Garibaldi at Clifton S. I. N. Y."

*Third*:— The territory in which its operations are to be principally conducted is The Borough and County of Richmond

*Fourth*:— The principal office of said Society is to be located in the Guiseppe Garibaldi house at Clifton in the Fourth Ward of the Borough of Richmond County of Richmond City and State of New York.

*Fifth*:— The number of its directors shall be fifteen: and the names and places of residence of the persons to be directors until the first annual meeting are as follows:—

Pilade Rigali Richmond Avenue, Arrochar, Borough of Richmond, New York,

Genserico Granata 227 Bay Street Stapleton, Borough of Richmond, New York,

Giulio Marchi 66 Fingerboard Road, Borough of Richmond, New York,

Gerolamo Nardini High Street, Fort Wadsworth, Borough of Richmond, New York,

Benvenuto Rigali 80 Pennsylvania Avenue, Borough of Richmond, New York,

Placido Mori Richmond Avenue Arrochar, Borough of Richmond, New York,

Agostino De Biasi 90 Center St. New York City,

Lionello Perara 69 Wall St New York City,

Nicola Conforti 204 E 116th Street New York City,

Francesco D'Alessandro 153 Albany Ave Brooklyn New York,

Francesco Ughetta 325 West 4th Street New York City,

Giovanni Di Leo 48 Spring Street New York City,

Clemente Volta 25 Mulberry Street New York City,

Alfredo Marzorati Columbia University New York City,

Dr Guiseppi Grana, 558 E. 150th Street New York City,

*Sixth*:— The time for holding its annual meetings shall be on the last Thursday of December in each year.

In witness whereof, we have made signed and acknowledged and filed this certificate in duplicate.

Dated this 27 day of April 1905

*Pilade Rigali*
*Genserico Granata*
*Gerolamo Nardina*
*Placido Mori*
*Benvenuto C Rigali*
*Giulio Marchi*

Signed and executed in the presence of John Widdecombe, Notary Public, Richmond County, N. Y.

Approved by Hon. Wilmot M. Smith, Justice of the Supreme Court of the State of New York.

### *Transfer of lot no. 4 from A. H. and M. D. Wellington to the Society for the preservation of the cottage*

*(17 July 1905, for $2,700)*

Liber 309, pp. 106-108

Recorded, Richmond County, July 15, 1905 at 9 A. M.

C. Livingston Bostwick Clerk.

*This Indenture*, made the 17th day of June, in the year nineteen hundred and five

*Between Aaron H. Wellington, and Margaret D.* his wife, parties of the first part, and *Society for the Preservation of the Dwelling House of the Late Guiseppi Garibaldi, at Clifton, S. I. N. Y.*, party of the second part.

*Witnessed*, that the said parties of the first part, for and in consideration of *Two thousand seven hundred dollars*, lawful money of the United States, paid by the party of the second part, do hereby grant, bargain, sell and release unto the said party of the second part, its successors and assigns forever, *all* those nine (9) certain lots, pieces or parcels of land situate, lying and being at Clifton, in the Borough of Richmond, City of New York, which taken together are bounded and described as follows: *Beginning* at the corner formed by the intersection of the Southerly side of Chestnut Avenue with the Westerly side of Tompkins Avenue; running thence Westerly at right angles to Tompkins Avenue, two hundred and one feet along the Southerly side of Chestnut Avenue; thence Southerly at right angles to Chestnut Avenue, one hundred and thirty-three feet on a line parallel to Tompkins Avenue; thence Easterly on a line parallel with Chestnut Avenue, or nearly so, one hundred feet; thence Northerly on a line parallel to Tompkins Avenue, seven feet; thence Easterly parallel with Chestnut Avenue, one hundred and five feet, six inches, to the westerly side of Tompkins Avenue, and thence Northerly along the Westerly side of Tompkins Avenue, one hundred and thirty two feet, one inch, more or less, to the place of beginning, be the said several diminzione more or less.

*Together* with the appurtenances and all the estate and rights of the said parties of the first part in and to said premises.

*To have and to hold*, the above granted premises unto the said party of the second part, its successors and assigns forever.

*Aaron H. Wellington L.S.*

*Margaret D. Wellington L.S.*

Executed in the presence of Frank O. Morse, Notary Public, County of Grafton, State of New Hampshire

### *Transfer of lot no. 4 and the cottage built on it, from the Society for the preservation of the cottage to OSIA*

*(13 January 1915, for $1.00)*

Liber 441, p. 569-571

Recorded, Richmond County, March 6, 1915 at 11.07 A. M.

C. Livingston Bostwick Clerk.

*This Indenture*, made the thirteenth day of January in the

year one thousand nine hundred and fifteen.

*Between Society for the Preservation of the Dwelling House of the Late Guiseppi Garibaldi, at Clifton, S. I. N. Y.*, a New York Membership Corporation, party of the first part and *Supreme Lodge Order Sons of Italy in America, Inc.*, a New York Membership Corporation, residing at 231 East 14th Street, Borough of Manhattan, New York City, party of the second part;

*Witnesseth*, that the said party of the first part, in consideration of the sum of One ($1.) dollar, lawful money of the United States, paid by the said party of the second part, and other valuable considerations, does hereby grant and release unto the said party of the second part, its successors and assigns forever,

*All* those nine (9) certain lots or parcels of land, with the building and improvements thereon erected, situate, lying and being at Clifton, Borough of Richmond, City of New York, which, taken together, are bounded and described as follows:—

*Beginning* at the corner formed by the intersection of the *Southerly side* of Chestnut Avenue with the *Westerly side* of Tompkins Avenue; running thence *Westerly* at right angles to Tompkins Avenue, and along the *Southerly side* of Chestnut Avenue, Two Hundred and One (201) feet; thence *Southerly* at right angles to Chestnut Avenue, One Hundred and Thirty-three (133) feet on a line parallel to Tompkins Avenue; thence *Easterly*, on a line parallel with Chestnut Avenue, One Hundred (100) feet; thence *Northerly*, on a line parallel to Tompkins Avenue, Seven (7) feet; thence *Easterly*, parallel with Chestnut Avenue, One Hundred and Five (105) feet and Six (6) inches, to the *Westerly side* of Tompkins Avenue; thence *Northerly*, along the *Westerly side* of Tompkins Avenue, One hundred and thirty two (132) feet, one (1) inch, more or less, to the point or place of beginning.

*Being the same premises* which were conveyed by Aaron H. Wellington and Margaret D. Wellington, his wife, to the party of the first part, by Deed dated June 17, 1905, and recorded in the Office of the Clerk of the County of Richmond in Liber 309 of Deeds, at Page 106.

*Together* with the appurtenances and all the estate and rights of the said party of the first part in and to said premises.

*To have and to hold*, the above-granted premises unto the said part of the second part, its successors and assigns forever, to apply the same or the income or proceeds thereof for the erection, improvement,

embellishment, preservation, repair or renewal of such monument, monuments or memorial, or of any structure, fences or walks upon its lands, or for the improving the same in any manner consistent with the design and corporate purpose for which the party of the first part was created.

*In Witness Thereof*, the said party of the first part has hereunto set its hands and its corporate seal the day and year first above written.

Signed, sealed and delivered:

in the presence of:

Francis A. Castellano, Jr.

Stefano Miele.

(Corp-Seal) Society for the Preservation of the Dwelling House of the late Guiseppi Garibaldi, at Clifton, S. I., N. Y.

*Genserico Granato, President,* and

*Giovanni Danieli, Secretary.*

Victor H. Miele, Notary Public, New York County, N. Y. Co. Clerk's No. (2548)

*Transfer of lot no. 4 and the cottage built on it, from OSIA to IAH&PS*

*(30 October 1917, for $1.00)*

Liber 478, p. 23-25

Recorded, Richmond County, November 20, 1917 at 9.57 A. M.

C. Livingston Bostwick, Clerk- For P. J. Brancato.

*This Indenture*, made the 30th day of October in the year one thousand nine hundred and seventeen.

Between Supreme Lodge Order Sons of Italy in America, Inc., party of the first part, and Italian-American Historical and Patriotic Society, Inc., of 226 Lafayette Street, Borough of Manhattan, City of New York party of the second part.

Witnesseth, That the said party of the first part for and in consideration of the sum of One Dollar, lawful money of the United States, paid by the said party of the second part do hereby remise, release and forever, quit-claim unto the said party of the second part, its heirs and assigns forever.

All those nine (9) certain lots, pieces or parcels of land, with the buildings and improvements thereon erected, situate, lying and being at Clifton, Borough of Richmond, City of New York, which, taken together, are bounded and described as follows:

Beginning at the corner formed by the intersection of the southerly side of Chestnut Avenue with the westerly side of Tompkins Avenue; running thence westerly at right angles to Tompkins Avenue, and along the southerly side of Chestnut Avenue, two hundred and one (201) feet; thence

southerly at right angles to Chestnut Avenue, one hundred and thirty-three (133) feet on a line parallel to Tompkins Avenue thence easterly on a line parallel with Chestnut Avenue, one hundred (100) feet thence northerly on a line parallel to Tompkins Avenue seven (7) feet; thence easterly, parallel with Chestnut Avenue one hundred and five (105) feet and six (6) inches to the westerly side of Tompkins Avenue, thence northerly along the westerly side of Tompkins Avenue one hundred and thirty two (132) feet and one (1) inch, more or less, to the point or place of beginning.

Being the same premises which were conveyed by Aaron H. Wellington and Margaret D. Wellington, his wife, to the "Society for the Preservation of the Dwelling House of the Late Giuseppe Garibaldi, at Clifton, S. I. N. Y.," by deed dated June 17, 1905, and recorded in the Office of the Clerk of Richmond County, in Liber 309 deeds at page 106.

Together with the appurtenances and all the estate and rights of the said parties of the first part, in and to the said premises.

To Have and to Hold, the above granted, bargained and described premises, unto the said party of the second part, its heirs and assigns forever.

*In* Witness Whereof, the said party of the first part has hereunto set its hand and seal by its authorized officers this 30 day of October one thousand nine hundred and seventeen.

Signed and delivered:

in the presence of:

Carmelo Amoruso,

Notary Public, New York County

(Corp-Seal) Supreme Lodge Order Sons of Italy in America, Inc.

By *Stefano Miele, President* and

*Francesco Mancini, Secretary.*

Morris Dickstein, Notary Public, New York County (165)

### *Transfer of lot no. 4 and the cottage built on it, from IAH&PS to OSIA*

*(24 July 1928, for $1.00)*

Liber 665, p. 458-460

Recorded, Richmond County, August 2nd, 1928 at 11.31 AM., *Peter J. Brancato* 350 Fulton Street, Brooklyn, New York.

*This Indenture*, made the Twenty-fourth day of July, nineteen hundred and twenty-eight between *Italian-American Historical and Patriot Society, Inc.*, a corporation organized under the laws of the State of New York, party of the first part and *Supreme Lodge Order Sons of Italy in*

*America, Inc*., party of the second part,

*Witnesseth*, that the party of the first part, in consideration of *One* ($1.00) Dollar, lawful money of the United States and other good and valuable considerations, paid by the party of the second part, does hereby grant and release unto the party of the second part, its successors and assigns forever.

*All* those nine (9) certain lots, pieces or parcels of land, with the buildings and improvements thereon erected, situate, lying and being at Clifton, Borough of Richmond, City of New York, which taken together are bounded and described as follows: *Beginning* at the corner formed by the intersection of the *Southerly side* of Chestnut Avenue with the *Westerly* side of Tompkins Avenue; running thence westerly at right angles to Tompkins Avenue and along the southerly side of Chestnut Avenue two hundred and one (201) feet thence southerly at right angles to Chestnut Avenue one hundred and thirty-three (133) feet on a line parallel with Chestnut Avenue one hundred (100) feet thence northerly, on a line parallel with Tompkins Avenue seven (7) feet thence easterly parallel with Chestnut Avenue one hundred and five (105) feet and six (6) inches to the westerly side of Tompkins Avenue, thence northerly along the westerly side of Tompkins Avenue one hundred and thirty-two (132) feet one (1) inch more or less to the point of place of beginning.

*Being the same premises* which were convey[ed] by Aaron H. Wellington and Margaret D. Wellington, his wife to said Supreme Lodge Order Sons of Italy in America, Inc. by deed dated June 17, 1905, and recorded in the office of the Clerk of the County of Richmond in Liber 309 of Deeds at page 106 and by said Supreme Lodge Order Sons of Italy in America, Inc conveyed to the party of the first part by deed dated October 30th, 1917 and recorded in the office of the Clerk of the County of Richmond on November 20th, 1917. Together with the appurtenances and all the estate and rights of the party of the first part in and to said premises.

*Together* with the appurtenances and all the estate and rights of the party of the first part in and to said premises. *To have and to hold* the premises herein granted unto the party of the second part its successors and assigns forever.

*In Witness Whereof*, the said party of the first part has caused its corporate seal to be hereunto affixed and these presents to be signed by its duly authorized officer the day and year first above written. pursuant to an authorization of the

Supreme Court of the State of New York by an Order made therefore by Honorable Norman S. Dike, Justice of the Supreme Court of the State of New York Second Judicial Department dated June 4th, 1928 and entered in the office of the Clerk of Richmond County on the 7th day of June 1928 pursuant to said order.

(Corp-Seal) *Italian-American Historical and Patriot Society, Inc.*

By *Stefano Miele, President*

By *Frank Mancini, Secretary*

## SUMMARY AND TRANSCRIPTION OF COURT PROCEEDINGS

### *James Mason vs. Antonio Meucci (et al.)*

[Supreme Court, City and County of New York, NY, file LJ 1857-M-382 (first case); Supreme Court, City and State of New York, NY, file LJ 1857-M-128 (second case); Municipal Archives of the City of New York - Record Group Staten Island County Clerk, Series 1859-1861, File Unit SI 75, Box no. 75, Shelf Location 111622 (third case)]

*Summary*

The documents of this case are contained in three different files, as it was tried in three different trials. In the first trial, James Mason sued Antonio Meucci through the law firm Brown & Averill (157 Broadway, New York) for, according to him, Meucci owed him $2,632, plus interest accrued as of 15 September 1856 (see the full transcription of the bill of complaint hereinafter), for sums that he had lent or advanced to Meucci in the period between 24 March and 16 September 1856. The bill of complaint, dated 9 February 1857, was delivered to Antonio Meucci by the Richmond County Sheriff on 16 February 1857. As Meucci did not answer to the bill of complaint within the deadline of twenty days, lawyers Brown & Averill obtained from the Court a judgment against Antonio Meucci who was to pay the sum claimed by Jim Mason, plus interest, amounting to a total of $2,711.17[76]. This judgment was filed on 10 March 1857, and the court proceedings up to said date were filed as LJ 1857-M-382, Supreme Court, New York.

At this point the case proceeds with another file, LJ 1857-M-128, Supreme Court, New York, which contains a copy of the documents of the previous file, followed, however, by an answer from Antonio Meucci (fully transcribed hereinafter), presented by his lawyer Henry H. Morange on 1 April 1857, therefore shortly after the foregoing judgment was issued, the execution of which lawyer Morange apparently was able to suspend. As can be seen from his answer to the bill of complaint, Antonio Meucci denied that he owed the sum claimed by Mason, and stated that, on the contrary, it was actually Mason who owed him $2,040. On 25 September 1857, the Justice of the Supreme Court, Hon. Charles A. Peabody, appointed a referee, George D. Kellogg, to determine how much the two parties owed each other. On 11 November 1857, the referee

[76]Legal interest, for 179 days, was calculated at $68.48. Therefore, the yearly interest was 5.3%.

presented his report, in which he indicated that Antonio Meucci owed $2,491.02 to Jim Mason. A judgment followed (transcribed hereinafter), filed on 25 November 1857, with which Meucci was sentenced to pay the sum indicated by the referee, plus trial expenses, for a total of $2,623.10[77].

The case, however, did not end here for, as is shown by a third file, which was found at the *Municipal Archives of the City of New York* (Record Group Staten Island County Clerk, File SI 75), it happened that when, on 20 February 1858, the Richmond County Sheriff received from the Court the order to collect the foregoing credit of $2,623.10, he had to acknowledge that Antonio Meucci was propertyless, as all his movables and property had been transferred first to William W. Badger, then from the latter to Esther Meucci and, finally, from Esther Meucci to a Capt. John Bennis, so that Esther Meucci as well was found to be propertyless. Therefore, the Sheriff was forced to return the outstanding order to the Court, wholly unsatisfied.

At this point, James Mason filed another lawsuit - which represents the third trial in the case in question - against Antonio Meucci, Esther Meucci, William W. Badger, John Bennis, the People of the State of New York and Henry H. Morange. The new bill of complaint bears the date of 25 February 1858. In it, James Mason complained that, having loaned in 1856 and 1857 to Antonio Meucci, in various ways, a sum exceeding $3,000, and notwithstanding the judgment (quoted above) in his favor, dated 25 November 1857, for $2,623.10, plus another one, also in his favor, obtained on 11 June 1857 from the Marine Court of New York for $307.86[78], he could not collect said sums, on account of fraudulent property transfers, which prevented the Sheriff to execute the orders of the Court. According to said bill of complaint, Antonio Meucci, Esther Meucci, William W. Badger and John Bennis were accused by James Mason to have plotted against him. In addition,

[77]Note that, in his unpublished typescript (see bibl.), Dr. Moncada considered the sum to pay for this judgment as an addition to (not a substitution of) the one decreed by the judgment of 10 March of the same year. Furthermore, he indicated the sum of $2,491.02, not including the trial expenses, instead of $2,623.10.

[78]We were not able to retrieve the documents of this trial and the related judgment, because the archives of New York's Marine Court were lost. However, we have found in the records of the Morange/Meucci trial (discussed ahead) a testimony of lawyer Morange stating that he defended the Meuccis in May 1857 and that on 11 June 1857, judge Thompson pronounced the foregoing judgment for $307.86 in favor of James Mason.

James Mason claimed that the mortgage granted by Esther Meucci to lawyer Henry H. Morange had to be declared null, as the transferor was not an American citizen and therefore had not the right to own - thence to transfer - real estate in the State of New York. Finally, the State of New York was also sued, as it could claim the ex-property of the Meuccis by escheat, in case said property would be decreed to have no legitimate owners.

Antonio and Esther Meucci replied separately to Mason's bill of complaint (thereby confirming the separation of their respective interests), on 17 August 1858 and on 13 August 1858, respectively, no longer through lawyer Morange[79] but through William I. Street. John Bennis' answer is dated 7 April 1859 (almost a year later). No other answer is contained in the court documents. It is worth noting that this case was joined by the Court to other two cases: Hermann Batjer vs. Antonio Meucci et al. and Louis W. Viollier vs. Antonio Meucci et al., which will be discussed in the following. In fact, all three bills of complaint were filed the same day, against the same defendants and with similar claims, apart from the specific credits claimed by each plaintiff.

We have transcribed hereinafter that portion of Antonio Meucci's answer that refers to his relations with Jim Mason. Esther Meucci's answer will be transcribed further ahead, when we will deal with the case Delos D. Pier et al. vs. Antonio Meucci et al., as it is practically the same as the one given in this (Mason/Meucci) case. John Bennis' answer, as well as that of Antonio Meucci, match, if with different words, with the arguments contained in Esther's answer. Such arguments were fully upheld by the judge of the Supreme Court, Justice William W. Scrugham, whose judgment is transcribed in full hereinafter, as it contains information of utmost importance, exposed in even greater detail than that contained in Esther's answer. Briefly, Justice Scrugham declared valid all the property transfers opposed by Mason, rejecting all of the requests by the latter.

Justice Scrugham's judgment was issued on 4 February 1861 and was filed on 19 March 1861. It was preceded by a report of the referee, Mr. W. Stevens, appointed by the Court on 12 April 1859, to gather the testimonies. James Mason was also sentenced to pay the trial expenses, in the amount of $290.87 to lawyer

[79]Lawyer Morange had sued the Meuccis in July 1857, demanding the extinction of the $500 mortgage raised in his favor on lots nos. 1 and 2, therefore he could no longer be their lawyer.

Street (the counsel for the defense of Antonio and Esther Meucci), and of $202.00 to lawyers Wright & Merrihew, counsels for the defense of John Bennis. Since, in the meantime, on 12 October 1860, the latter had died, the judgment was made enforceable as of 1 October 1860, in order for Bennis' heirs to benefit from it. We have transcribed hereinafter also lawyer Street's report, as it contains interesting information on the witnesses examined at the trial in favor of the defendants.

The court documents end with an exception of James Mason to the entire judgment which exception, however, according to the proceedings, was not followed up.

*Bill of Complaint, first trial (sworn on 16 February 1857)*
[Supreme Court, City and County of New York, NY, file LJ 1857-M-128 and M-382]

The complaint of the above named plaintiff respectfully shows that the said plaintiff on or about the 24th day of March 1856 to wit at the City of New York lent and advanced to this said defendant the sum of two hundred Dollars [$200]: that on the 4th day of April in the same year the said plaintiff lent and advanced to the said defendant the further sum of One hundred Dollars [$100]: that on divers days and times between the 4th day of April in the year 1856 aforesaid and the 16th day of September in the same year the plaintiff at the request of the said defendant paid laid out and expended divers sums of money for the said defendant in the whole amounting to the sum of Four thousand five hundred and ninety five Dollars and twenty nine cents [$4595.29]: that there is due to the said plaintiff on account of such loans and advances the sum of One thousand five hundred and seven Dollars and seventy four cents [$1507.74] over and above all payments made to the said plaintiff or moneys received on account thereof besides interest on such balance from the 15th day of September 1856.

And plaintiff further shows that over about the 15th day of January 1857 at the said City of New York he at the like request of the defendant assumed to pay and advance and did pay and advance for the said defendant to Messrs. Pier Parker & Co. by giving the plaintiff's promissory notes to them therefor and which they accepted as payment the sum of Eleven Hundred and twenty four Dollars and twenty nine Cents [$1124.29] which is now due and owing from the said defendant to the plaintiff together with the interest thereon from the 15th day of January 1857.

Therefore the said plaintiff demands judgment against the said defendant for the sum of Two thousand six Hundred and thirty two Dollars and three cents [$2632.03] with interest thereon as aforesaid.

Brown & Averill, Plffs Attorneys

*Answer of Antonio Meucci, first trial (1 April 1857)*
[Supreme Court, City and County of New York, NY, file LJ 1857-M-128]

The above named defendant answering the complaint of the above named plaintiff denies each and every allegation therein contained

And the defendant further answering avers that the above named plaintiff is indebted to the said defendant in the sum of two thousand and forty Dollars [$2040] for and on account of divers goods wares and merchandise sold and delivered to said plaintiff by said defendant and monies lent and advanced, and for work labor and materials, done performed and furnished by said defendant for and to the same plaintiff prior to the commencement of this suit, for which the said amount of Two thousand and forty Dollars with interest, this defendant counter claims against the said plaintiff and demands judgment therefor and that the plaintiff's complaint be dismissed with costs.

Henry H. Morange, Defts Atty

*Judgment, second trial (25 November 1857)*
[Supreme Court, City and County of New York, NY, file LJ 1857-M-128]

This action having been referred to George D. Kellogg Esq. to hear and determine the same and his report being filed, whereby he finds to be due from the defendant to the plaintiff the sum of two thousand four hundred and ninety one 02/100 Dollars [$2491.02]:

Now on motion of Brown & Averill plaintiff's Attorneys it is hereby adjudged that James Mason the plaintiff recover of Antonio Meucci the defendant the sum of two thousand and four hundred and ninety one 02/100 Dollars with one [hundred and thirty] two dollars and eight cents [$132.08] amounting to two thousand six hundred and twenty three dollars and ten cents [$2623.10].

*Answer of Antonio Meucci, third trial (17 August 1858)*
[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1859-1861; File Unit: SI 75; Box no. 75; Shelf Location: 111622]

… He also denies that during the years 1856 & 1857 the

Plaintiff loaned or advanced to or paid out or expended for this Defendant any sums of money amounting to three thousand Dollars [$3000] or any other sum; and alleges that at that period this Defendant had a very imperfect knowledge of the English language, and was almost entirely ignorant of general business (being by occupation a theatrical machinist & scene builder), that the Plaintiff spoke the Spanish language, with which language this defendant was conversant, and volunteered to assist this Defendant in his business, and obtained from this Defendant the sum of $3000 Dollars (being the consideration of the sum of the Samanos Mortgage referred to in the Complaint) & also a large amount of personal property to be appropriated to this Defendant's use, which the Plaintiff was at the period above mentioned largely indebted to this defendant. And this Defendant further says that at the times last above referred to the said Plaintiff well knew that the premises in the Complaint mentioned were held by this Defendant in trust for his said wife.

And as to the allegations in regard to the judgments referred to in the Complaint, and to the Execution and the return thereof, this Defendant has not any knowledge or information thereof sufficient to form a belief.

W. I. Street atty. for Deft.

*Opinion of Hon. William W. Scrugham, Justice, third trial (4 February 1861)*

[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1859-1861; File Unit: SI 75; Box no. 75; Shelf Location: 111622]

This cause being regularly called on the calendar for trial by the Court, on the pleadings and evidence, I William W. Scrugham the Justice of the Supreme Court before whom the said cause was tried do find and decide as follows.

As conclusions of fact I find that—

That prior to the Spring of 1850 the Defendants Antonio Meucci and Esterre Meucci his wife resided in the City of Havana in the Island of Cuba and for about twelve years the said Esterre Meucci had been employed at the Tacón Theater at a salary of sixty dollars per month [$60/mo.].

That during that period the proprietor of the theater gave her certain benefits and privileges from which she received about $1400 or $1500 per year; which benefits and privileges were donations from the said proprietor and formed not part of the remuneration he had agreed to give her for her labor and services. That at Havana aforesaid the said Esterre

Meucci lent to one Lorenzo Salvi the sum of $3500 part of her said $13,000 and he promised and agreed to repay the same to her with interest. That while in Havana and until the 7th April 1850 the said Esterre Meucci kept in her own custody the proceeds of such benefits and privileges, (except the sum so lent to Salvi) and that her husband never had possession of them, and that on that day intending at that time to emigrate with her husband to the State of New York, she the said Esterre Meucci placed in the hands of her husband the said Antonio Meucci, the sum of $9500, part of the said $13,000 and took from him an instrument in writing in the Italian language of which a correct translation is in the words and figures following viz:

I the undersigned declare that I have received from the Signora Esterre Meucci my wife the sum of Seven thousand five hundred dollars which money I obligate myself that upon my arrival in New York I will deposit in a Bank until a property can be found which will be satisfactory to her, I also declare that I have received $2000, more which I have left on deposit in the hands of Senior Don Boniface Acosta brother of the Countess of Reunion and in witness I have set my hand

Havana April 7, 1850

Antonio Meucci

That about the first of May 1850 the said Antonio Meucci and Esterre his wife, emigrated and came to the City of New York, that they were then aliens.

That the said Antonio Meucci, shortly after his arrival in New York, deposited the said $9500 in the Mechanic's Bank of the City of New York. That afterwards he drew the said fund from the Mechanic's Bank and deposited the same in the Seaman's Saving Bank in Wall Street in said City.

That without the knowledge or consent of the said Esterre Meucci, he deposited the said moneys in the said Saving's Bank in his own individual name, and not in the name of said Esterre Meucci; nor as her Trustee. That afterwards the said Antonio Meucci formed a partnership with the above named Lorenzo Salvi in business of manufacturing Candles, to be carried on in the town of Southfield Richmond County.—

That a factory was erected for said business on certain lands situated at Clifton in said County belonging to the said Lorenzo Salvi.— That in the erection of said factory the said Antonio Meucci used and applied a portion of the said moneys of the said Esterre

Meucci so as aforesaid deposited in the savings Bank.—

That afterwards and during said copartnership the said Antonio Meucci and the said Lorenzo Salvi purchased two other lots of Land adjoining the above mentioned lands and forming a portion of the land described in the complaint.—

That on one of said last mentioned lots of land at the time of said purchase there was a mortgage for $1500 which formed a part of the purchase money, which mortgage was afterwards paid off by the said Antonio Meucci with the moneys of the said Esterre Meucci, deposited as aforesaid in the Saving's Bank—

That in the said lands taken together included all the lands described in the Complaint.

That afterwards the said Lorenzo Salvi and Antonio Meucci dissolved the above mentioned copartnership— That in the latter part of the year 1850 the said Lorenzo Salvi borrowed of the said Esterre Meucci the sum of $2000, for one Joseph Avezzana, and became personally responsible for the said loan to the said Esterre Meucci—

That said $2000 was part of the said moneys in the hands of her said husband, and deposited as aforesaid, who paid the same, by the direction of the said Esterre Meucci to the said Lorenzo Salvi—

That at the time of the dissolution of copartnership above mentioned between said Salvi and Meucci the said Lorenzo Salvi still owed to the said Esterre Meucci, the sum of $3274.77 principal and interest, on the $3500 loan made by her to him at Havana, and the said $2000 loaned to Joseph Avezzana, had been paid by the said Avezzana, without the knowledge of the said Esterre Meucci, into the firm of Salvi and Meucci and had not been replaced in the said trust fund to the credit of the said Esterre Meucci, nor had the said Antonio Meucci replaced in the same fund, the moneys belonging thereto which he had invested in the said factory, nor any part thereof.

That a settlement of accounts between the said Salvi and the said Meucci was made by the arbitration of arbitrators duly appointed by them and … … … [in such settlement?] Meucci, and said Salvi in order to pay the [to] the said Esterre Meucci the sums for which he was liable to her above mentioned and also his indebtedness to said Antonio Meucci, conveyed to the said Antonio Meucci, all his right- title and interest in the real estate above mentioned.

That at the time such deed was executed the said Esterre Meucci objected to its being made to Antonio Meucci and demanded that it should be

made by the said Lorenzo Salvi to her and the said arbitrators, all of whom were Italians, advised and informed her that being an alien and not having filed intentions to become a citizen of the United States, she had no power to hold real estate, and did advise her that the deed ought to be made to the said Antonio Meucci (who had duly filed intentions to become a citizen) to hold the same in trust for her— That acting under said advice and in ignorance of her rights, she consented that the deed should be given to her husband, and the said Lorenzo Salvi thereupon conveyed the said Lands and his interest therein to the said Antonio Meucci.— That afterwards the said Antonio Meucci, converted the said Candle factory into a Brewery, and in so doing and also in the purchase of the furniture and fixtures necessary for a brewery, used all he had then left in his hands of the moneys so as aforesaid belonging to the said Esterre Meucci and referred to in the above mentioned instrument in writing dated April 7, 1850 with its accumulations.

That two or three months before the 22nd September 1856 the said Esterre Meucci was informed and first became aware that she had power to hold real estate in her own name, and shortly before 22nd September 1856 she did demand of her husband the said Antonio Meucci, a deed of the premises mentioned in the complaint.— That at that time the said Antonio Meucci was indebted to her for the full amount of the said $9500 and its accumulations.— That in consideration of receiving from her an acquittance and discharge of $9000 of the said moneys and to fulfill the trust as to the part of the lands previously owned by said Lorenzo Salvi he agreed to convey to her said lands (being the lands mentioned in the complaint) and in pursuance of said agreement, did on the 22nd day of September 1856 execute a deed thereof to the defendant William W. Badger, containing the following recital to wit, “to grant sell bargain and convey the said premises with the appurtenances, and each and every part thereof and said fixtures and furniture unto the said Esterre Meucci (his wife) her heirs and assigns forever, upon her giving to the party of the second part (said Badger) full receipts and acquittances for the sum of $9000, a part of the amount which the said Antonio Meucci has had of the said Esterre Meucci, out of her sole and separate estate, and invested in said premises furniture and fixtures; subject nevertheless to any specific liens by way of Mortgage or otherwise that may be on the premises hereby conveyed.—

That said Esterre Meucci united in said deed and the same was acknowledged by her and the said Antonio Meucci on the 23rd day of September 1856—

That the same William W. Badger by deed bearing date the 24th day of September 1856, and recorded in Richmond County on the 25th day of that month, after reciting the last above mentioned conveyance and the clause above set forth contained therein, and also that the said Esterre Meucci had given the receipts and acquittances therein mentioned, conveyed the said premises fixtures and furniture to the said Esterre Meucci, and did deliver to her the said deed.

That afterwards by deed dated March 18th 1857, acknowledged March 20th 1857 and recorded in Richmond County April 11th 1857, the said Esterre Meucci, for the expressed consideration of $6500 conveyed the said premises to the Defendant John Bennis and that her husband Antonio Meucci joined in the said deed.

That the said sum of $9000 mentioned in the said deed to William W. Badger was at the date of said deed due in good faith from the said Antonio Meucci to his wife Esterre Meucci for moneys belonging to her separate Estate which he had received for her use and benefit, and that the premises conveyed did not exceed in value the sum allowed therefor by the said Esterre Meucci.

That the said deeds and proceedings by which the said premises were conveyed by the said Antonio Meucci to the said Esterre Meucci and afterwards to the defendant John Bennis were in good faith, and were not fraudulent nor made with any intent to hinder delay or defraud the Plaintiff, or any other creditor of the said Antonio Meucci.—

And I do further find that on the 11th day of June 1857 the Plaintiff received a judgment against the Defendant Antonio Meucci in the Marine Court of the City of New York for $307.86 Dollars, which judgment was duly docketted in Richmond County by filing of a transcript according to Statute, and that on the 25th day of November 1857 the Plaintiff received in the Supreme Court of this State another judgment for $2623.10 Dollars against the said Antonio Meucci which judgment was also filed and docketted in the said County of Richmond.

That on the 20th day of February 1858 Executions were respectively issued on the said judgments against the said Antonio Meucci to the Sheriff of the County of Richmond, that such executions were respectively returned wholly unsatisfied, and that the said Antonio Meucci at the time of the

issuing of such executions resided in said County of Richmond—

And as conclusions of law I find—

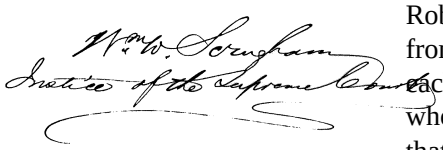
That by the laws of Spain the sum of $13,000 which the said Esterre Meucci had in Havana on the 7th April 1850 was her sole and separate property and not liable for the debts of her husband.—

That it remained her sole and separate property in the State of New York, not liable to the debts of her husband or subject to his disposal.—

That the deeds to and from Badger were valid as executing the contract of Antonio Meucci to convey the property to Esterre Meucci in satisfaction of his indebtedness and in fulfillment of his trust.—

That the deed to Bennis is not fraudulent as against the plaintiff but is valid.—

That the plaintiff is not entitled to recover in this action and the complaint must be dismissed with costs to be paid by the plaintiff to the defendants Antonio Meucci and Esterre Meucci and John Bennis.



Wm. W. Scrugham
Justice of the Supreme Court

Filed: March 19, 1861

*Statement by William I. Street, third trial (16 March 1861)*
[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1859-1861; File Unit: SI 75; Box no. 75; Shelf Location: 111622]

City and County of New York ss: William I. Street attorney for Antonio Meucci & wife being sworn says that the disbursements charged in the [rendered?] bill of costs were necessary and incurred in the regular progress of the cause, and are correct according to deponent's information and belief.

And deponent further says that on the taking of the testimony in said cause, the following witnesses attended on the part of said Defendants, viz.:

Joseph Fells, Joseph Avezzana, Michael Pastacaldi & Nelson [Nestore, Editor's note] Corradi from the City of New York for one day each except Avezzana who attended two days; and August [Garino?], Edward Blake, James M. Robinson & Esterre Meucci, from Staten Island for one day each except Esterre Meucci, who attended two days, and that said Staten Island Witnesses reside Eight miles from the place where their testimony was taken.

W. I. Street

Sworn this 16 day of March 1861 before me

A. D. W. Baldwin, Commissioner of Deeds

### *James Mason vs. Antonio Meucci and Joseph Fells*

[Supreme Court, City and County of New York, NY, file GA 1859-454]

*Summary*

The case began with the bill of complaint dated 20 February 1857, with which the law firm Brown & Averill, 157 Broadway, New York, demanded of Antonio Meucci and Joseph Fells the relief for damages claimed by James Mason. The latter stated that on 14 January 1857, he and Meucci had signed an agreement thanks to which he would be entirely in charge of running Clifton Brewery, while Meucci would supply his technical know-how and his work, and profits would be divided in half between the two of them (see transcription hereinafter). Consequently, Mason stated that he made purchases and incurred debts for the brewery that were still outstanding. Furthermore, Mason complained that on 15 February 1857, Antonio Meucci had transferred the management of the brewery to the other defendant, Joseph Fells - secretly, that is to say without Mason's consent - and that thereafter Mr. Fells proceeded at his will, leaving Mason out, even if, as of 9 March of that year, the same Fells transferred the lease to one Louis Gros.

Meucci and Fells, both defended by lawyer Henry H. Morange, replied to the bill of complaint on 6 and 11 March 1857 respectively, denying all charges. The two answers, prepared by lawyer Morange, were strictly formal, since they merely denied one by one all the charges contained in the bill of complaint (even denying the true statements), without supplying any reasons or explanations. It appears like Mr. Morange only aimed to gain time, in order to prepare the defense.

The Court met at a special term on 15 October 1858, under Hon. Josiah Sutherland, Justice, and, after having heard the lawyers of the two parties, decided to appoint a referee, Levi S. Chatfield Esq., to collect the testimonies and then present a report with his recommendations to the Court.

The Court met again on 4 April 1859, after the report was completed, and, accepting the recommendations of the referee, it passed judgment (fully transcribed hereinafter) upholding Mason's claims and establishing in particular:

—that the partnership between Antonio Meucci and James Mason was to be dissolved;

—that Jonathan S. Slanson, a New York City lawyer, was to

be appointed receiver in bankruptcy of the brewery;
—that Joseph Fells, upon request of the receiver, pay the sum of $450 for the goods (beer in bottles or kegs) illicitly purchased with the lease of the brewery, plus interest incurred as of 9 March 1857;
—that the plaintiff James Mason recover the expenses incurred for the trial, estimated at $173.19;
—that the receiver pay said costs to Mr. Mason, as well as his expenses first, then pay the debts of the brewery, and finally divide what remained between the two partners, according to what was due to each one of them.

The final hearing took place on 23 November 1859, after the liquidation by the receiver was completed (of which we found no records). The closure of the case was filed on 26 November 1859.

*Report of Referee Levi S. Chatfield (undated, ca. April 1859)*
[Supreme Court, City and County of New York, NY, file GA 1859-454]

To the Supreme Court.

The above action having been by this Court referred to me to take the Evidence therein and report the same to the Court with my opinion thereon

Do respectfully report that I have from time to time been attended by the parties to this action and their respective Counsel and have taken and reduced to writing all the evidence offered by either party and subjoin the same to this report, with a true copy of the written contract and the translation thereof produced in evidence and marked Exhibit “C.” referred to in the annexed testimony is annexed to this report.

*First.*— In my opinion said written contract constituted a full partnership between the above named plaintiff Mason and the Defendant Meucci commencing at the date thereof to wit the 14th day of January 1857 and that the same has never been dissolved by any agreement between said partners.

*Second.*— That the evidence shows good and abundant cause for dissolving said partnership.

*Third.*— That a Receiver ought to be appointed to take charge of the property effects rights and credits of said partnership with the usual powers of receivers.

*Fourth.*— That when the defendant Fells purchased the property of Meucci he knew of the partnership existing between Mason and Meucci and knew that the Ales and Beers in the Clifton Brewery taken by him belonged to said partnership of the value of $450 and in my opinion said Fells

should account to the receiver for the value thereof.

*Fifth.*— That the said partnership firm contracted debts to the amount of $260. or upwards which remain unpaid and that the plaintiff Mason has received no part of the property or earnings of said partnership.

I annex the form of a decree which I deem proper to be entered in this action and I decide and report that the plaintiff is entitled to the costs of this action.

Respectfully Submitted
L. S. Chatfield
Fees $42.00 Referee

Annex - Exhibit "C" Contract Meucci-Mason (14 January 1857)

… … … [previous words missing] make from this day a partnership for the working of the Brewery belonging to A. Meucci in Staten Island

Mr Mason has the entire direction of the business makes the purchases attends to the money matters, he has the right to choose a Superintendency for the brewery the books will be kept by Mr Mason Mr Meucci will work in the brewery to the best of his ability and agrees not to enter into any business engagements without the consent of his partner.

The profits of the Brewery after deducting all the expenses and interest on the mortgages $6500 will be equally divided. Mr Mason will liquidate Meucci's old business obtain a mortgage from M. pay the creditors in proportion Mr Meucci approving all Mr Mason's doings according to conversation of this day between the two contracting parties and Mr Violier

signed James Mason
signed Antonio Meucci
signed L. W. V. [Louis W. Viollier, Editor's note]

*Opinion, Hon. Josiah Sutherland, Justice (4 April 1859)*
[Supreme Court, City and County of New York, NY, file GA 1859-454]

At a special term of the Supreme Court of the State of New York held at the City Hall in the City of New York on the 4th day of April 1859.

Present Hon. Josiah Sutherland Justice

James Mason against Antonio Meucci & Joseph Fells

This cause having been reached in its order on the calendar and the same having been duly refereed to Levi S. Chatfield Esq. … … … therein and Report the same to the Court with his opinion thereon by an order bearing date October 15th 1858 and the said Referee having taken the testimony and made and filed his report with the evidence annexed and as matter of opinion

therein states that the written Contract set forth in said Report and given in evidence constituted a full partnership between the above plaintiff James Mason and the defendant Antonio Meucci commencing at the date thereof to wit the 14th of January 1857 and that the same has never been dissolved by any agreement between said parties

That the evidence shows good and abundant cause for dissolving said partnership

That a receiver ought to be appointed to take charge of the property effects rights & credits of said copartnership with the usual powers of Receivers

That when the defendant Fells purchased the property of the defendant Meucci he knew of the copartnership existing between Mason and Meucci and knew the ales or Beers in the Clifton Brewery[80] taken by him belonged to said copartnership of the value of Four Hundred and Fifty Dollars [$450] and the said Fells should account to the Receiver for the value thereof

That said copartnership firm contracted debts to the amount of $260. or upwards which remain unpaid and that the plaintiff Mason has received no part of the property or earnings of said copartnership

And the said Referee having proposed the form of a decree to be entered herein to the effect that the plaintiff and defendant Meucci became copartners on the 14th day of January 1857 for the working of the Brewery at Clifton Staten Island Richmond County

That they contracted debts to the amount of $260 which remains unpaid for materials used in their business

That the plaintiff has received nothing out of the copartnership business

That defendant Meucci became insolvent and disposed of the Brewery so as to deprive him of the ability to continue the copartnership business

That the defendants colluded together to dispose of the whole partnership property in fraud of the rights of the plaintiff and that since the commencement of this action the Defendant Fells with full notice of the plaintiff's rights and in violation of the order of this Court received of the Defendant Meucci all the copartnership property & leaving the copartnership's debts unpaid

That a receiver should be appointed and the said Fells be adjudged to pay the sum of Four Hundred and Fifty Dollars & interest thereon from the 9th day of March 1857[81] and

[80]This is the first official mention of the name *Clifton Brewery.*

[81]This is the date when Joseph Fells transferred the lease of the brewery to Louis Gros.

the Defendants be adjudged to pay the plaintiff the costs of this action to be taxed

That the receiver out of the monies received from the defendant Fells pay over to the partnership creditors the amount remaining due to them and take their receipts therefor after first deducting his own fees as receiver and bring the Balance into Court and make due report of his doings as such receiver in the premises

And the said Report opinion evidence and proposed decree having been submitted to this Court and this said Court having ordered judgement confirming the Report of the Referee and for the plaintiff with costs

It is hereby on motion of E. & E. F. Brown of Counsel for Plaintiff ordered adjudged & decreed that the plaintiff and Defendant Meucci became copartners under and by virtue of the copartnership agreement made by and between them bearing date January 14th 1857 for the working of the brewery at Clifton Staten Island in the County of Richmond and that said copartnership be and the same is hereby dissolved

That as such copartners they the said plaintiff and Defendant Meucci contracted debts amounting to Two Hundred and Sixty Dollars for stock and material purchased in their business

That the plaintiff has received nothing out of the copartnership business

That Defendant Meucci became insolvent and disposed of the Brewery so as to destroy the copartnership's business without the consent of the plaintiff

That the defendants colluded together to dispose of the whole partnership property in fraud of the plaintiff's rights & that since the commencement of this action the Defendant Fells with full knowledge of plaintiff's rights and in violation of the order of this Court[82] received of the Defendant Meucci all the copartnership property consisting of ale or Beer of the value of Four Hundred & Fifty Dollars and appropriated the same to his own use (and which was all the copartnership property) & leaving the copartnership debts unpaid

That Jonathan S. Slanson of the City of New York attorney at Law, be and be hereby appointed as receiver of the effects property and credits of

[82]Indeed, the deed of transfer from Joseph Fells to Louis Gros was signed on 9 March 1857, when the trial was already under way (it had begun on 20 February 1857). The transfer from Antonio Meucci to Joseph Fells was made around 15 February 1857 (deed not found, although another deed was retrieved, dated 19 February 1857, whereby Mr. Fells promises to return the lease of the brewery when requested by the Meuccis).

the said copartnership with all the powers and duties of receivers in such cases, upon filing an undertaking in this Court with sureties in the sum of Five Hundred Dollars to be approved by this Court

And it is hereby further adjudged and decreed that upon the filing of such undertaking by the said receiver that the defendant Joseph Fells immediately upon demand made by said receiver of such payment pay over to the said Receiver the said sum of Four Hundred and Fifty Dollars & interest thereon from the 9th day of March 1857 and in default thereof that an attachment issue against him

That said receiver first pay the costs & expenses not recovered and paid by the defendants as hereinafter mentioned incurred herein and secondly pay & extinguish the copartnership debts existing against said firm if their be sufficient for that purpose and if there be anything remaining after such payments to pay over the sum to the plaintiff & defendant as they may be entitled thereto and that after such payments the said receiver make and file his report of his acts and doings in the premises with all convenient speed

And it is hereby further adjudged that the plaintiff recover of the defendants the sum of one hundred & seventy three Dollars and nineteen cents [$173.19] for his costs & charges in prosecuting this action as adjusted by the Clerk of this Court and that the said plaintiff have execution thereof to be issued by his attorney as provided by law.

[Signed] *J. Sutherland*
Filed November 26, 1859

### *Hermann Batjer vs. Antonio Meucci (et al.)*

[Supreme Court, City and County of New York, NY, file LJ 1857-M-224 (first case); Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1859-1861; File Unit SI 75; Box no. 75; Shelf Location: 111622 (second case)]

*Summary*

This case featured two trials, with related documentation stored in separate files. The first trial began with a bill of complaint dated 17 February 1857, with which the law firm Brown & Averill, 157 Broadway, New York, on behalf of Hermann Batjer, demanded that Antonio Meucci pay the sum of $693.52 plus interest as of 15 January 1857, as well as trial expenses, for a promissory note signed by him on 12 September 1856, due to expire after four months. In his answer, dated 28 April 1857, presented by his lawyer at the time, Henry H. Morange, Antonio Meucci stated (see transcrip-

tion hereinafter) that James Mason made him sign that promissory note (which was then transferred to Batjer), and that he did not receive anything in return. He also stated that Mr. Mason had said it was a mere formality, to be resolved in a few days' time, ensuring that Meucci would never be requested to pay that sum.

At the hearing, called by the Justice of the Supreme Court, Hon. Thomas W. Clerke, on 19 June 1857, the witnesses Louis W. Viollier, Joseph Fells, R. R. Barthold, James Mason and W. C. Russell were heard, who testified in favor of the plaintiff, except Joseph Fells. Antonio Meucci was sentenced to pay the sum requested, plus expenses, for a total of $798.56. When the judgment was filed, on 26 June 1857, the first phase of the case - i.e. the first trial - ended.

As it had occurred with the previous case Mason vs. Meucci et al., the new trial began with the bill of complaint presented by Hermann Batjer not only against Antonio Meucci but also against Esther Meucci, William W. Badger, John Bennis, The People of the State of New York and Henry H. Morange. The new bill of complaint bears the date 25 February 1858, but was served by the Sheriff to the Meuccis on 12 June 1858. In it, Batjer complained that, in the summer of 1856, he had delivered a great deal of beer bottles to Clifton Brewery for a value of roughly $700, and that, not having been paid back, he had obtained the foregoing judgment of 26 June 1857, amounting to $798.56 in his favor, but that he could not recover said sum, owing to the fraudulent property transfers that prevented the sheriff to carry out the Court order. The same considerations of the previously-mentioned trial Mason vs. Meucci et al. followed, as regards the other defendants Esther Meucci, William W. Badger, John Bennis, The People of the State of New York and Henry H. Morange.

In this second trial, Antonio and Esther Meucci were defended by lawyer William I. Street and no longer by Henry H. Morange who, beside the fact that he was sued as well, had proved in the previous trials to be quite inefficient. The answers of Esther Meucci, Antonio Meucci and John Bennis bear the same dates (13 August 1858, 17 August 1858 and 7 April 1859, respectively) as the similar answers provided in the case Mason vs. Meucci et al., and have the same contents, except for Antonio Meucci's answer, in which the latter replied to Batjer's specific accusation as follows: "… *Denies that the sale of bottles referred to in the complaint was made to this defendant,*

*and alleges that such sale was made to one James Mason, and charged to him on the Plaintiff's books and not on this Defendant's responsibility …"* It therefore appears that Mr. Mason had convinced Mr. Batjer to try to recover his credit from Antonio Meucci, instead of from himself.

At this point, on 20 August 1858, the lawyers of the two parties (according to an affidavit sworn on 25 January 1861 by lawyer William I. Street) agreed with the Court to join the case in question with the one illustrated above, Mason vs. Meucci et al., and with the one that we shall illustrate later, Viollier vs. Meucci et al., as they were all started on the same date and for the same purpose. The sentence was passed by the judge of the Supreme Court, Hon. William W. Scrugham on 14 February 1861, with the same content as that of the case Mason vs. Meucci et al. and condemned the plaintiff, Hermann Batjer, to the payment of costs for the defense, amounting to $43.81, to be paid to Esther and Antonio Meucci's lawyer, and $42.00, to be paid to John Bennis's lawyer. Once again, since the latter had died on 6 October 1860, the judgment was made operative as of 1 October 1860, so that Bennis' heirs would benefit from it. The case was then closed with the filing of the judgment, on 19 March 1861.

*Answer of Antonio Meucci, first trial (28 April 1857)*
[Supreme Court, City and County of New York, NY, file LJ 1857-M-224]

The above named defendant answering the complaint of the above named plaintiff avers that the promissory note mentioned and described in the said complaint was made … without any consideration whatever and that no value whatever was paid to or received by the said defendant from said plaintiff or any other person whomsoever.

Defendant avers that he was induced by one James Mason to sign [said promissory?] note which defendant believes is the one described in said complaint, that the said Mason represented to said defendant that the said note would be retained but a few days and that the said defendant would never be compelled to pay the same.

Henry H. Morange
Deft. Atty.

*Louis W. Viollier vs. Antonio Meucci (et al.)*

[Supreme Court, City and County of New York, NY, file LJ 1857-M-223 (first case); Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1859-1861; File Unit:

SI 75; Box no. 75; Shelf Location: 111622 (second case)]

*Summary*

This trial began, like the aforesaid Batjer vs. Meucci trial, on 17 February 1857, with the subpoena for Antonio Meucci issued by the Brown & Averill law firm, 157 Broadway, New York, on behalf of Louis W. Viollier. In it, it was stated that in the period from 2 October to 3 December 1856 Mr. Viollier had made several advance payments on behalf of Antonio Meucci, amounting to $768.64 in total, and that, between 17 December 1856 and 3 February 1857, Antonio Meucci had paid back only a small part of said sum. Therefore, the plaintiff claimed the settlement of the debt, amounting to $588.00 plus interest accrued since 3 February 1857, plus legal costs. Antonio Meucci's reply, which is transcribed hereinafter, was forwarded by lawyer Morange on 19 March 1857. Meucci stated that he had paid back the sum due to the plaintiff, which only amounted to $105.00 (not $588.00), whereas, on the contrary, the plaintiff owed him $250.00 for services delivered and advance payments made on behalf of Viollier himself for beer supplies. Incidentally, from Meucci's reply, as well as from other documents (see, for instance, the aforesaid Meucci-Mason contract, undersigned by Viollier), it can be inferred that Mr. Viollier collaborated with Jim Mason in running the brewery, probably as a supervisor and Mr. Mason's trusty man.

On 23 March 1857 Louis Viollier rebutted Antonio Meucci's reply, denying that he owed the latter $250.00.

At the hearing, which must have been held shortly before the end of June 1857, Mr. Morange did not show up and the Court thus deliberated that Antonio Meucci would have to pay the debt claimed by Mr. Viollier plus expenses, for a total of $675.74. Note that Mr. Morange was about to sue the Meuccis (which actually occurred on 30 July 1857), therefore, at the time of this judgment, which was filed on 26 June 1857, he was already in conflict with his clients, as we shall see in the following.

The second trial began with a subpoena, dated 25 February 1858, which was served on 12 June 1858 to Antonio Meucci, Esther Meucci, William W. Badger, John Bennis, The People of the State of New York and Henry H. Morange. In it, the plaintiff complained that the sheriff in charge of collecting the sum of $675.74 set by the judgment of 26 June 1857, had gone to Antonio Meucci on 20 February 1858 to collect said sum, only to acknowledge that the latter was penniless (for the reasons out-

lined above) and had thus returned the order to the Court, unsettled. The plaintiff therefore asked the Court to annul all the transfers of property previously owned by Antonio Meucci, in order to settle the payment. The answers of Esther Meucci, Antonio Meucci and John Bennis bear the same dates (13 August 1858, 17 August 1858 and 7 April 1859, respectively) as the analogous answers provided in the Mason vs. Meucci et al. and Batjer vs. Meucci et al. trials and have the same contents. Antonio and Esther Meucci were defended by Mr. William I. Street, not by Mr. Morange anymore. In Esther's answer, the reason justifying the transfer of lot no. 3 to James Mason is worth to be quoted: "… *after paying two years interests upon the Mortgage on Plots 54-55-57 & 58 … conveyed the same to one James Mason in consideration of his assuming the payment of the mortgage …*" In his reply, John Bennis stated that he had paid the Meuccis some $900.00 "*to meet the necessary expenses of said Esterre Meucci and Antonio Meucci,*" thereby denying that the transfer of real estate and chattels made by the Meuccis to him took place without payment, as stated by the plaintiff.

The sentence was issued by the judge of the Supreme Court, Hon. William W. Scrugham, on 4 February 1861, and it was similar in content to the ones of the Mason vs. Meucci et al. and Batjer vs. Meucci et al. trials, deliberating that the plaintiff Louis W. Viollier would pay legal costs to Esther and Antonio Meucci's lawyer, amounting to $43.81 and to John Bennis's lawyer, amounting to $42.00. Also this sentence was made enforceable as of 1 October 1860, in order to benefit John Bennis's heirs. The case was closed on 19 March 1861, with the filing of the sentence.

*Answer of Antonio Meucci, first trial (19 March 1857)*
[Supreme Court, City and County of New York, NY, file LJ 1857-M-223]

The above named defendant answering the complaint of the above named plaintiff denies each and every allegation in the said complaint contained.

Defendant avers that some time in the fall or winter of 1856 the said plaintiff advanced the sum of One hundred and five Dollars [$105.00] for the purpose of paying the interests upon certain mortgage, but that the same was returned and paid to the said plaintiff by said defendant.

Defendant further avers that the said plaintiff is indebted to this defendant in the sum of

Two hundred and fifty Dollars [$250.00] for services rendered in the brewing of ale & beers for plaintiff's account and for monies paid laid out and expended in his behalf which said amount the defendant counterclaims against the above plaintiff

Henry H. Morange
Defts Atty

*Delos D. Pier et al. vs. Antonio Meucci et al.*

[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1859-1861; File Unit: SI 75; Box no. 75; Shelf Location: 111622]

*Summary*

The case began with the bill of complaint dated 27 June 1857, in which the plaintiffs Delos D. Pier, William A. Parker and Solomon Sanders Jr., through their lawyers E. & E. F. Brown, represented that during the summer of 1856 they had sold to Antonio Meucci a large amount of malt, valued $1140.90, without receiving any payment for it. Furthermore, the plaintiffs stated that they had obtained several (three) judgments in their favor, on 11 June 1857[83], for the recovery of said credit, plus interest, for a total of $1212.98. However, as the Sheriff in charge of collecting the money could not recover any asset belonging to the Meuccis, the plaintiffs also sued Esther Meucci, William W. Badger, John Bennis, the People of the State of New York and Henry H. Morange, under the same charges and motivations as in the aforementioned Mason vs. Meucci case.

At the beginning of the case, Antonio and Esther Meucci were defended by lawyer George Catlin but, towards the end of it, the defense was taken over by lawyer William I. Street, who was also in charge of the Meuccis' defense in the other two analogous cases. We have transcribed hereinafter the answer of Esther Meucci, dated 18 September 1857, which contains new and interesting information on the wealth accumulated by her in Havana and subsequently deposited in New York banks. In her answer, Esther also stated that she had lent $3,500 to Lorenzo Salvi (who was also well off but, evidently, lived extravagantly) as well as $2,000 to Gen. Avezzana, which latter fact also came up in the Viollier vs. Meucci case, described above. In his answer dated 9 Septem-

[83]As was have reported above, the archives of the New York Marine Court, where the cases in question were tried, were destroyed, hence we could not find the records of this trials. We have found a mention of them in Mr. Morange's deposition at the Morange vs. Meucci et al. trial, discussed in the following.

ber 1857, Antonio Meucci confirmed his wife's statements, and in particular he stressed that all their personal property in Clifton was purchased with the wealth accumulated by his wife in Havana and that, therefore, it belonged to her by rights. The answer of John Bennis, dated 18 July 1857, similar to the one given at the aforementioned Mason vs. Meucci case, was fully in accordance with Esther's answer. The answer of lawyer Morange, dated 23 July 1857, is interesting because he stated that Pier, Parker and Sanders did not sell any malt, in the summer of 1856, to Antonio Meucci (implying that they did sell it to James Mason) and that it was not true that Esther, at the time when the property mentioned in the bill of complaint was purchased or transferred, was not an American citizen. This latter statement, however, is in contrast with a statement by Esther's counsel, William I. Street, according to whom Esther Meucci had every right to engage in such transactions, *"although she did not have the American citizenship."*

Also in this case a referee, Hamilton W. Robinson, was appointed by the Court, on 17 December 1857. Later on (10 March 1858), a receiver, Tompkins Westervelt, was also appointed with the purpose to determine and collect the leases and revenues of the brewery, which was run by Louis Gros at the time. Upon the receiver's request, on 16 August 1858, the judge of the Supreme Court, Justice John A. Lott, authorized Mr. Westervelt to sue Mr. Gros in order to recover the outstanding debts due by the same Gros to Antonio Meucci, estimated at $500. However, as we shall see, the suit against Louis Gros was dropped, following the conclusion of the case in question.

On 18 March 1859, referee H. W. Robinson presented his conclusions, indicating in particular:

—that in July, August and up to 22 September 1856, the plaintiffs sold to Antonio Meucci goods for $1004.88 and, subsequently, other goods amounting to $1140.90, as mentioned in the Complaint;

—that there was no fraud on the part of Antonio or Esther Meucci in the transactions involving movables and property carried out as of 22 September 1856;

—that at the time said transactions took place Esther Meucci was an alien;

—that, in the case in question, the plaintiffs had no right to recover the sums claimed in the bill of complaint and that therefore the complaint had to be dismissed, but without charging the trial expenses to the parties involved.

It may be noted that Mr. Robinson's conclusions proved that lawyer Morange's statements quoted above were false.

The sentence upheld all of the referee's recommendations and was filed on 28 March 1859, on which date the case was closed.

Dr. Moncada, in his unpublished typescript (see bibl.) refers that, around February 1857, when Antonio Meucci turned to lawyer Morange, four bills of complaint had been received from the persons involved in the case in question: one from Delos D. Pier, for a credit of $403.10, of which we did not find any trace, and three from Parker & Solomon Sanders, for credits amounting to $1212.79. Of these latter three bills of complaint we have found mention in the testimony of lawyer Morange in the case Morange vs. Esther Meucci et al. (discussed hereinafter). More precisely, Morange said that, on 21 May 1857, he had been hired for the defense of Antonio Meucci in three lawsuits filed by Pier, Parker and Sanders against James Mason and Antonio Meucci and that on 11 June 1857, judgments in favor of the plaintiffs were passed in all three cases and that he filed appeals for the latter on 13 June 1857. Mr. Morange, though providing a detailed list of all the cases in which he defended Antonio Meucci, did not mention the case where Delos D. Pier was the sole plaintiff, claiming a credit of $403.10, as reported by Moncada. It is interesting to note that the other three cases were brought by all three plaintiffs not only against Antonio Meucci but also against James Mason. Furthermore, the fact that Morange mentions three judgments in favor of the plaintiffs, all dated 11 June 1857, leads to think that they were the same mentioned in the bill of complaint of the case described in this paragraph, where said judgments were said to amount to $1212.98, a sum very close to that of $1212.79 indicated by Dr. Moncada. Finally, we wish to remark that, as the three cases were tried before the Marine Court of New York, it seems likely that the malt sold by the plaintiffs to Antonio Meucci and James Mason was imported.

*Answer of Esther Meucci (18 September 1857)*

[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1850-1860; File Unit: SI 365; Box no. 365; Shelf Location: 11912]

The separate answer of Esterre Meucci one of the defendants in this action respectfully shows that she is the wife of the defendant Antonio Meucci

and was married to him at Florence, in the Duchy of Tuscany in the year 1831 [1834, Editor's note].

That in the year 1833 [1835, Editor's note] she with her husband the said Antonio Meucci removed to Havana in the Island of Cuba. That in the year 1850 the said defendant and her said husband removed to this State. That previous to this departure this defendant entrusted to the said Antonio Meucci the sum of Seven thousand five hundred dollars [$7,500] belonging to her sole and separate estate and property, to be laid out and invested in the United States for her sole benefit, either in the purchase of real estate or at interest in some safe institution, for which the said Antonio Meucci gave to this defendant an instrument in writing now in the possession of this defendant in the words and figures following viz.[84]:

"Io sotto scritto dichiaro di avere ricevuto dalla Sig.ª Esterre Meucci mia consorte la somma di scudi sette mila cinque cento quale denaro mi obbligo che al mio arrivo a New York lo depositerò en una Banca, fino a tanto che si possa trovare da comprare una proprietà che sia di sua soddisfazione, de più dichiaro di avere ricevuto ancora scudi duemila quale lascio in deposito in mano del Señ Don Bonifazzio [Acosta, fratello della] Contessa de la Reunion. Et in fide manu propria

Avana, 7 aprile 1850

[*Antonio Meucci*]

*Luigi Tartarini"*

"I the undersigned declare that I have received from the Signora Esterre Meucci my wife, the sum of Seven thousand and five hundred dollars, which money I obligate myself that at my arrival at New York to deposit in a Bank until a property can be found to purchase which will be satisfactory to her. I also declare that I have received $2000. more which I have left on deposit in the hands of Señ. Don Bonifacio Acosta, brother of the Countess of Reunion. And in witness (I have set) my hand

Havana April 7, 1850

*Antonio Meucci*

*Luigi Tartarini"*

And the said defendant for a further answer to the complaint says that before leaving Havana, she loaned to Lorenzo Salvi … … [Three] thousand five hundred dollars [$3500] of said estate, all of which except the balance of Eight hundred dollars [$800] he afterwards paid by a

[84]The exact words of the statements which follow, both in Italian and in English, vary slightly with respect to the corresponding ones used in the similar answers given by Esther Meucci in the suits brought by H. Batjer or L. W. Viollier versus the same defendants, though the substance is the same.

conveyance of certain real estate as hereinafter mentioned.

And the said defendant for further answer says, that sometime after their arrival in New York and in the year 1851 a part of the money above mentioned was invested by the said Antonio Meucci in the purchase of the real estate described in the Complaint which was bought in company with said Lorenzo Salvi. And that the said Lorenzo Salvi afterwards and in the year 1853 released his interest in the said real estate to the said Antonio Meucci in trust for this defendant as a payment of the above loan by the said Esterre Meucci, except the said balance of $800, which is still unpaid.

And the said Defendant further says that the said Antonio Meucci informed her, that he was advised to take the conveyance of said real estate in his name that this defendant objected to his doing so, and that the said Antonio Meucci advised this defendant that such a course was necessary because this defendant was not authorized by law to convey real estate, and promised her, that the property should afterwards be made over to her … … …

[the account of the various deeds follows]

George Catlin, Atty. for Deft.

### *H. H. Morange vs. Esther Meucci et al.*

[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1857-1858, File Unit: SI 73, Box no. 73, Shelf Location: 111620 (first case); Series: 1856-1861, File Unit: SI 75, Box no. 75, Shelf Location: 111622 (appeal); Series: 1850-1860; File Unit: SI 365; Box no. 365; Shelf Location: 11912 (auction sale and surplus money)]

*Summary*

This case was tried in three phases and, therefore, the related documentation is contained in three separate files. The first phase began on 30 July 1857, with the bill of complaint presented by Henry H. Morange against Esther Meucci, Antonio Meucci, John Bennis, Delos D. Pier, William A. Parker, Solomon Sanders Jr., James Mason, Hermann Batjer and Louis W. Viollier. In the bill of complaint, Mr. Morange indicated that on 20 February 1857, Antonio and Esther Meucci had raised a mortgage of $500 in his favor on lots no. 1 and 2 (see map on p. 400), as a guarantee for the payment of his fees, and that said mortgage envisaged the monthly payment of interest at an annual rate of 7%, within 10 days of the deadline (thus, as of 20 March 1857). Mr. Morange complained that he

did not receive the payment of the five months' interest accrued till 20 July 1857, amounting to a total of $14.57, and therefore, as the ten days' deadline expired on 30 July 1857, he demanded the sale of the mortgaged property and the payment of the mortgage itself, plus interest and trial expenses. Furthermore, Mr. Morange stated that the other defendants were sued because Antonio Meucci owed them money and he therefore asked the Court to prevent said defendants from claiming rights over the mortgaged property by virtue of their credits until the property was sold at a public auction and he had received his payments.

Antonio and Esther Meucci were first defended by lawyer George Catlin and then by lawyer William I. Street, as we shall see. John Bennis was defended by the law firm Wright & Merrihew, while the other defendants were defended by the law firm E. & E. F. Brown. Lawyer Morange defended himself. The answers of Antonio and Esther Meucci were presented by lawyer Catlin on 9 and 18 September 1857, respectively. In Antonio Meucci's answer, transcribed in full hereinafter, the latter stated that lawyer Morange had received from him $100 for his services, a sum which, in his opinion, was a sufficient compensation for said services; that the mortgage had been raised in favor of Mr. Morange only as a guarantee of the payment—which had already been settled—and that he therefore felt to have extinguished his debt towards Mr. Morange. The answer of Esther Meucci was rather rash for, in it, Mr. Catlin upheld that, as Esther was not an American citizen, the mortgage in favor of Mr. Morange was to be considered null (thereby contradicting what was declared in the other cases illustrated above in which, instead, Esther claimed—and was granted by the Supreme Court—her lawful right to purchase or sell real estate, though being an alien). On 27 September 1857, Mr. Morange rebutted Esther and Antonio Meucci's answers, pretending that his fees exceeded the $500 value of the mortgage.

On 9 November 1857, at the first hearing of the trial, held before the Justice of the Supreme Court, Hon. Lucien Birdseye, a referee was appointed, Hon. Robert Emmet, who collected testimonies and evidence starting from 11 January 1858. The reader should note that, as of this date, Antonio and Esther Meucci were represented by lawyer William I. Street, and no longer by lawyer Catlin. In his deposition, Mr. Morange provided a complete list of the trials in which he had defended

Antonio Meucci. We have mentioned all of them except a lawsuit for false imprisonment filed by Antonio Meucci against Hermann Batjer in June 1857, at the Superior Court of New York.

According to Mr. Morange's deposition, Meucci's imprisonment was caused by Batjer *"… on account of a charge of perjury made by Batjer against Meucci, from which I procured his discharge … The alleged perjury was in swearing to the answer in the Batjer suit …"* (referring to Meucci's answer to the bill of complaint of the case Batjer vs. Meucci illustrated above). In his deposition at the same trial (Morange vs. Esther Meucci et al.) Antonio Meucci stated: *"… I was arrested by Batjer on a Complaint made by him. Bennis was my Surety. Mr. Morange got me clear. He asked for some money & Captain Bennis paid him $50 on my account …"* This answer given by Meucci testifies to a payment of $50 made by Captain Bennis to Mr. Morange. In addition, Antonio Meucci exhibited a receipt issued by Mr. Morange on 28 March 1857, which read: *"Received, New York, March 28th, 1857, of Antonio Meucci, fifty dollars, on account of his fees in his divers cases. Henry H. Morange."* Therefore, in total, Mr. Morange received the sum of $100 for his services rendered to Antonio Meucci.

Finally, Maestro Theodore Peressoni, who had introduced Antonio Meucci to Mr. Morange in February 1857, was heard as a witness in favor of the plaintiff. A portion of his testimony is included hereinafter, as it is interesting for the account of the events.

Referee Robert Emmet presented his final report on 15 May 1858. His report is transcribed in full hereinafter, also because of its important information on the American citizenship of Antonio Meucci. As for the rest, his report upheld Mr. Morange's claims and the right of the latter to receive the liquidation of the mortgage plus interest, for an amount of $542.25. The judgment, endorsing the recommendation of the referee, was issued by the judge of the Supreme Court, Hon. John A. Lott, in his hearing of 7 June 1858, and was filed on 12 June 1858. The Meuccis were sentenced to pay Mr. Morange the sum of $542.25, plus trial expenses, estimated at $206.08. Consequently, the Richmond County Sheriff was charged with the task of selling the mortgaged property at a public auction and paying the amount due to Mr. Morange and to others, if any.

Lawyer Street filed a petition of appeal on said judgment, on 23 July 1858. It is

interesting to note that Mr. Louis Gros and a Martino Bardelli countersigned this petition as sureties, each guaranteeing for $2,000 in favor of Antonio Meucci. Mr. Gros' statements, transcribed in the following, are very interesting, since they confirm that, next to *Clifton Brewery* (which he had rented from Mr. Fells), there was a beer saloon (or beer garden, as was already mentioned elsewhere), featuring two billiard tables and a piano, where the product was directly sold to the patrons. Mr. Gros also said that he owned another beer saloon in New York, on 234 William St., where he lived. He also mentioned that at *Clifton Brewery* there were many cows and pigs as well as two wagons equipped for carrying beer and two horses. Also Mr. Bardelli, the other surety, stated that he owned a Lager Beer & Billiard saloon, on 231 William St. His place was, therefore, very close to Gros', though, evidently, both led successful businesses and were actually good friends.

The first hearing of the appeal was held at Brooklyn's City Hall on 23 February 1859, before the three judges of the Supreme Court, Justices John A. Lott, John W. Brown and James Emott. This time, Mr. Morange was represented by lawyer E. F. Brown. The judges reversed the first degree judgment, ordering a new trial: *"It is ordered and adjudged that the Judgment aforesaid at Special Term be and the same hereby is reversed, & that a new trial be had with costs to abide the event of the action; and it is further ordered that the new trial be brought on at the Circuit Court in & for the County of Richmond."* The proceeding of the appeal is described in detail in a report by lawyer Street, dated 22 January 1861. It states that lawyer Morange requested and was granted three adjournments, one in April 1859, another one in November 1859 and the third one in January 1860, when the decision was made to postpone the trial until February 1861, though it was later anticipated to January 1861.

The final hearing took place on 15 January 1861, before Justice William W. Scrugham, who decreed the sale of the mortgaged property at a public auction and the payment to Mr. Morange of the $500 mortgage plus interest and trial expenses. His judgment was filed on 12 February 1861. Hereinafter we have transcribed the executive order of the judgment. On 9 March 1861, lawyer Street filed an appeal against said judgment. However, on 10 September 1861, lawyer Street failed to appear before the Justices of the Supreme Court, John W. Brown, James Emott and William W. Scrugham, and, therefore, the judgment

ordering the sale of the mortgaged property by public auction was confirmed.

The auction was held by Sheriff Isaac M. Marsh on 13 November 1861, at the Seigerts (or Siegert's) Hotel, near Clifton Landing (or Vanderbilt Landing), and his report, the full version of which is transcribed hereinafter, was filed on 28 December 1861. According to this report, the buyer was Stephen A. Samanos, the son of Augustus A. Samanos, who won the auction, offering and paying the sum of $3,286.00. In this regard, it is worth highlighting that in his unpublished typescript (see bibl.), Dr. Moncada stated that the Sheriff did not publish the notice of the auction on local papers, as required by law, and that the auction was rigged in favor of Stephen Samanos. We did not verify Moncada's statement while, obviously, in his report - drafted on a preprinted form - the Sheriff stated the contrary and, what is more, he charged $90.49 for his expenses, including the ones allegedly incurred for advertisement of the auction. From the Sheriff's report it appears that, after having paid his own expenses ($90.49), Morange's credit ($729.50) and trial expenses ($318.16), the surplus money amounted to $2147.85.

A third trial had to be held for the allocation of said surplus money, which was wholly claimed by a lawyer, John Moody, the latest owner of the auctioned property, and, in part, by lawyer William I. Street, who requested the payment of a bill of $1,000 for his legal assistance to the Meuccis, and by Esther Meucci, who claimed a credit of $800 from the late John Bennis. The texts of the foregoing three claims are transcribed hereinafter, together with the report of the referee A. W. Winant, appointed by the Court (Hon. William W. Scrugham), on 6 January 1862. Mr. Winant's conclusion, forwarded on 30 January 1862, was that John Moody was entitled to receive all the surplus money resulting from the auction of the property, as it had been legally transferred to him on 3 December 1861, by one Chancey L. Brown, to whom it had been transferred on 8 November 1861, by the executrices of the late John Bennis, Nina and Anita Citcovich. One cannot fail to note that the two foregoing transfers were implemented - rather hastily - a few weeks before the auction of the mortgaged property.

On 3 February 1862, following Mr. Winant's report, a first judgment was pronounced by Supreme Court Justice John A. Lott, who ordered the payment to John Moody of a sum of $800 in advance, plus interest accrued as of 7 October

1861 (probably the date when the auction procedure began), while awaiting the conclusion of a new lawsuit brought against John Moody by Esther Meucci, which had not yet been settled when the judgment was issued. We found no documentation of this latter lawsuit in the records of the trial for the allocation of the surplus money. The final judgment was pronounced by the Supreme Court Justice, William W. Scrugham on 7 April 1862, ordering that the entire surplus money of $2147.85 be adjudged to John Moody. This leads to assume that, in the meantime, the litigation between Esther Meucci and John Moody had been settled in favor of the latter.

*Answer of Antonio Meucci, first trial*
*(9 September 1857)*
[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1857-1858, File Unit: SI 73, Box no. 73, Shelf Location: 111620]

The answer of Antonio Meucci, one of the defendants to the complaint in this action, respectfully showeth: That on or about the twentieth day of February, 1857, the said Antonio retained and employed the said plaintiff as his attorney and counsel in certain suits and proceedings commenced against him, the said Antonio Meucci. And in order to secure the payment to said plaintiff of a reasonable compensation for the services to be rendered by said plaintiff, the said defendants, Esterre Meucci and Antonio Meucci, executed and delivered to him the bond and mortgage mentioned in the complaint; and that said bond and mortgage had no other consideration.

And the said defendant, for further answer to said complaint, saith, since the execution and delivery of the said bond and mortgage, the sum of one hundred dollars has been paid to the said plaintiff for such services so rendered by said plaintiff. That said plaintiff, though requested so to do, has never rendered any statement or account of his charges for services rendered, and that the said defendant has no knowledge, except from the complaint, what amount or balance is claimed by the said plaintiff to be due to him for such services.

And the said defendant further saith, that the sum of one hundred dollars so paid to the said plaintiff, was, and is, a sufficient compensation for the services so rendered by him as aforesaid; and he denies that there is due on the said bond and mortgage the sum of five hundred dollars and interest from February 20th, 1857, or any other sum whatever.

GEORGE CATLIN,
Atty. for Deft. A. Meucci.

*Deposition of Theodore Peressoni, first trial*
*(January 1858)*
[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1857-1858, File Unit: SI 73, Box no. 73, Shelf Location: 111620]

Theodore Peressoni, a witness shown on the part of the plaintiff, testified as follows: *I am an Italian, and by profession an orchestra player at the theaters; I know Mr. Meucci and Mr. Morange; I took Mr. Meucci down to Mr. Morange's office in February, 1857: Mr. Meucci told me all his troubles, and asked me if I could do anything for him; I took him to Mr. Morange's office; Mr. Meucci could not speak English; Mr. Morange asked if Mr. Meucci was a man of means; I explained to Mr. Meucci, and he said a man named Fells would pay — he declined being security; Mr. Morange said he could not afford to do business unless he was paid, and proposed a mortgage; Mr. Meucci replied there was already a mortgage on the property, and Mr. Morange then proposed a second mortgage for $500, and Mr. Meucci agreed to give it; the day it was executed I went to Mr. Meucci's house, on Staten Island; Mr. Morange wanted the mortgage to be payable in six months; I told Mr. Morange Mr. Meucci would not be able to meet it; I proposed to Mr. Morange one year, and he accepted it; I explained that to both Mr. and Mrs. Meucci, and they were satisfied, Mr. Meucci saying that in one year he could arrange his affairs so as to be able to meet it; they both signed the bond and mortgage; this bond and mortgage was given to defend Mr. and Mrs. Meucci in all the suits that were then pending against them; so far as my recollection goes there were three, and probably four; Pier, Parker & Co., Mason, Viollier & Batjer were the respective plaintiffs; bond and mortgage was given to Morange for five hundred dollars, on his agreeing to perform all the business for Mr. and Mrs. Meucci in all the suits then pending against them; there were three or four; they agreed upon $500 for defending Meucci in these causes; I explained the bond and mortgage in the Italian language, before they signed it; Mr. Meucci understood a little of English at that time; they understood Italian.*
[Cross-examination follows]

*Report of Referee Robert Emmet, first trial*
*(15 May 1858)*

[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1857-1858, File Unit: SI 73, Box no. 73, Shelf Location: 111620]

I Robert Emmet, to whom the issues in this cause were referred by an order of the Court made on the 9th of November 1857 to hear and determine the same, having heard and considered the evidence produced before me by the parties respectively, Do hereby report that I find the following facts, viz.

That in or about the month of February 1857, the Plaintiff was retained and employed as an Attorney and Counsellor at law by the Defendant Antonio Meucci to defend him in certain lawsuits which had been commenced against him and to assist him generally with his advice and professional services … … … … … … … … which were then in an embarrassed condition.

That shortly after such employment of the Plaintiff and on or about the 20th day of February 1857, it was agreed between the Plaintiff and the Defendant Antonio Meucci and Esterre Meucci his wife, that the Bond and Mortgage mentioned in the Complaint should be given by the said Defendants to the Plaintiff as a security to the amount of $500 for the compensation to which he might be entitled for his said professional services rendered and to be rendered by him under such retainer and employment; and that the said Bond and Mortgage were accordingly executed and delivered to the Plaintiff in pursuance of such agreement.

That at the time of the execution of such Bond and Mortgage, several suits had been commenced and were pending in the Supreme Court against the said Antonio Meucci and that shortly afterwards other suits were commenced against him, in the defence of all which, the Plaintiff appeared and acted for him as his Attorney and Counsellor and rendered his services as such with fidelity and skill; and that such services in all the said suits were reasonably worth the sum of Five hundred and eighty five Dollars [$585.00].

That the Plaintiff also, for a period of about four months, rendered other services to the said Antonio Meucci, consisting of the drawing of various legal instruments, examinations of title and disbursements for the same, numerous consultations with and advice to him about his property and affairs and conferences with other Counsel in relation to the same, and that such other services were reasonably and fairly worth the additional sum of Two hundred and seventy Dollars [$270.00]. That the

Plaintiff has received Fifty Dollars [$50.00] from the Defendant Antonio Meucci on account generally of his said professional services and that at the time of the commencement of this action a sum of money exceeding the amount to secure with the said Bond and Mortgage were executed, was due to the Plaintiff for such services rendered by him in suits theretofore commenced against the said Antonio Meucci. That the Mortgaged premises described in the said Mortgage were on or about the 22d day of September 1856, conveyed by the said Antonio Meucci and wife to William W. Badger in trust to convey the same to the said Esterre Meucci; and that the said premises were so conveyed by the said William W. Badger to the said Esterre Meucci on or about the 24th day of the same Month.

That all the right title and interest of both the said Antonio Meucci and Esterre Meucci was granted and conveyed to the Plaintiff by the terms of the said Mortgage as security for the payment of their Bond therein mentioned, and that at the time of the execution of the said Mortgage, there were no liens on the Mortgaged premises held by or in favor of any of the Defendants who have answered the complaint in this action.

That on the 27th day of March 1854, a deposition made by the said Antonio Meucci on the 21st day of that Month, that he intended to become a citizen of the United States as soon as he could be naturalized and that he had taken such incipient measures as the Laws of the United States require to enable him to obtain Naturalization, was filed in the office of the Secretary of State of the State of New York; and that with the exception of proof of the filing of such deposition and that the said Esterre Meucci was believed to be from Tuscany in Italy, no evidence has been offered before me as to the alienage or citizenship of the said Esterre Meucci.

And upon the said facts I do decide and determine that no valid or sufficient defence has been made to this action by any of the Defendants; that there is due to the Plaintiff therein at the date of this my report for principal and interest on the said Bond and Mortgage, the sum of Five hundred and forty two Dollars and twenty five cents [$542.25]; and that the Plaintiff is entitled to the relief prayed for in his complaint, for that amount, together with his costs.

May 15th, 1858

*R. Emmet, Referee.*

*Examination of Louis Gros, surety for appeal*
*(August 3, 1858)*

[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk, Series: 1859-1861, File Unit: SI 75, Box no. 75, Shelf Location: 111622]

Louis Gros, one of said sureties being duly sworn says—

I live 234 William St. in New York City. I am a brewer, keep a lager beer Saloon at above place. Am a citizen. I have no real estate. I have a lease of 234 William St. It expires in 1861 (May). I have a lease of a place in Staten Island, it consists of 8 lots, there is a brewery upon it. It is for 10 years from 9th March 1857. The casks of the Brewery belong to Meucci. Everything in the brewery has been leased to me, consisting of kettles, coolers, casks and pails. I have got 2 horses, 2 wagons, 4 cows, 34 pigs, 20 geese, 100 chickens, 6 ducks; the beer is sold but I have the empty casks. I have a Piano. The horses are worth 4 or $500. Wagons $300. They are lager beer wagons. This lease includes the harness. Cows are worth $200. The pigs are worth $200. The empty barrels are worth $1000. They belong to me. I have two billiard tables here. They cost me $700. They are worth it now. I have also a large looking glass, it cost me $60; tables & chairs, bar furniture worth $100.

I am a married man. I think my household furniture is worth $300. I have a range there, it is worth $75. I have created a brick building on the lot, it cost me $2000. I pay $1200 a year rent for 234 William St. I think the lease is worth to me over & above the rent the sum of $1000 to the end of the term. I have $500 due me outstanding.

The rent of the place in Staten Island is $1000 a year. I have paid $700 on account of the rent. I paid the $700 to Meucci, in money. I have the lease…

[Examination by attorneys of both sides follows]

*Judgment on appeal, Hon. W. W. Scrugham*
*(January 15, 1861)*

[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk, Series: 1859-1861, File Unit: SI 75, Box no. 75, Shelf Location: 111622 (appeal)]

The Summons in this action having been personally served on the defendants Esterre Meucci Antonio Meucci John Bennis Delos D. Pier William A. Parker Solomon Saunders Jr. James Mason Herman Batjer and Louis W. Viollier and all the defendants having appeared and the defendant Esterre Meucci and Antonio Meucci answered the complaint therein,

Now on reading and filing the Affidavit of E. F. Brown of Counsel for Plaintiff proving that due notice of the pendency of the action was duly filed in the Office of the Clerk of the County of Richmond on the 30th day of July One Thousand Eight Hundred and fifty seven, and on filing the decision of the Hon. William W. Scrugham before whom this action was tried, Dated January 15th 1861 by which decision it appears there was due upon said Bond and Mortgage at the date of said decision the sum of Six Hundred and Thirty Six Dollars and seven cents [$636.07] and on motion of E. & E. F. Brown of Counsel for Plaintiff, It is adjudged in pursuance of said decision that the mortgaged premises described in the complaint in this action as hereinafter set forth or so much thereof as may be sufficient to raise the amount due to the plaintiff for principal interest and costs and which may be sold separately without material injury to the parties interested, be sold at public auction by or under direction of Isaac M. Marsh Sheriff of Richmond County and that said Sheriff give public notice of the time and place of such sale according to Law and the practice of this Court and that either or any of the parties to this action may purchase at such sale: that the said Sheriff execute to the purchaser or purchasers a deed or deeds of the premises sold, that out of the moneys arising from such sale, after deducting the amount of his fees and expenses on such sale and any lien or liens upon said premises so sold at the time of such sale, for taxes or assessments, the said Sheriff pay to the Plaintiff or his attorney the sum of three Hundred and one 11/100 Dollars [$301.11] adjudged to the Plaintiff for costs and charges in this action and also the sum of Forty 72/100 Dollars [$40.72] which is hereby allowed and adjudged to the plaintiff in addition to said costs pursuant the Statute making together the sum of Three Hundred and Forty-one 83/100 Dollars [$341.83] with interest from the date hereof and also the amount so reported due as aforesaid together with the legal interest thereon from the date of said report or so much thereof as the purchase money of the mortgaged premises will pay of the same, take a receipt therefor, and file it with his report of sale, that he pay the surplus money (if any) remaining in his hands to the County Treasurer of the County of Richmond to abide the further order of this Court. That he make a report of such sale and file it with the Clerk of this Court with all convenient speed, that if the proceeds of such sale be insufficient to pay the amount so reported due

to the plaintiff with the interest and costs as aforesaid, the said Sheriff specify the amount of such deficiency in his report of sale and that the defendant Antonio Meucci pay the same to the plaintiff and that the purchaser or purchasers at such sale be let into possession on production of the Sheriff's Deed.

And it is further adjudged, that the defendants, and all persons claiming under them, or any or either of them, after the filing of such notice of pendency of this action, be forever barred and foreclosed of all right, title, interest, and equity of redemption in the said mortgaged premises so sold, or any part thereof.

The following is a description of the mortgaged premises hereinbefore mentioned: All that certain lot, piece, or parcel of land situate, lying, and being in the town of Southfield, county of Richmond, and State of New York, and bounded and described as follows: Beginning at a point where the westerly side of Forest street intersects the northerly side of Maple avenue, running thence northerly on the westerly side of Forrest street one hundred and ninety-three feet three inches; thence running westerly, and parallel with Maple avenue, one hundred and ten feet; thence southerly, and parallel with Forrest street, forty-eight feet and three inches; thence westerly, and parallel with Maple avenue, one hundred and ten feet; thence southerly, and parallel with Forrest street, one hundred and forty-five feet, to Maple avenue; thence easterly along the northerly line of Maple avenue one hundred and twenty feet, to the place of beginning, being the same premises conveyed by Lorenzo Salvi to Antonio Meucci by deed bearing date the first day of May, one thousand eight hundred and fifty-four, and recorded in Richmond county clerk's office, March 23d, 1855, at 10 A. M., and therein further described as embracing all the plots marked numbered 47, containing lots numbered 184, 185, 186, 187, a part of lot numbered 187 [197, Editor's note], and all lots 198, 199, and 200, contained in plots 57, and a part of lot 209, in plot number 54, as laid down on a map entitled a map of lots at Clifton, Staten Island, belonging to William B. Townsend, Esq., made by George M. Root, city surveyor, June 22d, 1847, and filed in the office of the clerk of the county of Richmond, September 18th, 1847, and as likewise embracing a part of plot marked as 48 on said map.

*Auction sale report of Sheriff Isaac M. Marsh*

*(filed 28 December 1861)*[85]
[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1850-1860; File Unit: SI 365; Box no. 365; Shelf Location: 11912]

To the honorable the Supreme Court

I, *Isaac M. Marsh Sheriff of Richmond County* named in the Judgment in this action dated the [blank] day of [blank] one thousand eight hundred and fifty [blank] do respectfully report, that the mortgaged lands and premises mentioned in the said Judgment, were sold at public auction under my direction and superintendence on the *thirteenth* day of *November* one thousand eight hundred and ~~fifty~~ *sixty one* at *Seigerts Hotel Vanderbilt Landing* in the *Town of Southfield* County of *Richmond* that on such sale *S. A. Samanos* became the purchaser of said premises for the sum of *Three Thousand Two Hundred and Eighty Six* dollars, [$3286.00] that being the highest sum bidden for the same.

And I further report that due notice of the time and place of such sale had been previously given and published according to law, and the rules and practice of this Court.

And I further report that I have received from the said *S. A. Samanos* the said purchase money, and have made, executed and delivered to *him* a deed of Conveyance of the said land and premises; and I have paid out and disposed of the said moneys, as follows, to wit:—

I have allowed to the purchaser ———— dollars, paid by him for taxes and assessments, which were a lien at the time of such sale on said lands and premises, for the payment of which he has furnished duplicate receipts, hereto annexed.

I have paid to the *plaintiff's attorneys* the sum of *Three hundred and Eighteen 16/100* [$318.16] dollars, being *their* costs, for which *they have* given *their* receipt, which is hereunto annexed.

I have retained *Ninety 49/100* dollars [$90.49] for my charges and expenses of said sale *and previous advertisements.*—

I have paid over to *the plaintiff's attorneys* the sum of *seven Hundred and twenty nine 50/100* dollars [$729.50], for which *they have* given his receipt, which is hereunto annexed.

[85]This report by the Sheriff was attached to the report presented by referee Winant, filed on 30 January 1862. It is written on a standard preprinted form in which only the names, dates and sums of money were recorded by the Sheriff by hand. In our transcription, the handwritten words are shown in italics, whereas the typewritten portions are in regular print.

All of which is respectfully submitted.

Dated *Richmond*
*Isaac M. Marsh, Sheriff*

*Claim of surplus money by John Moody*
*(filed 28 December 1861)*
[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1850-1860; File Unit: SI 365; Box no. 365; Shelf Location: 11912]

City and County of New York ss. John Moody being sworn says this action was commenced to foreclose a mortgage and a decree of foreclosure and sale of the mortgaged premises was duly made and entered herein on the 9th day of February 1861. That in and by said decree the Sheriff of the County of Richmond where the mortgaged premises are situated was authorized to sell the same at public auction on the 13th day of November 1861 for the sum of Thirty two hundred and eighty six dollars [$3286] subject to prior incumbrances that said purchase money has been paid to said sheriff and he has paid therefrom Ten hundred and forty seven 66/100 dollars [$1047.66] the whole amount due upon said decree and has retained therefrom Ninety dollars and Forty nine cents [$90.49] Sheriff fees leaving a surplus in his hands of Twenty one hundred and Forty seven dollars and eighty five cents [$2147.85] as appears by his report of sale on file in the office of the Clerk of Richmond County where the decree is filed. Deponent further says that at the time of the entry of the decree herein Nina Citcovich & Anita Citcovich as the heirs and residuary legatees and devisees of John Bennis deceased were the owners of the Equity of Redemption of the mortgaged premises so sold. That as such owners of such equity of redemption they afterwards and on the 8th day of November 1861 by a deed of conveyance duly executed acknowledged and delivered conveyed the said equity of redemption to one Chauncey L. Brown who thereafter and on the 3d day of December 1861 duly sold transferred assigned and set over to the deponent the said surplus monies and all his right thereto and deponent is the owner thereof.

*John Moody*
Sworn to before me the 28th day of December 1861
A. M. Burr, Notary Public

*Claim of surplus money by William W. Street*
*(filed 28 December 1861)*
[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1859-1861; File

Unit: SI 75; Box no. 75; Shelf Location: 111622]

Take notice that I claim a portion of the Surplus moneys in this action, which amount to the sum of $2,147, 85/100, by virtue of a claim and demand for legal services past rendered against the said Esterre Meucci who is the equitable owner of the equity of redemption of the premises described in the Complaint in this action, amounting to the sum of One thousand Dollars which is now due to me with interest from December 28th 1861.

William I. Street, by George Catlin his Attorney.

*Claim of surplus money by Esther Meucci*
*(filed 6 January 1862)*
[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1850-1860; File Unit: SI 365; Box no. 365; Shelf Location: 11912]

Please take notice that I Esterre Meucci a Defendant in this action claim the whole of the Surplus moneys in said action for the sum of eight hundred Dollars [$800] and interest from October 7th 1861. That I claim such surplus money as the equitable owner of the equity of Redemption of the Mortgaged premises in this action subject to the lien of the heirs of John Bennis Deceased or their grantee or assignee for the above mentioned sum of Eight hundred Dollars and interest from October 7th 1861.

January 6th 1862

Esterre Meucci by George Catlin her Attorney.

*Report of Referee A. W. Winant, surplus money*
*(filed 30 January 1862)*
[Municipal Archives of the City of New York - Record Group: Staten Island County Clerk; Series: 1850-1860; File Unit: SI 365; Box no. 365; Shelf Location: 11912]

… I find the facts herein the following.

That said Esterre Meucci and Antonio Meucci on the 18th day of March 1857 conveyed by deed all their right titles and interest in and to the premises described in the complaint in this action to one John Bennis and that on the 7th day of November 1861 the Executrices of said John Bennis conveyed said premises by Quit Claim Deed to one Chancey L. Brown, and that said Chancey L. Brown on the 3rd day of December 1861 duly assigned by an instrument in writing all his right title and interest in and to the surplus moneys arising upon the Sale of the premises described in the complaint in this action to said John Moody Esq. and that said premises were sold by the Sheriff of the County of Rich-

mond, and that there is a surplus of Two Thousand one hundred and forty seven and 85/100 dollars [$2147.85] arising in said sale.

And I further certify and report that said John Moody Esq. is entitled to all the said Surplus Moneys arising on said sale, of the Sum of Two Thousand one hundred and forty seven and 85/100 dollars ($2147.85) …

## Chronology

1842 - The gothic revival style in country houses is strongly promoted by the book by Andrew Jackson Downing “Cottage Residences.”

1847, 13 September - The Townsends purchase many lots of land in Clifton, including one which they call *Forest Cottage*, where they build a cottage in gothic revival style, for rent.

1850 - The gothic revival style is further enhanced by the book: “The architecture of Country Houses.”

1850, 7 April - Antonio Meucci draws up a statement to his wife Esther in which he states that he received the sum of $9,500 (of which $2,000 he temporarily deposits with Señor Bonifacio Acosta) from her. Esther loans another $3,500 to the tenor Lorenzo Salvi. Esther’s fortune - estimated at $13,000 of the time, derived from her salary as costumier of $60 a month, plus $1,400 ÷ $1,500 in bonuses, awarded to her every year by Don Francisco Marty in Havana.

1850, 1 May - The Meuccis arrive in New York. Antonio Meucci deposits in his name the $9,500 received from Esther first at Mechanic’s Bank and then at Seaman’s Saving Bank on Wall Street. He then uses these funds to purchase land in Clifton on which to build the candle factory and later to pay (on a date unknown) a $1,500 mortgage on lot no. 2.

1850, early October - Meucci, Garibaldi and Bovi Campeggi move to Forest Cottage and, a few months later, they start to produce salami and subsequently stearic candles in the basement.

1850, Fall - Esther Meucci withdraws $2,000 from the bank to loan it to Gen. Avezzana, availing herself of Lorenzo Salvi as surety. Gen. Avezzana will return said sum before 1854, without Esther knowing it, and the money will be used by Antonio Meucci and Lorenzo Salvi for the candle factory.

1851, 10 September - Transfer of lot no. 1 from the Townsends to Lorenzo Salvi. A building for the candle factory was built on it.

1852, 12 May - Transfer of lot no. 2 (called *Forest Cottage*) from the Townsends to Lorenzo Salvi and Antonio Meucci.

1853, 1 July - Transfer of lot no. 3 from the Townsends to Lorenzo Salvi and Antonio Meucci.

1854, 21 March - Antonio Meucci officially declares his intention to become an American citizen and, on 27 March 1854, his statement is filed at the office of the Secretary of State in New York.

1854, 1 May - Lorenzo Salvi transfers to Antonio Meucci (for nominal $5) his share of lots nos. 1, 2 and 3 in order to extinguish his debt with Esther. Esther complains about not having been nominated in the deed of transfer, but she is told that, as she is not an American citizen, she cannot own real estate in the USA. Esther states that, regardless of this transfer, Salvi still owes her $800. Antonio Meucci continues the candle manufacturing business on his own but after about a year he closes it down on account of low market demand.

1854-1855 - Antonio Meucci sets up a telephone link between Garibaldi’s room, the basement and the outside laboratory, equipped with a call bell.

1855, November - Meucci manufactures pianos and celestas, until the beginning of the following year.

1856 (beginning) - Meucci sets up the *Clifton Brewery* in the same building as the former candle factory.

1856, 1 May - A mortgage of $3,000 is raised by Antonio and Esther Meucci on lots nos. 1 and 2 in favor of Augustus A. Samanos, who loans money for buying equipment for the brewery. Mr. James Mason appropriates the $3,000 supplied by Mr. Samanos.

1856, 28 August - Antonio and Esther Meucci transfer lot no. 3 to James Mason for $3,300 plus his shouldering of a preexistent mortgage on it, amounting to $3,300 and related interest.

1856, 22 September - Esther learns that she can own real estate. Therefore, Antonio Meucci transfers lots nos. 1 and 2, comprehensive of buildings, fixtures and furniture to a certain William W. Badger and the latter commits to transfer the latter to Esther.

1856, 24 September - Transfer of lots nos. 1 and 2 with buildings, fixtures and furniture, from William W. Badger to Esther Meucci.

1857, 14 January - Antonio Meucci signs a contract with James Mason in which he gives the latter full responsibility for the management of *Clifton Brewery*.

1857, 15 February - Antonio Meucci transfers (documents not available) the management of *Clifton Bre*wery to Joseph Fells, who ousts James Mason.

1857, 16 February - (Mason vs. Meucci case) James Mason sues Antonio Meucci, demanding the reimbursement of $2,632 plus interest which, according to him, he had advanced to Meucci in the period between 24 March and 16 September 1856, including a payment made to Pier, Parker & Co., on 15 January 1857.

1857, 17 February - (Batjer vs. Meucci case 1) Hermann Batjer sues Antonio Meucci for the outstanding payment of a promissory note amounting to $693.52[86] signed by Meucci on 12 September 1856, with a four-month deadline, plus interest and trial expenses. In his answer, Antonio Meucci states that Mr. Mason made him sign the promissory note as a mere formality, without receiving anything in return.

1857, 17 February - (Viollier vs. Meucci case 1) Louis W. Viollier sues Antonio Meucci for having failed to return part of various sums that he loaned to him between 2 October and 3 December 1856, demanding the payment of the outstanding debt of $588.00, plus interest and trial expenses. In his answer, Antonio Meucci states that he had paid back his debt (which only amounted to $105.00) and that Viollier owed him $250.00.

1857, 19 February - Joseph Fells promises that he will cease the rent of *Clifton Brewery* whenever Antonio and Esther Meucci will request it.

1857 - (Mason vs. Meucci-Fells case) Antonio Meucci and Joseph Fells are sued by James Mason, who asks for relief for damages, having been ousted from the management of *Clifton Brewery*.

1857 (before 20 February) - Maestro Theodore Peressoni introduces Antonio Meucci (who does not speak English) to a New York lawyer, Henry H. Morange, who is to defend him in the pending lawsuits. On 20 February, a mortgage of $500 is raised on lots nos. 1 and 2 in favor of lawyer Morange, as a guarantee for the payment of his legal assistance to the Meuccis. Monthly interest is to be paid on the 20th day of each month.

1857, 9 March - Joseph Fells transfers the lease of the brewery to Louis Gros for nine years and eleven months at an annual rent of $1,000.

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[86]In his subsequent bill of complaint, Mr. Batjer specifies that said sum represented the payment of beer bottles supplied by him in the summer of 1856.

1857, 10 March - (Mason vs. Meucci case 1) As Antonio Meucci did not answer to the bill of complaint, he is sentenced by the Supreme Court to pay the sum of $2,711.17 to James Mason.

1857, 18 March - Transfer of lots nos. 1 and 2 with premises and fixtures from the Meuccis to John Bennis for $6,500 (plus the two preexistent mortgages amounting to $3,500).

1857, 28 March - Lawyer Morange receives from Antonio Meucci the sum of $50 as a down payment on his fees.

1857, 30 March - Joseph Fells gives back the renting of *Clifton Brewery* to Esther Meucci, receiving $452 in return.

1857, 1 April - (Mason vs. Meucci case 1) Antonio Meucci answers, if belatedly, to the bill of complaint, stating that Mr. Mason owes him $2,040. The case is reopened.

1857, 14 May - Transfer of personal property and furniture of the cottage and of *Clifton Brewery* from the Meuccis to John Bennis.

1857, 21 May - Lawyer Morange is hired by Antonio Meucci to defend him before the Marine Court of New York in the litigation with Delos D. Pier, William A. Parker and Solomon Sanders Jr.

1857, 11 June - (Mason vs. Meucci case 2) The Marine Court of New York passes judgment in favor of James Mason mandating the payment on the part of Antonio Meucci of his debt, amounting to $307.86.

1857, 11 June - (Pier-Parker-Sanders vs. Meucci-Mason case 1) The Marine Court of New York passes judgment in favor of the plaintiffs, Delos D. Pier, William A. Parker and Solomon Sanders Jr., mandating the payment on the part of Antonio Meucci and James Mason of a sum amounting to $1212.98, due for malt supplies delivered to *Clifton Brewery* between July and September 1856. On 13 June, lawyer Morange files an appeal against this judgment.

1857 (before June 18) - (Batjer vs. Meucci case 1) Antonio Meucci is reported by Hermann Batjer and is arrested on the charge of having committed perjury in his answer to the bill of complaint. Capt. John Bennis stands surety for him and gives $50 to lawyer Morange, who, on 18 June, completely frees Antonio Meucci from blame.

1857, 20 June - Transfer of letting rights from Esther Meucci to John Bennis.

1857, 26 June - (Batjer vs. Meucci case 1) Antonio Meucci is condemned by the Supreme Court to pay the sum requested by Mr. Batjer plus expenses for a total of $798.56.

1857, 26 June - (Viollier vs. Meucci case 1) Lawyer Morange does not show up for the final hearing of this case and Antonio Meucci is condemned by the Supreme Court to pay the sum requested by Mr. Viollier plus expenses, for a total of $675.74.

1857, 27 June - (Pier-Parker-Sanders vs. Meucci case 2) As the Sheriff was unable to collect the credit of $1,212.98 from Antonio Meucci, given that the latter was found to be propertyless, Delos D. Pier, William A. Parker and Solomon Sanders Jr. sue Antonio Meucci, Esther Meucci, William W. Badger, John Bennis, The People of the State of New York and Henry H. Morange, on the charge of having plotted to their detriment by depriving Antonio Meucci of all his property and demand that the deeds of transfer of said property be declared null.

1857, 30 July - (Morange vs. Meucci case 1) Lawyer Morange sues *Esther Meucci, Antonio Meucci, J. Bennis, D. D. Pier, W. A. Parker, S. Sanders Jr., J. Mason, H. Batjer* and *L. W. Viollier* on account of the Meuccis having failed to pay the five months' interest, amounting to $14.57, on the $500 mortgage raised in his favor on lots nos. 1 and 2, and demands that said mortgage be paid by selling the property at a public auction and that the other creditors not be allowed to

recover their credits over said property. Antonio Meucci will answer that he already had paid $100 to Morange, a sum which he deems suitable for the services rendered to him by the latter.

1857, 25 November - (Mason vs. Meucci case 1) Antonio Meucci is condemned by the Supreme Court of New York to pay James Mason the sum of $2,623.10, comprehensive of trial expenses.

1858, 11 January - (Morange vs. Meucci case 1) Referee Robert Emmet starts taking the testimonies. He will present his report to the Court on 15 May of that year.

1858, 20 February - (Mason vs. Meucci cases 1 and 2) The Richmond County Sheriff returns to the Court the orders to collect the sums of $2,623.10 and $307.86 in favor of James Mason, due by Antonio Meucci, since the latter is found to be propertyless. The same occurs with the sums of $798.56 in favor of Hermann Batjer and of $675.74 in favor of Louis Viollier.

1858, 25 February - (Mason vs. Meucci case 3) James Mason sues Antonio Meucci, Esther Meucci, William W. Badger, John Bennis, The People of the State of New York and Henry H. Morange for the plot perpetrated against him by depriving Antonio Meucci of all his property and demands that the deeds of transfer of said property be declared null.

1858, 25 February - (Batjer vs. Meucci case 2) Hermann Batjer sues Antonio Meucci, Esther Meucci, William W. Badger, John Bennis, The People of the State of New York and Henry H. Morange for the plot perpetrated against him by depriving Antonio Meucci of all his property and demands that the deeds of transfer of said property be declared null.

1858 - February 25 - (Viollier vs. Meucci case 2) Louis W. Viollier sues Antonio Meucci, Esther Meucci, William W. Badger, John Bennis, The People of the State of New York and Henry H: Morange for the plot perpetrated against him by depriving Antonio Meucci of all his property and demands that the deeds of transfer of said property be declared null.

1858, 12 June - (Morange vs. Meucci case 1) The Sheriff receives the order of the Supreme Court to sell lots nos. 1 and 2 at a public auction and to use the money obtained to pay lawyer Morange $542.25 plus his trial expenses amounting to $206.08.

1858, 23 July - (Morange vs. Meucci case 2) Lawyer William I. Street, counsel for the defense of the Meuccis, submits the request of appeal to the judgment passed on 12 June (Morange vs. Meucci case 1). Louis Gros and Martino Bardelli, New York brewers, act as sureties in favor of the Meuccis.

1858, 20 August - The Supreme Court decides to join the three cases Mason vs. Meucci 3, Batjer vs. Meucci 2 and Viollier vs. Meucci 2, as they were opened on the same date, for the same reasons and against the same defendants.

1858 (exact date unspecified) - William E. Rider meets Antonio Meucci for the first time and finds him in 'humiliating conditions.'

1859, 23 February - (Morange vs. Meucci case 2) The Supreme Court reverses the first degree judgment (Morange vs. Meucci case 1) and orders a new trial.

1859, 28 March - (Pier-Parker-Sanders vs. Meucci case 2) The Supreme Court rejects the requests of the plaintiffs Pier, Parker and Sanders, judging valid the deeds of transfer of the movables and property mentioned in the bill of complaint, stressing, what is more, that Esther Meucci had every right to engage in said deeds. Trial expenses are not charged to any of the parties involved.

1859, 4 April - (Mason vs. Meucci-Fells case) The Supreme Court decrees: that the partnership between Antonio Meucci and James Mason be dissolved; that Clifton Brewery be liquidated by a receiver in bankruptcy, who will pay the creditors, for

$260; that Antonio Meucci and Joseph Fells pay Mr. Mason his trial expenses amounting to $173.19; that Joseph Fells pay the receiver $450 for the goods illicitly acquired with the brewery.

1859, 26 November - (Mason vs. Meucci-Fells case) Final hearing and official closure of the case, the receiver having completed his task.

1860, 6 October - John Bennis dies, after having appointed Nina and Anita Citcovich as his executrices.

1861, 15 January - (Morange vs. Meucci case 2) The Supreme Court orders the sale through public auction of the mortgaged property and the payment to Mr. Morange of the $500 mortgage plus interest and trial expenses (judgment filed on 12 February 1861). Lawyer Street files an appeal against the judgment on 9 March 1861.

1861, 19 March - (Mason vs. Meucci case 3; Batjer vs. Meucci case 2; Viollier vs. Meucci case 2) The Justice of the Supreme Court, William W. Scrugham, rejects the requests of the plaintiffs James Mason, Hermann Batjer and Louis W. Viollier and condemns them to the payment of trial expenses to Antonio and Esther Meucci and John Bennis. The deeds of transfer are all judged valid. The following testified for the defendants: Joseph Fells, Giuseppe Avezzana, Michele Pastacaldi, Nestore Corradi, Augusto Garino, Edward Blake, J. M. Robinson, Esther Meucci.

1861, 10 September - (Morange vs. Meucci case 2) Lawyer Street does not show up in Court and the Supreme Court confirms the judgment whereby to sell the mortgaged property at a public auction.

1861, 8 November - Nina and Anita Citcovich transfer lots nos. 1 and 2, previously owned by the late John Bennis, to one Chancey L. Brown.

1861, 13 November - (Morange vs. Meucci case 2) The auction of lots nos. 1 and 2 is held by Sheriff Isaac M. Marsh at Siegert's Hotel in Clifton. Stephen A. Samanos wins the auction offering the sum of $3,286. He assures Esther that he shall keep the promise made to her by John Bennis to sell the property back to her once the legal litigations were resolved and to allow her and her husband to continue to live in the cottage for free.

1861, 3 December - Chancey L. Brown transfers lots nos. 1 and 2 (previously owned by John Bennis) to lawyer John Moody.

1861, 28 December - (Morange vs. Meucci cases 2 and 3) The report of Sheriff Isaac Marsh is filed. After having deducted his expenses ($90.49) and paid trial expenses to Morange ($318.16) as well as his credit ($729.50), he deposits the surplus money amounting to $2,147.85 with the Court. The following stake a claim on said surplus money: lawyer John Moody claims the whole sum; lawyer Street claims $1,000 (his fee for the defense of the Meuccis); Esther Meucci claims $800 as money owed to her by the late John Bennis.

1862, 3 February - (Morange vs. Meucci case 3) The Supreme Court decrees an advance payment to John Moody of $800 plus interest, while awaiting the settlement of a new lawsuit which Esther Meucci brought against John Moody, and still pending.

1862, 7 April - (Morange vs. Meucci case 3) The Supreme Court adjudges to John Moody the entire surplus money of $2,147.85, resulting from the auction of the Meuccis' former property.

1862, 27 October - Deed executed by *Augustus Samanos* for Antonio Meucci, cited by Moncada, the content of which is unknown.

1862 (exact date unknown) - Maria De Gregorio (or Mary Gregory) is hired by the Meuccis. She will work for them for ten years, namely until (a few months) after the explosion of the *Westfield* ferry-boat.

1866 - (exact date unknown) Stephen Samanos sells, without informing Meucci, part of the property (formerly

owned by the Meuccis) to a Bernard Stirn.
1868, 29 July - Bernard Stirn, in turn, sells the foregoing share of property to the brewer David Mayer.
1875, 22 October - Matilda Brignoli, the wife of Luigi Succi (or Ciucci), begins to work for the Meuccis.
1879, October (exact day unknown) - Stephen Samanos sells the rest of the property to *Mayer & Bachmann Brewery*. The new owners ask the Meuccis to vacate the cottage, as they need the land to enlarge the brewery. Esther Meucci sues both the owners and Stephen Samanos, claiming ownership of the cottage.
1880, March (exact day unknown) - The *Mayer & Bachmann Brewery* is dissolved and Frederick Bachmann takes over as sole owner. The latter proposes a settlement to Esther.
1880, 28 November - Judge Erastus Cooke closes the case Esther Meucci vs. Bachmann-Samanos in view of an extrajudicial settlement between the parties.
1881, March (exact day unknown) - Notary Public Angelo Bertolino draws up a deed of agreement between the Meuccis and Frederick Bachmann, whereby the latter pays Esther the sum of $400 in exchange for her dropping the legal suit against him and Samanos and her consent to move the cottage to the opposite side of Forest Street.
1881, 16 March - The *Richmond County Gazette* reports about the transfer (probably executed the day before) of the cottage to the opposite side of Forest Street.
1882, 10 April - *L'Eco d'Italia* publishes a drawing of the cottage by G. Ciani.
1882, 2 June - Death of Giuseppe Garibaldi in Caprera.
1882, 3 June - *Frank Leslie's Illustrated Newspaper* publishes a drawing of the cottage.
1882, 11 June - A huge procession of Italians goes on pilgrimage to the cottage. Frederick Bachmann publicly declares his intention to donate the cottage to the Italian Nation.
1882, 12 June - Transfer of the cottage from Frederick Bachmann to the Italian Nation through the three trustees Carlo Barsotti, Antonio Lazzari and Vincenzo Polidori, to become effective as of the death of the Meuccis.
1882, 1 July - Deed of Lease for Life of the cottage from Frederick Bachmann to the Meuccis.
1884, 9 March - Inauguration of the tablet in honor of Garibaldi at Meucci's cottage. The latter is photographed with a group of friends in front of the cottage (this is, probably, the oldest photograph taken of the cottage).
1883-1884 (exact date unknown[87]) - Henry Tyrrell, accompanied by a watercolorist, Walton Roberts, visits the Meuccis. The furnace for the melting of tallow is still in its place, on the corner of Maple Avenue and Forest Street.
1884, 21 December - Death of Esther Meucci.
1885, March (exact day unknown) - Dr. Luigi Roversi, nephew of Col. Paolo Bovi Campeggi, visits Antonio Meucci.
1887, 8 June - The *Richmond County Gazette* publishes an article on the cottage, stating that the furnace and boiler of the candle factory are still in their place.
1887 - The *Hotel Caprera* and Antonio Lazzari's house appear on Staten Island maps, on Chestnut Avenue and Dunns Lane respectively. Furthermore, the *Bachmann Brewery* is shown to extend on both sides of Forest Street.
1889, 18 October - Death of Antonio Meucci. The trustees immediately or-

[87]Mr. Tyrrell (1907, see bibl.) literally says: *"A year or two after Garibaldi's death, which occurred on June 2, 1882 …"* Since he mentions Esther as still being alive, it may be deduced that his visit must have taken place between June 1883 and December 1884.

der the Nisinis, who had assisted Meucci till the end, to vacate the cottage.
1889, 6 November - The Italian Prime Minister, Francesco Crispi, sends a telegram to the Italian Consul in New York, asking to entrust the preservation of the cottage to the Italian government, but the three trustees object to this.
1891, 20 April - The goods and chattels of Garibaldi and Meucci left in the cottage are put up for auction.
1898 and 1903 - Funds are raised to save the cottage from growing deterioration and neglect.
1901, 2 June - The *Sunday Journal* states that the furnace *"stands in a quiet corner of the grounds of an Italian restaurant at Rosebank"* and that, after the restoration made by Antonio Lazzari, it was the place of pilgrimages and ceremonies in honor of Garibaldi and Meucci. The furnace was probably moved from the yard of Bachmann's Brewery to Lazzari's Restaurant a few years before.
1905, early January - Frederick Bachmann dies. His heirs order the trustees to remove the cottage from their land. The *Società Garibaldi* of Staten Island puts up the sum necessary to purchase another piece of land where to move the cottage.
1905, 27 April - Incorporation of a Society for the preservation of the cottage.
1905, 17 June - Transfer of lot no. 4, on the corner of Tompkins Avenue with Chestnut Avenue, from Aaron H. Wellington and wife to the Society for the preservation of the cottage.
1906, 2 June - The first stone of the *Garibaldian Pantheon* or *Garibaldi Memorial* is laid on lot no. 4.
1907 - On the maps, the *Bachmann Brewing Co*. appears to extend beyond Maple Avenue and has its own station on the SIRT's Beach Branch line. The *"A. Lazzari Caprera Hotel"* appears to have moved further down Chestnut Avenue, beyond the SIRT railroad's Beach Branch, while the large complex of the *G. Siegle Co. Color Works* appears in its place, on the premises of which remains the furnace-boiler of Meucci and Garibaldi.
1907, 4 July - The cottage is dismounted and moved to lot no. 4. Ten thousand Italians inaugurate the *Garibaldi Memorial*, which encloses the cottage.
1908 ÷ 1932 - The ceremonies at the *Garibaldi Memorial* take place almost every year, until 1932, when they are interrupted on account of brawls between Fascists and anti-Fascists.
1909, 4 July - Ten thousand Italians celebrate the 102nd anniversary of Garibaldi's birth. The pantheon and the cottage inside it are in pitiful conditions.
1914, 7 January - The *Garibaldi Memorial* is auctioned in order to pay the builder, but a period of a few months is granted for its redemption.
1914, 10 January - The *Giornale Italiano* launches an intense campaign to redeem the property of the pantheon.
1914, 1 May - The campaign for redemption of the pantheon is successfully completed.
1914, 8 May - Vandals try to set fire to the pantheon, which is unprotected. After the incident, its custody is entrusted to the *Tiro a Segno Nazionale* (National Shooting Range) of New York.
1914, 4 July - Celebrations in honor of Garibaldi are suspended on account of an attack of three hundred anarchic Italians who raise the red flag on the pantheon.
1915, 13 January - Lot no. 4 and the pantheon are transferred by the Society for the preservation of the cottage to OSIA (*Order Sons of Italy in America*).
1917, 30 October - Lot no. 4 and the pantheon are transferred by OSIA to IAH&PS (*Italian-American Historical and Patriotic Society*).
1918, 25 September - It is agreed that the furnace-boiler be moved from the premises of the *Siegle Co. Color*

*Works* to lot no. 4, where the pantheon stands.
1923, 16 September - Inauguration of the monument to Antonio Meucci, within lot no. 4, where the pantheon stands.
1925, 4 July - Brawls involving opposing political groups burst in front of the pantheon. Financial difficulties in covering operating costs are still encountered.
1928, 24 July - Lot no. 4 and the pantheon are sold back by IAH&PS to OSIA.
1932 - Severe disorders between Fascists and anti-Fascists burst in front of the pantheon on account of which the Garibaldian celebrations will be discontinued for years.
1950 - Attempt by Daniel Santoro and the *Staten Island Italian Historical Society* to resume the Garibaldian celebrations. The pantheon is in a state of abandonment.
1952 - OSIA removes the superstructure of the pantheon around the cottage and proceeds with the restoration of the latter; the belongings of Meucci and Garibaldi are collected and reordered.
1956, 20 May, Sunday - The former *Garibaldi Memorial* is inaugurated in its new version and renamed *"Garibaldi and Meucci Memorial Museum."*
1966, 13 September - The *Garibaldi-Meucci Museum* (new name) is proclaimed a Landmark Site of New York City.
1980, April (exact day unknown) - The *Garibaldi-Meucci Museum* is proclaimed monument of the State of New York and national monument of the United States of America.
1985-1986 - With monetary aids from the *New York State Council on the Arts* and from the *Office of the Borough President of Staten Island* further improvements are made, more relics are collected, and full-time professional staff is employed in the *Garibaldi-Meucci Museum.*

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## HISTORY OF THE PIANO

### Preliminary remarks

Keyboard of a modern piano and C frequencies of the various octaves

It is to be taken into account that, up until practically the end of the seventeenth century, the musical notes produced by keyboard instruments had to adapt to the various musical systems adopted by different composers. At the end of that century, so many systems (called *temperaments*) were in use, that no single keyboard could possibly ever have reproduced all corresponding sounds, not to speak of the fact that, had this been possible, a practical problem would inevitably have ensued, namely that the player would have needed more than ten fingers, as well as a breadth greater than the span of an average human hand. Eventually, in the early eighteenth century, the so-called *equal temperament* (proposed in the previous century) was adopted and from then on the notes corresponding to each key were rigorously determined according to a precise mathematical rule. Following this standardization, composers gradually began to adapt, writing their music with those notes.

In the equal temperament, the *octave* (see Glossary and the figure below) was subdivided into twelve *semitones*, so that the ratio between the frequencies (i.e. number of vibrations per second) of any two adjacent semitones, or their *interval* (see glossary), would be constant, and equal to:

$$\sqrt[12]{2} = 1.05946.$$

In fact, by multiplying said interval by itself 12 times, it gives a ratio of 2, corresponding to an octave interval. The picture shown above indicates the frequencies in Hz (number of vibrations per second) corresponding to the Cs of the various octaves of a modern piano with 88 keys, i.e. a piano featuring seven octaves and a *third* (see below). The succession of the white keys constitutes the so-called *diatonic scale*, while the black keys are called *chromatic semitones*. The succession of all twelve keys of an octave constitutes the so-called *chromatic scale*. Once again, the interval between the notes corresponding to two adjacent keys - regardless of whether they are both diatonic or one is diatonic and the other chromatic - is always the same, namely of 1.05946.

It is, however, to be remarked that the aforesaid *equal temperament* was not an exact solution from the harmonic viewpoint, as compared with that indicated by the ancient Greeks. In fact, Pythagoras of Samos is credited with the discovery that when the lengths of various vibrating strings (with the same diameter, material and structure) are related according to ratios of simple in-

teger numbers (for instance 2:3 for the *fifth*, 3:4 for the *fourth* or 5:6 for the *third*), the sounds produced are 'in harmony.' Since the frequency of the sound produced by said strings is inversely proportional to their length, the same law described above also applies to frequencies. As an example, if a struck string produces the sound of the note C, then a similar string that is twice as long shall sound the note C an octave lower, in perfect harmony with the first one. According to said Pythagorean rule, the intermediate sounds between two successive Cs, are produced by strings the lengths of which are related to the length of the string emitting the higher C by the following ratios: 2:1 for the lower C; 16:9 for D; 8:5 for E; 3:2 for F; 4:3 for G; 6:5 for A; 16:15 for B; 1:1 for the higher C. Such a succession constitutes the so-called *scale of simple ratios*. It may be interesting to note that the above rule can be considered as the forerunner of quantitative laws of acoustics, or even of physics.

As can be seen from the table above, the values of the ratios between two notes of the diatonic scale, according to the *scale of simple ratios*[88] differ slightly from those calculated in accordance with the *equal temperament*, the difference, however, being always lower than 1%, yet still noticeable by the human ear.

It was by mere chance that equal temperament was introduced when the piano was invented. In order to better understand the reasons that led to the invention of the piano - for, as we shall see, the invention of the piano was *commissioned* rather than spontaneous - it is necessary to premise a few considerations on the classification of musical instruments.

## Classification of musical instruments

There are many ways to classify musical instruments. The most common way is that based on the type of element that produces the sound.
According to this criterion, we have *chordophones* (or *stringed instruments*) whenever the sound is produced by vibrating strings; *membranophones*, when the sound is generated by vibrating membranes; *aerophones* (such as *wind instruments* and organs), when the vibrating element is an air column; *idiophones* (from the Greek *ídios* = own), when the sound is produced by the material with which the instrument is made (for instance tuned rods made of crystal, metal or wood) and, lastly, *electrophones*, when the sound

[88]According to Carl B. Boyer (see bibl.), such a scale was attributed to Pythagoras, whereas, according to Pietro Righini (see bibl.), the scale of simple ratios differs slightly from that suggested by Pythagoras.

is generated by electronic oscillators, tuned to different frequencies. The *idiophones* can also be denominated *crystallophones*, *metallophones* and *xylophones*, depending on the material they are made of.

**Comparison between simple ratios and equal temperament**

| *Note* | *Simple ratios (rational)* | *Simple ratios (decimal)* | *Ratios—Equal Temperament* | *Difference* (%) |
|---|---|---|---|---|
| **C** | 2 | 2 | 2 | 0 |
| **D** | 16 : 9 | 1,777777777777 | 1,781797436 | +0,2 |
| **E** | 8 : 5 | 1,6 | 1,587401052 | -0,8 |
| **F** | 3 : 2 | 1,5 | 1,498307077 | -0,1 |
| **G** | 4 : 3 | 1,33333333333 | 1,334839854 | +0,1 |
| **A** | 6 : 5 | 1,2 | 1,189207115 | -0,9 |
| **B** | 16 : 15 | 1,0666666666 | 1,059463094 | -0,7 |
| **C** | 1 | 1 | 1 | 0 |

A second classification of musical instruments has to do with the way in which the foregoing instruments are made to vibrate by the player. According to this classification, we have *percussion instruments* (*direct-*, like in the vibraphone, or *indirect-*, by means of a keyboard that moves hammers), *plucked instruments* (*directly-*, by means of the fingers, with or without plectrum, or *indirectly-*, by means of a keyboard that moves plectra or quills) or *rubbed instruments* (*directly-*, for instance with a bow, or *indirectly-*, by means of a keyboard that moves wedges).

The latter classification allows to highlight a class of instruments, which comprises many of the instruments belonging to the previous classes, namely the *keyboard instruments*[89], characterized by the fact that the player indirectly acts on the elements that generate the sounds, through a keyboard. The instruments belonging to this class possess peculiar characteristics: first and foremost, they can produce more than one sound at the same time (*polyphony*), thus, in a certain sense, they can simulate, in theory, an orchestra with ten elements, i.e. as many elements as the fingers on the player's hands.

[89]Initially, the word *keyboard* (*clavier* in French, *Klavier* in German, both stemming from the Latin *claves* = key) was meant to indicate any keyed instrument. This had to do with the fact that many music compositions of the time were written *for keyboard*, without specifying whether for the harpsichord, the clavichord or, later, the piano.

## The forerunners of the piano

The forerunner of all keyboard instruments is the organ (an aerophone instrument), of which it is said that, around 250 BC, Ctesibius of Alexandria realized a prototype, called *hydraulos*, featuring very few keys.

The first medieval organs also had few keys, which were very large. After the twelfth century, organs became very popular. The number of keys gradually increased, until they reached the current value of 61 keys on each of the two (or more) keyboards, each of which controls different series of pipes. A pedal board was also introduced, later on.

Being the piano an (indirect) percussion chordophone instrument, its nearest ancestors could be considered the harpsichord (or cembalo) and the clavichord, both chordophone keyboard instruments, the harpsichord featuring plucked strings, the clavichord featuring strings struck by wedges (also called tangents), which remain in contact with the string for as long as the key is depressed. However, the true forerunner of the piano should be considered the *dulcimer*, a percussion zither, in which the strings are stretched over a board that serves as resonator.

The dulcimer probably originated in Persia, in the tenth century, when it was called *santir* (from the Greek *psalterion*). The wooden soundboard, presenting a trapezium-shaped section, was not very high and contained 14 (or more) groups of four metal strings each, stretched over tiny bridges; the strings were struck by light wooden hammers with a hooked end. Therefore, the dulcimer was a direct percussion chordophone. It became widespread in the West, in the wake of the Arab invasions, as well as in the Far East. There exists a painting of it, which dates back to the twelfth century, in Santiago de Compostela, Spain. Around the fifteenth century there also existed a keyboard version of the dulcimer, known as *dolce melos*. Other versions of the dulcimer were the *hackbrett* and the *tympanon*.

Around 1697, a man named Pantaleon Hebenstreit built a large dulcimer, more precisely, a hackbrett, and became famous throughout Europe for his virtuosity with this instrument, so much so that Louis XIV renamed the instrument after its creator and player, *pantaleon* that is. This name became commonly used to the extent that, in 1714, Mr. Hebenstreit was named *pantaleonist* of the orchestra of the court of Dresden. The dulcimer has survived as a popular instrument in Northern Europe. A re-elaboration of it, as used in Hungary and neighboring

countries, goes by the name of *cimbalom*.

The harpsichord and the clavichord do not appear to have had official fathers, nor specific dates of birth. It seems that the harpsichord was already in use in the fifteenth century. Subsequently, it became very popular until approximately the mid-eighteenth century. The clavichord, instead, seems to have appeared in the fifteenth century, staying in use until the end of the eighteenth century.

These two instruments (and, generally speaking, all keyboard instruments of the time, including the pipe organ) were basically criticized because they did not allow the player to control the volume of the generated sound, unlike instruments with direct control, namely those that did not require the use of a keyboard. In other words, while the guitar-player, the violinist and the flute-player could vary at will the intensity of the vibration of the strings they plucked or rubbed, or the intensity of the air column of their instruments, the same could not be said of the organ-player or of the harpsichord-player, who merely controlled the two instants of depression and release of the key, being the rest entirely dependent on the mechanism of the instrument. For this reason, the sound of keyboard instruments of the time was criticized as being *void of individuality*, notwithstanding their undoubted advantage of allowing *polyphony*.

In Florence, at the court of Grand Duke Cosimo III de' Medici, the Florentine nobility presented the court's harpsichord-maker, Bartolomeo Cristofori from Padua (1655-1732), with the problem of *humanizing* the harpsichord. It was said that this was also "the will of His Royal Highness Prince Ferdinand," namely the (not ruling) prince Ferdinand de' Medici, deceased in 1713, a great and sensitive lover of good music. Cristofori's experiments began in 1698 and, in 1700, an "Harpsicembalo of Bartolomeo Cristofori, newly invented, which generates soft (piano) as well as loud (forte) sounds" is mentioned for the very first time. Hence the name *pianoforte* (or *fortepiano*[90]), which was later adopted for the instrument. The date 1709, indicated in some encyclopedias, with reference to Cristofori's invention of the piano, does not take into account the highly accurate determinations by Mario Fabbri (see bibl.), that led to establishing the exact dates, reported here.

[90]The term *fortepiano* is usually used to indicate the models built between the second half of the 18th C. and the early 19th C. The term *pianoforte* is generally used to indicate the subsequent models.

## Bartolomeo Cristofori's "harpsicembalo with piano and forte"

The title above is the same as that of a detailed description of Cristofori's pianoforte, published by Scipione Maffei in 1711 in the *Giornale de' Letterati d'Italia*.

Drawing of Cristofori's 'action,' as published by S. Maffei

He related that, by that time, Cristofori had already constructed three piano's prototypes[91]. The drawing reported in Maffei's paper, reproduced here, which illustrates the *action* (see glossary) of Cristofori's pianoforte, has gone down in the history of the piano, and it is believed that it was drawn by Cristofori himself.

It is worth highlighting that in the harpsichord every key set in motion a small rod, known as *saltarello*, at the end of which there was a moving tongue equipped with a pointed element, known as *quill*, which plucked the desired string[92]. In the clavichord, instead, every key set in motion a small brass wedge (or tangent), which served to strike the string but stayed in contact with the latter for as long as the key was depressed.

Cristofori had the idea to strike the keys in a different way, introducing inside the harpsichord an effective system of hammers, which withdrew from the string following percussion (*escapement*), for he believed that only this way would the player have been able to dose the stroke, namely the intensity of percussion, hence of the sound generated by the instrument. Someone stated that Cristofori's choice was influenced by Hebenstreit's dulcimer (or *pantaleon*), which had become famous in 1697, that is to say one year before Cristofori began his experiments to build his first piano. However, it is worth noting that Hebenstreit's instrument featured a percussion system that was entirely different from that of Cristofori.

The mechanism according to which, by depressing a key, a string is struck and damping and escapement (see the glossary hereinafter) are controlled, is known as *action*[93]. Cristofori's action, as outlined in the drawing shown above, can be synthetically explained as follows: key *C* (also called the *first lever*), by means of socle *D*, placed at the other end of the key, sets in motion a *second lever E*, hinged on *F*, which performs two functions: first of all, by means of tongue

[91]We believe that the year 1709, reported in some encyclopedias, was extrapolated from this assertion and from the year (1711) of Maffei's paper.

[92]An accurate description of this *action* is contained in Leschiutta's paper (see bibl.).

[93]In non-English literature the word *mechanics* is often used instead.

*G*, it raises hammer *O*, which, with its *tooth* (not yet covered in felt, as will be done later) strikes string[94] *A-A* (above in the drawing); furthermore, by means of arm *Q* (which goes down when key *C* is depressed) it lowers the *damper* (or, as Maffei calls it, *saltarello*) *R*, which thus releases the string; as soon as the key is released, the damper returns to its rest position against the string, making the sound stop.

In 1726, Cristofori equipped one of his pianos with a manual command which shifted all the keyboard slightly to the side, so that only one of the two strings for each note was struck by the hammer, with the purpose to soften the sound. Later on, as we shall see, said "one-string" device, was to be activated with a pedal, so as to avoid the pianist having to take his hands off the keyboard.

## Development of the pianoforte

When Cristofori died in 1732, his work was continued by one of his pupils, Giovanni Ferrini. However - remaining in Italy - the first innovation worthy of being mentioned was introduced by a Tuscan priest, Domenico Del Mela, who, in 1737, built a piano with a vertical rather than a horizontal soundboard. However, it is a fact that, already before Cristofori's death, German, French and British builders had begun to develop various versions of the pianoforte, which thus became, as the poet Dall'Oglio complained in 1794 "a gift of the British, the Gaul and the German." Indeed, one of the first to take up Cristofori's pianoforte was the German Gottlieb Silbermann, immediately after having read the German translation of Maffei's article in 1725. Silbermann, an organ-maker at the Prussian court and already the inventor of the *cembalo d'amore* (which was basically a double clavichord), built several pianos, one of which was refused by Johann Sebastian Bach who, even later, never accepted the piano. Many years before Silbermann, precisely in 1716, the Frenchman Jean Marius had presented a *clavecin à maillet* (a hammer harpsichord) at the *Académie des Sciences* of Paris and, in 1717, another German, Christoph Gottlieb Schröter, had presented a *harpsichord with hammers* at the court of Saxony. In 1744, yet another German, Johann Söcher, built a table pianoforte (*Tafelklavier*) featuring a transversal (like the harpsichord) rather than longitudinal soundboard, in order to take up less room.

The Seven Years' War, which devastated Prussia, Sax-

[94]Actually there were two strings, in unison, like in the harpsichord, in order to obtain a greater volume of sound.

ony, Silesia and Austria, and also involved Russia, France and Sweden, lasting from 1756 to 1763, brought about the exodus to England of many worthy German craftsmen. Among them was a piano-maker, Johann Christoph Zumpe, who had worked in Silbermann's workshop; he reached London around 1760. The following year, together with the Scotsman John Broadwood, he entered the workshop of the famous Swiss harpsichord-maker Burkhardt Tschudi (changed to British-sounding *Shudi*), where he created a primordial action which, in its evolved form, would become the so-called *English action*. In 1776, Zumpe opened his own workshop, where he mainly constructed table pianos, while Broadwood became Shudi's associate in 1770, after having married his daughter the year before.

If to these craftsmen we add the Dutch Americus Backers and the composer Johann Christian Bach (the eleventh child of the famous Johann Sebastian), who arrived in London around 1761, one might say that a group of high musical quality was formed in the English capital, comprising experts from all over Europe. One of the pianos built by Backers in 1772 featured the innovation of two pedals: the *one-string* or *soft* pedal, mentioned previously, and the more important *loud pedal* (or *resonance pedal*) which lifted all the dampers simultaneously[95]. With the introduction of the loud pedal, the pianoforte was said to have made an important step forward, not only in terms of sonority but also of the quality of timbre.

Meanwhile, when the Seven Years' War came to an end, German craftsmanship experienced a renaissance with the Stein family from Augsburg. Johann Andreas Stein perfected the so-called *Viennese action*[96] - which did not stem from Cristofori's (which, instead, was kept in the *English action*) - whereby the hammer, which rested on the key, is *thrust* against the string when the key is depressed. This system was inexpensive, reliable and very sensitive to the touch. This *action*, together with the structural lightness of the Viennese pianoforte, provided an ideal instrument for the mature compositions of Haydn, Mozart and their contemporaries.

[95]This represented an innovation, as can be deduced from an enthusiastic letter written by Wolfgang Amadeus Mozart to his father, in 1777, in which he praised the device that raised the dampers of the Stein piano, which, however, unlike Backers' pedal, was operated by the knee.

[96]Actually, it was a *German*, rather than *Viennese*, action, since *Stein*'s laboratories were in Augsburg, Germany. It was Stein's daughter who moved the laboratories to Vienna, hence the adjective *Viennese*.

Mozart, in particular, after having tried a Stein piano in 1777, definitively converted himself to the piano. Another famous Viennese piano-maker was Anton Walter who opened a workshop in 1780. The Viennese action was adopted until approximately 1830, when it was overtaken by the French action.

Getting back to England, John Broadwood must be credited for having introduced in the piano very significant mechanical improvements. In 1782 he became the sole owner of the company and devoted himself to making the mechanisms of the pianoforte less noisy, while at the same time enhancing the sonority of the instrument. To achieve this latter objective, he made the frame considerably sturdier, in order to increase the tension of the strings. Finally, he patented the movement of the pedals. Since Broadwood had focused on the grand piano and on its production on an industrial scale[97], he imposed on the market the English pianoforte, an instrument with greater sound volume and better *cantability* with respect to the Viennese piano. The latter, however, remained unrivaled in that which concerns sensitivity, agility and stability.

Many efforts were made to combine the features of the English instrument with those of the Viennese one. Many years after the end of the French Revolution such efforts finally proved successful, thanks to the Frenchman Sébastien Érard. The latter was born in Strasbourg of a German family, Erhardt, in 1752. He moved in 1768 to Paris where he worked for many years in a workshop as a harpsichord-maker, until he built his first table piano, in 1777. He continued producing table pianos in a workshop which he ran together with his brother until the French Revolution broke out (1789), on account of which he moved to London. There, he opened a new workshop and had the opportunity to study the structure of Broadwood's pianos and piano-making techniques. In 1796 he returned to France and began to produce grand pianos of the Broadwood type until 1809, when he began to develop autonomous innovative skills, as with his patent of the *agraffe*, a hook-and-loop system whereby to improve the hooking of the strings to the wrest plank (see glossary). In the same period, Érard introduced the soft pedal (which he defined *celeste* or *angelical voice*) whereby a thin layer of felt was interposed between the

[97]At the end of the century John Broadwood produced more than 400 pianos a year, as against the 50 pianos produced by its major Viennese rival, Andreas Streicher.

hammers' line of percussion and the soundboard.

Sébastien Érard's most important invention, however, was that of *double escapement* (or *double action*), patented by him in 1821, thanks to which the piano made a quantum leap, combining the qualities of the English action to those of the Viennese action, mentioned previously. For instance, thanks to double escapement, it became possible to rapidly repeat percussion without having to wait for the key to be released altogether. A competitor of Érard's - and openly preferred by Frédéric Chopin - was Ignaz Pleyel, an Austrian who had moved to Paris. The latter benefited from the collaboration of a worthy German mechanic by the name of Heinrich Pape, who held more than one hundred patents related to the piano, among which the covering with felt of the hammer and the crossing of the strings of the medium and high registers over the strings of the grave register, which made it possible to make the former longer, thus increasing their sound volume, while at the same time not taking up too much room. Around 1830, Paris became the capital of the piano in every sense, and retained such a privilege until around the mid-nineteenth century.

The upright piano was independently introduced, in the early nineteenth century, by an American, Isaac Hawkins from Philadelphia, PA, and a Viennese, Mathias Müller. The mechanics of this piano featured two basic innovations: the soundboard went all the way down to the ground instead of being entirely placed above the keys (like in the previous prototypes), and the hammers were withdrawn by braces. As for other types of pianos, the table piano became less widespread in Europe, already as of the mid-nineteenth century, whereas in the United States it remained quite popular up until the end of the nineteenth century.

Getting back to the grand piano, in spite of the progress achieved by the French industry, there still remained the problem as to how to reinforce the structure of the frame in order to increase the tension of the strings, thus the sonority of the instrument. Initially, the builders resorted to the employment of heavier and thicker wood for the frames. Later on, metal reinforcements were introduced. Finally, in 1825, the first single-block cast-iron frame was patented by the American piano-maker Alpheus Babcock. The next objective was that of producing a single-block metal frame for the grand piano. John Mackay and Jonas Chickering, in the United States, joined forces to solve the problem. Similar ef-

forts were made in Germany and in Austria. However, one had to wait until 1872, after progresses were made in iron metallurgy, especially after the Bessemer process for the production of steel was perfected[98], before seeing a grand piano frame, cast in a single piece. In this regard, it is worth noting that the tension to which the strings of a piano are subjected is very high: in a grand piano, produced during the first decade of the nineteenth century, it reached a *mere* 4,500 kg. In the more modern pianos it reaches thirty tons.

The Steinweg family deserves special mention. After moving from Germany to the United States, the family changed its name to Steinway and achieved unprecedented success. The original business was started around 1825 in Seesen, Germany, by Heinrich Engelhard Steinweg. After the revolutionary riots of 1849, his second son, Christian Karl Gottlob, migrated to New York, followed by his father and most of the family, while the eldest son, Karl Friedrich Theodor, remained in Seesen. At that time, thanks to Jonas Chickering, the American piano industry was almost sufficient to satisfy the domestic market needs, and the import of pianos from Europe was limited. However, Steinway & Sons, officially founded in 1853, won first prize at New York's 1855 Exhibition, after which it rapidly gained ground in the domestic as well as in international markets. In 1859, the Steinways applied the crossing of strings on the grand piano, thereby obtaining a remarkable increase in sound volume.

In 1865, also the eldest son Karl Friedrich Theodor left Germany and moved to the United States, since his brothers had died in New York, while the Seesen factory was run by his business partner Friedrich Gotrian, under the name of *Gotrian-Steinweg*, which still exists today. Karl Friedrich Theodor faced the problems of the piano *ab initio*, adopting a strictly scientific approach. What is more, he was personally acquainted with the famous German physicist Hermann L. F. von Helmholtz, author, in 1863, of the famous work "Die Lehre von den Tonempfindungen" (The Theory of the Sensations of Sounds). Displayed at the Universal Exhibition of Paris in 1867, the new Steinway pianos routed seasoned competitors like the Streichers, the Broadwoods,

[98]It is worth noting that, while the first fusions of cast iron were made ever since 1709, the fusion of steel, before the Bessemer process was invented in 1857, was only possible on small objects. It took several decades before the Bessemer process could be successfully employed for a wider range of applications.

the Pleyels and the Érards, and contended with the Bechsteins and Blüthners for primacy worldwide. In 1872, Steinway patented the frame of the grand piano, cast into a single block (called *cupola iron frame*). A few years later, in 1877, Steinway opened a branch in London, and, in 1880, a factory in Hamburg, Germany.

The most important German piano-makers of the same period, rivals of Steinway, were Julius Ferdinand Blüthner from Leipzig, who gained fame worldwide around 1860, Friedrich Wilhelm Karl Bechstein, whose industry was founded in 1856, and, in Vienna, Ignaz and Ludwig Bösendorfer. The primacy of the Steinways was undermined around the middle of our century by the Japanese industry, but only in a quantitative sense.

We refer the reader to the "Chronology," at the end of this chapter, for other interesting events in the history of the piano.

### The modern concert piano

Three basic types of pianos have been built: the square (actually rectangular) or table piano, now obsolete, the upright piano and the grand piano. The latter is preferred for concert performances, whereas the upright piano is generally preferred for private homes.

The normal range of a modern grand piano is of seven octaves and a third, corresponding to eighty-eight keys. Behind the keyboard is the wrest plank, made of hard laminated and perforated wood, where the tuning pins are set. Between the wrest plank and the soundboard, which covers most of the internal surface of the instrument, a narrow space is left through which the hammers strike the strings from down upwards. A hard wood bridge, glued to the soundboard, transmits the vibrations, caused by the stroke of the hammer on the strings, to the soundboard, which, vibrating in turn, amplifies and enhances the sound. A heavy metal frame, cast into a single block, is placed over the wrest plank and the soundboard. The tuning pins reach out through the front side of the frame, while the back bears the pins to which the other ends of the strings are attached; this way the frame is able to withstand the enormous tension of the strings. The instrument has one string for every note in the lowest (bass) register, two strings for each note in the medium register (the second octave, after the lowest one), and three strings per note in the high (treble) register. Modern pianos have three pedals[99]. Of the three pedals, the one to the

[99]In upright pianos, the middle pedal is sometimes omitted.

left, the *soft pedal*, serves to deafen the sound, by shifting the keyboard to the right with the related equipment, so that the hammers of the medium and high registers each strike one string less; the central pedal, the *tonal* or *sustaining pedal*, modifies the dampening effect in the lower register, keeping in the raised position the dampers of the keys that have been struck and kept depressed prior to the use of the pedal; the right pedal, the *resonance* or *loud pedal*, raises the group of all dampers from the strings, thereby allowing the strings to prolong their vibrations.

The technology of the piano requires a thorough knowledge of mechanical engineering as well as an accurate choice of materials, such as glues, leathers, fabrics, woods and metals. Starting from the second half of the nineteenth century, soft iron strings were replaced by steel strings. Several studies on the art of piano-making were published in Germany and Austria during the first half of the nineteenth century. One of the first to come out was the book by Andreas Streicher, dated 1802, which described the Viennese action.

The nineteenth century, with its cult of the virtuoso and the encouragement to own a piano, viewed as a cultural status symbol, truly represented the golden age of the piano.

## Piano compositions

As was previously mentioned, at the dawn of the age of the piano (first decades of the eighteenth century), great musicians like Johann Sebastian Bach and Georg Friederich Händel ignored or refused to acknowledge the value of the piano. Things changed starting from the second half of the eighteenth century, to the extent that in the years that followed, most composers were pianists. Ludovico Giustini seems to have been the first composer of music for Cristofori's new instrument, as, in 1732, he published in Florence his "12 Sonatas op. 1 for Cembalo with piano and forte."

Muzio Clementi, Wolfgang Amadeus Mozart and Franz Joseph Haydn were the first composers of piano music who reached celebrity. However, Clementi was the first to exploit the structural advantages and the virtuosities allowed by the piano, unlike the styles of Haydn and Mozart, which were initially connected to the keyboard-like tradition of the harpsichord and clavichord. Muzio Clementi, born in Rome in 1752, migrated to England in 1766 and, as of 1773, he worked as harpsichord maestro and teacher. In 1779, he published his "Sonatas op. 2," one

year after Mozart published his "Sonata K 310," in 1778. There was a deep contrast between Clementi and Mozart, unfortunately tainted by Mozart's envy, and bias towards the Italians. According to M° Piero Rattalino (see bibl.), *"For Mozart, like for Chopin, the music-hand-keyboard relationship is one of total identification. For Clementi, as for Beethoven later, the relationship of identification is between the music and the strings stretched over the frame, that is to say between the music and the possibilities provided by the piano in terms of sounds that can be produced."* M° Rattalino (op. cit.) also remarked that, at any rate, *"London's piano culture develops in the direction set forth by Clementi and London becomes the pole of attraction for the leading virtuosos."* As we reported previously, London will retain that primacy until at least the mid nineteenth century.

For a short period, in the early nineteenth century, the piano's potentialities as a serious musical instrument was eclipsed by virtuosity, namely the technical skills. Consequently, mature compositions 'for keyboard' by Ludwig van Beethoven and Franz Schubert were ignored by the public in favor of the countless concert virtuosity pieces of a number of other piano composers. The great romantic composers, led by Robert Schumann, Frédéric Chopin and Franz Liszt, were left with the task to reconcile virtuosity and the highest musical contents. One might say that while Beethoven developed orchestral sonority and variety of musical color, Schumann, Chopin and Liszt were the fathers of the great romantic piano music of the nineteenth century.

In the twentieth century, the piano's primacy in concert music began to be mitigated by a stylistic evolution, which gradually led to move away from the *cantabile* as wella as from individualism and virtuosity.

## The celesta and the pianoforte with glass rods

Simplistically, the celesta is like a piano in which the strings are replaced by tuned metal rods. If crystal rods are used instead of metal rods, the resulting instrument is known as the 'piano with glass rods.' Both instruments, the piano and the celesta, belong to the class of keyboard instruments with indirect percussion.

The classical celesta was that patented in 1886 by Auguste Mustel, a manufacturer of musical instruments in Paris. It contained a series of tuned steel rods that were struck by hammers, through a mechanism similar to that of a

piano. Instead of the piano's soundboard, however, a wood resonator was placed beneath each tuned rod. Munstel's celesta had a range of only four octaves, but today's celestas can have five octaves (starting from C2, an octave below middle C) and the part is written one octave below the real sounds. From the outside, a celesta looks like a small piano.

Its extremely pure sound, sweet and delicate (often defined *ethereal*, hence the name *celesta*), yet at the same time rather piercing and sharp, captured the imagination of Peter Ilyich Tchaikovsky, during his visit to Paris, so much so that in 1892 he decided to introduce the celesta in a dance of his "The Nutcracker." Tchaikovsky was thus the first important composer who used Mustel's celesta. Many other composers would follow, who used the celesta as an orchestra instrument in operas, ballets or mystical pieces, in which its peculiar sound qualities could be exploited. Among them was Richard Strauss who, in 1911, used it in "Der Rosenkavalier," and Béla Bartók, who, in 1936, reserved the celesta an important part in his "Music for Strings, Percussions and Celesta".

Many instruments could be considered as the forerunners of the celesta. Munstel himself could have drawn inspiration from a previous instrument, the dulcitone, built some twenty years before, by himself and/or by his father. Other ancestors of the celesta (or, at any rate, relatives thereof) are all direct percussion idiophones, featuring tuned wood rods (xylophones), like some African and Central American instruments (for example the marimba), as well as tuned metal rods (metallophones), like the German glockenspiel, which, in Italian, is known as *cariglione* or *gariglione*, from the French *carillon*[100].

In particular, the classical glockenspiel is an instrument that contains a series of steel rods, set on a horizontal frame, tuned to the chromatic scale and played with two light hammers, being, therefore, a direct percussion instrument. Resonators are suspended beneath the metal rods. In some versions, the rods could be struck from underneath by means of a keyboard. Its first important appearance in an orchestra was in the "Magic Flute" by Mozart (1791), followed by many others. A portable version of the glockenspiel is used by street bands.

[100]In ancient times, in Northern Europe, the term *glockenspiel* or *carillon* referred to a series of bells - with a range between two and four octaves - hanging on a tower and set in motion indirectly by means of a keyboard. Such a system is still used today in Holland and in Great Britain.

A more recent forerunner of Mustel's celesta (also equipped with a keyboard) was the clavicylinder, conceived in 1799 by Ernst F. Chladni, a physicist from Wittenberg, Germany. The keys of this instrument acted in such a way as to push tuned glass rods against a rotating cylinder, making them to vibrate in a rather peculiar way, producing continuous, sibilant and ethereal sounds. However, although it featured tuned crystal rods, the clavicylinder does not belong to the class of celestas, for it was a rubbed instrument, not a percussion instrument.

Instruments more similar to the celesta, made with struck crystal rods, were already built at the end of the eighteenth century, namely about one century before Munstel's celesta. The crystal had to be very pure, with high lead content, in order to maintain a very pure vibration. These instruments were given various names, for instance 'pianoforte with glass rods' (see figure on p. 96 and Harding in bibl.) or, somewhat incorrectly, 'fortepiano with glass strings' (see further ahead). An instrument of this type, made in Umbria towards the end of eighteenth century, of popular origin, was being restored at *Il Laboratorio* in Milan, the official restorer of the Teatro alla Scala, when this appendix was written, in January 1993. According to the Director of the workshop, Mrs. Rita Trecci Gibelli (see bibl.), said instrument presented:

"*crystal rods instead of metal ones, and the shape of a small table pianoforte, whose hammers do not strike strings but crystal rods that have been previously tuned … The keyboard and the action are similar to those of a positive organ of the eighteenth century, and it has no dampers. The key is hooked to the frame by means of leather, and it is attached to the hammer with a brass wire that is hinged into a rod and kept suspended by a small spring. When the key is depressed, the string pulls the hammer which strikes the crystal bar as it goes down. The purpose of the spring is to allow the hammer to go back up after percussion when the key is released. This instrument, of popular origins, is very rare, for the vibrating body is made of crystal rods, and all the parts that comprise it date back to the end of the eighteenth century. It differs from Mustel's celesta not only in its mechanics but also in the compass of the keyboard, which, in this case, is of 3 octaves and 3/4. Other instruments of this type existed, with a smaller compass of the keyboard, even of only 2 octaves and* $\frac{1}{2}$*.*"

Another instrument of the same kind is mentioned in an issue of the *Journal de Paris* of 1785 (see bibl.), which announced the invention of a 'forte piano à cordes de verre' (fortepiano with glass strings), obviously referring to an instrument with crystal rods (not actually *with glass strings*, but *with glass rods instead of strings*), invented that same year by a certain M. Beyer:

**Journal de Paris N. 322**
Vendredi 18 Novembre 1785, de la Lune le 17, p. 1326

*"Arts.— Le S^r^ Beyer prévient les Amateurs que le fortepiano à cordes de verre de son invention, annoncé dans le Journal du 24 Août dernier, qui a merité le suffrage de L'Académie des Sciences, sous le nom de "glass-chord" que lui a donné M. Franklin, peut être vu chez lui les Dimanches depuis onze heures jusqu'à une heure & demie; il sera joué par le S^r^ Schonk, Maître de clavecin, pendent 15 jours, à commencer de Dimanche prochain."*

It is worth noting that a feature characterizing instruments with crystal or metal rods, like the celesta or the fortepiano with crystal rods described previously, was that, unlike regular pianos, they did not need to be tuned from time to time.

The news reported in the *Journal de Paris* (which apparently was not contained in the most knowledgeable texts on the history of musical instruments) was traced and supplied to the author by Mr. Renato Meucci, Professor of History of Musical Instruments at the Conservatories of Milan and Vicenza.

## Glossary

*Action* - The mechanism according to which by depressing a key a string is struck and damping and escapement are controlled.
*Chromatic scale* - The succession of the twelve semitones of the octave (white and black keys of the piano, played one after the other).
*Damper* - Element used to stop the vibration of the strings in harpsichords and pianos or the vibration of the rods in celestas and other idiophones.
*Diatonic scale* - The succession of the seven fundamental notes; it corresponds to the succession of only the white keys on the keyboard.
*Equal temperament* - Subdivision of the octave into twelve equal intervals (see below), of 1.05946.
*Escapement* - System whereby the hammer rapidly returns to its original position (or, in *double escapement,* to an intermediate position), after the string has been struck.
*Frame* - Structure that withstands the tension of the strings.
*Interval* - Frequency ratio between any two notes.
*Octave* - The distance between any two notes with frequency ratio (interval) equal to 2:1 or 1:2.
*Register* - The range of a voice or of an instrument.
*Saltarello* (or *salterello*) - This word had, in the past, a double meaning: according to S. Maffei, it indicated

the damper; however, in plucked string instruments, as the harpsichord, it indicated a rod (set in motion by a key), equipped with a plectrum or quill on its tip with which the strings were plucked.
*Spinet* - Small harpsichord with a single keyboard.
*Tuning pin* - A pin fixed on the wrest plank (see below) that is turned to adjust the tuning of the strings.
*Wrest plank* - A board of hard wood on which the tuning pins are fixed.

## Chronology

c1300 BC - In the city of Ugarit, in Syria, a musical notation on clay tablets is in use.
c540 BC - The Greek philosopher Pythagoras of Samos discovers the mathematical ratios between the lengths of vibrating strings, emitting musical notes, in harmony.
c250 BC - Ctesibius of Alexandria creates the first, elementary keyed instrument in history, a sort of organ called *hydraulos*.
c tenth C. - The *santir*, later called *dulcimer*, a direct percussion zither, is in use in Persia.
1036 - Guido d'Arezzo, a Benedictine monk and music theorist, devises the four-line staff, thus anticipating the modern musical notation. He had also invented, in 1026, the "great scale," i.e. the entire series of recognized notes.
c fourteenth C. - The harpsichord is already in use, the origins of which are unknown.
c 15th C. - Various versions of the *dulcimer* are in use in Europe; they are called *hackbrett* or *tympanon*. A keyboard version also exists, known as *dolce melos.* The clavichord appears, the origins of which are unknown.
1697 - Pantaleon Hebenstreit builds a very large hackbrett, which he plays with great skill. King Louis XIV renames the instrument *pantaleon*.
1698 - In Florence, a harpsichord-maker from Padua, Bartolomeo Cristofori, begins to make experiments on a *harpsichord with hammers*. In 1700 he completes his first prototype, named by him "harpsicembalo with piano and forte," which marks the beginning of the age of the pianoforte.
18th C. (early) - Equal temperament is adopted.
1711 - Scipione Maffei illustrates Cristofori's pianoforte in the *Giornale de' Letterati* and reports that Cristofori had already created three pianos.
1714 - Pantaleon Hebenstreit is appointed *pantaleonist* at the court of Dresden.
1716 - The Frenchman Jean Marius presents a *clavecin à maillet* at the *Académie des Sciences* of Paris.
1717 - The German Cristoph Gottlieb Schröter presents a *harpsichord with hammers* at the court of Saxony.
1726 - The German Gottfried Silbermann builds his first pianoforte models.
1726 - Cristofori introduces the *one-string* device with manual command in one of his pianos.
1732 - Bartolomeo Cristofori dies. Lodovico Giustini publishes in Florence his "12 Sonatas op. 1 for Cembalo with piano and forte."
1737 - Domenico Del Mela builds the first pianoforte with soundboard set in the vertical position.
1744 - The German Johann Söcher builds the first table pianoforte with transversal soundboard.
1747 - Johann Sebastian Bach tries Silbermann's pianos at Potsdam, Germany, but does not appreciate them.
1772 - In London, the Dutch Americus Backers builds a piano with *soft (one-string)* and *loud* pedals.
1775 - After the end of the Seven Years' War, German craftsmanship experiences a renaissance with the Stein family from Augsburg.
1776 - The German *Johann Christoph Zumpe* opens a piano factory in London.

1777 - In Augsburg, Mozart plays a *Stein* piano with the knee-command to raise the dampers.
1777 - *Sébastien Érard* builds his first table piano.
1778 - Wolfgang Amadeus Mozart publishes his "Sonata K 310" for piano.
1779 - In London, Muzio Clementi publishes the "Sonatas Op. 2" for piano.
1780 - Anton Walter opens a piano factory in Vienna.
1781 - Mozart and Clementi play in Vienna before Emperor Joseph II.
1783 - The Scotsman John Broadwood patents the pedal-moving mechanism in London.
1791 - Wolfgang Amadeus Mozart uses the glockenspiel in his "The Magic Flute."
1799 - The German physicist Ernst F. Chladni creates a musical instrument with rubbed crystal rods, which he calls *clavicylinder*.
18th C. (late) - Instruments of popular make, similar to the celesta, featuring crystal rods are in use. In particular, the *Journal de Paris* of 18 November 1785, announces the invention by M. Beyer of a "glass-chord piano."
1800 - In Vienna, Mathias Müller builds the first upright piano, almost simultaneously with the Englishman John Isaac Hawkins, who migrated to Philadelphia.
1802 - In Vienna, Ludwig van Beethoven publishes his "Sonata op. 27 no. 2."
1802 - Andreas Streicher publishes a book which describes the art of building pianos, illustrating the Viennese action.
1808 - James Shudi Broadwood, son of John, begins to introduce metal bars in the frame of the piano.
1810 - Sébastien Érard introduces the *double action harp pedal.*
1820 - Franz Liszt makes his debut as pianist in Sopron, Hungary.
1821 - Sébastien Érard patents the *double escapement.*
1825 - In Boston, MA Alpheus Babcock patents a (small) frame, for table pianos, entirely made of metal and cast into a single block.
1825 - The German Heinrich Engelhard Steinweg founds in Seesen the company which will give rise to the American *Steinway & Sons*.
1826 - Heinrich Pape patents the coating of the piano hammers with felt.
1830 - Paris becomes the capital of the piano, in every sense, and remains such for twenty years.
1849 - Most of the Steinweg family migrates to the United States and changes its name to *Steinway*.
1853 - *Steinway & Sons* is founded in New York.
1855 - The pianos of *Steinway & Sons* win first prize at the New York Exhibition.
1856 - Friedrich Wilhelm Karl Bechstein founds the famous homonymous piano factory.
1857 - The Bessemer process for the production of steel is patented. After many years, it will allow to obtain large single-block fusions, like the Steinway's *cupola iron frame*.
1859 - Steinway & Sons introduces the crossing of strings in the grand piano.
1860 - The piano builder Julius Ferdinand Blüthner from Leipzig, Germany becomes famous worldwide.
1863 - The English musician Eric Fenby invents a device - which he calls *phonograph* - able to write music while it is played on the piano or on another instrument. Some years later, Mr. Fenby helps the composer Frederick Delius to write his music, when the latter was blind and partially paralyzed.
1863 - The German scientist Hermann L. F. von Helmholtz, friend of Karl Friedrich Theodor Steinweg, publishes his famous study on acoustics "Die Lehre von den Tonempfindungen."
1865 - After arriving in New York from Germany, Karl Friedrich Theodor Steinweg takes over the lead of *Steinway & Sons*, introducing in

the piano highly innovative scientific ideas.
c1866 - Auguste Mustel (and/or his father) builds the *dulcitone*, forerunner of the celesta.
1867 - The new Steinway pianos achieve great success at the Universal Exhibition of Paris.
1872 - Theodor Steinway patents the metal frame of the grand piano, cast into a single block.
1874 - Theodor Steinway patents the sustaining (or tonal) pedal.
1877 - Steinway & Sons opens a branch in London.
1880 - Steinway & Sons opens a factory in Hamburg, Germany.
1886 - In Paris, Auguste Mustel, a musical instruments manufacturer, patents the celesta.
1887 - In Marseilles, a mechanic and music-lover, Augustin Lajarrige, invents an automatic device for the piano which serves to turn the pages of the score.
1892 - Peter Ilyich Tchiaikovsky uses the celesta in his "The Nutcracker."
1897 - Edwin S. Votey of the *Farrand & Votey Organ Co*. from Detroit, MI, patents the *pianola* or *player piano*, i.e. a piano equipped with a mechanism for automatic playing. The music is recorded by means of a series of perforations on a roll of paper which passes over a tracer bar, while pneumatic devices set the hammers of the piano in motion. The system is controlled by pedals and levers which allow the player to vary the pace and the volume of the music.
1911 - Richard Strauss uses the celesta in his "Der Rosenkavalier."
1936 - Béla Bartók gives the celesta an important part in his "Music for Strings, Percussions and Celesta."

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## BREWING BEER

### History

As known, beer is an alcoholic beverage obtained by the steeping in water and subsequently allow to ferment a germinated cereal, called malt, to which hop flowers (of the species *Humulus lupulus*) are added both to give it a bitter flavor and improve its preservation. The cereal most commonly used is a particular species of barley called *two-row barley* (botanical name: *Hordeum disticum*). However, beer was originally prepared also with other cereals such as millet, corn, oats, rye or rice, while the added substances could be honey, juniper, various types of berries and even mushrooms and bark, but never hop. In fact, the first records of hop-growing date back to 736, in Bavaria. Beer is a popular beverage because it is refreshing, frothy, genuine, palatable, and moderately inebriating. In fact, beer has the lowest alcoholic content (around 5%) of all alcoholic beverages.

The production of fermented beverages dates back to ancient times. According to the Bible, the fermentation of grape juice to obtain wine goes all the way back to Noah's time (ca twentieth century BC). Another fermented beverage, equally easy to produce and thus known since prehistoric times, was mead (*Met* in German; *idromele* in Italian). Said beverage was prepared by simply mixing wild bee honey and water and leaving it exposed to the air for a few days. The beverage thus obtained was inebriating, like grape wine. In more recent times, the ancient Greeks and Romans improved mead by adding fruit and spices, which gave it a more pleasant flavor. Also the Celtic and Teutonic tribes, even before the Roman occupation (ca 50 BC), knew mead and called it *the drink of Gods*[101]. For many centuries this beverage was widespread in Germany and in other European countries, its popularity having reached its peak in the fifteenth century, after which it began to decline, as soon as sugar began to replace honey in food preparation.

From the above, it appears that man had noticed the exterior manifestations of fermentation, i.e. the forming of bubbles and a superficial layer of froth, ever since prehistoric times. However, beer actually came into the picture (if with a vague resemblance to modern beer) when cereals began to be used as the basic components of fermented beverages. This probably occurred in Mesopo-

[101]Some authors believe that the mead prepared by Teutons and Celts also included Indian corn, which was fermented in water together with honey.

tamia around 7,000 BC. The first farmers who had settled down there, ground corn manually, adding then either a small amount of water to produce a (unleavened) bread of sorts, or a large amount of water to make it ferment. A tablet with cuneiform characters was found which contained the recipe of this fermented Mesopotamian beverage known as *wheat wine*[102]. As one can imagine, it tasted nothing like today's beer, although it was an inebriating beverage.

Egyptian bakery and brewery, Tomb of Qenamon, Thebes (18th Dynasty, c1500 BC)

Some scholars have even hypothesized that beer was invented before bread, for the latter requires yeast, that is more easily obtained from beer. Indeed, the most ancient archaeological finds of leavened bread, discovered in Egypt, are dated around 3,500 BC. It was also ascertained that already around 3,000 BC, Egyptians and Sumerians prepared a fermented beverage with germinated barley instead of wheat. As clearly shown in many Egyptian murals (one of which is reproduced on the preceding page), barley grains were steeped in water and left to germinate. After germination (conversion into *malt*, see glossary), the grains were tread underfoot by slaves, in order to separate the barley radicles, and then boiled in abundant water. The mass was stirred with long sticks and then left to rest, to undergo spontaneous fermentation.

The Egyptians taught this art to the Greeks, who had previously produced a beer of sorts from barley, without, however, making it germinate before. It is worth highlighting that, as the Greeks, likewise the Romans later on, had more refined tastes than the Egyptians, they definitely preferred grape wine to that type of beer. Dr. Tullio Zangrando of *Birra Moretti*, in a letter to the author, provided the following motivation, accounting for the Greek-Roman predilection for wine: *"The juice of grapes, which constitutes the fermentable substratum of wine, is rich in organic acids and thus acts more selectively on micro-organisms, so that, during fermentation, if spontaneous, it is less likely that micro-organisms develop which damage the flavor of the finished product. Instead, in infusions of unhopped cereals, left to spontaneously ferment, putrefaction bacteria, acetic bacteria and other bacteria multiply as well, with negative effects on organoleptic properties of the fermented beverage, as one can easily imagine."*

Although fermented cereal infusions were not palatable to the Greeks and Romans, they were nonetheless very popular,

[102]Some historians believe that those farmers used germinated wheat to make *wheat wine.*

in Roman times, in Thrace, in Friesland (currently Belgium), in Scythia and in Germany, and they were therefore viewed by the Romans as 'barbaric drinks.' Among the Germans, mead as well as beer must have had great importance, as they were amply mentioned, for instance, in the 'Saga of the Edda.' It is not known whether in pre-Roman Britannia something similar to beer was drunk. It is certain that in later periods the Welsh drank a very strong and spicy version of mead which they called *metheglyn*.

The Egyptian art of making beer, hardly appreciated by the Greek-Roman world, was not only cultivated in the regions mentioned above, but also by the Arabs, who brought it to Spain, in the eighth century, and to France, in the ninth century, through the Arab invasions of the early Middle Ages. This art, like many others, was then taken up and perfected in transalpine monasteries, especially the ones in Northern Gaul, in what is currently the Flanders region of Belgium. The monks patiently researched into the ways to make beer less perishable and more palatable, experimenting with all sorts of flavorings and preservatives, until they started to use hop around the year 1,000. Soon afterwards, its use became widespread and a new era began in the art of obtaining fermented beverages from cereals.

Typical cart with beer kegs at Munich's Oktoberfest

Another historical curiosity, that is well documented, refers to the monastery of St. Gallen (located in the homonymous Swiss canton) where, in 890, the monks produced beer using, among other things, a cam operated by a hydraulic wheel[103]. A popular legend dating back to the same period (ca 850) attributes the invention of beer to a likewise legendary Flemish king by the name of Gambrinus, who must have lived at the time of Charlemagne (though he was never mentioned in history books), and was considered the symbol and patron of brewers thereafter. This also confirms the prestige of the Flanders, where beer became very popular in the Middle Ages, retaining such popularity to the present day.

In the course of the following centuries, beer making, which was initially confined to monasteries, gradually passed from the latter to the artisans of the middle class. In Germany especially, breweries in some towns became one of the main factors of development. The most ancient brewery (which still exists) is allegedly that of

[103]This device was used by the Greeks ever since the third century BC. It consisted of a small board perpendicularly fixed to a rotating shaft, which, at every turn, struck any object it came across.

Weihenstephan, north of Munich, Germany, which, according to available records, has operated uninterruptedly from 1143 to the present day. For centuries its production was limited; only recently has it expanded and become a medium-size brewery. However, larger private companies (often, consortia) developed more in the North of Germany, especially in Saxony and in Thuringia, starting from the twelfth and thirteenth centuries. Indeed, documents dating back to the sixteenth century mention beer brands that were famous in the Middle Ages, such as the ones from Erfurt, Einbeck and Braunschweig, as well as from Zerbst and Naumburg. It is worth noting that in Northern Germany, up until the fourteenth century, a beer called *Grutbier* was produced from germinated wheat, flavored with rosemary of the marshes (*Ledum palustre*), then with hops, which, however, was replaced by barley beer starting from that period.

In the early seventeenth century supremacy in beer making shifted from Northern Germany to Bavaria. This occurred during the period of the Thirty Years' War (1618-1648) which devastated the Northern regions in particular, thus making Bavaria Germany's main producer of beer. Still today, beer is so deeply rooted in the German culture, especially in Northern Germany, that one drinks engagement beer, wedding beer, birth beer, death beer, and harvest beer to celebrate the related events.

As for other regions, far from the ones mentioned previously, it is worth recalling that the Incas, after the expansion of their empire around the late fourteenth century, grew Indian corn which they used to produce a fermented beverage called *chicha*. It was served on particular occasions, for instance during State ceremonies. Furthermore, in Africa, ever since ancient times, a fermented beverage was made from millet, while in the Far East a similar drink was obtained from rice. We must also recall that the famous Japanese *sake* is made with rice which is steam cooked, hydrolyzed and fermented and that the Russian drink *Kvass* is a kind of beer, made from barley and rye malt, to which fruit is added. One last curiosity (European this time) consists of a patent that was obtained in London, in 1823, by a grocer, Mathias Archibald Robinson, for a beverage similar to beer, which the inventor named *barley water*.

## Research on fermentation[104]

It must be remarked that, in the Middle Ages, although the art of making beer progressed and brewers' confraternities gained more and more power (also because the tax revenue connected to the production of beer benefited Lords, Princes and Kings), knowledge on the phenomenon of fermentation, which underlies the production of beer as well as wine, was practically non-existent, remaining such up until the end of the eighteenth century. Indeed, it was believed that fermentation was a sort of *purification* process whereby the noble and pure components of wort rose to the surface while the base and muddy ones (the dregs) precipitated to the bottom. Indeed, the term *leaven* (*levain* in French, *Hefe* in German, respectively coming from the verbs *lever* and *heben*, which mean *to raise*) actually describes this *raising* or *leavening* of the noble components (as alcohol), which were supposed to be already contained in the dormant state in the wort and released by fermentation. The deposits that formed during fermentation were called *dregs* (using the Latin terms *faeces vini* for wine, and *faeces cerevisiae* for beer) to highlight the fact that *impurities* were eliminated through fermentation.

We know today that the layer of froth in medieval beers contained lumps of leaven cells, of the *top fermentation* type, typical of the spontaneous fermentation of the period. Indeed, at the end of fermentation, when the fermentable sugars were completely used up, the leaven rose to the surface, i.e. to the top (hence the expression *top fermentation*). On the contrary, most of the beer types produced today are obtained through *bottom fermentation*, as the types of leaven currently used settle on the bottom of the vat, at the end of fermentation.

In the Middle Ages, following the beliefs of the time, dregs were accurately eliminated after each fermentation. Various centuries elapsed before it was realized that subsequent fermentation could much better and much more easily performed if the leaven collected from the preceding batch was used in the following one, thereby also obtaining a more palatable final product. This important innovation was introduced in the year 1650, when, in London, the leaven of the previous fermentation was kept and inoculated in the subsequent batch.

[104]This paragraph is largely inspired by a note sent to the author by Dr. Tullio Zangrando, Technical Director of *Birra Moretti*.

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This notwithstanding, official science continued to fumble in the dark. For instance, scientists were still not able to understand the differences in the process of digestion compared to fermentation, nor in the process of rotting compared to putrefaction. Furthermore, any transformation of matter in the course of which bubbles and gas were produced, was viewed as fermentation, even including the attack of acids on minerals, since the forming of froth could be observed. Consequently, the term *fermentum* (ferment) was used to describe any substance that could bring about such transformations. This should come as no surprise, since we are speaking of the period in which alchemy thrived (chemistry was still unknown), and alchemists sought the *philosophers' stone* which would allow to transform any material into solid gold.

A first rudimentary theory of fermentation was introduced by Andreas Libavius, in 1595, stating that, among other things, the ferment had to present a certain affinity with the substratum. A small step forward was made by the chemist Johann Joachim Becher, who stated, in 1669, that a distinction had to be made between fermentation and putrefaction, for the former entailed an improvement in matter whereas the latter caused its deterioration. Furthermore, he specified that only sugars could produce alcohol through fermentation. Later on, in 1697, Georg Ernst Stahl published his book "Zymotechnica Fundamentalis" (Fundamentals of Fermentation Technique), where he defined fermentation as the decomposition of a fermentable substance (made up of small particles, which he called *molecules*[106]) into its constituents, while at the same time forming new and more stable compounds.

In the 1680s, microbiology experienced a boom, thanks also to the remarkable work of the Dutch Antoni van Leeuwenhoek, who perfected the microscope[107]. Thanks to his self-made microscopes, he was also the first scientist to observe unicellular organisms (protozoa), giving an account of his research to the *Royal Society*, in 1683. For this and other research he is considered

[106]We recall that, at the time, the word *molecule* was used in a generic way, not yet having the precise meaning that was given, in 1811, by the Italian physicist Amedeo Avogadro.

[107]Although the first rudimentary microscopes were built between 1590 and 1610 (by Hans and Zacharias Jannsen, in about 1600, and by Johannes Kepler, in 1611), Antoni van Leeuwenhoek must be credited for having rendered the microscope practical and accurate, though using only one lens. For his microbiology studies, Leeuwenhoek built lenses and microscopes himself (he built over 400 of them), reaching a magnification of 270.

Galilean microscope, attributed to Giuseppe Campani (Rome, ca 1666)

the father of modern microbiology. The microscope, and the thrust it gave to microbiology, provided a strong stimulus to studying the phenomenon of alcoholic fermentation, although the possibility to observe micro-organisms did not automatically imply that their mechanisms of action were understood or that the useful ones could be distinguished from the harmful ones, such as the pathogenic bacteria.

The perfecting of the microscope, in particular, allowed to run experiments aimed to verify the theory of spontaneous generation, according to which animals and plants could be generated directly by inanimate substances. On this subject, the Florentine Francesco Redi demonstrated in 1675 that the worms that appear in the putrefaction of meat did not form if, after sterilizing the meat itself, one prevented it from coming into contact with insects. Redi's theory was opposed in England by Rev. John Turberville Needham and in France by count Georges Leclerc de Buffon, who conducted experiments according to which, after sterilizing (by boiling) a certain amount of water, a few weeks later one could observe, with the microscope, the presence of living micro-organisms. The Italian Lazzaro Spallanzani, one of the fathers of modern biology, proved that the experiments conducted by Needham and Buffon were not sufficiently accurate. In fact, if, in addition to water, also the air coming into contact with it was sterilized, no micro-organism would develop. In the same instance, Spallanzani also proved that the reproduction of bacteria occurred by fission, not by spontaneous generation. It is also worth highlighting that Finally, in 1765, Spallanzani demonstrated the analogy between the action of ferments in the decomposition of sugars and that of gastric juice in the decomposition (or digestion) of meat.

Towards the end of the eighteenth century, progress in chemical science was greatly accelerated by the important work and discoveries of Antoine Laurent Lavoisier - one of the fathers of chemistry - and, among them, his work on oxygen (named by him[108]). In 1787 Lavoisier conducted research on alcoholic fermentation, asserting that oxygen played an important role in it. However, in 1798, since a satisfactory explanation for fermentation phenomena had not yet been given, Paris' *Académie des Sciences* decided to launch a contest among scientists, to provide an exhaustive answer to the following

[108]Oxygen was first isolated, independently, by the English Joseph Priestley and the Swedish Karl Wilhelm Scheele.

question: "*What are the features that, in animal and vegetable substances, distinguish the ones that serve as ferments and the ones that undergo fermentation?*" As we shall see, such a contest had no winners, and the question remained unanswered, for almost half a century.

In 1810, Joseph Louis Gay-Lussac began to conduct experiments to clarify the process of fermentation. Influenced by Lavoisier, he too (wrongly) hypothesized that fermentation could only take place in the presence of oxygen, a theory that seemed to be confirmed also by the experiments performed by Nicolas François Appert on the preservation of canned food, in the absence of air. Apart from his incorrect assumption as to the (catalyzing) role of oxygen, Gay-Lussac's findings on the chemistry of fermentation were confirmed by modern science. In particular, he came up with the chemical formula, still valid today, of the conversion of glucose and maltose into alcohol plus carbon dioxide:

$$C_6H_{12}O_6 = 2\ C_2H_5OH + 2\ CO_2$$

He reached this result after performing many accurate measurements on the metabolism's products. Today we know that such a conversion is not favored (catalyzed) by the presence of oxygen but by that of the enzymes contained in the leavens (or yeast).

According to Prof. Domenico Meneghini (see bibl.), in 1830, one Dubrufani extracted from the juices of germinated barley (malt) a substance that could hydrolyze (decompose through hydrolysis) the starch contained in barley, converting it into fermentable sugars. In 1833, the French chemist Anselme Payen (the discoverer of cellulose, dextrin and pectin) found out that the substance isolated by Dubrufani was an enzyme called *diastase*. Today we know that diastase is a mixture of two enzymes: *amylase*, which favors (i.e. catalyzes) the decomposition through hydrolysis of starch into dextrins and maltose, and *maltase*, which favors the subsequent conversion of maltose into glucose. Another important contribution was given in 1837 by Jöns Jakob Berzelius, who hypothesized that, during fermentation, leavens only acted through their presence - that is to say without directly intervening in the reaction - thus introducing the concept of *catalysis*.

A few decades later, precisely on 12 June 1857, baron Charles Cagniard de la Tour, responding to the contest promoted by Paris' *Académie des Sciences*, which had seen no winner, presented a study on

fermentation in which he stated, among other things, that yeast is comprised of corpuscles which, observed under the microscope, present a spheroidal shape, that such corpuscles belong to the vegetable kingdom and that, if alive, they act on sugary solutions, triggering their fermentation, so that one could plausibly conclude that the generation of carbon dioxide and the formation of ethyl alcohol were the consequences of their vegetative activity. Other researchers, such as Kuetzing and Theodor Schwann, reached the same conclusions, almost contemporarily. But their *vitalistic theory* was refuted by such resolute opponents as Jöns Jacob Berzelius, Marcelin Berthelot, Noehler and others and, especially, by the famous baron Justus von Liebig (see hereinafter) who, on the contrary, asserted that fermentation was an exclusively chemical-physical phenomenon, that had nothing to do with the *life* of the yeast.

The most famous (and authoritative) supporter of the vitalistic theory was Louis Pasteur who, after demonstrating in 1850 that fermentation as well as putrefaction are caused by living micro-organisms that grow and proliferate, proved that also many diseases are caused by various types of micro-organisms (pathogenic germs). Pasteur also acknowledged that every type of fermentation is induced by a particular species of micro-organisms and he stated that good fermentation depends on the pureness of the micro-organism cultures. Furthermore, in his fundamental work "Études sur la bière" (Studies on Beer), published in 1876, he demonstrated, with the support of experimental evidence, that deterioration of beer was caused by contaminating bacteria (lactic and acetic bacteria especially), other than that (*Saccharomyces Cerevisiae*) causing beer fermentation. Ever since 1862, Pasteur had also indicated his method to fight beer diseases, consisting in heating it at temperatures above 57.2 °C, in order to destroy harmful micro-organisms (or stunt their growth), while maintaining its flavor and appearance substantially unchanged. Such a process (called *pasteurization*) could also be applied to wine, vinegar, milk and other beverages, as is done still today, operating at temperatures comprised between 50 °C and 75 °C.

Notwithstanding the precise indications given by Pasteur, the quality of the product supplied by the beer industry never reached the desired levels of quality, because the cultures of *Saccharomyces Cerevisiae* were never of sufficient pureness. The situation changed, in 1889, thanks to E.C. Hansen, a microbiologist

from Copenhagen, Denmark, who applied to yeast the *pure culture* method, that had been previously introduced by Robert Koch in the field of medicine. In this way, it was possible, with a pure yeast, to obtain a far better beer quality than that obtained in the past.

Research on the chemical mechanisms of fermentation continued for some decades, with various interpretations. In 1871, for example, Justus von Liebig, acknowledging the importance of the role of yeast in fermentation, hypothesized that it was a nitrogenous compound in a permanent state of decomposition and agitation and that, therefore, by colliding with sugar molecules, it ended up causing their decomposition, mechanically. In other words, Liebig explained that sugars were decomposed by ferments in the same way as explosives were decomposed, that is to say by effect of multiple collisions.

Nevertheless, neither the previous *vitalistic* interpretations nor Liebig's *mechanistic* theory were correct. The true interpretation came up in 1897, when the Bavarian chemist Eduard Buchner demonstrated that if enzymes[109] were isolated from yeast, they still catalyzed the conversion of sugar into ethyl alcohol (or ethanol) and carbon dioxide. For such results Buchner was awarded the Nobel prize for chemistry in 1907.

In 1889, the Swedish chemist Svante Arrhenius gave an explanation of the modus operandi of an inorganic catalyst, according to which the catalyst causes a drop in the so-called *activation energy* (or *energy gap*) of a given chemical reaction. He also gave a formula, known as *Arrhenius law*, allowing to calculate the speed of the reaction. Some years later, the German biologist Peter Michaelis demonstrated that Arrhenius's concept also applied to organic matter (as enzymes), and he gave a formula, analogous to Arrhenius's, later known as *Michaelis-Menton law*. In 1894, the German chemist Emil Hermann Fischer (Nobel prize for chemistry in 1902) highlighted the importance of the spatial configuration of the enzyme's molecule compared to that of the substance on which it has effect. In 1904, a British biochemist, sir Arthur Harden, together with William J. Young, further clarified the process of alcoholic fermentation, discovering its responsible enzyme, *zymase*, as well as its co-enzyme, *co-zymase*. For this research, Arthur Harden was awarded the Nobel prize for chemistry in 1929.

[109]The term *enzyme* (from the Greek 'en zyme,' meaning 'in leaven') was coined in 1878, when it was still believed that the enzymes contained in leaven could operate only *inside* living cells.

## Carbohydrates and their fermentation

Some basic notions that underlie the operations required for brewing beer are reported in the following paragraphs.

Carbohydrates, which include, among other things, sugars, starches and cellulose, are extensively present in nature. They form in green plants in the presence of sunlight (photosynthesis), using the carbon dioxide in the air, and supply all the nourishment needed by the plant itself. Last century's chemists, having discovered that they contain carbon, hydrogen and oxygen, according to the general formula $C_n(H_2O)_m$, gave them the name *carbohydrates*. In fact, this formula tells us that a generic carbohydrate contains *n* atoms of carbon and *m* molecules of water.

Carbohydrates can be grouped into two categories: *saccharoidal carbohydrates*, comprising all sugars, and *polymeric carbohydrates* or *polysaccharides*, comprising starches, cellulose and other long-chain (polymeric) compounds[110]. While sugars are soluble in water and sweet in flavor, and crystallize rather easily, polymeric carbohydrates are insipid, insoluble and amorphous. All carbohydrates can be more or less easily decomposed through hydrolysis, and all yield, as end product, simple sugars or monosaccharides, which can therefore be considered the fundamental constituents of carbohydrates.

Monosaccharides include glucose (also called *dextrose* because it has a right polarizing effect on light) and fructose (also known as *levulose* because it has a left polarizing effect on light)[111]. Disaccharides include saccharose (common sugar), whose molecule is the result of the combination of one molecule of glucose and one molecule of fructose, and maltose, whose molecule is the result of the combination of two glucose molecules. Monosaccharides are directly used by the tissues of the human body and are immediately converted into energy. On the contrary, polysaccharides, such as starches, must first be decomposed (for instance, by the enzymes in the digestive organs), to obtain monosaccharides, which will be then assimilated by the human body. In other words, they must be *digested* or *metabolized*. Finally, both monosaccharides and disaccharides can

[110]Starch and cellulose are also called *anhydrous saccharides*, as they are formed by a chain of many molecules of glucose linked together, without water.

[111]The word *dextrose* comes from Latin *dexter* (right-hand), while the word *levulose* comes from Latin *laevus* (left-hand).

be converted into alcohol, by submitting them to fermentation, as better shown in the following.

Starch is the first product that forms in plants by chlorophyll photosynthesis. It is partly hydrolyzed by an enzyme, amylase, which converts it into sugars to nourish the plant, and, partly, it is stored in various parts of the plant (including seeds) as reserve starch.

Cellulose, instead, is the fundamental constituent of plant cell walls and is found in the pure state in the fibers of cotton, linen and jute. Its degree of polymerization (that is to say the number of glucose molecules present in the chain, or macromolecule) ranges from a few hundred to several thousand. In starches it is generally less than one hundred. Dextrins are starch derivatives, more precisely, they are intermediate products of the hydrolysis of starch and therefore contain fewer molecules of glucose (generally a few dozens). As said above, the hydrolysis of starch, before yielding glucose, must pass through maltose, which is composed of two molecules of glucose.

Fermentation of carbohydrates is caused by ferments, or yeasts, veritable living organisms that act through enzymes (also called *soluble ferments*) contained in them which, in turn, determine or accelerate specific chemical reactions. Ferments or yeasts are fungi that belong to the class of ascomycetes. They can be found on the leaves and flowers of plants, on the skin and in the intestines of warm-blooded animals (where they often live in symbiosis with the latter), and also in soil and salt water, where they perform the function of decomposing vegetables and algae. An important sub-class of ferments is that of saccharomyces, which intervene in the transformation of sugars into alcohol, i.e. in alcoholic fermentation.

Many saccharomyces species exist. The aforesaid saccharomyces cerevisiae is a member of this class, that is mainly responsible for the fermentation of sugars contained in cereals (rice, wheat, barley and Indian corn), and is utilized to produce alcoholic beverages or to make bread, cakes and pastries. Some other yeasts exist, featuring peculiar characteristics. For example, the *top fermentation yeasts* float on the liquid that has fermented. Others, called *bottom fermentation yeasts* or *bottom yeasts*, precipitate to the bottom of the fermentation vat. Some others are characterized by the temperature range in which they are active.

As was mentioned previously, after acknowledging that alcoholic fermentation was

caused by living microorganisms which were given the name of *yeasts*, it was proved that fermentation could also be caused by substances extracted from the cells of those microorganisms, which were given the name *enzymes*.

Without enzymes, the fermentation processes that we are dealing with, as well as a large portion of biological processes that occur in living organisms, could not take place. Their mechanism of action is very complex and has not yet been fully explained, as it is connected to the identification of the chemical and spatial structure of proteins. In fact, in 1926, the American biochemist James B. Sumner - the first who managed to isolate an enzyme, urease, in crystalline form - demonstrated by extrapolation that all enzymes are proteins. Thereafter, many enzymes were isolated and studied, and, today, they are commonly used in the textile, food, leather and alcoholic beverages industries. Artificial enzymes have also been produced. The name of an enzyme always ends in *-ase* and always contains the name of either the type of reaction which it favors or the substance on which it acts. In fact, unlike inorganic catalysts such as platinum or palladium, every enzyme acts on a very restricted number of substances and chemical reactions. In other words, it is endowed with selectivity. As was said previously, Emil H. Fischer demonstrated that enzyme selectivity is to be ascribed not so much to the chemical constitution of the substance on which the enzyme acts, but rather to its spatial molecular configuration in relation to that of the enzyme.

The activity of enzymes depends on temperature to a significant extent, as we briefly mentioned before; furthermore, the temperature range is rather limited. Many enzymes operate correctly between 30 °C and 50 °C. Enzyme activity normally stops below 0 °C and above 60-70 °C, although there are some enzymes (for instance the diastase of malt) that reach the peak of their activity at 80-85 °C. In general, however, temperatures over 70-80 °C destroy enzyme activity, a phenomenon which is employed, as was previously mentioned, in the pasteurization of beverages. Also pH (see glossary) plays an important role in enzyme reactions. In fact, for every reaction there exists an optimum pH, and there are pH limits beyond which enzyme activity stops. Finally, there exist substances that exert an inhibitory or even destructive action on enzymes. Among them are silver, mercury, copper, lead and zinc salts (true poisons for enzymes) as well as other high-

concentration salts. For instance, the salting of meats and vegetables for their preservation serves to paralyze or slow down the enzymes that catalyze oxidation and putrefaction processes.

As regards the brewing of beer, the enzymes not only act in the fermentation process, but also in the two preceding stages of malting and mashing, as follows:

*1.* During barley's conversion into malt (*malting*), the enzyme contained in barley, diastase, is activated.

*2.* During mashing, diastase catalyzes the conversion of starch contained in barley[112] into fermentable sugars (maltose and glucose), according to the reaction:

starch + water + (diastase) → glucose + maltose

where the parenthesis indicates that diastase does not take part in the reaction directly, but acts through its presence;

*3.* During fermentation, the enzyme *zymase* contained in yeast catalyzes the conversion of maltose and glucose into ethyl alcohol (or ethanol), according to the reaction:

glucose and maltose + (zymase) → ethyl alcohol + carbon dioxide

[112]Barley's content in starch amounts to 55-72% of its weight.

The latter reaction, known as *alcoholic fermentation reaction*, is the only one that takes place in vinification, since the sugars contained in grapes are already fermentable. Moreover, grapes, unlike cereals, do not contain starch and, as their peel already contains the yeast (*zimase*) required for fermentation, there is generally no need to introduce additional yeast. For all these reasons, making wine is much simpler than brewing beer.

## Methods of brewing beer

As said in the beginning of this chapter, the methods for brewing beer have changed dramatically from the period considered in this book (1856-1857), when *Clifton Brewery* existed, to the present day. Over one hundred years ago, an Italian paper of New York, *L'Eco d'Italia* (1877, see bibl.), published the following description, referring to the *Clifton Brewery* founded by Antonio Meucci some twenty years before:

*"… Barley is steeped in order to make it germinate and to allow the sacchariferous principle to develop; it is exposed to a temperature of 60 degrees Centigrade to stunt the sprout and give it a bitter flavor and its color; it is then separated from the radicles by rubbing; it is ground and finally it is boiled in water. The resulting*

*liquid is immediately subjected to fermentation; hop flowers are added and a small amount of yeast is stirred in at 12 degrees* [*Centigrade*] *which triggers significant fermentation; the latter stops a few days later. After clarification and filtering, this liquid constitutes the so-called beer which contains 2 or 3 hundredths of alcohol and varying amounts of carbonic acid, a small quantity of acetic acid, sugar, dextrin, bitter and aromatic extracts, inorganic salts and plentiful vegetable-animal matter …"*

Although by and large the description given by the *L'Eco d'Italia* is correct, in practice - also in the nineteenth century - the brewing process was much more complex.

The first stage of the process, known as *malting*, whereby starch is converted into fermentable sugars, can be performed in outside firms, called *malt houses*. They sell malt to breweries, as well as bakeries, food industries and industries that produce other alcoholic beverages obtained by fermentation of cereals.

In order to obtain malt from barley, five steps are required, as shown in the diagram hereinafter:

*A) Cleaning.* It consists in freeing the barley of foreign weeds and impurities.

*B) Steeping.* It serves to imbibe barley with water in the amount of 50% of its weight, in order for it to swell; at the end of this step, which lasts some 3 days, it increases its volume by 40%. This step of the process was generally performed in large iron tanks some two meters tall or more.

*C) Germination.* Its purpose is to make the barley grains germinate, to obtain the germinated barley or *green malt*. This operation was performed in so-called *germinators*, i.e. in large closed areas with cement floors where imbibed barley was set in layers some 30 cm tall and left for 5 to 7 days. Since heat is generated in the course of germination, barley had to be manually winnowed so as to keep its temperature around 15 to 20 °C. Today, special rotating cylinders are used, or large kilns with a double bottom made of perforated plate, and mechanical mixers (Saladin-Müger system). The barley radicles (see the figure ahead) are already formed on the second day. This operation requires great cleanliness. Green malt contains diastase, that forms inside it during germination, to cause the subsequent saccharification of starch, which is essential to the nourishment of the sprout.

*D) Drying* and possibly *charring.* Its purpose is to stop the germination of green malt and bring its water content down to not more than 3%. On the other hand, prolonging germination could lead to unwanted

destruction of carbohydrates, which would be used up to feed the sprout. When the operation is completed (after about two days) crude dry malt is obtained.

Steps required to obtain dry malt (malting)

At the times considered in this book, dryers consisted of three large (ca. 10 sq. m) metal nets, arranged on three levels, on which green malt was placed. An ascending current of hot air was made to flow through them, and, as it was exhausted through a chimney placed in the center of the room's ceiling, the lower dryers were at a higher temperature than those at a higher level. For this reason, green malt was first taken to the top level net and arranged in a layer approximately 30 cm in height. Here it was left to dry, at a temperature of 45-50 °C, for about twenty-four hours, after which its moisture would drop to 22.5% approximately. Then, it was (manually or mechanically) transferred to the level below, where it was arranged in a layer some 20 cm in height. Here it underwent further drying, at a slightly higher temperature than before, for another twenty-two hours, and its moisture would drop to about 10%. Finally, it was transferred to the bottom level, arranged in a layer that was only 15 cm in height, and kept there for four-to-five hours at a temperature between 80 and 110 °C, bringing its moisture down to the desired value of 2-3%.

Grain of germinated barley. a) internal leaves b) external radicles

According to the temperature and duration of drying, different types of dry malt were obtained, i.e. yellow, golden, amber or brown. If the dry malt was charred at 150-200 °C, diastase was destroyed and the product, called *caramel malt*, of a brownish-black color, was used (mixed in a certain proportion with regular dry malt) only to give color to very dark beers.

*E) Screening.* The purpose of this operation is to eliminate barley radicles from dry malt. The radicles come off easily and can be used as fodder.

Let us now illustrate the process of brewing beer, assuming that dry malt is available from either external malthouses or internal malting facilities. The brewing process requires about twelve main operations (outlined in the block diagram ahead), that we shall briefly describe hereinafter.

*F) Grinding.* Dry malt (which should already have been cleaned in order to eliminate dust and other foreign matter) is first of all coarse-ground (today this is done with cylinder mills). The so-called *malt flour* thus obtained, is used in the subsequent stage G) of *worting*, which includes four different steps:

*$G^{1}$) Mashing and blending.* These are done in a large mix-

ing kiln[113], surmounted by a cowl for the steams, in which water is added to the malt flour in the proportion of 440 liters per quintal of malt flour. The mass is steam heated until it reaches a temperature of approximately 35-40 °C. This operation is known as *cooking* or *decoction*[114].The water used in this as well as in the previous brewing steps - and, as we have seen, water is required in large amounts - must be perfectly pure and soft, for such factors greatly influence the quality of the final product. In fact, many brewers indicate on the label of their beer that spring water was used for brewing. Once mashing is completed, one or more *blends* are made, which consist of removing a part of the mixture (generally one third), heating it in a special boiler (*blending boiler*) for some tens of minutes at 65-70 °C, then bringing it to boiling point for 10-30 minutes, and, finally, pouring it back into the original mixture in order to raise its temperature. Blends are repeated as many times as is required to raise the temperature of the mixture to 75 °C approximately. The purpose of boiling part of the product is to destroy a part of the saccharifying enzymes so as to obtain the desired ratio between fermentable carbohydrates (maltose, fructose and saccharose) and non-fermentable carbohydrates (dextrins and pentosans). The desired ratio depends on the type of beer to be produced. For instance, for lighter beers, such a ratio is 3:1 (75% against 25%), whereas for darker beers it is 3:2 (60% against 40%).

*G[2]) Filtering and decantation.* This operation is performed by sending the mash (partially converted into wort) into a copper decantation vat with large capacity (7-8 hl per quintal of processed malt) and a bottom with holes or slots to hold back the residues, that is to say those parts (some 37 kg per quintal of dry malt) that did not melt during the previous steps and that can be used as excellent fodder.

*G[3]) Boiling.* The filtered mash, to which the water used to clean the residues is added, is boiled at a temperature of 90-95 °C in a hemispherical copper boiler, of the bain-marie type. This boiler must have a capacity of some 3.2 hl per quintal of processed malt and must be equipped with a stirrer. At this point, a large portion of the starch contained in the malt is converted into fermentable sugars, thereby resulting in the so-called concen-

[113]There are kilns of various sizes, according to the production capabilities of the brewery. A typical kiln is 4 m in diameter and 1.50 m in height.

[114]This procedure is the most popular one. However, in Great Britain, instead of *decoction*, the *infusion* process is used, whereby malt flour is treated with water at 75-80 °C.

trated wort. Through boiling, the wort reaches the right concentration and, moreover, is sterilized. During boiling other cereals can be added, such as non-germinated barley.

*G[4]) Hopping*. Also this operation is performed in a copper boiler, in which hop is added in amounts varying between 200 and 500 grams per hectoliter of wort. Lupulin (a substance contained in hop) also causes the clarification of wort, as it coagulates the albuminoidal substances present in it, while the (soluble) bitterish and aromatic resins of hop give beer its characteristic flavor. This operation lasts between 1.5 and 2.5 hours. When completed, the following steps are performed:

*H) Filtering and hop separation*, which is performed in an ad-hoc small boiler;

*I) Refrigeration*, which is performed in two stages: the first, known as *cooling*, was conducted, at the time, in a rectangular shaped steel basin, 25 cm deep, with a slightly slanted bottom to facilitate discharge. In it, the temperature of the liquid spontaneously dropped from 90 °C to approximately 45 °C. The next step, the true *refrigeration*, was performed in a closed chamber, kept at +5 °C. Here the beer was sprinkled along horizontal refrigerating copper pipes (soldered along their generatrices, one above the other), inside which cold water or brine flowed. The wort - which now appears further clarified and concentrated by effect of evaporation - flowed down along the refrigerating pipes and was collected at the bottom to be sent to the fermentation chambers.

*L) Fermentation.* It is obtained by adding a pure culture of bottom yeast[115] to the wort in order to obtain the conversion of sugars into alcohol at a low temperature. During this stage, as occurs in the fermentation of wine must, a great deal of carbon dioxide is produced. There exist many processes whereby to obtain the fermentation of wort, for instance the *Nathan process*, conceived in such a way that beer never comes into contact with the air until its consumption. A description of the most common process, called the *regular process*, is contained hereinafter. Said process envisages three steps:

*L[1]) Main fermentation.* This stage is the longest and, at the time, it could last between 6 and 12 days. It consisted in placing the wort in large rectangular-shaped kilns (open or closed) made of either enameled cast-iron, stainless steel, aluminum or cement covered with ceramic tiles, in an environment with room temperature between 5 and 8 °C. These

[115]This type of yeast was used to brew lager beer (see glossary), the most demanded by the market.

kilns could have a large capacity (from 50 up to 5000 hl) and were fitted with either internal refrigeration coils made of tin-plated copper or cooling jacket. At the end of main fermentation, the yeast is collected and is reused in the next batch, as previously mentioned.

*L[2]) Secondary fermentation and aging.* These stages take place in refrigerating cellars where the temperature is kept between 0 and 3 °C. Beer is placed in barrels or in tanks made of cement or aluminum, closed and fitted with air valves so that part of the carbon dioxide produced remains dissolved in the beer. During aging, which lasts from a minimum of two weeks up to a maximum of eight months, further digestion of the proteins that have remained in the beer takes place, whereas the indigestible proteins are eliminated. Various nitrogenous substances are also present in beer which stabilize froth, but can coagulate with time, clouding the product. Therefore, in American breweries (seldom in Europe) various additives are used in order to stabilize foam and to maintain freshness. Such additives are banned by Italian laws.

*L[3]) Filtering of beer and separation of the yeast.* After secondary fermentation is completed, the resulting beer has to be cleared as much as possible of the yeast that is still present and is partly active. Part of the yeast, which settles on the bottom of the aging tanks, is eliminated by decantation, the rest by filtering. The beer must be filtered, not only to eliminate the living yeast, which would keep fermentation going, but also to obtain the desired clearness. To this purpose, press-filters with filtering elements made of cellulose, asbestos and diatomaceous earth are used. The yeast thus recovered, which contains approximately 45% of protein substances, constitutes another by-product of breweries, which is sold to food industries that produce so-called *vegetable meat extracts*. After filtering, beer goes on to the subsequent stage of:

*M) Bottling and pasteurization.* Beer is poured from the large tanks or barrels of secondary fermentation into stainless steel kegs[116] or bottles made of dark glass or, more recently, tin cans. During bottling, special care is taken to ensure that the carbon dioxide present in beer is maintained. This is usually achieved by working with counter-pressure. To preserve

[116]In the past, tarred barrels were used; the tarring of barrels was necessary to sterilize them completely and also to prevent beer from coming into contact with wood, thereby loosing carbon dioxide. A mixture of special odorless and flavorless resins (i.e. suited for aliments) was used in tarring.

beer in bottles or cans, pasteurization is performed in the final containers, heating them slowly, bain-marie, at about 60 °C. Pasteurization destroys the smallest residues of yeast which have not been blocked by filters and would keep fermentation going. On the contrary, beer destined for consumption, such as draft beer, must not be pasteurized but stored at a very low temperature, until consumption, so that the yeast residues are completely inactive.

Just to give an idea of what the state-of-the-art was some fifty years ago, we indicate some general data on the brewing of beer at the time, taken from Colombo's Handbook (see bibl.).

The yield of a malt house was roughly around 78-80 kg of malt per quintal of barley. Since with a quintal of malt some 550 liters of beer are produced, the final yield was around 450 liters of beer per quintal of barley[117].

Block diagram of brewing beer (excluding malting)

Average energy consumption per hectoliter of beer produced was: electric power, 5-6 kW; steam, 70-90 kg; refrigeration, 10,000 frigories[118].

The production capacity of breweries could range between 30,000 to 150,000 hl of beer a year (today over one million hectoliters/year are reached). Many factories operated as malt houses from October to February and as breweries from February to October of the following year, with daily production varying between 250 and 350 hl.

[117]Sometimes, rice was added to barley in the amount of 10% of its weight.

[118]*Frigories* are equivalent to *calories* of heat 'subtracted' from the substance in question.

## The evolution of beer in the United States

After the failure of the German independence riots of 1848, a wave of German immigration into the United States was registered just as had occurred with Italian immigration following the failure of the Italian independence revolts of the same period. Previously, British beer, such as ale and porter (see glossary), was produced or imported in the United States. Then, thanks to the immigrant German brewers, lager beer (see glossary) started being produced, the quality of which was far superior to the previous ones. It quickly became popular and determined a decline in consumption of other types of beer.

It seems that the first lager brewery in the United States was that founded by Johann Wagner in Philadelphia, in 1840. Always in Philadelphia, in 1845, *Engel & Wolf* started to build the first underground storehouses where lager was aged. In 1846, another famous

lager beer brewery was founded, that of Georg Manger. In 1848, the *F. & M. Schäfer* brewery was set up, immediately followed by other breweries in Cincinnati, OH, Milwaukee, WI, St. Louis, MO, as well as in any other areas, where a large German colony existed, serving as a start-up market. As said in the foregoing, in early 1856 (though H. McMillen and the Webbs Directory indicate 1851) Staten Island's first lager beer brewery was set up by Antonio Meucci. The number of breweries throughout the United States, grew from 431 in 1850 to 1269 in 1860, most of which (approximately 85%) were concentrated in New York State and in Pennsylvania, where German immigration was strong. In 1877, there were, in Philadelphia, several hundreds large breweries, whereas, in New York, there were some forty of them. However, the bulk of the United States' beer production ended up concentrating in Wisconsin, especially in Milwaukee and in nearby La Crosse. The breweries of these cities and those of Cincinnati used barley imported from Germany, deemed of higher quality than that grown inland, in order to produce a lager with quality as close as possible to that of imported lager. The situation today is changed, in that the United States produce excellent barley and even are the world's leading producer.

We also recall that the *Clifton Brewery*, founded in 1856 by Antonio Meucci in Clifton, Staten Island passed, in the years that followed, into the hands of several owners until, around 1867, it was taken over by two German brewers, David Mayer and Frederick Bachmann, who improved and expanded it considerably, winning first prize at the *Centennial Philadelphia Exposition* of 1876. Thereafter, their beer was known as *Centennial Lager Beer*. In that year, *Mayer & Bachmann's Clifton Brewery* produced 50,000 barrels[119] of beer a year, employing over one hundred people, working 15 hours a day with a salary between 45 and 65 dollars a month (equivalent, on average, to approximately $825 of 1990). The workers were authorized to drink as much beer as they liked, generally between 20 and 100 glasses a day. Here is how New York's *L'Eco d'Italia* spoke of it in 1877 (see bibl.): *"The ice-houses of this brewery are magnificent and contain an enormous number of barrels where beer is stored after having been strongly cooled by flowing along the external walls of copper pipes*

[119]A barrel of beer contained some 141 liters, that is to say 37 gallons (one gallon being equivalent to 3.79 liters).

*placed horizontally one over the other and cooled by an icy current. Clifton's beer is diaphanous, mildly golden and bitter, always cold and pleasantly frothy. Some twenty wagons distribute it every day throughout the island, New York, Brooklyn, Williamsburg, Jersey City and Hoboken …"*

The first lager beer shop in New York was opened by the Schäfers in 1848, in a tavern, on the corner of 7th Avenue and 17th Street. Immediately thereafter, a regular beer-house was opened on Broadway, close to Canal Street. From then on, New York's breweries spread like wildfire, so much so that even classy restaurants like Delmonico's were forced to include beer on their menu in addition to wine, owing to the great demand for it on the part of clients, regardless of social class. For the sake of comparison, it may be interesting to point out that, in Italy, Udine's *Birra Moretti* was founded in 1859 and, initially, it produced 900 hectoliters of beer a year.

Beer production in the United States has grown from some nine million barrels in 1877 to some 157 million barrels in 1977, which is equivalent to an average 10% annual rate[120]. As for beer consumption per capita, Germany ranks first in the world, with some 150 liters/year, followed by Belgium and Czechoslovakia, whereas the United States ranks fourteenth on the list, preceded by far by Great Britain.

## Varieties of beer and their characteristics

The characteristics of beer (flavor, alcoholic content, clearness, color and bouquet) vary considerably depending on the degree of malt charring, the quantity of water used in brewing, the wort's concentration, the adding of hop and other flavoring substances, the more or less content in *extract* (see glossary) and in other unfermented substances, as well as the ratio between fermented and unfermented carbohydrates. According to these characteristics, many types of beer are available on the market. Such a wide variety aims to satisfy the changing tastes of consumers in different countries as well as in different time periods.

Alcohol content in commercial beers - expressed as a percentage of alcohol, in terms of weight[121] - ranges between

[120]Over recent years the average growth has been of only 4.5%. Therefore, around the end of the past century, it must have been of even 15-20% per year.

[121]If alcohol content is expressed in % of volume, to get alcohol content in % of weight the former must be multiplied by 0.79 (the specific gravity of alcohol). In Italy, also for tax purposes, the strength of beer does not

1% of light beers and 8% of strong beers. Strong beers are obtained with highly concentrated worts. Light beer, made with light wort, acidifies quickly and therefore, today, there is very little demand for it. In hypo-alcoholic beers (like the Anglo-American *near beer*[122] or the German *nährbier*) alcohol content is below 1.5%, though its extract content is rather high. Instead, alcohol content in so-called *low-calorie beer* ranges between 2.5 and 2.7%, and its extract content is low as well.

Common beer contains between 3 and 4.5% of alcohol. In general, the lower the alcohol content the lower the dextrin content. The ratio between fermentable carbohydrates (maltose, fructose and saccharose) and non-fermentable carbohydrates (dextrins and pentosans) is around 3:1 in clear beers, such as *pale ale* (see glossary) and 3:2 in dark beers, such as *stout* (see glossary).

As was already mentioned, around the mid nineteenth century lager beer was introduced into the Unites States, which was initially produced by German immigrants. The term *lager beer* comes from the German word *lager* which means *storehouse*, hence *lager beer* means *beer aged in a storehouse*. Indeed, as was previously explained, the production of lager beer requires aging in cold containers (at about 0.5 °C), during winter, so as to be ready for consumption in spring. Lager beer is a light, averagely hopped beer. In the United States lager beer has an alcohol content of 3.3-3.4% and is highly carbonated. European lager beers, like Pilsner, have a higher alcohol content and are aged for a longer time.

Before lager beer was introduced, *ale* was the most popular beer in the United States. The term *ale* comes from Latin *alumen* (alum) which recalls its astringent flavor. The characteristics of ales are essentially determined by the type of yeast used which, instead of being active at low temperatures, is actually of the “medium” type, meaning that it becomes active at higher temperatures, thus causing wort to ferment faster. This gives ale a slightly higher alcohol content than lager and its characteristic sharp smell. Furthermore, ale is generally more hopped. The *pale ale* differs from ale only in that light malt is used in brewing and

refer to alcohol but to the percentage of extract present in wort (*primary extract*), even if it will be only partly converted into alcohol (typically, in the amount of 70%). Thus, in Italy, a 12° beer is obtained from a wort that has 12% in weight of extract, whereas its alcohol content can be, say, of 6% in volume or 4.7% in weight.

[122]*Near beer*, prepared with a particular process, appeared on the market in 1909. The term *near* is used in the Old English meaning of *frugal*.

coloring ingredients are omitted. Ever since the end of the nineteenth century there has been no demand for ale in the United States. English *bitter* is none other than a strongly hopped pale ale with an astringent flavor (which is not *bitter* at all, as the name *bitter* might suggest). The bitter flavor of this beer is similar to that of Italian herbal liquors, called *amari* (meaning *bitter*) certainly not because they have a bitter flavor.

Very dark ale, like English *stout*, is prepared with a mixture of regular malt and charred malt and is strongly hopped. It is a full-bodied beer, with a strong bitter taste of malt and hop.

*Porter* is another type of dark and strong beer (with 6-7% alcohol content) which differs from *stout* because it is sweet rather than bitter. It was originally obtained by mixing ale and regular beer. The name *porter* comes from the abbreviation of *porter's beer*.

One type of dark beer, of which there is a significant production in the United States, is *bock beer*, a beer that can be drunk already in early Spring (thus with less aging), which is stronger and richer in flavor than lager. This beer is of German origin and its name comes from the contraction of the German *Einbecker bier*, which means beer from *Einbeck*, a city in Germany.

Finally, it is worth mentioning a type of beer called *malt liquor*, that it is obtained from a wort with a high concentration of fermentable carbohydrates derived from malt (hence its name). It has a fruity and spicy flavor and its alcohol content ranges between 5 and 9%.

## Glossary

*Alcoholic fermentation* - Process whereby sugars are converted into alcohol, in the course of which carbon dioxide is produced. The term fermentation comes from Latin *fervere* (to boil), which indicates the effervescence entailed in the generation of carbon dioxide.

*Ale* - A beer that was very popular in the United States before the mid-nineteenth century. It is more alcoholic and hopped than lager and is made with rapid fermentation yeasts (active at medium temperatures).

*Amylase* - The enzyme that, through hydrolysis, favors the breakdown of starch into shorter-chain polymers, such as dextrins and maltose (see).

*Beer* - The words *bier* (in German), *beer* (in English), *bière* (in French) and *birra* (in Italian) all derive from the Celtic (Northern Gaul) word *beor*, which is similar to the Old High German term *bior*. According to the *Grimm* brothers, these words, in turn, stem from the term *brior* (what has been brewed), which comes from the Old High German verb *briuvan* (brewing).

*Bitter* - It is an English ale which is clear (pale ale), strongly hopped, and characterized by a bitter taste of herbal liquor.

*Blends* - Repeated steps whereby part of the wort is removed, boiled in a separate boiler for a few hours and poured back into the original wort.

*Bock* - Dark-brown beer, moderately aged, with a stronger and fuller taste than lager. It stems from the ancient *Einbecker bier*, popular in Germany ever since the Middle Ages.

*Carbohydrates* - Organic compounds with general formula $C_n(H_2O)_m$, which contain n atoms of carbon and m molecules of water, hence the name carbohydrates. They include sugars, starches and celluloses.

*Catalyst* - A substance that triggers a chemical reaction without being directly involved in it. A catalyst acts by virtue of its presence.

*Dextrins* - Polysaccharides obtained from hydrolysis of starch, mainly used in adhesives and thickeners.

*Diastase* - Mixture of two enzymes contained in malt: amylase and maltase (see).

*Dry malt* - Green malt that has been dried. If it is also charred, it becomes *caramel malt.*

*Enzyme* (or *soluble ferment*) - Organic catalyst that accelerates specific biochemical reactions which would otherwise be too slow or impossible in ordinary environment. All enzymes are proteins.

*Extract* - It consists of all the fermentable carbohydrates contained in wort or beer, namely glucose and maltose (thus it does not include starches and dextrins). Only about 70% of the extract contained in wort actually ferments; the remaining 30% remains unchanged and represents the *extract* present in beer.

*Ferment* or *leaven* or *yeast* - The words *ferment*, *leaven* (from Latin *levitum*) and *yeast* are synonyms. However, *ferment* highlights the fermentation (boiling), as that of wort; *leaven* highlights the rising (leavening), as in dough; *yeast* highlights the froth, and is particularly suited when talking of beer. Ferments or leavens or yeasts are micro-organisms that belong to the class of *ascomycetes* (fungi), inside which the enzymes are contained.

*Green malt* - Germinated cereal (that has not yet been dried).

*Hydrolysis* - The breakdown of molecules of organic compounds, by reaction with water.

*Infusion* - The solution of a substance (such as malt) in water or other agent, also at a warm temperature, where it is left for hours or days with the purpose to extract its nutritional or useful principles, like in medicaments.

*Lager beer* - Beer that is obtained by moderate fermentation at a low temperature but is left to age in refrigerated storehouses over long periods of time. It is a light beer with alcohol content at 3.3 - 3.4% (or higher, in European brands), averagely hopped and highly carbonized.

*Leaven* - see *Ferment*

*Low-calorie beer* or *light beer* - Beer with alcohol content at 2.5-2.7%, with moderate extract content.

*Malt* - From German *Malz*, a term that indicates 'germinated barley,' to be used in brewing.

*Malt flour* - Ground malt.

*Malt liquor* - Unhopped beer, with alcohol content ranging between 5% and 9%, made from wort containing a high percentage of fermentable carbohydrates. It has a fruity and spicy flavor.

*Maltase* - Enzyme that favors the conversion of maltose into glucose.

*Maltose* - Carbohydrate comprised of two molecules of glucose.

*Mash* - Crushed malt steeped and stirred in hot water to ferment.

*Mead* - Ancient beverage made from honey fermented in water, to which fruit and spices were sometimes added. The Teutons let Indian corn and honey ferment in water and called it *the drink of the gods*. In pre-Roman times, the Welsh drank a similar beverage, which was very spicy and was called *metheglyn*.

*Near beer* - Hypo-alcoholic beer (with alcohol content less than 1.5%) with a rather high extract content.

*Pale ale* - Clear ale made with light malts, omitting the ingredients that give color.

*Pentosans* - Polysaccharides contained in cellulose of plants.

*pH* - The pH of a watery solution is a number that expresses the degree of acidity or alkalinity of the solution. pH = 0 corresponds to maximum acidity; pH = 7 corresponds to a neutral solution, while pH = 14 corresponds to maximum alkalinity.
*Porter* - (English) ale, dark and strong, with 6-7% alcohol content, but rather sweet. The name comes from the fact that it was very popular among porters.
*Stout* - (English) ale, very dark, with a strong bitter taste of malt and hop.
*Wort* - An infusion of malt, ready for alcoholic fermentation, from the moment it is placed in the fermentation kiln to the moment in which fermentation is over and the alcoholic liquid is taken out of the kiln.
*Yeast* - see *Ferment*.
*Zymase* - An enzyme which favors the breakdown of glucose into ethyl alcohol (ethanol) and carbon dioxide.

## Chronology

c20th C. BC - The Bible mentions the first form of fermentation of grape juice whereby wine is obtained
c7000 BC - A tablet with cuneiform characters, discovered in Mesopotamia, contains the recipe of a *wheat wine* obtained through the fermentation of wheat that is ground and mixed with abundant water
c3500 BC - Epoch of the most ancient traces of leavened bread, discovered in Egypt
c3000 BC - The Egyptians and the Sumerians make beer with germinated barley and then pass this art on to the Greeks who had used ungerminated barley
1st millennium BC - An alcoholic beverage known as *mead* is widespread among the populations of Thrace, Scythia, Friesland (Belgium) and Germany. It was obtained through the fermentation of a mixture of water and honey of wild bees. The Greeks and the Romans add fruit and spices to enhance its flavor, yet they prefer wine.
c50 BC - The Teutons prepare mead through fermentation of Indian corn and honey, dissolved in water. They call it the *drink of gods.* The Romans call it *the drink of barbarians*. This beverage will remain very popular until about the 16th C., when honey was replaced by sugar in food consumption
First centuries AD - The Welsh drink a very strong and spicy mead which they call *metheglyn*
eighth-ninth C. - With the Arab invasions, the art of brewing spreads from the Middle East to Spain and then to Gaul
736 - The first hop crop appears in Bavaria
ninth C. - In the monasteries of Northern Gaul (currently the Belgian Flanders region) monks make beer from malt
c850 - A popular belief attributes the invention of beer to a legendary Flemish King called Gambrinus who allegedly lived at the time of Charlemagne and who will be considered the symbol and patron of brewers
890 - In the monastery of St. Gallen in Switzerland monks make beer using, among other things, a cam operated by a hydraulic wheel
c1000 - Flemish monks begin to use hop as a flavoring and preservative ingredient in beer
1143 - The first small brewery is founded in Weihenstephan, north of Munich, which still exists today
twelfth and thirteenth C. - Larger private breweries spread in the towns, mainly in the North of Germany, especially in Saxony and in Thuringia
fourteenth C. - In Northern Germany, beer, up until then produced from germinated wheat, flavored with rosemary of the marshes (*Ledum palustre*), then with hops, is replaced by barley beer. Its production, however, is mainly domestic
End fourteenth C. - The Incas, after the expansion of their empire, grow Indian corn with which they prepare a type of beer called *chicha* which is served mainly during ceremonies

sixteenth C. - According to historical documents, renowned beers, during the Middle Ages, are the ones from Erfurt, Einbeck, Zerbst, Naumburg and Braunschweig. The *Einbecker bier* will become famous in the United States with the name of *bock beer*. The first Bavarian breweries are set up in convents

1590 ÷ 1610 - The first rudimentary microscopes are created

1595 - Andreas Libavius proposes a first rudimentary theory of fermentation

1618 ÷ 1848 - During the Thirty Years' War European supremacy in beer production passes from Northern Germany to Bavaria

1650 - In London the yeast collected during previous wort fermentation is gathered and used in a subsequent batch

1669 - Johann Joachim Becher states that fermentation must be distinguished from putrefaction

1675 - The Florentine Francesco Redi demonstrates that in the putrefaction of meat worms do not form if one ensures that once the meat is sterilized it does not come into contact with insects

1683 - The Dutch Antoni van Leeuwenhoek notifies the Royal Society that he has observed unicellular organisms (protozoa) through microscopes perfected by himself

1697 - Georg Ernst Stahl publishes his book "Zymotechnica Fundamentalis" in which he defines fermentation as the decomposition of fermentable matter

1765 - The Italian Biologist Lazzaro Spallanzani demonstrates the analogy between the action of ferments and that of gastric juice in decomposition of meat

1787 - The French chemist Antoine Laurent Lavoisier conducts the first research on alcoholic fermentation

1798 - Paris' *Académie des Sciences* announces a contest to award anyone who can clarify the differences between fermenting and fermented substances

1810 - Joseph Louis Gay-Lussac discovers the chemical law according to which sugars are converted into alcohol and carbon dioxide, but wrongly indicates oxygen as the catalyst

1823 - The grocer Matthias Archibald Robinson from London obtains a patent for a beverage similar to beer which he calls barley water

1830 - Dubrufani extracts from germinated barley (malt) a substance that hydrolyzes starch

1833 - The French chemist Anselme Payen discovers that the substance isolated by Dubrufani is diastase and that thanks to it the starch of barley is converted into fermentable sugars

1837 - Jöns Jakob Berzelius hypothesizes that ferments act only by virtue of their presence, thereby introducing the concept of catalyst

1840 - The German Johann Wagner sets up the first lager brewery in the United States in Philadelphia

1845 - *Engel & Wolf* builds the first cellars for aging lager beer in Philadelphia, PA

1846 - Another famous lager beer brewery is founded (in Philadelphia?), that of Georg Manger

1848 - Following the failure of Germany's independence revolts, strong German immigration into the United States is registered. The *F. & M. Schäfer* brewery is founded in New York, immediately followed by other breweries in Cincinnati, OH, Milwaukee, WI, St. Louis, MO

1848 - In New York the Schäfers open the first lager beer shop in a tavern on the corner of 7th Avenue and 17th Street. Immediately thereafter, a regular beer-house is opened on Broadway, close to Canal Street

1850 - There are 431 breweries in the United States

1850 - Louis Pasteur demonstrates that fermentation and putrefaction are caused by living micro-organisms that grow and proliferate (vitalistic theory)

1856 - The Italian Antonio Meucci sets up the first lager beer brewery on Staten Island, which is called *Clifton Brewery*

1857, 12 June - Baron Charles Cagniard de la Tour presents a study on fermentation, supporting the vitalistic theory on ferments. His views are shared by Schwann and Kuetzing, but refuted by Berzelius, Noehler, Berthelot and Justus von Liebig in particular

1860 - Breweries in the United States rise to 1269; their number has grown almost threefold in ten years. Some 85% of them are concentrated in the States of New York and Pennsylvania

1862 - Louis Pasteur discovers the so-called pasteurization of beverages, consisting in heating them over 57.2 °C in order to destroy or stunt the growth of the harmful micro-organisms

1867 - *Clifton Brewery* is taken over by two German brewers, David Mayer and Frederick Bachmann, who improve and enlarge it

1871 - The German chemist Justus von Liebig hypothesizes that leaven is a nitrogenous compound in a state of constant decomposition and agitation and that, therefore, it decomposes sugars by multiple collisions, similarly to the decomposition of explosives (*mechanistic* theory)

1876 - Louis Pasteur publishes his fundamental work "Études sur la bière" demonstrating, what is more, the need for yeast to be pure in order to guarantee good fermentation as well as to avoid the contamination induced by foreign micro-organisms

1876 - The beer produced by *Mayer & Bachmann* wins first prize at the *Centennial Philadelphia Exposition* and is thus called *Centennial Lager Beer*. At the time, the *Mayer & Bachmann Clifton Brewery* produced 50,000 barrels of beer a year, employing more than one hundred workers

1877 - New York City alone accounts for some forty large breweries, but in Philadelphia there are several hundreds. The bulk of beer production moves to Wisconsin, primarily concentrating in Milwaukee and La-Crosse

1877 - The yearly production of beer in the United States amounts to some nine million barrels, while the population amounts to fifty million, approximately. Therefore, average annual consumption of beer is of about twenty-five liters per capita, without considering imported beer

1878 - The word enzyme is coined (from the Greek εν ζυμε= in leaven), when it is still believed that the enzymes of leaven can operate only inside living cells

1889 - In Copenhagen, E.C. Hansen applies to yeast the method of pure culture, previously introduced by Robert Koch in medicine

1889 - The Swedish chemist Svante Arrhenius discovers the law of catalysis for inorganic catalysts, introducing the concept of *activation energy* or *energy barrier* of a given chemical reaction (Arrhenius' law). Some years later, the German biologist Peter Michaelis demonstrates that Arrhenius' law also applies to enzymes (the law of Michaelis-Menton)

1894 - The German chemist Emil Hermann Fischer (Nobel prize for chemistry in 1902) highlights the importance of spatial configuration of the molecule of an enzyme against that of the substance on which it acts

1897 - The Bavarian chemist Eduard Buchner demonstrates that, after extracting some enzymes from yeast, they can still catalyze the conversion of sugar into alcohol and that, therefore, neither Pasteur's vitalistic theory nor Liebig's mechanistic one were correct. For such research, Buchner obtains the Nobel prize in 1907

1904 - An English biochemist, sir Arthur Harden, together with William J. Young, clarifies the process of alcoholic fermentation, discovering the responsible enzyme, *zymase*, as well as its co-enzyme, *co-zymase*. For this research, sir Arthur Harden will receive the Nobel prize for chemistry in 1929

1909 - *Near beer*, with only 1.5% alcohol content, but with a large content of extract is introduced on the market

1926 - The American biochemist James B. Sumner succeeds in isolating an enzyme, *urease*, in the crystalline form, and demonstrates by extrapolation that all enzymes are proteins

1977 - Beer production in the United States amounts to approximately 157 million barrels, while the population amounts to over 200 million. Therefore, their average annual consumption rises to over 100 liters per person, without considering imported beer

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## OILS AND VARNISHES

### Preliminary remarks

Antonio Meucci used vegetable and mineral oils as vehicles for varnishes, receiving two patents from the US Patent Office, and as fuels for lamps, receiving a patent for a method whereby to make such oils burn without generating smoke, thereby not requiring to be fitted with the classic glass tube. For these reasons, we have deemed it useful to include a few basic notions on this subject, also providing some historical background.

We will first of all deal with animal and vegetable oils since, from a historical point of view, they were the first ones to be used by man. They were followed by mineral oils, starting from the early seventeenth century.

However, it is worth highlighting that so-called mineral oils (which also have remote vegetable origins) were initially obtained from the carbonization and distillation of wood and coal. Only starting from the last decades of the past century did they begin to be obtained from the distillation of petroleum. Therefore, we will also present some general information on coal and petroleum before discussing their distillation.

### Animal and vegetable oils

*— Historical notes*

In the past, solid fats (at room temperature) were simply called *fats*, whereas liquid fats (at room temperature) were called *oils*. Today, in chemistry, the word *fats* embraces both, whereas the term *oils* is used for the derivatives of petroleum. However, in everyday language, the old terms are used, and, as far as oils are concerned, the terms of animal, vegetable or mineral oils are used, depending on their origin.

In ancient times, vegetable oils were used for lighting, as well as for food and as ointments for the body. In particular, sesame, castor and linseed oils, obtained by pressing the seeds with stone-wheel mills, were employed in ancient Egypt many centuries before olive oil began to be used in the Mediterranean. Around the twelfth century, vegetable oils (especially linseed oil) began to be used also as drying oils for paints and varnishes. In 1752, the cylinder crusher for pressing oil-seeds was invented by J. S. Meaton and it gradually replaced stone-wheel mills in that job. In 1795, the invention of the hydraulic press by Joseph Bramah allowed the oil-seeds pressing much more effectively and thoroughly. Moreover, in the same year, in Birmingham,

England, a certain Jesse introduced the use of solvents (e.g. carbon sulfide) for the extraction of oil from oil-seed husks.

As extensively described in the chapter "The stearic industry," between the years 1810 and 1830, important discoveries were made on the chemical composition of fats and their processing, thanks to research conducted in France, principally by Chevreul, Gay Lussac and De Milly.

A few unconventional applications of oils were made in the following decades. In 1849, by treating unbleached cotton with a mixture (that could be colored, as required) of cooked linseed oil and turpentine, the Americans J.R. and C.P. Crockett from Newark, NJ, obtained a product very similar to leather. In 1860, the English Frederick Walton elaborated a process whereby to obtain *linoleum* (a word coined by him) from linseed oil, by pouring a mixture of cork powder, oxidized linseed oil and resin over a linen cloth base. Linoleum was the first example of flooring made with artificial materials and was very successful.

Finally, in 1903, the process of catalytic hydrogenation of fats was patented by the English William Norman, who exploited the previous discoveries made in 1897 by the French Paul Sabatier and Jean Baptiste Senderens. This process made it possible to use large amounts of second-rate oils for a wide range of uses and stimulated the development of hydrogenation processes of other substances, such as coal, gasoline, benzene, phenol, naphthalene, etc.

— *Characteristics of animal and vegetable oils*

All animal and vegetable fats consist of mixtures of glycerin esters of various types of fatty acids, which can be *saturated fatty acids* (such as butyric, caproic, lauric, myristic, palmitic, and stearic acid), as well as *unsaturated fatty acids* (such as linoleic, linolenic, oleic acid). Since all fats are made up of three molecules of a fatty acid and one molecule of glycerin (which is a trivalent alcohol) they are also called *triglycerides*, as, for instance, glycerin tripalmitate, glycerin tristearate, glycerin trioleate, and so on. Unsaturated fatty acids have a lower melting point and are thus the main constituents of oils. At the same time, as they can be more easily oxidized, they are more liable to turn rancid. Hydrogenation of these latter avoids this inconvenience and is therefore frequently employed.

Fats can be extracted from animals or vegetables in four ways: by melting, if they are solid fats, by pressing (as for soy, peanuts, coconut, linen

etc.), by steam distillation, or by chemical processing, using solvents, this latter method being often combined with (or replacing) pressing. It is worth noting that, as solvents are volatile, they can be easily recovered and recycled. After extraction, oils can be submitted to further processing, such as refining (with soda or caustic soda), bleaching, hydrogenation, etc.

Vegetable oils can be obtained from herbaceous plants or trees. As regards the former, the most important ones used today are sesame, linseed, soy, sunflower, peanut, rape, safflower, cotton, corn, hemp and jojoba oils. Among the oils obtained from plants are castor, coconut, palm, palm nut, olive and walnut oils. Of these latter, tropical vegetable oils like palm, palm nut and coconut oils (see hereinafter) are rich in saturated fats, unlike all other vegetable oils.

In the following, we will briefly touch upon the oil types which are used as either drying oils, or vehicles for varnishes, or for the production of resins and plastics, neglecting the oils almost exclusively used in food, as they are uninteresting for this book.

— *Fish oils*

They are obtained from fish scraps (herring, sardines, salmon, mullet, tuna fish, etc.), by melting them with water or steam. All of them are usually hydrogenated. Whale oil (which, in point of fact, cannot be classified as a fish oil) is used as foodstuff and to make soap. Also interesting is spermaceti[123], a liquid of the cephalic and dorsal cavities of the sperm whale, which solidifies in the presence of air; it can be used as an excellent raw material in candle manufacturing instead of, or mixed with, tallow.

— *Olive oil*

It is obtained from the fruit of the olive tree, which contains an average 25-30% of oil and 30-55% of water, called *vegetation water.* Olives are gathered still unripe, then crushed into a paste, which is placed in sacks wherein it is pressed repeatedly. The oil that drips from the presses is left to stand, to be separated from the vegetation water, and is then clarified and washed. More oil is then extracted from the olive husks remained from pressing, by means of solvents (such as carbon sulfide); this oil, however, is generally used in the production of soaps.

— *Cotton oil*

Cotton seeds, which are left over after the cellulose filaments (to be used in the textile and paper industries) are ex-

[123]Owing to its chemical structure (cetyl ester of palmitic acid), spermaceti should be considered a wax rather than a fat.

tracted, contain oil in the amount of 17-23% of their weight. They are dried, peeled and ground. The flour obtained is then heated to 100 °C and pressed. The crude oil that is thus obtained is purified with caustic soda or with sulfuric acid or milk of lime.

— *Linseed oil*

Linen seeds contain oil in the amount of 36-43% of their weight. Linseed oil is extremely fluid, thanks to its unsaturated fatty acid content, and is thus highly suitable as a drying oil and as vehicle for varnishes (see hereinafter), as well as for the production of linoleum.

— *Other vegetable oils*

Although they are not relevant to the subjects dealt with in this chapter, it is worth mentioning some of them, for their general importance. Soy oil ranks first in world production of natural oils. It is used as foodstuff and in the production of paints, of printing inks, as well as of resins and plastics. Peanut oil ranks second on the world level after soy oil and is mainly used as foodstuff. Coconut oil (extracted from the fresh pulp of coconuts), copra oil (extracted from the dry pulp of coconuts), palm oil (extracted from the pulp of African oil palm) and palm-kernel oil (extracted from the seeds of oil palms), are used as foodstuffs, and also for the production of soaps and other detergents.

## Coal and coke

When speaking of coal, it is necessary to distinguish if we refer to charcoal or to coal proper. The latter is a natural product of mineral origin, although it was produced from vegetable residues which, in a distant past, experienced profound transformations on account of particular conditions of pressure, temperature and other factors. The formation of carboniferous terrains and rocks took place over an extensive period of time which goes back from 3 million to 500 million years ago. The most ancient coals, which formed in the Paleozoic Era (see glossary) and are found in so-called primary terrains, are lithanthraxes and anthracites. They are also the most important for the industry. Lignites are found in less ancient terrains, known as tertiary terrains, and, finally, peat is present in terrains of more recent origin, known as quaternary terrains.

Charcoal, instead, is an artificial product, for it is obtained by means of a chemical transformation triggered by man, namely the carbonization of wood. Thus, it comes from a veritable vegetable substance. Carbonization consists in

heating wood at a high temperature in the absence of air and dates back to very ancient times. It is performed in the same way still today, that is to say by heaping wood in piles which are then covered with earth. Holes are made in the earth in order to allow the passage of air, which is necessary to trigger combustion. Once combustion begins, the holes are closed. With this process, on average one obtains, for each quintal of dry wood, 48 kg of charcoal, 37 kg of water, 9 kg of tar and 6 kg (equivalent to some 11,500 liters) of gas. Charcoal consists almost entirely of carbon, in the amount of 90%, which is about twice the amount contained in non-carbonized wood. Instead, average carbon content in (non carbonized) coals amounts, on average, to 60% in the case of peat, 67% in lignites, 82% in lithanthraxes and 95% in anthracites.

Coal, in addition to wood, can be carbonized, by heating it in the absence of air (between 900 °C and 1200 °C, depending on its utilization) with a process that is similar to that of charcoal. The coal thus obtained is called *coke*. In addition to coke the following products are obtained:

- non-condensable gases, which were once used to obtain so-called illuminating gas;
- condensable vapors which, after cooling, yield so-called *ammonia liquors*, from which ammonia and coal tar (sometimes simply called tar) are extracted. In turn, a great deal of products of industrial and commercial importance are extracted from the latter, as we shall see later on.

The carbonization of coal is basically performed on lithanthraxes. The coke produced, if free of humidity and ashes, contains 95% of carbon, on the average.

Coke was obtained for the first time in 1611 by an English iron maker, Simon Sturtevant. In the beginning, the vapors (condensable and not) that were produced together with coke were not utilized for industrial purposes, coke being only exploited as a solid fuel. It started to be employed as a reducer in the iron and steel industry, in England, more than a century later, precisely in 1735, Germany only following in 1765. This does not mean that the usefulness of coal as a reducer in the iron and steel industry was not known prior to those dates. Indeed, ever since 1709, another English, Abraham Darby, used coal (not coke) in his blast furnace to produce iron. Only in the nineteenth century, with the development of the iron and steel industry, did the use of coke in blast furnaces spread progressively, though it was obtained with about the same process as in charcoal kilns.

In the first decades of the nineteenth century, coal kilns started being replaced by brick furnaces, but still without any means to reuse the gases produced, not even to refuel the process. As of 1860 (when almost half the iron was still produced with charcoal) furnaces with refractory chambers began to be used, whose walls were heated through the combustion of gases produced in the process. This way, the coke yield, which was of 50-60% of coal (lithantrax) used, grew to 70-80%. In 1861, the open-hearth blast furnace was developed by Sir William Siemens, who was running the English branch of the Siemens company, and his brother Friedrich. Said furnace was the basis of the renowned Siemens-Martin process, extensively used in the glass and steel industries. Further improvements in the construction of metallurgical coke furnaces allowed to considerably reduce the consumption of gas required to heat them, to the extent that 50-60% of the gas produced could be sold as illuminating gas. Thus, it was the metallurgical coke industry (often located in the vicinity of iron and steel plants) that boosted improvements in coke manufacturing techniques.

As for the by-products of coke manufacturing, namely gas and coal tar (besides ammonia, which is extracted from ammonia liquors), we already mentioned the use of gas for lighting purposes (Clayton, 1691, Minkelers, 1785, Murdock, 1792 and 1807) in the Appendix “Artificial lighting.” As for coal tar, although it had already been obtained in England just before 1681, it was only in the early nineteenth century, after gas began to be used for lighting, that one began to look into the possible industrial uses of this other by-product of coke, namely coal tar. During the late nineteenth century, after a number of cooking ovens were developed in Germany (among them the Hoffmann furnace), a huge amount of coal tar was placed on the market, further stimulating its uses.

## Oils distilled from coal tar

The German baron Karl von Reichenbach, a philosopher and industrial entrepreneur (the same who obtained solid paraffin wax from petroleum, in 1830) is credited to have extracted creosote from the distillation of either coal tar or hard-wood tar, in 1833. Creosote was widely used as a preservative for wood, in particular for telephone poles and railroad crossties. In 1847, Auguste Laurent obtained phenol (or carbolic acid) always from the distillation of coal tar. Phenol was then used to produce plastics and dyes in par-

ticular. In 1856, Sir William Perkin discovered the first dye derived from coal tar. Lastly, in 1909, the first synthetic plastic, denominated *Bakelite*, was obtained, always from coal tar.

Coal tar is obtained, as was said, from the carbonization and subsequent distillation of coal, in the amount of 2.5-5% of the weight of the coal employed. Approximately half the weight of the coal tar consists of volatile components, which can therefore be fractionated by distillation. The other half constitutes the solid residue, called coal-tar pitch. The four fractions that are obtained from the distillation of crude tar are:

- *light oils*, with boiling point below about 200 °C. They include benzene, toluol, xylol;
- *medium oils*, with boiling point between 200 °C and 250 °C. They include kerosene, naphthalenes and paraffins;
- *heavy oils*, with boiling point between 250 °C and 300 °C. They include paraffins, creosotes;
- *anthracene oils*, with boiling point between 300 °C and 350 °C. They include anthracene, paraffins and phenanthrene.

As for coal-tar pitch, it was of great importance in ship building up until the past century, for it was used to caulk wooden ship hulls, being insoluble in water. The production of pitch, mostly obtained from the carbonization of pine wood, represented one of the first industries of the European colonies in America. Today, tar, pitch and asphalt are mainly used for waterproofing roofs and cellars, paving roads, preserving wood.

Among the products of coal-tar distillation, it is worth mentioning paraffin and kerosene, owing to their relevance to the topics dealt with in this book. Antonio Meucci's Memorandum Book also mentions peat oil, evidently obtained through the carbonization of peat and distillation of peat-tar.

— *Paraffin*

Paraffin is a mixture of solid saturated hydrocarbons (see glossary) with polymerization level above 17. It can be obtained by distillation of paraffinic oils, mentioned previously, which, in turn, are obtained from the distillation of either coal tar, or petroleum, as we shall see later, or, through solvents, from certain mineral waxes like montan wax.

Paraffin (sometimes called artificial wax), is the most widely used wax, although it is often mixed with various products to increase its hardness and/or improve its appearance. Hard paraffins, which are available in cakes, are used (mixed with stearin) in the production of candles. Soft, or microcrystalline, paraffins also

exist, with melting point below 70 °C.

— *Kerosene*

Kerosene (also known as *paraffin oil* or *coal oil*) was obtained for the first time in 1850 by James Young, who patented a process whereby to extract it from coal tar through fractional distillation (at temperatures between 175 °C and 275 °C). Young himself launched its industrial production five years later. Young's process, however, was overtaken, in a few decades, by others, based on the fractional distillation of petroleum, which yielded kerosene as the intermediate product between gasoline and diesel oil.

Kerosene was originally used as a fuel for lamps. Today, it is mainly used for home heating and, duly purified, as fuel for gas turbines of jet airplanes. It is also used as a solvent and thinner for paints and varnishes.

It is worth noting that, as kerosene has a rather high boiling point, in order to obtain good combustion it is necessary to take measures (such as pumping), at room temperature, to favor its evaporation.

Many inventions were introduced which aimed to improve the combustion of kerosene used for lighting. For instance, it is worth mentioning the "double burner lamp," introduced by the English James and Joseph Hinks in 1865.

## Oils distilled from petroleum

The word *petroleum* comes from Latin and it means *rock oil*. In fact, it is found in the sedimentary rocks of the earth's crust. Although it can exist under various physical states, it generally appears as a greenish oily liquid, consisting of a mixture of liquid and gaseous hydrocarbons, in addition to various impurities. The product as it is extracted from the earth is called crude oil.

Although petroleum was known ever since ancient times, when it could be found at the surface of the earth in natural ponds, it started being used for practical purposes only around the mid-nineteenth century. More precisely, it started being distilled after 1850 (when it was still obtained from natural ponds) in order to separate its medium-boiling fraction, to be sold as a mineral fuel oil (kerosene) in competition with kerosene obtained through distillation of coal according to the Young's process. At that time, the heavy fractions of petroleum distillation were burned in order to heat the distillation boilers, whereas the light fractions (among them, gasoline) were dispersed, as they were deemed too dangerous. Incredible as it may be, this state of affairs persisted until 1880.

As of the end of 1859, the use of petroleum was given a remarkable boost, after the American Edwin L. Drake decided (amid general disbelief) to start drilling in Titusville, PA, with the intention of finding oil *mineral* deposits. On 27 August 1859, he found a deposit twenty-one meters underground, from which a jet of oil spurted out, yielding four tons of crude oil a day. Systematic drilling ensued thanks to which, some decades later, the precious fluid was widely available on the market for all industrial purposes.

The products obtained from the distillation of crude oil can be grouped into fractions as follows:

- *natural gases*, which include various gaseous hydrocarbons, methane being the major component;
- *light oils*, with boiling point below 200 °C approximately;
- *lamp oils*, with boiling point between 180 °C and 280 °C;
- *medium oils*, with boiling point between 250 °C and 350 °C;
- *heavy oils* and *residues*, with boiling point above 350 °C.

Each of these fractions supplies, in turn, more specific products, such as gasolines, from light oils, fuel petroleum and kerosene from lamp oils, diesel oil from medium oils, lubricating oils, petroleum jellies (Vaseline) and waxes (paraffins) from heavy oils, and, lastly, bitumens (see glossary) from residues. As is common knowledge, from the commercial point of view, light oils and natural gases are exceedingly important with respect to the other products. Many of the aforementioned oils have replaced similar oils which were once obtained from coal tar.

It is worth noting that, although petroleum extraction originated in 1859, the sophisticated processes that made it possible to obtain most modern synthetic materials from petroleum were only developed after World War II.

## Paints, varnishes and lacquers

Paints are substances, generally liquid, which are applied over the surface of other bodies for decorative and/or protective purposes. They essentially consist of a liquid base, called vehicle or binder, and a solid powdered ingredient, which provides the color, called pigment. Depending on whether the vehicle is oil, water, milk of lime or a glue solution, we have oil paints, fresco paints[124], lime paints or glue paints. When the pigment is very finely dispersed, we have the

[124]Fresco paints are generally intended as the paints that are applied on *fresh* plaster.

so-called enamel varnishes[125], which give particularly smooth and shiny surfaces. Varnishes proper differ from paints in that they are essentially transparent. When they are not (pigmented varnishes) they can be called paints as well.

Paint is applied over the surface to be treated in the liquid form. It then solidifies into a thin film, which is resistant and is not sticky, following the evaporation of the volatile fraction of the paint itself and/or on account of chemical reactions between the paint and the substrate.

As is common knowledge, ever since pre-history, man has used paints primarily for decorative purposes. Only later was the protective function of paints or varnishes discovered and appreciated, especially for the house building. Egg whites, milk rennet, pitch and the exudative humors of plants, were used as binders, while chalk, colored earths, charcoal, ashes and vegetable dyes were used as pigments.

— *Varnishes*

Varnishes proper can simply consist of drying oils, more or less oxidized and polymerized (oil varnishes) or of resins dispersed in turpentine (short oil varnishes); varnishes with intermediate characteristics are obtained by using various resinates (see glossary), or (natural or synthetic) resins, with or without additives such as plasticizers, thinners or other. Other types of varnishes are alcohol varnishes, which are made with resins dissolved in alcohol, cellulose varnishes, consisting of cellulose derivatives (such as nitrocellulose) dispersed in suitable volatile solvents, and synthetic varnishes, consisting of synthetic resins, also dispersed in volatile solvents.

Solvents evaporate when they are exposed to air or heat, leaving on the substrate a film consisting of the vehicle and the pigment, if any. Such a film, when exposed to air, undergoes oxidation and polymerization, which both improve its characteristics. Such processes can be accelerated by siccative compounds like cobalt, manganese or lead resinates. The resins used as vehicles in varnishes which retain their elasticity as they solidify after the evaporation of the solvent, are called thermoplastic resins, for they soften with heat and harden with cold. Instead, the resins that solidify, losing their elasticity, after the evaporation of the solvent, are known as thermosetting resins.

As was stated previously, most of the above types of varnishes are transparent, but can be colored, if desired, by dissolving suitable pigments into the volatile solvent. Other var-

[125]Not to be mixed up with enamels proper, which are hot-worked on objects made of ceramics, iron, clay, etc.

nishes, that are basically opaque, as lacquers, can be colored, if desired, using insoluble pigments dispersed in the varnish.

The influence of the pigment on the final characteristics of the film obtained after the paint has dried is remarkable, especially if the latter has protective rather than decorative purposes. A colored and opaque pigment makes the film more compact, less permeable to humidity, carbon dioxide, oxygen (as in rust-preventive varnishes), and blocks ultraviolet rays, which often cause chemical transformations in the substrate of the varnish. It can also speed up or slow down the drying of the vehicle in which it is dispersed.

Various additives can be added (in small amounts) to varnishes, pigmented or not, with the purpose to make them denser or more fluid (thus preventing the forming of bubbles), to facilitate the dispersion of the pigment, to reduce the freezing point of the varnish, or else.

— *Water paints*

Water paints are characterized by the fact that water is used as vehicle of the solid and viscous ingredients of the paint, as an alternative to solvents. Though they are quite interesting, we will not discuss them in this chapter.

— *Drying oils*

Drying oils, used in varnishes, are made up mainly of unsaturated fats, with a high degree of non-saturation, namely, they contain several double bonds between their carbon atoms. For oil paints and artistic painting, esters of linolenic acid are preferred because they are less subject to yellow with time. The properties of the films formed by these oils depend on the macromolecules that form during the oxidizing and polymerizing processes. If the oil is heated at a high temperature for a long time (thus obtaining cooked oil) and if metal oxides are added to it, its drying power increases. A similar effect is obtained, as was mentioned previously, by mixing lead, manganese or cobalt resinates to the oils.

— *Primers*

As the word suggests, they are products used for a preliminary coating of the surface to be treated, in order to allow the varnish or paint that will be applied subsequently to set better. Primers for wood differ from those for metal. On wood, a primer must penetrate as much as possible, sealing the cracks, in addition to favoring the adhesion of the subsequent coat of paint. The combination of the primer and the paint will have to be sufficiently elastic to withstand the thermal shrinking and swelling of wood, without

cracking. The latter property is not required of metal primers. Indeed, their purpose, in addition to improving the setting of the external paint, is to create a barrier against damage produced by the outside environment (for instance, oxidation or rust).

Fire-retardant coatings are characterized by their superficial structure, which, in the presence of heat, takes on a cellular-type configuration, serving as a progressive and retardant barrier against the spreading of flames.

## Glossary

*Asphalt, bitumen, tar* - They are often used as synonyms, the first coming from Greek, the second from Latin, the third from Old English. However, asphalt should be used to indicate the natural rocks that contain bitumen (bituminous rocks). Tar should indicate the residues of the dry distillation of coal or petroleum, containing bitumen. Bitumen should therefore indicate the substance contained in asphalt or tar, but also found in nature.

*Carbonization* - The process of heating wood or coal at a high temperature in the absence of air.

*Cenozoic Era* - The most recent geologic era that goes from approximately 65 million years ago to the present day. It includes the *Tertiary period* (from 65 million to 3 million years ago) and the *Quaternary period* (from approximately 2 million years ago up until today).

*Coke* - Carbonaceous product obtained through the carbonization of lithantrax. It is gray and hard and, as it burns clean, it is used as a reducer in blast furnaces for the production of steel.

*Coloring* - Selective reflection (in wavelength) of incident light.

*Colors* - Colored substances, namely substances that have their own color. They can be natural or artificial, mineral, or organic.

*Copra* - The dried pulp of coconuts (or other palms).

*Creosote* - Oily liquid, brown in color and with a strong smell, obtained from the distillation of coal tar or charcoal tar. It is used as a preservative of wood, especially for telephone poles and railroad crossties.

*Ester* - The chemical combination of an alcohol and an organic acid.

*Fat* - Fat, in chemistry, is an ester of a fatty acid with trivalent alcohol (glycerin) thus called triglyceride of the fatty acid involved. Common fats, animal and vegetable, are made up of mixtures of various triglycerides of fatty acids.

*Fatty acid* - It is an organic acid of the *fatty series* that contains a single carboxyl (COOH). Its chemical formula can be obtained from that of hydrocarbons (see) by replacing one hydrogen atom with one carboxyl. For instance, *saturated fatty acids* have the general formula $C_nH_{2n+1}COOH$ and (like the corresponding saturated hydrocarbons with the general formula $C_nH_{2n+2}$) all carbon atoms are bound by one valence only (simple bond). On the contrary, unsaturated fatty acids (as most oils are) have their carbon atoms bound by several valences and are recognized because they have a number of hydrogen atoms lower than twice that of the carbon atoms.

*Fossil* - Petrified (also in part) substance of organic origin that is drawn from the earth (from mines in particular, thus a *mineral*) where it has remained buried for many centuries.

*Fossil fuels* - Residues of vegetable origin, dating back to the most ancient eras, which are found in primary terrains (fossil coals, namely lithantraxes and anthracites), as well as in tertiary terrains (lignites) and in the more re-

cent quaternary terrains (peats)[126]. They have undergone profound transformations on account of particular conditions of pressure, temperature or other factors. Lithantraxes and anthracites are the most important for industry.

*Fraction* - Product of the distillation of a mixture, having a boiling point comprised between two specified limits.

*Geologic eras* - Starting from our days and going back in time, there are five geologic eras: the Cenozoic era, the Mesozoic era, the Paleozoic era the Precambrian era, and the Azoic era, which latter starts from the earth's origin.

*Hydrocarbons* - Hydrocarbons are the simplest organic compounds and are comprised only of carbon atoms and hydrogen atoms. They are insoluble in water. If the carbon atoms contained in one hydrocarbon molecule are linked by one bond only, the hydrocarbon is said to be *saturated*. If, instead, the carbon atoms are connected by one or more double bonds, then the hydrocarbon is said to be *unsaturated*. Saturated hydrocarbons (also called *paraffins* or *alkanes*) have the general formula $C_nH_{2n+2}$ and are gaseous from n=1 (methane) to n=4; liquid from n=5 to n=17, and solid for n>17. Unsaturated hydrocarbons include *olefins* (or *alkenes*), with general formula $C_nH_{2n}$, and *acetylenes* (or *alkynes*), with general formula $C_nH_{2n-2}$. As one can see, unsaturated hydrocarbons have a smaller number of hydrogen atoms than the corresponding saturated hydrocarbons with the same number of carbon atoms.

*Kerosene* (mineral oil) - Mineral oil, obtained as a medium-boiling product from fractional distillation of coal or petroleum.

*Lacquer* - Opaque and colored varnish, of both natural and synthetic origin.

*Mesozoic era* - Geologic era that begins around 230 million years ago and ends at the beginning of the Cenozoic era, that is to say 65 million years ago.

*Paleozoic era* - Geologic era that begins around 700 million years ago and ends at the beginning of the Mesozoic era, that is to say 230 million years ago.

*Pigment* - Coloring (though sometimes colorless) organic substance which, mixed or chemically combined with another substance, gives it color. However, it is often used as synonym of *coloring substance*, also inorganic, or of *color*, that is to say *colored substance*.

*Pitch* - Pitch is the solid residue of the distillation of coal (or charcoal) tar or of petroleum. It is more fluid than the tar from which it is obtained.

*Resinate* - Salt or ester of a resinic acid. Cobalt, manganese or lead resinates are used as dryers; copper, zinc or mercury resinates are used as wood preservatives; aluminum resinates are used in paper sizing.

*Rosin* or *colophony* (named after the ancient town of Colophon) is the solid residue of the distillation of crude turpentine. In turn, the distillation of rosin yields rosin oils.

*Synthetic resin* - Incorrect denomination given to a very wide range of artificial high-polymer products commonly known as plastics.

*Turpentine* - Fluid resin (oleoresin) obtained by tapping the trunks of various oak, larch and pine species. When crude turpentine is distilled, *spirits of turpentine* is obtained along with a solid residue called *rosin* or *colophony*. If spirits of turpentine is further distilled, *oil* (or *essence*) *of turpentine* is obtained.

*Vegetable resin* - Solid (sometimes oily) amorphous substance secreted by many plants, insoluble in water, but soluble in alcohol as well as in other organic solvents. Vegetable resin varnishes, following the evaporation of the solvent, produce a (gen-

[126]Petroleum and natural gas are also considered fossil fuels.

erally transparent) film that is very resistant to external agents.
*Wax* - Ester (see) of a fatty acid with monovalent alcohol.

## Chronology

1611 - An English ironmaker, Simon Sturtevant, obtains coke from coal
1681 - Coal tar is discovered in England
1691 - J. Clayton obtains illuminating gas from the distillation of coal
1709 - The English ironmaker Abraham Darby obtains fused iron in a blast furnace fed with iron ore and coal (not yet coke)
1735 - In England, coke is used in iron metallurgy. Germany will follow many years later
1785 - In Paris vegetable oil lamps start to be used for public and private lighting. J.P. Minkelers lights an auditorium of the Louvain University with gas obtained from coal distillation
1800 - In France, Philippe Lebon launches industrial activities based on the distillation of wood (gas, liquid and tar products), while in England William Murdock starts industrial activities based on the distillation of coal
19th C. (beginning) - After the exploitation of gas, possible industrial uses of coal tar are looked into, tar being obtained, together with gas, from coal carbonization
1830 - The German baron Karl von Reichenbach, philosopher and industrial entrepreneur, obtains solid paraffin wax from petroleum
1833 - Karl von Reichenbach obtains creosote from the distillation of either coal tar or hard-wood tar
1847 Auguste Laurent obtains phenol from the distillation of coal tar. It will be used to manufacture plastic materials and dyes in particular
1849 - J.R. and C.P. Crockett from Newark, NJ, invent a process whereby unbleached cotton is treated with a mixture of cooked linseed oil and turpentine, yielding a sort of artificial leather, that could be given any desired color
1850 - James Young patents a process to obtain kerosene (also called paraffin or coal oil) from the fractional distillation of coal and launches its industrial production five years later
1856 - Sir William Perkin discovers the first dye derived from coal tar
1859, 27 August - During the drilling performed in search of deep petroleum deposits, the American Edwin L. Drake finds in Titusville, PA, a petroleum deposit twenty-one meters deep with a crude oil jet of four tons a day. Petroleum (still obtained in part from natural ponds) starts to be distilled; its medium-boiling fraction (kerosene) is sold as fuel, whereas the heavy fractions are burned to heat distillation boilers, and (up until approximately 1880) the light fractions (gasolines) are dispersed, because they are deemed much too dangerous …
1860 - Furnaces with refractory chambers, with walls heated through the combustion of gases produced in coal distillation, start to be used. With these fumaces, the coke yield, which was of 50-60% of the distilled coal, grows to 70-80%. In the same period, charcoal is used in about half the production of cast iron
1861 - Sir William Siemens and his brother Friedrich, while running the English branch of the Siemens company, design the open-hearth blast furnace which will be used extensively in the iron and steel industry as well as in the glass industry (Siemens-Martin process)
1865 - The English James and Joseph Hinks create an oil lamp with double burner
1868 - The open-hearth Siemens-Martin process of steel making is introduced in the United States
1879 - A number of artificial flavorings and scents are obtained from coal tar

1893 - The Hoffmann furnace, consisting of a retort in which coal is converted into coke, is invented. Soon after, a large amount of coal tar is made available for sale on the market
1909 - The first synthetic plastic is obtained from coal tar and is called Bakelite
>1945 - After World War II, the industry based on petroleum derivatives develops

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## THE HISTORY OF PAPERMAKING

### From the origins to the Middle Ages

The paper we use today consists essentially of a thin layer of cellulosic fibers (which mostly come from cellulose of plants), obtained from a pulp which is processed so as to form a solid and generally opaque sheet. The English word *paper*, as well as French *papier*; German *Papier* and Spanish *papel*, comes from the Greek *pápyros*, which means papyrus plant[127]. Instead, the Italian word *carta* (paper) comes from the Latin *charta*, which, in turn, comes from the Greek *chártes* meaning *papyrus sheet*.

The evolution of paper, considered as a base for writing, is connected to the evolution of writing systems, from the oldest forms of handwriting to the more sophisticated and modern means of typewriting and printing. The most ancient examples of (cuneiform) writing, which come from the Sumerians, date back to roughly 3500 BC, when the base used was a clay tablet. The Greeks and Romans carved their most important documents on bronze or copper, not to speak of the inscriptions in stone or marble. In the sixth century BC, Solon wrote his laws on wooden tablets called *axones*, while the Roman famous collections of public deeds, the Ivory Books (*libri elephantini*), were thus called because they were written on ivory tablets. All these bases obviously offered the advantage of preserving the writing for a long time.

The Egyptians began to use papyrus even before 2500 BC. The latter remained the main base for writing all the way up to the Roman times and even thereafter, in Medieval Europe, until approximately the twelfth century. Its preparation was as follows: papyrus rush was steeped in water and then cut into bands; the bands were set one next to the other and overlapped at a right angle so as to form a rectangular sheet; they were then treaded, pressed and kept together with starch. Thanks to its abundance, papyrus was widely used by ancient Egyptians not only for making writing sheets, but also as foodstuff, as fuel and to make tools.

Parchment[128], made with the hide of animals (sheep, lambs, kids, calves, etc.), duly tanned, was much cheaper than papyrus and was used in Asia

[127] Papyrus is a perennial (non-woody) aquatic plant that grows by river banks and lake shores in many African regions.

[128] The word *parchment* comes from the name of the ancient city of *Pergamum*, founded by the Greeks in Anatolia (currently Turkey) on the coast of the Aegean Sea.

Minor and then in Europe as of the second century BC, up until the fourteenth century. Parchment, or vellum - which was used not only in the traditional scrolls, but also to write books - was appreciated especially for its resilience and durability. Furthermore, all materials, whether in sheet or in tablets, which could bear and retain signs (produced by a pen, a brush or a stylus) were used in various parts of the world as a base for writing. Among the most renowned it is worth mentioning incisions on gold, silver or lead plates, all kinds of fabric, waxed or plastered wood plates, palm leaves and even the inner bark of trees cut in thin sheets.

For instance, on the Tonga islands (north of New Zealand) as well as in Polynesia, Indonesia and Central and South America, still today a type of paper is produced which is called *tapa* and is made with bands of the inner bark of mulberry, according to a technique which dates back to the first century AD. In India, Buddhist manuscripts were found which date back to around 350, inscribed on tree leaves called *bai-lan*. Finally, it is worth mentioning *huun* paper, invented around 250 BC by the Mayas, who obtained sheets fit for writing from wild fig trees. This type of paper was later denominated *amatl* by the Aztecs, who used it up until the Spanish invasion led by Hernández de Cortés, and which is produced still today, in Mexico and in Honduras.

Paper, more or less as we know it today, was invented by the Chinese, and precisely by a eunuch by the name of Ts'ai Lun, a labor inspector of Emperor Ho-Ti, of the second Han dynasty, in the city of Lai Hang. In 105, Ts'ai Lun came up with the idea of making paper using various vegetable fibers, like tea or rice straw, bamboo canes, hemp waste and also old fishing nets. His method consisted in chopping the vegetable materials, boiling them and letting them steep, then beating them for a long time with wood pestles in stone pits (see the picture on page 580). To the pulp that was thus obtained he added mucilage (vegetable rubber), extracted from lichens, which served as a sizing (see glossary), before shaping the sheets[129]. Shaping of the sheet was first done by pouring the pulp over a normal piece of fabric, stretched over a frame, however, with the inconvenience that water drained very slowly from the fabric and the sieve could not be used immediately after to make another sheet of paper. To avoid this shortcoming, Ts'ai Lun devised, later on, a sieve with rounded bamboo joists tied to-

[129]This latter step is what is known today as *bulk sizing*.

gether with camel hair, which allowed water to drain more quickly. He also rendered the sieve mobile, separating it from the frame, which only had to set the boundaries for the sheet of paper. The paper sheet was thus obtained by dipping the sieve in the pulp instead of pouring the pulp over the sieve; as soon as the water drained off, the sieve was removed from the frame and the freshly-made sheet of paper was placed over the dry one that had been made just previously, separating it from the sieve.

Prior to this period, the Chinese produced a type of paper with silk fibers (fragments of this paper were found in Gansu, in Northern China, which date back to 140-180 BC) but it was much more expensive. In 137, Ts'ai Lun manufactured much more valuable paper using the inner bark of mulberry-trees, and this paper in particular was used many years later to make paper money. Indeed, China was the first country to use paper money. The first paper money factory was founded in the city of Szechwan, in south-central China, in 910. In his 'Milione' ('Travels of Marco Polo') of 1298, Marco Polo thus described the procedure adopted by Emperor Kublai Khan whereby to make paper money: *"… They take the inner bark of a tree called mulberry - it is the tree whose leaves eat the worms that make silk - and take the thin bark that lies between the thick bark and the wood beneath it, and with that bark they make paper as it were made from cotton*[130] *…"*

The processes invented by Ts'ai Lun, like many other discoveries of the Chinese technology, were kept secret by the imperial court for many centuries, during which Ts'ai Lun was venerated and honored. Only in the seventh century did the Koreans and Japanese acquire them through a Buddhist monk, Do-Kio, as it was said. In particular, we know of a paper mill which existed in Kyoto, in Japan, in 610. We also know that the Japanese reproduced a book of Buddhist prayers on paper, of which some one million copies were made in 770.

Still later, the art of papermaking also reached the West. Its course - which we could call the *paper route* (see the picture hereinafter) and that closely followed the well-known *silk route* - stretched across the entire Asian continent, reaching all the way to Arabia and Egypt, and from here it crossed the Mediterranean heading towards Italy and

Pestles used by the Chinese to beat small pieces of bamboo shoots into a pulp

[130]Around the end of the thirteenth century, paper was made, in Italy, with cotton rags, hence it was also called *cotton paper*.

Spain from which it spread to all of Europe.

More in detail, we have evidence of the existence of paper mills in Tun Huang, in Central-Northern China, in 150, then in Loulan, in Western China, in 200, and, many centuries later, in the Arab city of Samarkand, in Western Turkistan. According to history, this city was attacked in 751 by Chinese plunderers who, however, were defeated on the banks of the Tharaz River, leaving many casualties on the battlefield and plenty of prisoners. Among the latter there were some expert paper-makers who were forced by the Turkistans to build a paper mill in Samarkand and to teach their art to the winners. The raw materials used to make paper in that mill were rags and wastes of linen and hemp fabrics, which the city had in abundance, as well as water. The sieve for forming the paper sheet was modified with respect to the one used by the Chinese: it was made with bronze rods slightly separated from each other and joined with thread made of horsehair. However, the sieve was fixed to the frame rather than being mobile. As regards sizing, the Turkistans (as well as the Arabs, later on) replaced the lichen rubber used in China with starch obtained from rice or wheat. Furthermore, the Turkistans adopted the technique of separating the damp sheet from the sieve by placing it on a piece of woolen felt instead of over another (dry) paper sheet, as well as that of expelling water from the pile of fresh paper sheets by means of screw presses. In addition, according to recent discoveries of mineral components in Arab and Turkistan paper of the eighth century, it appears that they had also discovered the usefulness of *filling materials* or *fillers* (see glossary).

Samarkand became the main center of paper production in the Arab world. From Samarkand the art of papermaking spread rather quickly to the West, and, indeed, already in 793 a paper mill existed in Baghdad. It was followed by other factories in Damascus and in Cairo around the year 1000. It was said that the Bedouins, as well as Arab and Egyptian merchants, stole bandages from the mummies in Egyptian tombs to sell them as rags to paper factories. Also worn cordage were used, being difficult to collect rags in sufficient amounts. The art of papermaking was later brought to Italy, Spain and France by the various attacks and invasions of the Moors, which took place starting from the eighth century, and touched almost all of the Mediterranean regions. Favorable conditions to set up a paper mill were the abundance of water, the existence of

The 'Paper route,' from China to Europe

blacksmiths able to create the necessary tools and devices, as well as the existence of a certain level of culture, often derived from teaching imparted by Benedictine monks of the Medieval convents.

The first evidence of the presence of paper in Europe was found in Palermo, Sicily. In the city's State Archives, a paper document is kept which is dated 1109 and comes from the Chancery of the Norman Kings of Sicily. It is attributed to Countess Adelaide, the first wife of Roger I. Although the factory which produced the paper on which the document was written is unknown, it is only logical to think that it must have been a factory founded by the Arabs in Sicily, before 1061, when they were ousted by the Normans. The first paper factory on the European continent, of which there is evidence (preceded by a paper mill built in Fez, Morocco, in 1100), seems to have been the one built by the Arabs in Spain, in Játiva (or Xátiva) near Valencia, in 1151. It was mentioned by the Caliph Edrissi in 1173. Furthermore, a document of 'perpetual concession' to the paper-makers of Játiva's Moorish community was found. Up to this time, all Sicilian and Spanish factories were run directly by the Arabs. From Spain the art of papermaking spread to France, where a first factory near the Hérault River was set up, in 1189.

As regards Italy, it is important to remember that the Emperor Frederick II of Swabia, with his 79th decretal "De instrumentis conficiendis" (On the manufacturing of instruments), issued at the assembly held in Melfi (Apulia) in 1231, prohibited the law offices of Naples, Sorrento and Amalfi from using paper (called *cotton paper*) for public deeds, for which the use of parchment was stated as mandatory. Note, however, that at that time, in the Royal Swabian Chancery, paper produced in Syria, Spain and probably Sicily was used, as none of it was yet available from continental Italy. In fact, it is common knowledge that the art of papermaking was established in continental Italy in Amalfi and Fabriano only around the middle of the thirteenth century. Fabriano's paper mill surely existed before 1264[131]. The one

[131]A register that is kept in the historical archives of Matelica, a small town near Fabriano, indicates that already in the year 1264, the Notary Public of the Municipality purchased paper from Fabriano. Some encyclopedias incorrectly state that the first paper mill in Italy was in Montefano (a small outlying district of Fabriano, situated at an altitude of 750 m), probably misled by the fact that one of Fabriano's many paper mills belonged to the Sylvestrin monks of Monte Fano, also known as the Monks of Monte Fano (not Montefano, which is in the province of Macerata).

in Amalfi existed before 1289[132]. However, the two cities mastered this art in two very different ways. In Fabriano it was the prisoners taken during the Arab invasions who taught the art of papermaking. In the case of Amalfi it seems that the art of papermaking was introduced in the wake of the excellent relations between the Duchy of Amalfi and the Arab world. In fact, Amalfi, which formally belonged to the Eastern Roman Empire, had settlements in the ports of the Aegean Sea, of Constantinople and of the Black Sea, and they entertained intense and friendly trade with the Arabs.

In Fabriano as well as in Amalfi and in many other Italian cities, ever since 1200, fulling mills were widespread; they were small plants where wool rags were processed, from which practice the method of pre-processing rags to manufacture paper originated. Fabriano is to be considered the first Italian paper mill, chronologically speaking, as well as the most important one, for its many technological innovations which were adopted by most paper mills that were subsequently founded in Italy and in Europe. For instance, it is worth noting that Padua's paper mill was founded by Pace de' Penacci from Fabriano, who moved there in 1340, as was that of Treviso, founded in the year 1365. Other famous Italian paper mills, documented in various ways, were set up in the fourteenth century in Foligno, Bologna, Modena, Lucca, Prato, Colle Val d'Elsa, Genoa, Caselle Torinese, Salò, Cividale del Friuli, as well as in various towns in Abruzzo, the Salerno and Caserta regions, and Latium.

An old paper mill of the fourteenth century on the Amalfi coast (Minori)

Later still other paper mills sprung up: in Troyes (1338) and Marly (1411), France; in Nurnberg (1389) and Lübeck (before 1420), Germany; in Cracow (around 1491), Poland; in Stevenage and Hertford (1494), Hertfordshire, England; in Moscow (1576), Russia; in Reval (1697), Estonia; and in Oslo (1698), Norway.

Thus, we can say that, by the sixteenth century, every country in Europe had at least one paper factory. This notwithstanding, many scholars preferred to write on parchment, but, this time, only because it was cheaper. In the

[132]Indeed, Matteo Camara (mentioned by Apuzzo, see bibl.) traced a document from Ravello, dated November 27, 1289, registered at the Archives of Naples, which states that a supply of cotton paper and other goods had arrived from Amalfi. Unfortunately, in 1343, a terrible seaquake destroyed Amalfi's archives and paper mills, thus making it impossible for contemporary researchers to document the presence of paper mills in Amalfi prior to the date mentioned. For extensive documentation on Amalfi's paper mills, see Milano, N. in the bibliography.

United States, the first paper factory was founded by a Protestant priest, William Rittenhouse, in Germantown, PA, in 1660.

## The innovations introduced by Fabriano

In order to better follow the evolution of papermaking techniques from China to Arabia, and from here to Europe, it may be opportune to provide a detailed account of the process whereby hand-made paper was produced in Fabriano some seven hundred years ago, as it marked a great advancement with respect to the Arab art of papermaking. We shall resume the historical account from Fabriano to nowadays further on.

One must bear in mind that so-called hand-made paper (now produced in very few cities in the world and in very limited quantities) is used still today for particular applications such as valuable editions, drawings and art prints, securities, Treasury bonds, University diplomas, etc. Precious raw materials are used in this particular productions, such as rags and/or wastes of cotton, hemp and linen.

— *Preparation of the pulp*

Rags, which were brought to Fabriano by merchants from the neighboring regions, were first subdivided by type by workers called *sorters*; then they were weighed and carried to the rag rooms, where the *rag-master* supervised over the subsequent phases of rag processing, i.e. *dusting* (by beating and brushing), *scratching* and again *sorting*. The rags were then steeped (*cooking*) in a solution of hot water and lime for many hours. Lime had the purpose to eliminate the dressing and greasiness of the rags and was used in the amount of 15-20% of the weight of the rags. Colored rags were boiled in a solution of wood ashes (rich in calcium and potassium carbonate), then they were exposed for a long time to sunlight, after which they were washed. After these operations, the rags were sent to the *cutting* rooms, where they were cut into rectangles the size of a few centimeters. They were then sent to *pulping*, which was performed with a device, called *pistogio* (see figure), an invention from Fabriano, probably derived from the fulling machines used in wool factories, of which there were many in the region.

The *pistogio* featured a series of hammers made of hard wood, set in motion alternately by a cam shaft connected to a hydraulic wheel. These hammers, which rose one after the other, beat the rags in order to obtain a pulp similar to what is known today as *half pulp*. There existed three types of pistogio: for *shredding*, for

Papermaking in the thirteenth century

*breaking* and for *refining*. The heads of the hammers for shredding were equipped with sharp nails; those of the hammers for breaking also had nails, but ending with a flat head; those of the hammers for refining had no nails and the head of the hammer was flat and coated with a metal plate. Especially in the first pistogio the mass underwent abundant washing, to remove dirt as much as possible.

It often occurred that the pulp was then packed into cakes that were pressed, dried and stored for future needs (for instance for the periods in which the rivers were shallow).

Note that, notwithstanding the use of lime, which clarified the steeped rags to a certain degree, the paper obtained was not as white as is today. As we shall see, only around the end of the eighteenth century paper-pulp bleaching began to be performed, adding about 10% calcium chloride, in special vats called *bleaching Hollanders*.

A «pistogio» in a lithograph of 1607

— *Making hand-made paper from pulp*

The pulp that came out of the refining pistogio was placed in a vat, looked after by the *vatman*, an expert craftsman endowed with a very sensitive touch. The vatman (see the picture hereinafter) dipped the sieve into the vat, always extracting the same amount of pulp. Then, with small oscillating movements, he managed to evenly spread the pulp over the entire surface of the *wire* (see glossary), draining at the same time the excess water.

The sieve, which was rather different from the one used by the Arabs, consisted of a wooden frame called *deckle* which was placed (but not fixed) on the perimeter of the *wire* to allow the pulp to stay in place and to determine the size of the sheet of paper to be formed. The wire, instead of bronze rods, was made of metal wires, set parallel and close to one another, stretched over a wood frame, and transversally connected at regular distances by means of *chains*, fixed to underlying wood *ribs*.

After the sheet of paper was formed, the vatman handed the sieve over to another worker, called *coucher* who, after having waited for the water to drain further, removed the wood frame from the sieve, then overturned the sieve and placed it on a piece of woolen felt, pressing it slightly so as to make the sheet of paper come apart from the wire and stick to the felt. The paper sheets were then piled up, alternating them with sheets of felt, in order for the latter to absorb most of the water left in the paper. The pile of paper sheets and felt (also called *post*) was then pressed with a hand-operated screw press.

Manual papermaking in Fabriano, today, almost like 700 years ago

After pressing, water contained in the sheet was reduced by 50%, therefore the paper had to be dried further. To do this, a third specialized worker, called *remover*, carefully removed the pressed paper sheets from the felts and handed them over to other women workers who laid them out in the fields or hung them up in large rooms where they could dry in free air at room temperature. Sometimes the sheets were hung along the outside walls of a brick furnace. When the sheets were dry they were submitted to sizing, the aim of which was to make them more resistant and smooth. For this purpose, the sheets were dipped, a few at a time, in the so-called *gluer's pail*, which was heated on a raw flame and contained a solution of animal gel, that prevented the ink to penetrate the internal part of the sheet and also ensured durability. Sizing was generally followed by further pressing, to more evenly distribute the sizing over the surface of the sheet. After this operation, paper was taken again to the drying room, where it was left to dry for a few days.

When dried, the paper was brought for final finishing from the paper mills (generally out of town) to the workshops of the so-called 'cialandratori'[133] (calenderers), downtown. The finishing operations performed there included: *selection*, *counting*, *pressing* (for the third time), *glazing*, *packing* (in reams), and *seasoning* (in storerooms).

— *Preparing the sieve and the watermark.*

The *watermark* (see glossary) was discovered in Fabriano, accidentally, probably on account of a metal wire of the sieve that had come off and bent, thereby leaving a particular mark during *couching*. The oldest watermark from Fabriano, which is kept in its historical archives, represents a factory trademark, dated 1282. It was obtained with segments of pre-shaped wire sewn to the sieve. When, in the eighteenth century, sieves began to be made with metal texture (called *wire*, as well) instead of parallel wires, it became possible to obtain watermarks that were much clearer and evident, as well as chiaroscuro watermarks by stamping with a punch[134] an image in relief in the wire of the sieve.

—*Progress made in Fabriano with respect to the Arab art*

Fabriano introduced a series of innovations in the art of papermaking with respect to what had been taught to them by the

[133]The tool used to smooth paper, generally made of flint stone, was called 'cialandra,' hence the word 'cialandratori' and the modern word 'calender.'

[134]As of the beginning of our century, punches were prepared with electroplating techniques.

Arabs. As we have mentioned, it is believed that the people of Fabriano learned this art from the Arabs that had been taken prisoners during their frequent attacks against the cities on the coast, after the eleventh century, and imprisoned in the high Esino Valley for security reasons. Some historians maintain that it was the Knights Tau (an order that claimed to be connected to that of the Knights Templars) who revealed the art of papermaking, on their return from the Crusades in the Middle East. In any event, the fact that this art was learned from the Arabs is confirmed by the fact that in Fabriano (as, on the other hand, in Játiva) the same raw materials were initially used as those used by the Arabs, namely linen and hemp rags. It is also worth recalling that paper production was originally spread in a number of small handicraft mills. In 1326, in Fabriano, there were several dozens of them scattered along the banks of the Giano River. Many centuries later, they dropped in number and grew in size. In the second half of the eighteenth century there were only seven, and in 1854 their number further reduced to three.

The innovations introduced by the paper-makers of Fabriano were many and very significant, as appears from the list below.

- Replacement of the stone pit and wood pestle (operated manually or by simple lever), as used by the Arabs for beating rags, with the multiple-hammer hydraulic machine, the pistogio, derived from their existing fulling machines.
- Replacement of bronze rods of Arab sieves with parallel metal wires stretched on a frame. The paper produced with these sieves reproduced the structure of the net, taking on the appearance of the so-called *laid paper*.
- Replacement of (rice or wheat) starch used by the Arabs for paper sizing, with animal glue obtained from the inner side of hides, as supplied by local tanneries. This way, the durability of paper against time and pathogenic agents was greatly improved, as was the permanence of the written or printed characters. On the contrary, paper sized with starch was perishable to the extent that it could not be used for the public deeds issued by chanceries and notary publics. In addition to the previously-mentioned decretal of Frederick II, it is also worth mentioning the analogous ban issued by the city of Padua in the early thirteenth century that also prohibited the use of the so-called *cotton paper* for public deeds, which had to be written on parchment. It was thanks to the improved sizing technique introduced by the

manufacturers from Fabriano that paper gradually started to replace parchment, with which it could compete in terms of cost as well as of endurance and permanence.

- Introduction of the watermark. It is universally acknowledged that the use of trademarks in paper sheets was introduced in Fabriano. Today said trademarks are known as watermarks. The most ancient document which can definitely be attributed to Fabriano, dated around 1282, presented a watermark. The watermarking of paper, which can be observed by holding the sheet up against the light, was initially used to reproduce the trademark of the various paper-makers, in the same way as the woolen cloth manufacturers from Fabriano had done in the past, their trademarks having been registered in the books of the guild.

In the wake of the foregoing considerations, the fact that - as was done in China - strict laws were issued in Fabriano which prohibited the Master Paper-makers from teaching their art to anyone outside of Fabriano, is quite understandable. It is a fact that this Municipality drew the attention of the Italian as well as European markets and became one of the leading and major papermaking centers in Italy, a position which it succeeded to maintain for over two centuries.

## From the Middle Ages to the present day

Let us now resume the historical account of papermaking from where we had left off, that is to say from the end of the thirteenth century.

In 1280 something occurred which seemed to have nothing to do with paper but actually turned out to be very important for its development. The German engineer Hans Speyer succeeded in mechanizing the spinning wheel, thereby lowering the prices of cloths. Consequently, the purchase of new cloths increased while at the same time old cloths were sold to the rag-merchants. As rags were the most coveted raw material to make quality paper, owing to their increased availability, paper could be produced at a lower cost. In a few years' time, its cost dropped to one sixth that of parchment.

Another factor that boosted the production of paper was marked, one and a half centuries later, by the invention of printing. Indeed, as paper was more porous than parchment, it was more fit to absorb the special printing ink, invented by Johann Gutenberg in 1450, and it was also more resistant than parchment to the impact of the printing press (also invented by Gutenberg). Some historians uphold that the quick success of printing was also favored by the exorbitant prices charged

by scribes in Europe, as of the fifteenth century, following the black plague that had decimated them. On the other hand, precisely on account of the foregoing epidemics, many rags had to be burned for they represented an easy vehicle for the spreading of the disease. For this reason, other fibrous materials were also taken into consideration, particularly vegetable ones. In 1609, the first newspapers appeared, like the *Aviso*, printed by Julius Adolph von Sohne, chief of the Royal Press of the Court of Saxony, and *Relation*, printed in Strasbourg by Johann Carolus.

In 1540, the hydraulic drop hammer for smoothing paper was introduced in Germany, which replaced the hand-operated calender. In 1665, the Englishman Charles Hildeyard introduced so-called blue sugar paper. In 1680, Dutch paper makers introduced the rag breaker - operated by a hydraulic wheel or by the wind - which replaced the multiple-hammer pistogio used in Fabriano. It consisted of an oval vat (called *Hollander*) which contained a fixed plate at the bottom (called *platen*) with many blades, over which a rotating cylinder was set, which also presented many blades, fixed along its generatrices. The rags, previously steeped and cut into small rectangles, were forced through the two sets of blades, which broke them and reduced them to fibers. In the early eighteenth century, Dutch paper makers also introduced the cylinder calender, which consisted of two wood cylinders through which the sheet of paper was made to pass to be smoothed; the degree of smoothness could be adjusted by varying the pressure between the two cylinders. The cylinder calender replaced the hydraulic drop hammer in the smoothing of paper. These two Dutch innovations were quickly adopted in all of Europe.

In 1695, in Denmark, printed paper was recycled for the first time. In 1741 the Frenchman Jean Étienne Guettard tried to use swamp moss as a fibrous raw material. In 1757 an English printer, John Baskerville, introduced the *mesh sieve*, which presented metal threads braided into a thick mesh, to avoid leaving more or less rectilinear marks (laid lines) on the paper sheet, creating instead a fine meshed structure. Paper thus obtained was called *wove paper*[135]. The mesh sieve made it possible to produce tissue-paper, that is to say paper with a much smoother surface, which competed with parchment for its brightness and smoothness. Other progress was made after

[135]Paper that is intentionally watermarked is called *laid paper*.

chlorine was discovered in 1774 by the Swede Karl Wilhelm Scheele, who also observed the bleaching effect of chlorine on vegetable fibers. In 1789, the French chemist, Count Claude Louis Berthollet, used chlorine in the form of sodium hypochlorite (also called *Javelle's water*) on colored rags of inferior quality, obtaining very white paper. In 1799, the Scottish chemist Charles Tennant patented the system whereby to make chlorine absorbed on calcium oxide, thus obtaining a white and stable powder, calcium hypochlorite or chloride of lime, which could be put into barrels and shipped anywhere. Then, on destination, chloride of lime was treated with hydrochloric acid, to perform bleaching with chlorine gas. The massive use of chloride of lime made it possible to bleach paper perfectly, and, therefore, to also utilize colored cotton rags and fabrics, as starting material. This happened just when the market demand for paper was rapidly growing. We shall see in the following, that the use of chlorine and its derivatives as bleachers was found to entail polluting effects, to the extent as to force paper factories to resort to less harmful solutions.

In 1787, the watermark with dark effect was invented by an unknown papermaker. Many years later, in 1848, the Englishman W. H. Smith created the *chiaroscuro* watermark, also known as *ombré.*

In 1795, the Englishman Joseph Bramah invented the hydraulic press, that was subsequently perfected, around 1835, by the Englishman William George Armstrong, who added the hydraulic accumulator. The hydraulic press effectively replaced the cumbersome hand-operated screw press in paper mills.

In 1798, Nicolas Louis Robert, head of the paper mill attached to the Didot printing house in Essonnes, France, built the first machine for continuous paper production[136]. Said machine featured a moving sieve (with meshed metal wire) connected to a belt that was made to rotate by hand, which was dipped into the vat that contained the fibrous pulp and lifted up a thin layer of paper pulp, thus producing sheets one at a time, like in manual production, but in a continuous way. The sieve was kept vibrating to shake off the excess water and make the fibers mat. Then the sheet of paper was passed through squeeze rollers that pressed it and squeezed the water out. Finally, it was left to dry in free air. On account of the outbreak of the French Revolution, Robert turned to England in search of financial support to his inven-

[136]According to Ceragioli et al (see bibl.), the paper machine was invented by Robert in 1779.

tion. Here he obtained two patents, in 1801 and in 1803 respectively. Almost immediately he transferred his patents to two London-based stationers, the brothers Henry & Sealy Fourdrinier, who financed the construction of the machine. The construction was entrusted to an engineer from Bermondsey, Bryan Donkin, who introduced some improvements to the project, and, in 1805, he built his first model. With this machine, paper production went from the daily hundred pounds produced by hand to over six hundred pounds (in 24 hours). This notwithstanding, the Fourdrinier brothers went bankrupt in 1808, after having repeatedly, but in vain, attempted to convince the English paper mills to use their new machine, even by installing it at the premises of some prospective customers to demonstrate its effectiveness. At any rate, they went down in history, since still today the plane-table paper machine (see ahead) is called fourdrinier. Engineer Bryan Donkin was not discouraged by those first commercial failures and went on to further improve his machine. In 1822, he introduced the on-line drying of paper by means of drying cylinders which were initially heated on a raw flame, then by steam.

Another type of papermaking machine was invented in England in 1809 (in much the same period as the fourdrinier machine) by John Dickinson, the so-called *cylinder paper machine*. This machine (see figure on p. 604) is characterized by the fact that the paper pulp is collected from the vat by a large cylinder covered with a metal *wire* from which it goes to a felted sheet that drags and partially dries the layer of pulp, then sending it to the various other devices, as in the plane-table paper machine. Around 1870, a cylinder machine with several cylinders was developed which made it easy to produce very thick paper, like paperboard.

The production of paper with continuous machines became normal practice, soon after the first decade of the nineteenth century, while the production of handmade paper was confined to very particular types of paper.

Throughout the nineteenth century many other improvements were achieved in papermaking. In 1806, the Londoner Ralph Wedgewood invented carbon paper. In 1826, the Frenchman Canson introduced suction boxes in paper machines to take excess water from the pulp layer during its flow, thereby speeding up the process of dehydration. That same year, 1826, Illig introduced sizing with resins, which replaced sizing with animal gel. In 1840, the Saxon Frie-

drich Gottlob Keller began to use *mechanical wood pulp*, simply called *mechanical pulp* (see glossary), aiming to extend the range of raw material to make paper, instead of only using rags. A first attempt in this direction had already been made by Matthew Koops in 1808, who, besides wood, had also used other vegetable fibers as well as waste paper. His paper was cheaper, yet it was not as white as that obtained with rags. A procedure analogous to Keller's was patented in the United States by Faherty in 1844.

The Frenchman Anselme Payen discovered cellulose in 1838 and determined its chemical formula. In 1840, the same Payen suggested to free wood of its encrusting substances by means of nitric acid, but the use of acids (including hydrochloric acid and sulfuric acid) was later abandoned, as lignin (the main encrusting substance) is insoluble in the foregoing acids. In 1846, in Paris, Louis Figuier and Poumarède were the first to produce so-called *parchment paper* from a pulp obtained with vegetable fibers only.

The introduction of the rotary printing press, as of 1845, by the New Yorker Richard M. Hoe, which could print ten thousand sheets of paper per hour, boosted research in high-yield papermaking techniques. However, a great leap forward was achieved in the paper industry only once it was discovered how to use wood as a raw material from which to obtain paper. On the other hand, Keller's method of simply reducing the wood chips into pulp with crushers rotating in water, providing the so-called mechanical pulp, yielded poor quality paper, as the encrusting substances contained in the wood were not eliminated. Therefore, a number of processes were devised, whereby wood was cooked with various reagents that were supposed to attack said substances and chemically transform them into soluble products that could be easily eliminated. Pulps thus obtained were called *chemical pulps*.

More precisely, in 1852, Coupier and Meiller suggested the use of caustic soda in the chemical treatment of wood and, in 1854, the Englishmen Watt and Burgess set up their first plant for the treatment of wood under pressure with soda, to improve the elimination of the encrusting substances. Such processes were called *soda processes*.

Before mentioning other processes to use wood to obtain paper pulp, it is worth mentioning the process elaborated in England by Thomas Routledge, in 1861, aimed to use vegetable fibers other than wood. It was used to process esparto, a type of strong grass,

used to make ropes, mats etc., which grows in Tripolitania, Tunisia, Algeria and Spain. More than 1000 tons of esparto were successfully treated in England in that year, with satisfactory results.

A new process whereby to obtain chemical pulp from wood was the *bisulfite process*, or, more correctly, the *acid sulfite process*, which was tried for the first time in 1866, without much success, by the brothers B.C. and R. Tilghmann in the W.W. Harding Mills paper factory in Pennsylvania. The process consisted of cooking the chopped wood in a solution of calcium bisulfite. In 1872, such a process was perfected by the Swede Carl Daniel Ekman, who succeeded in producing excellent and durable paper with the Tilghmann process but working under steam pressure. Other variants were proposed by Mitscherlich in 1878, who treated wood with direct steam, before submitting it to cooking with sulfite (performed with indirect steam heating), and, a few years later, by Ritter-Kellner, who used direct steam and sulfite together, but in two different stages, with different temperatures and different durations. In 1872, Menzies and Davies patented a process which consisted in a treatment with chlorine, followed by another treatment with weak alkaline solutions (*chlorine-soda process*). Subsequently, in 1884, Dahl patented his *sulfate process* (an evolution of the previous *soda process*), which progressively superseded all others in chemical pulp making. Actually, the chemical agent which dissolved the encrusting substances of wood, was a soda and sodium sulfide mixture, but the process was called *sulfate process* because sodium sulfate was the product that was actually used up.

In 1885, Karl Kellner came up with the idea of electrolyzing a salt solution containing the wood to be treated, with the purpose to attack lignin. His process, however, did not find practical applications. In 1895, in Polonghera, Italy, Beniamino Cataldi patented and tested a gaseous chlorine process while De Vains and Peterson proposed the use of chlorine water. The chlorine processes proposed by Cataldi, perfected and made continuous by U. Pomilio, were, in fact, an application, on the industrial scale, of a process used in laboratory by Cross and Bevan for determining the amount of cellulose contained in vegetable matter. These processes were applied in the processing of straw, especially in South America and in Italy.

Productivity in papermaking grew in the course of the nineteenth century, to the extent that, in 1881, the machines

of the Voith company, equipped with six drying rollers online, were able to produce rolls of paper two meters wide at a rate of fifteen thousand pounds a day.

At the beginning of our century, precisely in 1904, another important event took place in the history of papermaking, i.e. the introduction of *offset printing* by the American Ira W. Rubel. This technique made it possible to use less valuable paper and to increase the speed of printing, which entailed a further increase in the demand for printing paper.

During World War I, on account of the shortage of raw materials, new attempts were made to use annual vegetables in papermaking. After World War II, as of about 1950, it is worth mentioning the use of chlorine dioxide for the bleaching of mechanical pulps, which made it possible to obtain paper whiteness comparable to that featured by sulfite pulps, but with lesser polluting effects.

We will not deal further with the history of papermaking in modern times, as we deem the explanation provided heretofore to be sufficient for the purpose of this book. On the contrary, we will describe in some detail the methods of papermaking adopted in the second half of the nineteenth century, most relevant to the subject of this book.

**Table - The main vegetables used in papermaking**

| *family* | *species* | *family* | *species* |
|---|---|---|---|
| Conifers (wood) | fir | Annual plants | wheat straw |
| | pine | | rice straw |
| | larch | | alpha |
| | cypress | | esparto |
| Broadleaf trees (wood) | poplar | | cane |
| | beech | | combed cotton |
| | chestnut | | cotton linters |
| | trembling poplar | | cotton stalk or flock |
| | birch | | hemp |
| | eucalyptus | | linen |

## Evolution of papermaking processes from 1850 onwards

Instead of rags, which were almost exclusively utilized for hand-made paper, today wood is the most employed raw material, accounting for 90% of the paper produced, and, to a lesser extent, annual plants. In addition, an increasing use of so-called *secondary material*, such as waste wood residues,

recycled newsprint etc., is also made. Each of these materials require specific chemical processing, to eliminate the encrusting or foreign substances and to bleach the pulp. In fact, the cellulosic fibers which are contained in vegetables (wood and annual plants) are not free but united in bundles, attached one to the other by an intercellular encrusting material, *lignin*, which cannot be easily eliminated. Today, rags are practically no longer used as stock, especially on account of the fact that it is virtually impossible to find rags that do not contain synthetic fibers, the elimination of which would be extremely expensive.

The various types of paper produced, may require, in addition to raw materials, one or more additives, such as fillers, sizings and dyes, depending on the specified characteristics. As regards fillers, calcium carbonate, which was introduced during our century, is often found in substantial amounts (accounting for up to 40% of the weight of the finished product). Calcium carbonate (also natural, like pulverized marble) gives paper greater opacity and brightness, less gloss, less darkening after calendering and more receptivity to printing inks. Other fillers, such as kaolin, talc, barium sulfate, titanium dioxide and chalk, can be used to improve *feel* (see glossary) (*finishing fillers*), or to impart specific properties which we will touch upon in the following.

Over half the paper produced today is made with so-called *primary wood*, namely wood which comes from forest trees or annual plants, specifically grown for this purpose. The rest is obtained from *secondary* materials, that is to say materials obtained by recycling waste paper as well as from wood discarded by saw-mills (secondary wood) and, to a much lesser extent, from non-woody matter such as esparto grass, scraps from the processing of sugarcane (bagasse), cereals and linen straw, rushes, cotton and linen rags, scraps from cotton mills, and, more recently, sea weeds and corn flour.

Some of these raw materials are particularly suitable for the production of a specific type of paper. For instance, conifers yield long-fiber pulps from which highly resistant paper can be obtained. Broadleaf trees yield short-fiber pulps which, mixed with long-fiber pulps, are suitable for the production of soft and opaque paper. Among broadleaf trees, poplars provide the whitest pulp. Cotton, hemp and linen provide the best pulps for the production of securities and other types of paper that are to be preserved for a very long time.

Quality paper is made to a very large extent or entirely of chemical pulps, namely pulps that are chemically delignified (deprived of lignin) and possibly contain a limited amount of mechanical pulp (10-20%). Instead, in paper used for newspapers, the percentage of mechanical pulp can reach 85%. The thin paper used for cigarettes is obtained exclusively from very pure and refined chemical pulps and it is important that very soft water is used in their processing, with no iron content. Other thin papers such as tissue-paper, manifold paper for typing, tissue-paper to wrap citrus fruit, are obtained to a large extent with chemical pulps from wheat or rice straw. Securities and paper for artistic drawing are prevalently made from chemical pulp obtained from cotton, which is definitely more expensive but highly resistant. Lastly, the chemical pulp obtained from linters (see glossary) is advantageously used for filter paper and for watermarked papers, not particularly resistant.

Papermaking is generally performed in three phases:

1. Preparation of paper pulp;
2. Paper manufacturing from pulp;
3. Paper finishing and packaging.

### *Preparation of paper pulp*

The pulp, which is used by paper machines to form the paper tape, is a mixture of chemical pulps made with long fibers (from conifer wood) and short fibers (from broadleaf wood) to which suitable amounts of mechanical pulps and/or secondary material pulp, may be added.

Mechanical pulp is obtained by breaking the wood chips (generally pine, fir or poplar) with either a grindstone or disk refiners, always in the presence of large quantities of water. The pulp is then subjected to *sorting*, e.g. by vortex sorters, which allows to separate the splinters and large unwanted residues. The tiniest impurities, like sand, bark fragments and unbroken fascicles are then removed by means of a centrifugal machine, after which the pulp is ready for use. The yield of mechanical pulp is around 350-400 kg of dry pulp per ton of green wood.

Chemical pulps are obtained by cooking the chopped wood in a boiler (or autoclave) with solutions of various chemical agents. Generally, high temperature and pressure are adopted so as to solubilize the encrusting substances and transform wood into elementary fibers. After cooking, the fibers still contain a small amount of lignin which can be subsequently eliminated during pulp bleaching.

Three main types of processes were used in the last hundred and fifty years for the preparation of chemical pulps: *chlorine-soda*, *sulfite*, and *sulfate* process. Of them, the chlorine-soda process was less widely used and was abandoned already around the end of the nineteenth century. The sulfite process, though still used in some cases, is presently being abandoned. Therefore, the process that is mostly used today is the sulfate process. Nevertheless, for the purpose of this appendix, aimed to better understand Antonio Meucci's patents of 1864-1866 on the preparation of chemical pulps, we deem it opportune to describe all three aforesaid processes, particularly focusing on their central phase, namely that of *cooking*, which begins with the placing of chopped vegetable in the boiler and ends with the output of raw pulp (see glossary).

*Chlorine-soda process*

As mentioned previously, the chlorine-soda process was introduced in 1872 by Menzies and Davies and was subsequently taken up again with some modifications by Cataldi and by De Vains and Peterson in 1895. It was used to obtain chemical pulps from the stems of annual plants like esparto, hemp, cotton and castor-oil plant and sometimes from a mix of straw, ditch reeds and chopped wood. In some cases, like in the processing of ditch reeds, a mixed sulfite and chlorine-soda process was adopted.

In the chlorine-soda process, after the raw material was chopped, it was subjected to three subsequent treatments, implemented in a continuous cycle:

i) mild digesting with caustic soda, at 70 °C;

ii) treatment with chlorine gas or chlorination;

iii) a second cold alkaline digesting or alkaline washing.

The chopped material was introduced continuously from the top of an iron digesting tower by means of a helical conveyor. When the material reached two thirds of the height of the tower it was sprayed with a highly-diluted caustic soda solution (from 0.6 to 3%, depending on the kind of material to be treated) together with direct steam, and kept at approximately 70 °C. The material thus soaked was extracted from the base of the tower by means of a second helical conveyor and it was left to set for a few hours after which it was pressed to eliminate the excess liquor. The material was then conveyed by means of compressed air to the top of a second tower, called chlorination tower, made of reinforced concrete, coated inside with stoneware. In this tower, when the material reached a certain height (but

not such as to cause excessive self-compression) it was passed through a current of gas chlorine, at a low temperature. Finally, opening the lower lid of this second tower, the material was dropped in a tank below in which it was continuously stirred by means of agitators, thereby forming an acid pulp. The excess water was then removed from the latter by means of a filtering cylinder, and, lastly, the pulp was transferred in a suitable vat where it underwent cold alkaline washing.

The average yield of the chlorine-soda process was of approximately 40%. The consumption of reagents was roughly 20% of caustic soda and 45% of gas chlorine, with respect to the weight of the pulp produced, referred to a dry environment. For the subsequent bleaching operation 10% of lime chloride was required.

*The acid sulfite process*

As we have mentioned, though this process was patented in the United States by the Tilghmann brothers in 1866, it only yielded positive results after 1872, thanks to the modifications introduced by Ekman, who applied steam pressure, and later by Mitscherlich (1878) and by Ritter-Kellner. From then on, up until about 1930, when it was overtaken by the sulfate process, this process became the most popular one, providing chemical pulps of a definitely better quality than that provided by other processes.

The acid sulfite process (also called *sulfite* or *bisulfite* process) basically consisted in cooking the chopped wood in a solution of calcium bisulfite containing excess sulfur dioxide, called *sulfite liquor*. Before describing the various cooking stages it is opportune to mention how the liquor was prepared before the end of the nineteenth century.

— *Preparation of the sulfite liquor*

Calcium bisulfite, $Ca(HSO_3)_2$, was obtained inside a tower[137] filled with limestone, at the base of which sulfur dioxide, $SO_2$[138], was introduced through a wood grid, while water was sprinkled from above, which watered the limestone. Thus, a solution of calcium bisulfite collected at the base of the tower together with a certain amount of (unwanted) calcium sulfite. Some plants preferred to use magnesite instead of limestone since magnesium sulfate (also unwanted), which forms together with magnesium bisulfite, is much more soluble than cal-

[137]It was a tower made of concrete, some 30 meters tall, coated inside with acid-resistant material.

[138]Sulfur dioxide was obtained from the combustion of sulfur or pyrites, generally performed in the same plant.

cium sulfate and is thus more easily eliminated. A mixture of limestone, magnesite and dolomite could also be used to fill the tower. A more sophisticated system envisaged two towers, both filled with limestone, to prepare the liquor. In the first tower sulfur dioxide was introduced from the bottom, as mentioned previously. After passing through the limestone and exiting from the top of the first tower, the sulfur dioxide was introduced into the base of the second tower, from the top of which water was sprinkled. The diluted liquor, which dripped to the base of the second tower, was pumped back to the top of the first tower, at the base of which a more concentrated liquor collected which contained some 3.5% of sulfur dioxide, half of which in a free state. However, before the liquor thus obtained was used, it was further enriched in sulfur dioxide, which rose to 4-5%, by utilizing the sulfur dioxide recovered from the waste gases of the boiler, as specified hereinafter.

— *Cooking*

The sulfite liquor, prepared in the way described above, was sent by means of a pump to a pipe that ended near the base of the boiler, through a filtering device. A small portion of the liquor was introduced into the boiler from the bottom, while the rest of it was heated and introduced into the boiler from the top. According to the Ritter-Kellner method, after filling the boiler with wood and liquor and closing it, direct steam was introduced until the temperature reached and remained at 110 °C for about six hours. Then, hotter direct steam was introduced until the temperature rose to 130-135 °C, and was kept this way for some fourteen hours. According to the Mitscherlich method, instead, before sending the liquor to the boiler the wood was submitted to the action of direct steam for four-eight hours at normal pressure, after which the cold liquor was introduced. The boiler underwent depression so that the liquor could better penetrate into the pores of the wood. Cooking was then performed at approximately 130 °C for fifteen to twenty-five hours with indirect steam[139].

The Mitscherlich process was longer and more expensive, but it yielded a pulp presenting more resistant fibers. In turn, the Ritter-Kellner process provided a pulp that could be more easily bleached. It is also worth noting that there existed many variants of the two processes mentioned, as well as intermediate processes.

[139]Note that, since then, the duration of cooking, in this process as well as in the sulfate process, has gradually decreased to a few hours, basically by working at higher temperatures than in the past.

The mechanism according to which it was supposed that the sulfite liquor separates lignin from cellulose was the following: sulfur dioxide reacts with lignin and converts it into ligninsulfonic acid. The latter, in turn, is neutralized by the base present (lime or magnesia) and the salt that has formed becomes soluble under the acidity conditions of the sulfite liquor.

When cooking was over, before emptying the boiler, the sulfurous gases were collected from the top of the latter and sent to a recovery tower countercurrently to the fresh liquor in order to enrich it with sulfur dioxide as required. The boiler was then emptied from the bottom and its contents were dropped onto a metal net, placed over a tank, so as to withhold the raw pulp in the net and drop the spent liquor in the tank below.

At this point, as in other processes, the pulp underwent washing, purification, thickening and, in another section, bleaching, and possibly drying (in case it was not used directly in the paper mill). It is worth noting that pulp produced with the acid sulfite process required a smaller amount of lime chloride (7-12%) for its subsequent bleaching.

The amount of sulfite liquor required in the acid sulfite process was of 5-6 liters of liquor at 3.5-6 °Bé per kg of pulp produced. The average pulp yield was around 36% of the dry wood employed, while water consumption was at 500-600 liters per kg of bleached pulp, in a dry environment.

*Alkaline processes (soda and sulfate processes)*

Alkaline processes include the soda and the sulfate processes. We may also include in them the medieval boiling of rags in lye, i.e. in liquor obtained by leaching wood ashes. The sulfate process, now the most extensively used, was preceded by the soda process, the first to be adopted, historically speaking. The first caustic soda plants of Coupier and Meiller (1852) and those of Watt and Burgess (1854), despite their low yield and the fragility of the paper produced, were nonetheless used for a certain time, mainly in the processing of annual plants, where the problem of yield is not crucial.

The sulfate process was introduced by Dahl much later than the soda processes, precisely, as mentioned previously, in 1884, but in the space of forty years it prevailed over all others. Instead of caustic soda, it uses a mixture of three-four parts of caustic soda and one part of sodium sulfide. As was said, the process was called sulfate process because sodium sulfate is the product that is actually used up, taking

into account the recovery of the leaching liquor. The sulfate process was also called *kraft process* (from German *Kraft*, which means *strength*) for the excellent mechanical properties of the paper produced. Other advantages of this process, underlying its success, are:
- its high yield
- its capability to treat any woody species
- the possibility of working at high temperatures, thereby reducing the cooking time
- its capability to operate in a continuous cycle
- the efficient recovery of spent liquors
- its practical energy self-sufficiency
- the valuable by-products that can be extracted from wood, such as tall oil and turpentine.

In the sulfate process, the wood chips, barked and chopped, or the straw or other annual vegetables, minced, beaten and separated from the heavy parts, are cooked in a boiler in which the leaching liquor (caustic soda and sodium sulfide, in the aforesaid proportions) is introduced, under steam pressure. The boiler consists of a large steel cylindrical container (generally vertical and over ten meters tall), with conical or hemispherical lids, and coated on the inside with antacid materials.

Cooking lasted some five-eight hours, when working at temperatures between 140 and 175 °C and at pressure of three to nine atmospheres. Today, by operating at some 200 °C, the duration of cooking has been drastically reduced, in addition to working in a continuous cycle.

The process entails the recovery of the spent liquor (or *black liquor*), during the pulp washing stage, thus reducing the consumption of soda, though part of it is inevitably lost. To make up for such a loss, sodium sulfate (which in the subsequent combustion will be reduced to sodium sulfide) is added to the black liquor in the amount of approximately 20% of the chemical pulp produced. The black liquors, extracted from pulp washing, are concentrated, in a vacuum, in multiple-effect evaporators; they are then introduced, together with sodium sulfate, into a recovery furnace where all organic compounds are burned while inorganic compounds, containing oxides, sulfides, carbonates and other alkaline salts, collect in the molten state on the bottom of the furnace. Said compounds are then dissolved in water and treated with caustic soda, in order to restore the alkaline solution, to be sent to the boiler for the next processing.

The raw pulp, discharged by the boilers, will undergo re-

fining and bleaching, as shown ahead.

The pulp yield of the sulfate process exceeds 50% of the dry wood, while water consumption is of approximately 200 liters per kg of raw pulp, or 500 liters per kg of bleached pulp, in a dry environment (values indicated by Meneghini, 1961, see bibl.).

*Secondary fibers*

The production of secondary fibers, primarily obtained from waste and used paper, has become increasingly important over the past few years, especially in countries like Italy and Japan which do not own forests from which to obtain so-called virgin fibers. Moreover, a growing need to preserve forests for ecological reasons is worldwide felt.

There are four types of paper, with reference to the pulping treatment that need: *inferior* (mixed papers), *medium* (used newspapers, books, etc.), *superior* (printing scraps, unprinted papers, etc.), and *kraft* (based on kraft paper, namely paperboards, paper bags, and so on).

All types of waste and used paper undergo sorting, beating (to rid them of dust), and a first breaking treatment inside a pulper, where a first rough cleaning is also performed. Processing into elementary fibers is then completed in other pulping machines, after which sorting and purification are performed. The latter operation implies specific chemical treatments, to remove ink (generally using chlorine) or other impurities, as contained in special types of paper, such as waterproof, bituminized or adhesive paper. We shall not go into the details of these operations, which are generally complex. Demanding readers may consult specialized literature (see bibl.) for further information.

*Refining and bleaching the pulps*

After the pulp is cooked with any of the processes illustrated above, it is passed through a series of pressurized containers, called *diffusers*, after which it is carefully washed and sorted, to eliminate the uncooked wood knots or any other foreign bodies still present. For this purpose, special sorting machines are used, such as flat or revolving screens, as well as vortex or centrifugal machines. We also recall that chemical pulps generally undergo *thickening* before leaving the cooking section. In another section, pulps undergo *bleaching*, the purpose of which is to eliminate both the residual encrusting substances and the chromophores present in the fibers, thus making them whiter. Lastly, if the pulp is to be marketed as such or stored for later needs,

it must be dehydrated and dried, as well as molded in the form of sheets or blocks. If the pulp is to be used on site, it is sent to the paper manufacturing section, generally located in a different compartment or building, where it is mixed with other pulps and various additives, according to the type of paper that is to be produced, before being sent to the headbox of the paper machine.

The bleaching of pulps usually requires several more or less complex steps, depending on the type of pulp to be bleached and the degree of whiteness desired. Bleaching the kraft pulp, as obtained with the sulfate process, requires perhaps the most complex processing: it is first treated with chlorine and/or chlorine dioxide or oxygen, to also eliminate residual lignin; this is followed by an alkaline treatment, to better solubilize the encrustants and, finally, it undergoes a true whitening treatment with oxidizers, such as sodium hypochlorite, chlorine dioxide or hydrogen peroxide, generally repeated two or more times.

### *Paper manufacturing from pulp*

Pulps for papermaking can either be obtained from dried pulps in the form of thick sheets or blocks or be conveyed in their natural state from the pulping department to the paper manufacturing department through a suitable pipeline. In the first case, they are first introduced in water, in large round steel tanks (pulpers), the purpose of which is to mash the blocks or sheets, so as to obtain a thick homogeneous pulp. In the second case, the pulp is first conveyed from the pipeline to a vat, where it undergoes refining, one time performed by the aforementioned refining Hollanders, currently performed with conical or disk refiners (or beaters).

Each type of pulp, as well as all non-fibrous additive materials (fillers, sizings, dyes, etc.) are stored in their specific vat. A dispenser extracts them from their vat in the specified amount that depends on the particular type of paper to be manufactured, and conveys them to the so-called blending vat. When blending is completed, the pulp undergoes a sizing treatment, to make the paper waterproof, i.e. to avoid writing or printing inks from dripping and spreading. Originally, as was previously stated, sizing was only performed on finished paper (sheet sizing). Starting from about 1826, pulp sizing was introduced, that was performed by mixing to the bleached pulp a natural resinous substance (rosin), preliminarily saponified with caustic soda or reduced to colloidal suspension. For some time

now, synthetic chemical products are also used as sizings. If, after blending, a certain amount of aluminum sulfate diluted in water is added to the pulp to be sized, it will facilitate the colloidal rosin particles in wrapping the individual fibers, making them waterproof.

The pulp that is thus prepared is about ready to reach the headbox of the paper machine. It is stored with all its water into vats equipped with agitators (called *feeding vats* or *collection vats*) where it is constantly stirred, becoming like a more or less dense milk, depending on the thickness of the sheet that has to be obtained.

Incidentally, it is worth recalling that, since the end of World War II, the archives and libraries of the United States conducted a survey on publications, printed between the second half of the nineteenth century and the first half of the twentieth century, showing that the deterioration of paper was such that it would no longer be possible to consult them in the following century. The responsibility for such an inconvenience was attributed to the use of aluminum sulfate and rosin, which confer acidity to paper. In the wake of this survey new generations of sizings have been developed (see, for instance, Ceragioli et al. in bibl.), in order to obtain acid-free paper, capable to last a long time.

After the operations illustrated above, the pulp is diluted with the same water that drips from the machine wire and is then sent to the purifiers, after which it goes through yet another refiner (the so-called *head refiner* of the paper machine) and from here to the so-called *machine vat*. From this vat the pulp is picked up by a pump which conveys it to the headbox of the paper machine, where it is kept at a strictly constant level by specific devices. The pulp flow from the headbox towards the wire screen is proportional to the specific weight of the paper that is to be produced.

### *Continuous paper Machines*

The two most commonly used paper machines are the *plane-table paper machine* or *fourdrinier* and the *cylinder machine*. Both can reach production speeds of 800÷1000 meters per minute, the width of the paper tape being up to nine meters. However, most of the paper that is produced today is made with fourdriniers. The cylinder machine is particularly suitable for the production of either very thin paper with attractive watermarks or, using several cylinders, thicker paper, multilayer paper and paperboard. Both machines end with a large reel to wind the paper into large rolls, that

are then carried to the finishing departments.

Both machines contain a *wire* (laying on plane table or on cylinder) which runs in a closed loop and is closely woven (in the past with copper or phosphor bronze thread, today with synthetic thread coated with thermosetting resin). The wire carries a continuous layer of pulp with which the paper is made. The wire undergoes continuous shaking (though decreasing towards the end of the wire), with the purpose both to evenly distribute the pulp and to facilitate the draining of water. Along the course, the pulp loses most of its water, both by draining and by suction, after which it is transferred onto a woolen felt screen, also endless (running in a closed loop), which conveys it to the other online devices, before undergoing smoothing and rolling towards the end of the machine. Overall, the equipment contained in a plane-table paper machine covers a remarkable distance (around 150 meters).

— *The fourdrinier or plane-table paper machine*

In the plane-table paper machine the pulp and water is introduced into the headbox of the machine, which is slightly raised with respect to the moving wire. From the headbox the pulp is sent through a slot toward the wire. The speed of inflow is adjusted so as to obtain a pulp layer of a specific thickness on the wire. The table along which the wire moves is called fourdrinier table and is about 40 meters long. Along the first one third of the table there are many draining rolls set close to each other beneath the wire mesh, the surface of which is such as to retain water[140], thereby helping to dry the pulp which is dragged by the wire. Subsequently, drying is carried on by a series of suction boxes, also set beneath the wire mesh along most of the remaining table. Suction is obtained by means of a suction pump connected to the boxes.

Just before leaving the table, the top surface of the pulp (the one that is not in contact with the wire) comes into contact with a cylinder which is also covered with a wire mesh; said cylinder can freely move in a vertical direction, hence it is called *dandy roll*. This cylinder helps to mat the fibers and makes them more uniform on the two surfaces. The same purpose is served by paper machines (called *twin-wire* machines) that differ from the fourdrinier in that they employ two metal wires instead of one, between which the pulp is sandwiched so that water is

[140]Ceramics-coated elements called *hydrofoils* have been in use for some time now.

drained from both sides. The paper produced by these machines presents the same characteristics on both sides, which is particularly appreciated for printing paper. Another function of the *dandy roll* is to stamp the watermark on the paper that is being produced. For this purpose, the desired writing or drawings are reproduced on its surface by means of metal wires or plates.

Before leaving the wire and moving on to the woolen felt screen, precisely at the point where the wire turns back towards the machine head, the pulp travels over a suction cylinder, which serves to further improve pulp dehydration also to let it more easily come off the wire and be picked up by the next felt screen. The pulp has now reached the consistency of a *wet sheet* with moderate dry content (20% roughly). This sheet, conveyed by the woolen felt screen, is passed through a series of cylinder presses called *wet presses* which drain water both by squeezing the sheet and, as regards part of them, by suctioning. By the time it comes out of the wet presses, the paper's dry content has increased to 40-45%. The part of the fourdrinier machine described thus far, namely from the headbox to the wet presses, is called the *wet end*. The section that follows the wet end is called *dry end*, and it ends with the paper rolling machine.

Outline of the first section of the cylinder machine

The dry end begins with the so-called *dryer section* in which the paper sheet is dried by many metal steam-heated cylinders. The dryer section is divided into two parts in order to submit the paper to an intermediate treatment by means of the so-called *size-press*, the purpose of which is to apply various products to paper in order to improve its surface characteristics[141]. As the size-press treatment dampens the sheet, the latter passes to the second part of the dryer section (called *post-dryer*) for final drying. The paper is then cooled, by passing it through one or more cylinders (once made of copper, currently made of cast iron coated with anti-rust material), cooled, in turn, by cold water which circulates inside. It is then smoothed[142] by passing it through a series of rolls placed one on top of the other and, finally, it is wound into large rolls.

[141]As was already mentioned, many sizings used in the past were acid, thus causing the paper to deteriorate. Modern alkaline sizings, in addition to eliminating this inconvenience, improve other paper characteristics.

[142]This type of operation, performed within the paper machine, is called *smoothing*, while the one that is performed off-line is called *calendering*.

*Cylinder machine*

The cylinder machine differs from the fourdrinier basically in that which concerns the *wet end*. Instead of having a flat wire that moves horizontally, it features a large rotating cylinder covered by a metal wire, which is submerged for more than half its diameter in the vat that contains the cellulosic pulp, which is kept at a constant level (see the figure above).

This cylinder, called *creator* cylinder, rotates slowly on its horizontal axis, dragging a layer of pulp onto its external surface; the pulp is then picked up by a felted mat above, as we shall see later. The inside of the cylinder is kept at a slightly lower pressure than normal, so that the water contained in the pulp is sucked through the meshes of the wire into the cylinder, while the fibers are retained on its surface, thus forming a layer of pulp, the thickness of which depends on the rotation speed of the cylinder and the density of the pulp. Drawings for the watermarks can be sewn or punched onto the wire. A roller is set above this cylinder which drags the *couching* felt, whose function (analogous to that of the *coucher* in hand-made paper) is to pick up the layer of pulp that has formed over the cylinder and to carry it towards the wet presses. Unlike in fourdriniers, wet presses act on the sheet through the felt rather than directly.

From this point onwards, processing continues much like in the plane-table machine. As was previously mentioned, by using machines with several cylinders it is possible to produced multilayer paper and paperboard.

*Paper finishing and packaging - Types of paper*

Finishing and packaging are performed off line, being, in a way, analogous to the operations carried out in the middle ages by the *cialandratori* who had their workshops in town and received paper to be finished and packaged from the fulling mills situated along the river. The first finishing step which is performed off line is *calendering*, a more vigorous treatment than machine smoothing. When required, paper also undergoes *glazing*, which is generally not performed within the paper machine. Calendering is performed with a series of superimposed cylinders, stiff cylinders alternating with elastic ones; pressure, temperature and dampening are adjusted in order to monitor the degree and quality of smoothing. Calendering is followed by reeling, in which paper is rolled around a disposable cardboard or plastic tube. The rolled paper is then cut into sheets, which are trimmed, in-

spected and sorted, and finally packaged and labeled.

As for the varieties of paper produced, in addition to the various types of paper for writing or printing (from common paper for newspapers to very thin and fine paper like tissue-paper), there also exist countless other types, from paper towels to toilet paper, absorbent paper, wallpaper, paperboard and cardboard with which to make containers, the various types of paper used in the building industry, for instance for tar-board paving or roofing, for electric insulation, soundproofing and acoustic insulation. Special paper can be manufactured to withstand impact and tear, water, gas, vapors, fire, insects or molding strains. Indeed, paper can be shaped into different types of containers, from egg boxes to bags and containers for industrial equipment.

It is worth mentioning *parchment-type paper* (not to be confused with parchment proper, or vellum) and *vulcanized paper*. So-called *parchment paper* is greaseproof and is used to wrap food. It is obtained by further refining the pulp, until a gel-like pulp is obtained which is then processed by a fourdrinier machine, where the final sheet undergoes particularly vigorous smoothing. *Vegetable parchment* (sometimes also called *parchment paper*), instead, is obtained with a pulp derived from cotton rags. After forming, the paper sheets are soaked for a few seconds in concentrated sulfuric acid (at 60 °Bé), which has the effect of transforming the superficial cellulosic fibers into a semipermeable (amyloid) substance.

Vulcanized paper products, generally obtained with many overlapped sheets of vulcanized paper, pressed and shaped into the desired form, is extremely resilient and resistant and can withstand extreme temperatures. It is thus suitable for suitcases, brake gaskets, silent gears and insulating materials. Like vegetable parchment, it is obtained from rags, submitting the unsized sheet to a particular treatment. Precisely, the latter is soaked into a 75% solution of zinc chloride, at a temperature of about 28 °C. The sheets are then hot-pressed and washed thoroughly to eliminate all the zinc chloride. Finally, they are pressed again and hot-calendered, in addition to being dyed and impregnated with particular substances, according to the use that is to be made of them.

**Yearly production (FAO/1990) and consumption (PPI/1991) of wood pulp and paper**

| *Country* | *Wood pulp production* kilotons | % | *Paper & cardboard prod.* kilotons | % | *Consumption* Kg/person |
|---|---|---|---|---|---|
| United States | 57,217 | 37.05 | 71,965 | 30.21 | 302 |
| Canada | 22,835 | 14.78 | 18,466 | 7.75 | 211 |
| Japan | 11,321 | 7.33 | 28,088 | 11.79 | 235 |
| China | (1,744) | 1.12 | 16,058 | 6.74 | 14 |
| Germany | (2,799) | 1.81 | 12,214 | 5.12 | |
| USSR | 11,857 | 7.67 | 10,657 | 4.47 | |
| Sweden | 9,633 | 6.24 | 8,426 | 3.54 | |
| Finland | 8,888 | 5.76 | 8,781 | 3.69 | |
| Brazil | 4,307 | 2.79 | 4,844 | 2.03 | |
| Italy | (621) | 0.40 | 5,582 | 2.34 | 123 |
| **Total** | **154,421** | 100 | **238,238** | 100 | |

## General data and environmental aspects

In the table above we have gathered some interesting figures regarding pulp and paper production as well as their consumption pro capita in some countries of the world. As can be seen, the United States rank first in all three sectors, followed by Canada and Japan. If we compare these figures (which refer to 1990-1991) with the ones of thirty years before (see Meneghini in bibl.) we can see that, in the span of thirty years, the world production (and, consequently, the consumption) of paper has gone from roughly 5 million tons a year to some 240 million tons, with an average annual increase of 13.7%. This shows how this industrial sector has become of increasing importance in modern life. According to figures provided by *Pulp and Paper Industry* (PPI) journal, paper consumption in 1991 was split among the various uses as follows: 13.3% for newspapers, 28.2% for printing and writing, 38.2% for wrapping and 20.3% for other uses.

In the last few decades, papermaking has experienced great changes, especially in relation to environmental problems, which have become increasingly pressing. In the past, on account of the need for water and wood whereby to obtain wood pulp, paper factories were often located along river banks or near forests and woodland. This, along with the boom of paper consumption, led to progressive impoverishment, water pollution and rapid deforestation, often entailing irreparable damage to the forests. Indeed, for every

kilogram of bleached chemical pulp produced, some 7 kilograms of living tree must be destroyed, on average. For some time now an increasing use has been made of reforestation wood, instead of wood from virgin forests, and, as far as possible, of annual vegetables and of secondary material. Reforestation is carried out also in countries already rich in woodland, with planned production cycles that go from seven-eight years for eucalyptus (as in Spain, Portugal, Brazil, Argentina) up to thirty years for conifers (as in Sweden, Russia, Finland, Canada).

The other way to preserve forests is to resort to annual vegetables. Paper can be manufactured from vegetable residues from annual plants, such as cotton linters, wheat straw and bagasse (the residue from sugarcane). Typically, this paper is composed of (Favini, see bibl.): 60% pulp from annual vegetables, 10% starches, 23% calcium carbonate (and water). Another way of saving trees is that of mixing annual vegetable pulp and regular wood pulp. In 1991 the Novamont Co. (Italy) produced a pulp from corn kernels (starch), which was composed of: 52% bleached pulp, 10% Indian corn starch, 31% calcium carbonate (and water). Finally, the recycling of paper must be mentioned which, moreover, allows to reduce the volume of solid urban wastes. Such a process is becoming more and more widespread, especially in the United States.

As for water consumption, the manufacturing processes have been constantly reviewed and modified, so that, in the space of a few decades, the water consumption has been reduced from about hundred liters per kilogram of paper produced to roughly twenty liters per kilogram. Energy consumption has dropped as well, although not as dramatically, reaching the current values of 0.5-0.75 kg of oil per kilogram of paper produced.

Pollution is another problem involved in paper production. In fact, the paper manufacturing processes produce liquors that contain chloro-organic compounds and other dangerous chemical substances. In the past, these substances were somewhat diluted in the waste waters of paper mills, which were discharged into rivers, endangering the life of fish and the health of the population. Furthermore, traces of dioxin were found in some paper products like baby diapers and food containers and their presence was attributed to the use of chlorine and its derivatives for pulp bleaching. It was assessed that to produce the roughly 100 million tons of bleached pulp, annually required by the market, some 2.7 million tons of chlorine was

used, generating about 270,000 tons of chloro-organic compounds and between 1 and 3 kg of dioxin.

For this reason, the organizations in charge of environmental protection, like the American Environmental Protection Agency (EPA), have issued new laws, both to regulate the effluents of paper mills and to curb the presence of noxious elements in the finished products. Many industries did readily comply, and indeed some rivers which were polluted in the past are gradually returning to their original state; others were invited to adopt non polluting processes within a specific date, which, as far as the United States are concerned, was the year 1995. One of the measures adopted by paper industries was that of modifying the bleaching process by replacing elementary gas chlorine with less polluting chlorine compounds (Elementary Chlorine-Free, or ECF, pulps) or, better yet, by replacing chlorine and its derivatives with oxygen bleaching processes which prevent chlorine derivatives from forming (Total Chlorine-Free, or TCF, pulps). It must, however, be remarked that, for the time being, paper thus produced, though being about 10% more expensive than that obtained with chlorine bleaching, is not as white (it has an off-white color) and, furthermore, it features slightly inferior mechanical characteristics, though it is hoped to achieve better results in the future. Paper obtained with pulps certified as free from organic chloro-derivatives is called “Chlorine-Free” paper and it is already available on the market with guaranteed less than 25 ppm (parts per million) of organic chlorine compounds (in terms of chlorine content).

Finally, a problem that came up during the war on account of the shortage of raw materials, namely that of using less valuable annual plants (like herbs from the marshes) than the ones mentioned thus far, has currently become an environmental problem in relation to the infestation of macro-seaweeds[143] in lagoons. This problem is particularly felt in Venice’s lagoon (see *Il Leonardo News* in bibl.) where some 50,000 tons of weeds have to be eliminated every year. In the course of studies promoted in 1989 by the Italian Waters Magistracy, an attempt has been made to use macro-seaweeds also in papermaking (in addition to using them as an organic fertilizer in soil). The related process was elaborated in 1992 by ENEA (National Agency for the Alternative Energies), by the Cartiera Favini of Rossano Veneto (Vicenza), by the Consorzio Venezia Nuova and

[143]The surface of a single macro-seaweed leaf can cover as many as ten square meters.

by the SGS Ecologia, and it consists of drying weeds, converting them into flour, and therefrom preparing a pulp that is used in a certain percentage (about 5%), mixed with regular bleached pulp (58%), starches (7%), and calcium carbonate (21%), to produce paper. Currently, the cost of the process is about 15% higher than that of the regular one, and the paper obtained is slightly dotted and either light-green or off-white colored.

In Japan, with the same objective, an attempt is being made to create, by means of genetic engineering, a weed with small leaves, called *aliform microweed*, presenting a high cellulose content.

## Glossary[144]

*Alkali* - (from the Arabic *Al Qali*, soda) - Substances like soda and potash (see below).

*Bagasse* - The residue of sugarcane processing, after juice has been extracted.

*Calender* - Machine used to vigorously smooth paper, to produce silk-like glossiness.

*Caustic potash* - Potassium hydroxide.

*Caustic soda* - Sodium hydroxide.

*Cellulosic pulp* - The pulp of fibers of which cellulose is the main chemical component (around 50%).

*Cialandra* - An old tool, generally made of flint stone, used to smooth paper by hand.

*Cotton paper* - The name given in the middle ages to paper made with rags of cotton, linen, hemp etc.

*Dry environment* (in a dry environment) - An environment with specified low humidity (e.g. 12%). Reference to a *dry environment* is especially recommended when quoting the characteristics of hygroscopic materials, such as paper pulp, which absorb water in a damp environment.

*Esparto* - A type of strong and resilient grass that is grown in Spain and in Northern Africa, which yields excellent fibers, also used in making ropes.

*Fast pulp* - Pulp that is hardly refined and lets water drain more easily. It is suitable for manufacturing absorbent paper.

*Feel* - A technical term in papermaking indicating the sensation received when touching a paper sample.

*Fillers* - Substances mixed into cellulosic pulp with the purpose to confer particular characteristics to the paper to be produced, like greater brightness, opacity, smoothness, etc.

*Fulling mill* - Ancient small factory, generally situated on the banks of a river, where wool cloth was processed by a machine similar to the hydraulic ram with multiple hammers, later used in medieval paper factories for beating rags.

*Greasy pulp* - Highly refined pulp which, in the felting stage, lets water drain more slowly from the wire mesh. It is suitable for manufacturing thin paper, like tissue paper.

*Hollander* - (washing, breaking, shredding, refining, etc.) - Oval vat,

[144]This glossary merely contains a few technical terms that are used in this appendix as well as in Meucci's patents and Memorandum Book. More complete glossaries on papermaking terminology are available from the various national standardizing agencies (such as UNI and ATICELCA in Italy).

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introduced by Dutch papermakers and utilized up until the early twentieth century, equipped with various devices that allowed to perform specific operations on paper pulp.

*Leaching* (or *lixiviation*) - Remotion of unwanted substances through the action of a suitable solution, called *leaching* or *lixiviating liquor*. In the past, this liquor (called *lye*) was simply obtained by boiling wood ashes in water and was used in laundry. Even today, a liquor often used for leaching is a medium-concentrated solution of (caustic) potash and soda in water.

*Lignin* - An organic substance that fills the interstices between the wood's cellulose fibers, making it rigid. It is considered an encrusting substance for what concerns the extraction of cellulose from wood and must therefore be eliminated. It is contained in wood in the amount of 25-30% of its weight.

*Linters* (cotton) - The short fibers that remain adherent to cotton seeds after the first ginning and that are not used in the textile industry. They contain very pure cellulose with a high degree of polymerization.

*Lithography* - Printing process on lithographic stone (slate), invented by Aloys Senefelder in 1796.

*Manilla* (or *manila* or *Manila hemp*, also called *abacá*, botanical name *Musa textilis*) - Plant of the Philippines which takes its name from the capital, Manila, and yields very strong fibers, suitable for making ropes, cables, paper and textiles.

*Matting* (or *Felting*) - The compacting of fibers into a thick mass, as in felt production. In everyday language, *felt* is a compressed (unwoven) wool cloth which is soaked with glue in order to make it compact.

*Mechanical pulp* - The paper pulp that is obtained from wood by mechanical breaking of wood in water and subsequent sorting.

*Offset* - Indirect printing process that implies the transfer (*offset*) of the image on an intermediate rubber cylinder.

*Potash* - Impure potassium carbonate, once derived from the leaching of wood ashes.

*ppm* - Abbreviation of "parts per million."

*Raw cotton* (or *cotton wool*) - Material made up of extremely long cellulosic fibers (10-30 mm long), surrounding the cotton seeds.

*Raw pulp* - Chemical pulp that comes out of the boiler (after most of lignin is eliminated) and is yet to be submitted to washing, sorting, refining and bleaching.

*Rosin* or *colophony* - Colophon resin used for paper pulp sizing. In papermakers' jargon it is sometimes simply called *resin*.

*Sieve* (or *module*) - A device made up of a rectangular wood frame, set on a screen or wire mesh, which serves to form the hand-made sheet of paper, dipping it into the pulp. The inner edge of the frame corresponds to the size of the sheet to be obtained.

*Sizing* - Procedure whereby paper is impregnated with suitable substances that coat the cellulose fibers, making them waterproof. In this way, paper becomes smoother, more resistant to inks and to pathogenic agents, and more durable. It can be performed on the pulp (*bulk sizing*) or on the sheet (*surface sizing*).

*Soda* - Impure sodium carbonate, once derived from the leaching of ashes of marine plants.

*Vulcanization* - Treatment that enhances the elasticity and resistance of certain materials and makes them insensitive to hot and cold. In the past it referred to the treatment of gutta-percha with sulfur at very high temperature to obtain the above mentioned characteristics.

*Watermark* - Mark or image that can be seen by observing a sheet of paper against light.

*Wire* - The screen on which sheets of paper are formed in a papermaking machine or sieve.

## Chronology

c3500 BC - The Sumerians write on clay tablets, in cuneiform script

<2500 BC - The Egyptians write on papyrus, which will remain the main base for writing for at least two mil-

lennia, as its use was protracted up until the twelfth century

c600 BC - Solon writes his famous laws on wood plates called *axones*

c250 BC - The Mayas invent *huun* paper, obtaining a sheet suitable for writing from the wild fig. It was later called *amatl* by the Aztecs and it is used still today in Mexico and Honduras

140-180 BC - In Gansu, China, a type of paper made from silk fibers, is used. Fragments of this paper dating back to that period were retrieved by archaeologists

Second C. - In the Tonga Islands a paper known as *tapa* is used which is made with the inner bark of mulberry. It is used still today in some regions of Central and South America

105 - In China, Ts'ai Lun, chief of the workshops of the Emperor Ho-Ti in the city of Lai Hang, invents paper as we know it today, namely made from cellulosic pulp. The materials used by Ts'ai Lun were: tea or rice straw, bamboo shoots, hemp waste as well as old fishing nets

137 - Ts'ai Lun manufactures more valuable paper using the inner bark of mulberry. This type of paper was used in China some centuries later to make paper money

150 - A paper mill is operating in Tun Huang, in Central-Southern China, whence the art of papermaking will begin its journey to the West

200 - A paper mill is operating in Loulan, Western China

350 - In India, Buddhist monks write on tree leaves called *bai-lan*

610 - The first paper mill in Japan is set up in Kyoto. It is believed that, perhaps, prior to this date, the art of papermaking traveled from China to Korea

751 - The art of papermaking arrives in Samarkand, probably brought by captured Chinese marauders. Here, linen and hemp are used as raw materials, of which Turkistan abounds, and starch is used as sizing instead of rubber obtained from lichens, as was used in China. Paper dating back to that period has been found, which already contained inorganic fillers

770 - In Japan, some one million copies of a book of Buddhist prayers are reproduced on paper

793 - The first paper mill is set up in Baghdad

910 - The first paper-money factory in the world is set up in Szechwan, in South-central China

1000 - First paper mills appear in Damascus and Cairo

1100 - A paper factory is set up in Fez, Northern Morocco

1109 - A document on paper is issued from the Chancery of the Norman Kings of Sicily, currently at the Palermo State Archives

1151 - The first paper factory on the European continent, is built by the Moors in Játiva, near Valencia, Spain

1189 - First French paper mill is built near the Hérault River, that flows to the Gulf of the Lion

1231 - In the Kingdom of Sicily, Frederick II issues a ban to use cotton paper for public deeds, which will have to continue being written on parchment. The same ban is issued in the city of Padua and in other regions in the same period, the reason for such decrees being the easy deterioration of the paper produced at the time, mostly caused by starch sizing

1264 - In Italy, the paper mill of Fabriano (near Ancona) has been operating for some time

1280 - The German engineer Hans Speyer mechanizes the spinning mill, thus causing a drop in the cost of cloth. Consequently, sizable amounts of rags and old clothes become available on the market, thus lowering the cost of paper production

1282 - The oldest watermark known, currently kept at Fabriano's Historical Archives, represents the trademark of a paper factory in Fabriano. Fabriano's papermakers also introduce a series of innovations, among them sizing with animal glue instead of starch, screens made with metal wires instead of bronze rods and beating performed with a hydraulic ram with

multiple hammers instead of with a stone pit and a hand-operated pestle
1289 - In Italy, Amalfi's paper mill has been operating for some time
1298 - In his *Milione* (*Travels of Marco Polo*), Marco Polo describes the method used by the Chinese to make paper with the inner bark of mulberry
1326 - Dozens of small artisan paper mills are operating in Fabriano, all situated along the banks of the Giano River. Their number will be gradually reduced (in 1854 there will be only three of them), and their size contextually increased
1338 - Second paper mill is set up in France, in Troyes
1340, 1365 - The Fabrianese Pace de' Penacci sets up first paper mills in Padua and Treviso, Northern Italy
1389 - First paper mill is set up in Germany, in Nürnberg
1411 - Third paper mill is set up in France, in Marly
<1420 - Second paper mill is set up in Germany, in Lübeck
1450 - Johann Gutenberg invents a new printing press and ink, for which paper proves to be better than parchment, therefore increasing paper demand on the market. It is believed that the success of printing was also due the exorbitant wages of scribes, who were decimated by the outburst of black plague epidemics in the early decades of the century
c1491 - First paper mill is set up in Poland, in Cracow
1494 - First paper mill is set up in England, in Hertfordshire (Stevenage, Hertford)
1540 - The hydraulic drop hammer for smoothing paper is introduced in Germany, which replaces the hand-operated 'cialandra'
1576 - First paper mill is set up in Russia, in Moscow
1609 - The first newspapers are printed, like the *Aviso* in Saxony and the *Relation* in Strasbourg
1665 - The Englishman Charles Hildeyard introduces blue sugar paper
1680 - Dutch papermakers introduce the shredding machine, called the *Hollander*, which is driven by a hydraulic wheel or by the wind and replaces Fabriano's multiple-hammer *pistogio*
1690 - First paper mill in the United States is founded in Germantown, PA, by a Protestant priest, William Rittenhouse
1695 - In Denmark a first attempt to recycle printed paper is performed
1697 - First paper mill is set up in Estonia, in Reval
1698 - A first paper mill is set up in Norway, in Oslo
1700 (early) - Dutch papermakers introduce the cylinder calender, which replaces the hydraulic drop hammer, to smooth paper
1741 - The Frenchman Jean Étienne Guettard utilizes the swamp moss in paper pulp making
1750 - An English printer, John Baskerville, introduces the metal mesh sieve which allows to produce paper with a more uniform structure and without laid lines. In 1757, he publishes his first book illustrating all his innovations in papermaking
1774 - The Swede Karl Wilhelm Scheele discovers chlorine and its bleaching effect on vegetable fibers
1787 - An unknown papermaker invents the dark watermark
1789 - The French chemist, count Claude Louis Berthollet, uses chlorine in the form of sodium hypochlorite (also called Javelle's water) on colored and second-rate rags, obtaining very white paper
1795 - The Englishman Joseph Bramah invents the hydraulic press which will replace the hand-operated screw press for pressing stacks of hand-made paper
1796 - Aloys Senefelder invents the process of printing on lithographic stone (slate)
1798 - The Frenchman Nicolas Louis Robert, chief of the paper mill annexed to the Didot printing house in Essonnes, France, creates the first machine for continuous paper pro-

duction. Then, with the outburst of the French Revolution, he looks for financiers in England

1799 - The Scottish chemist Charles Tennant patents a system whereby chlorine is absorbed on calcium oxide, obtaining a white and stable powder (chloride of lime) that can be put in barrels and shipped anywhere. Wood pulp is perfectly bleached with chloride of lime, thus making it possible to use colored rags and fabrics in papermaking. Shortly after, chloride of lime becomes of widespread use for wood pulp bleaching

1801, 1803 - Nicolas Louis Robert obtains two English patents on his machine for continuous paper production and transfers them to the brothers Henry & Sealy Fourdrinier of London

1804 - Rosin begins to be used for pulp sizing

1805 - An English engineer, Bryan Donkin, introduces great improvements in Robert's continuous machine and builds a first prototype which allows to increase paper production from the daily one hundred pounds of hand-made paper to over six hundred pounds a day (with 24 working hours)

1806 - The Londoner Ralph Wedgewood invents carbon paper

1808 - After vain attempts to install their new continuous machines in English paper mills, the Fourdrinier brothers go bankrupt

1808 - Matthew Koops tries to use wood together with other vegetable fibers and waste paper to obtain a cellulosic pulp, but does not achieve satisfactory results

1809 - The Englishman John Dickinson invents the first cylinder paper machine

1822 - Bryan Donkin further improves his fourdrinier. He introduces on line drying by means of cylinders, initially heated with a raw flame and later with steam

1826 - The Frenchman Canson introduces suction boxes in the fourdrinier, which remarkably speed up paper drying

1826 - Illig introduces sizing with resins instead of animal gel

c1835 - The Englishman William George Armstrong introduces the accumulator in hydraulic press, thus enhancing its efficiency

1838 - The French chemist Anselme Payen discovers cellulose and its chemical formula

1839 - Vulcanization of rubber is invented by Charles Goodyear

1840 - Anselme Payen suggests to eliminate the encrusting substances of wood by means of nitric acid which, however, does not dissolve lignin

1840 - The Saxon Friedrich Gottlob Keller is the first to create and use mechanical wood pulp in papermaking

1844 - In the United States, Faherty patents a procedure analogous to Keller's to obtain mechanical pulp

1845 - The New Yorker Richard M. Hoe builds the first rotary press that can print up to 10,000 sheets per hour on a continuous roll of paper. As the prices of printing paper drop, paper demand rises

1846 - In Paris, Figuier and Poumarède are the first to produce so-called *parchment paper*, obtained from vegetable fibers only

1848 - The Englishman W. H. Smith creates chiaroscuro watermarks, also known as *ombré*

1852 - In France, Coupier and Meiller suggest using caustic soda to obtain chemical pulp from wood (soda process)

1845 - The Englishmen Watt and Burgess build the first plant using soda under pressure to obtain chemical pulp from wood (another soda process)

1861 - The Englishman Thomas Routledge elaborates a process to obtain chemical pulp from esparto

1864-1866 - The Italian Antonio Meucci, resident in Staten Island, NY, obtains three patents for the production of chemical pulps, treating wood, annual plants, rags (or any other secondary material) in autoclave, with

aqua regia (nitrohydrochloric acid) and, subsequently, with caustic soda
1866 - In the paper factory *W.W. Harding Mills* in Pennsylvania, the brothers B.C. and R. Tilghmann try, without much success, to treat chopped wood with a solution of calcium bisulfite to obtain chemical pulp (bisulfite process)
1870 - A multi-cylinder machine is built which allows to produce very thick paper, like paperboard
1872 - Menzies and Davies patent the chlorine-soda process to obtain chemical pulp from wood; the process consists of treatment with chlorine followed by treatment with weak alkaline solutions
1872 - The Swede Carl Daniel Ekman improves Tilghmann's bisulfite process, implementing it under steam pressure. Other improvements will be introduced by Mitscherlich, in 1878, and, shortly thereafter, by Ritter-Kellner, so that the bisulfite process prevails, especially in Europe, in the production of chemical pulp
1881 - The machines of the Voith company, equipped with six drying cylinders on line, produce 2-meter-wide paper rolls at the rate of some 15,000 pounds a day
1884 - Dahl patents a process that, instead of caustic soda, uses a mixture of 3-4 parts of caustic soda and 1 part of sodium sulfide. This process will be called *sulfate process* or *kraft process*
1885 - Karl Kellner electrolyzes a salt solution in the presence of wood to attack lignin, but his system will not be taken up
1895 - In Polonghera, Italy, Beniamino Cataldi patents and experiments with a *gas chlorine process*, while De Vains and Peterson suggest the use of chlorine water. Cataldi's chlorine process, perfected and implemented by U. Pomilio, will be applied, mostly in South America and in Italy, for obtaining paper pulp from straw
1904 - The American Ira W. Rubel invents the *offset* printing process which allows to use cheaper paper and to increase printing speed. This considerably boosts the demand for printing paper
1917 - During World War I, on account of the shortage of raw materials, various attempts are made to use annual plants in paper pulp production
1930 - From now on, the sulfate process for obtaining chemical paper pulp will prevail over all others
1950 - Following a survey according to which gas chlorine and chloro-organic compounds generated in the bleaching processes are hazardous, chlorine dioxide begins to be used instead. The latter makes it possible to bleach the kraft pulps, obtaining results comparable with those of sulfite pulps
1989 - In Italy, research begins aiming to utilize macroweeds that infest the Venice lagoon, in making paper pulp
1992 - the *Favini* paper mill in Rossano Veneto (Italy) produces a chemical pulp from seaweed flour, with fairly good characteristics

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## LETTERS WRITTEN OR RECEIVED BY ANTONIO MEUCCI UNTIL 1871

**Note:** Most of the following letters are translated from original Italian. In them, every unreadable word in the original Italian is indicated with three dots (…). If there are several unreadable words, they are indicated with an equal number of three-dot sets.

### To his brother Giuseppe

*(14 November 1855)*

[From: Respighi L., *Il Telefono e la Priorità di Antonio Meucci*, p. 15[146]]

*If I do not write more it is because I do not wish to give you more trouble than you already have, for I can only tell you that I find myself in many bad circumstances, that I might have to escape and go somewhere else. I have used up all that I had and all that is left now is the house, the land and the candle factory. But it is useless to speak of the latter, they cannot be sold. Now, I have started building pianos, but also this business is going badly.*

*Thus, it seems that there is no luck for me, and everything I set out to do is bound to fail. Believe me, given my situation, I would rather be in my country, amid misery and cholera, than to stay here …*

[Respighi's quotation of this letter ends here, Editor's note].

### To Garibaldi

*(23 September 1859)*

[Museo Centrale del Risorgimento, Rome]

*My friend, the General*

*Clifton, Staten Island, 23 7ber, 1859*

*Given that my critical circumstances prevent me from coming and embracing you in person, I write these few lines, which I am sure you shall accept all the same. At the same time I wish to thank you, also on behalf of my wife, for the greetings you sent us through our mutual friend Negretti.*

*I hope that A God shall give you all the health and good fortune you need to achieve your Mission and everything that Italy desires. But do not spare those who do not call themselves Italian?*[147]*. Here, the only one who left to defend our Country was the Good Stagnietti* [*Stagnetti*, Editor's note], *well known by you, who left his family and took off without saying a word to anyone. I think that also our Friend Specke* [*Speck*, Editor's note] *will be with you; before I die, I would like to see Italy and you again and embrace you, as well as my family,*

[146]Respighi specifies: "to his brother Giuseppe, hospitalized at S. Maria Nuova." Respighi does not indicate where the original text of this letter is kept, and he gives no details about Giuseppe Meucci's hospitalization at S. Maria Nuova in that period.

[147]In some letters Antonio Meucci uses the question mark instead of the exclamation mark.

*whom I have not written to in a long time, to avoid telling them about my sufferings and misfortunes.*

*Now I am working at a factory where I have made a new invention for new candles made from stone coal* [*paraffin*, Editor's note], *but I do not know how it will end up, though I hope it will go well, and then you'll be happy.*

*Forgive the liberty I'm taking and if, some day, I will see you again, I hope you shall be happier.*

*Please accept my greetings as well as those of my wife and with all my esteem, believe your most affectionate*

*Friend Antonio Meucci.*

*P.S. Everyone here sends their regards, starting from old Tausend* [*Townsend*, Editor's note] *who always asks about you, and the Tenor Lorini and the Young Venetian* [*Giovanni Morosini*, Editor's note] *who was on board with you for … who has a wife and children and has a good job working for a railroad. Others I shall … name no more for I would need a calendar with all the Saints to remember the names.*

*The white cat that you brought from the woods is still living in my house, but she is all ill. If you have time, I would accept a couple of lines from you.*

To his brother Giuseppe

*(20 December 1859)*

[Museo Storico PT, Rome]

*To Mr. Giuseppe Meucci*
*Studio Pieri,*
*420, Via del Oriolo*
*Florence*
*Italy*
*My Dearest Brother,*
*Clifton, X$^{ber}$ 20, 1859*

*I do no fail to reply to the letter you sent me through our friend Negretti, since so long has been my silence, given the bad circumstances I am in and not to give you any more trouble than you already have, without being able to help you in any way; I deemed it best not to inform you, for if I had written otherwise, I would have lied to you.*

*Now, as you know, I have obtained a patent ... ... for a new invention of Candles extracted from stone coal, which they call paraffin candles, but my critical situation has forced me to find through Lorini a company of Americans, his relatives, thus in my old age I have to work like a slave for a mere 15= dollars a week, that here is a porter's salary, and to live I am obliged to do this.*

*For three years I have been in litigation with my creditors and I haven't seen the end of it, and I don't know how it will end up, though I have put everything in my wife's name, but her complaints to me are such that even death would be better. I have sold or pawned eve-*

*rything, and I do not even have enough money to buy a piece of bread, to protect my wife and to set aside something for her to live on, were I to die, but I am always reproached, and this shortens my life. This is what happens, when a man does good business and is lucky, then everyone says that he is a man who knows how to look after his interests, but if, on the other hand, his business and luck run out, then they say that he is a thief and a fool .*

*Finally, I am glad to hear that you are all in good health, and if I am happy, who knows whether God will give me the good fortune and I will live long enough to see you once again, one day, as well as my father and mother, even in their old age. I am glad that Negretti gave my father 50 francs. If they had been 50 Scudi* [*dollars*, Editor's note], *it would have been better but perhaps I would not have been able to pay him back; finally, hope for the best, as I do.*

*I enclose a letter for my Friend Garibaldi, the General; take it to him when he comes up there, and bring your Father with you, as I have already made him informed with a letter which I wrote to him, where I sent him a present of Candles.*

*Please, accept my regards as well as those of my wife, the same you will do to my father and Mother and all brothers and sisters and brothers-in-law and believe me*

*your very Affectionate Brother*
*Anto Meucci*

## To Garibaldi

*(26 December 1859)*
[Biblioteca Nazionale Centrale, Rome]

*My Friend, the General*

*Clifton, X^ber 26, 1859*

*The longed for moment has come, at last?*

*After so long time that I have waited for my friend Negretti to return here, I was much relieved when I saw him coming to me last Sunday, the 18th instant;. He has given me the most certain reports about you and your good fortunes, as well as the latent purpose that you have exploited in your enterprises, of which I have never doubted otherwise; also, the valor of our friends who stand at your side, as our dearest Speck, Bovi etc., well known to me. This Sunday was indeed a true consolation for me and I trust in a god who shall keep you all in good health so that you* [may fulfill] *your wish and intent to achieve the Union of our beautiful Italy. My dear friend, the General, I wish nothing else than this, and after Death … (Suffering teaches and Prudence achieves).*

*But now I shall speak of Other things, As I have obtained a patent for manufacturing So-called Paraffin candles - made from stone coal,*

*that is - I have taken the liberty to send you, through our Friend Negretti, a sample of this new Genre as I hope that you will accept it, so that you may examine this new branch of Industry. But my misfortune as well as that of all of us, Italians, is that of being in the hands of Foreigners in the new and in the old world. I reduced myself to work like an apprentice for a mere $15 a Week, much to my shame, but in my present situation I am obliged to do this.*

*In the box that Negretti is shipping you, when you'll open you'll find two Large candles on top, made of the said substance, but they are not very attractive because the molder did not do a good job - plus two tricolored Candles - and a box of white candles - a piece of Coal wherein this substance is situated, and a cloth with some Paraffin as it comes out from Coal through Distillation. This substance forms in the oil that is burned in lamps* [*kerosene*, Editor's note] *and it gives off light as that of grease, as you shall see from the candles that you will light. In the same box there is a false bottom and under it you will find a rifle that Negretti will mention in his* [letter]. *Forgive me if I have taken such liberty.*

*I was pleased to hear that you went to Bologna to see our friend Salvi, who told Negretti that he wrote to me, although, unfortunately, I have not received any letter. I am happy because at least Salvi is in Italy with his family, while I am in a foreign country, where I have been living in misery since three years. Mea culpa!*

*My dear friend, the General, all I ask of you is that, if ever you go to Florence and my Brother and Father come to you with a letter written by me, I recommend them to you for* [procuring some] *work, if possible, as perhaps you do not lack the means. I have many relatives in that city but I cannot help them in any way.*

*Please, accept my wife's regards, as well as mine, and we all wish you a happy New Year's Day and please give our love to all our friends.*

*Your most affectionate Friend*
*Meucci*

### To Garibaldi

*(14 January 1861)*

[Museo del Risorgimento, Milan]

*Valiant Friend*
*Staten Island 14th of 1861*

*Yesterday, Sunday, I had the pleasure to spend the day with our Friends Negretti and Magniasco; they brought with them your friend Major Leggero* [*Leggiero*, Editor's note], *who arrived from the South and who loves to return to our home country, with great anxiety, as well as to meet you again; it cannot be denied that he has been a faithful Com-*

*panion of yours, in arms as well as in all your ideas.*

*It has given a great pleasure to me and my wife to be in the company of a man who is so full of Patriotism and valor.*

*I am also giving him a box with large Church Candles, one green, one red and one white, and I hope that the Good Chaplain Gavozzi* [*Gavazzi*, Editor's note] *will light them when he will sing the Te Deum in Rome or in St. Mark's in Venice.*

*Here Political affairs are causing disunion in the United Stated and all trade is paralyzed; I don't know how it will end up.*

*Given my age and my past bad business, I don't know if they will ever make me see my Italy again, which I am longing for so much after your happy outcome. Glory to you and to your Endurance and to all those brave men who never abandoned you and I hope you will come to an end, when accomplishing the final Redemption ...."*

*Our Friend Leggiero will inform you about our situation and the illness of my wife; she sends you all due compliments, that you will accept as well from*

*Your Friend*
*Anto Meucci*
*Capitano Bontempo*

### To Garibaldi

*(24 May 1861)*
[Museo Centrale del Risorgimento, Rome]

*My Friend the General*
*Clifton 24= May 1861*

*I take the opportunity that our friend Negretti is leaving for Europe to send you some news about us as well as our thanks for the letter you sent me where I learned that you have received the candles and you give your approval to this genre.*

*We are in good health now, but I have been very ill; as for business, Negretti will inform you better in person.*

*Please, accept my compliments as well as those from my wife; we wish you to live another one hundred years so that your great endeavor be accomplished.*

*Your most devout Friend*
*Ant Meucci*

### To his brother Giuseppe

*(16 February 1863)*
[Museo Storico PT, Rome]

*Dear Brother*
*Staten Island F. 16, 1863*

*When you receive this letter, send a letter to Genoa to the following Address: To Mr. Stefano Canzio, Fratelli Canzio Co., Shop-keepers in Free Port Genoa claiming A Box of Samples of Paraffin Candles, with the Box marked No. 2, letters G.M. and you pay the expenses. The Box contains 5. Cardboard Boxes of 6. &: and*

*one of these three colors plus Church Candles of one &: you will tell me if they are to your Satisfaction.*

*You still have not answered my last Letter and I do not know what to think. In your last letter you did not send me the address where to write, as you told me that it is no longer that of lawyer Pieri, your Boss.*

*Send my love to everyone at home and to our Father, as well as to all the friends that ask of me. Write soon to*

*your Brother Anto Meucci*

To his brother Giuseppe

*(16 April 1863)*

[Museo Storico PT, Rome]

(original letter very damaged)

*Dearest Brother,*

*Stapleton Staten Island N.Y.*

*April 16, 1863*

*I have received your letter of March 16 in reply to my last letter … I wrote to you, but yours also is far from … … … to hear that you are convinced that it is expensive and made of stone*[?] *… … speculation as regards the Factory, since I had … … but that I mentioned for a small … … … <u>50 Thousand Scudi</u>* [*dollars*, Editor's note] *do you think that a … … … don't you know that here the smallest factory of Algae, … … of Coal, at least has a Capital of 150 to 200 thousand Scudi? It is true that money is made of paper, but after all it is spent in trade as if it were of gold, and it is true that over there one speaks in terms of lire and francs whereas here one speaks of Scudi = Also, you tell me that Italy still accounts for 700 million francs? = While here one speaks of Millions of Millions of Scudi. Don't you know that here to maintain the troops and the war it is necessary to spend a daily sum of 2 million and a half, not francs but Scudi, without considering what they steal = Here bank notes are printed with a Steam-powered machine, so imagine how much money the Government can print in one day, and all of it is circulated in the trade. One day one will know how much money was issued in excess of the requested loan, but it doesn't matter, here everyone steals, as all Governments do = the same that sentence Thieves to jail, while they, that come from the <u>Cacco</u>* [*wealthy*, Editor's note] *family can do anything they want = If a poor man is in debt, he loses his honor. If the Government and the Rich make debts, they are Honored, you see what a fine world it is! What will have to result here, and I will tell you, everyone will see, when after two years there will be the Elections of a new President; they will elect Someone who will make peace and who will not recognize the debts made by this one, so that the United States will go bankrupt and everyone will be … this way and for this reason now*

*those who* [have a finger] *in the pie … and who steal with no shame … have property, and so when the … goes bankrupt … We are now philosophizing = Take it with … the Hoe? they are all Thieves =*

*You believe that at 37 soldi* [*cents,* Editor's note] *the candles are expensive. You must know that now they cost 40= to 43, due to the War expenses, therefore do not think about this anymore = the Only thing that could be done over there is the Oil business but it is useless to talk about all that, You will always be poor in your Speculations and for yourselves and Always in the hands of Foreigners, who make the Speculations for you; it is a true shame. Where is your freedom? Do as they do here and hate Foreigners, whom they always call Demi-French for they call all foreigners French. That is why I Love*[?] *them and they are right. Do as they do, you are Italian and you must hate the Foreigner as well as Priests. Be united in the arts and Commerce, and You will be Happy. Italy lacks for nothing, I regret I am old? = you tell me that lamp oil stinks. I do not say the contrary, but the stink of this oil is better than that of a small olive-oil lamp, and moreover its light is like that of gas. This would Rightly be one of my Speculations to come and do over there, both for the oil and for the lamps, but I see that it is useless to talk about it = Just like the Stoves here that burn stone coal* [*coke,* Editor's note] *and warm houses, and not like the old braziers which burn and blister your thighs; but you answer that in Italy there is no stone coal, this is not true, and if I were there I would find it = The fault is not yours but of those who have the money and are wealthy, who love to see … Italian … make no progress*[?] *these are your enemies*[?]; *destroy them, these harmful … Worms? your … … … are happy = They tell me that also a King … … … but it seems he is betrayed by the ones … … described by me above … by the way? my oil would be good to destroy them because in my Last few Experiments I have noticed and proven that it is Very good for killing insects that form inside wood, such as bugs, and woodworms, of which I will send you an Explanation later.= As to the candle manufacture in London, I don't know what to tell you, but I think that Someone from the Company here screwed me up and went there to teach to the Hypocritical English my way of making Candles, but now I shall Know through Negretti = I hope in another letter to tell you about what I have done about the new company that I think will be set up = you tell me that you made up your*

*mind too late to go and see my Friend Garibaldi — I don't know what you were thinking, since I had sent you the letters for him such a long time ago = you also tell me that I should Write to him about my Situation; don't you know? that I don't even ask anything of Myself, I am philosophical and I Always Hope for the best, and I never get myself down, I believe in Fate? and you should be satisfied that I Hope to see Italy before I die and embrace you all = as for the Asbestos, don't worry, there is plenty of it here and it is very cheap; as people don't Know what to do with it, how to process it, that's why I asked. Something will come out from here as well*[148] *= I am very sorry to hear about our Father's situation, he must Suffer very much; take … … … as for my litigation, as I mentioned to you, I lost it … … the Brewery and the house, all was lost, but as I said I am a fatalist and a philosopher, and I Hope to buy back the … I don't want to bother you further … also my Regards … … … everyone at home and relatives and also … I don't think anyone who knows me cares … … … principal*

*Embrace our F…*

*Your aff. Brother Anto Meucci*

[148]The reader should know that asbestos is found in veins of certain rocks in Tuscany. This is why Meucci asked his brother some information about.

To his brother Giuseppe

*(31 March 1864)*

[Museo Storico PT, Rome]

*Dear Brother*

*New York, March 31, 1864*

*I have received two letters at once, one, the first, giving me news about you, as well as our Father and the rest of the family, which were excellent, the Second announcing the death of our poor Father. This one I was expecting any moment because one cannot live an old man. I am old too, but death does not trouble me because I have worked so much, but I see that despite all my efforts, I will never be able to recover the fortune I had; never mind.= In your first letter you said that you wanted to do something with lamp oil and Lamps, but I am not in this business. I will only say that if a good house might wish to enter this business, appointing a company that must be well known here so that they might draw a bill on it, I could make them ship as much Oil and as many Lamps they might wish; and I think it would be a good business for you, provided that you were employed in that branch by the person who would do the Speculation. =*

*Here, I do have things that they could ship immediately whatever you may want, provided it would not be a miserly order; only with the exchange rate here you would make A*

*good deal and I could help you in this; paper money here is worth no more than 30 Soldi to the Scudo* [*thirty cents to the dollar*, Editor's note], *thus great Speculations are made all over Europe = You never have told me anything about the candles whether they are appreciated and whether they are like those of London = I tell you nothing else for the time being; my business is always neither good nor bad; here the war is destroying us = Give my love to all of the family and relatives, and* [tell them that] *at better times I will not forget them - I send you all my love*

*your Brother Anto Meucci*

*Write back at once about the Oil and the lamps; here I enclose my new patent.*

[Annexed Circular *«Antonio Meucci's Patent Oil»* (see pp. 208-9)].

### To Garibaldi

*(27 April 1864)*

[Biblioteca Nazionale Centrale, Florence]

*My Friend Garibaldi*

*Clifton, Ap$^{l}$ 27, 1864*

*We went crazy on hearing of how the just peoples of Europe* [*of England*, Editor's note] *welcomed the true Soldier of Freedom. What I would give to be there, to see and share in the happiness of you all, but my fate doesn't allow this.*

*I hope that over there you won't lack the opportunity to send us a portrait of you; all we ask is this simple gift, which my wife and I would so wish to have.*

*I think you must have received my previous letter, which I had sent you by hand of our Friend Negretti.*

*Be always happy and = accept our love*

*believe your Friend*

*Antonio Meucci*

*Capitan Buontempo*

*Lorini, who is here, sends you his regards*

### To his brother Giuseppe

*(27 August 1864)*

[Museo Storico PT, Rome]

*Mr. Giuseppe Meucci*

*Via del Oriolo Studio Pieri*

*in hand of Mr. Papanti*

*Florence*

*Dear Brother*

*New York, A$^{st}$. 27, 1864*

*I introduce to you my friend Mr. Papanti who is the Envoy and traveling agent of the Allen Company, with whom you can make a deal, and to whom you can introduce the Oil dealer from Pistoia, so that you can arrange something. The same in case others may wish to get the merchandise and deal with said Company.*

*I send my love and believe me*

*Your B$^{r}$*

*Anto Meucci*

*Allen & Co. has replied to you in regard to the payment modalities as you mentioned in your letter but if you haven't received it yet go and look for it at the Post Office as the No. of the Pieri residence* [is not] *indicated.*

## To Garibaldi

*(end of 1864?)*

[Museo Centrale del Risorgimento, Rome]

*Valiant General ∴*[149]

*I regret having to write these few lines to inform you about the bad situation I find myself in now, after three years of litigations issued by my creditors.*

*Not only did I spend an enormous amount of money on lawyers, but I have also lost everything, and my poor Wife and I find ourselves penniless, as all we had was sold through the Sheriff = You can imagine how my situation will be and, if you can help me, I beg you to do it. As I have read in the papers here that you have been elected Grand Master of all the L & M* [*Masonic Lodges*, Editor's note] *∴ of Italy, Glory to the Great Architect.*

*I have a fabrication of shotgun bullets and Field Cannon balls, which I intended to submit to the Government here = but I have been told that I have to run all the experiments at my own expense and that I must form a battery belonging to the Artillery or the army, which is impossible, so I thought to mention it to you, lest you should think they may be Good for Italy, and I enclose their description herewith.*

*Please accept my most devout compliments per Your B* [*Brother* (in the Masonic sense), Editor's note] *∴*

*Anto Meucci*

*Explanation for the balls*

*The gunshot bullet is oval-shaped, it weighs some two ounces, and it is wrapped in a cotton sheath smeared with tallow. It is loaded like all common bullets. When it exits the shotgun it splits into two or four parts, without losing its trajectory = the cannon ball is also oval-shaped like the bullet, it is wrapped in a cover of thick sail-cloth and it is loaded like regular cannon balls, but when it exits the mouth of the cannon it splits into two parts which are attached by means of a chain of a certain length, that is held inside said cannon ball. The length of the chain is between one and two meters = the cannon can be of 4-6. or 8 =* [*inches*, Editor's note]

*Antonio Meucci*

[149]The Masonic symbol ∴ corresponds to the highest rank of Freemasonry.

To Garibaldi

*(22 March 1865)*

[Museo del Risorgimento, Milan (see also A. Monti, 1936, in bibl.)]

*Dear General,*

*S. I. Mch 22, 1865*

*After a very long silence, I finally pick up my pen again to give you some excellent news. I hope that you have good news for me as well. The reason why I have waited so long to write is that I wanted to tell you about my new discovery, and I did not want to mention it until I was sure about the results and about the experiments conducted by the Press Saint* [*Associated Press*, Editor's note]*, which has acquired my patent for paper manufacturing for the sum of $ one hundred thousand, for all the United States. With my invention, after having conducted many long experiments, I managed to disorganize and remove all Mineral and Resinous substances from wood, as well as from all vegetable substances, so that their fibers and filaments are suitable for the arts of Weaving, for paper manufacturing &., and can replace cotton and linen rags, and also be used to make Felt Hats and whatever one fancies. I have enclosed a sample of the first experimental paper which was made by the Company that has purchased my Patent, and they also say that with my discovery it is possible to make paper of any quality, both for newspapers and for Writing, without uniting any substance of Rags. Hence, the sample that I am enclosing is produced without any sizing or Glue, and it is made out of the most common wood found here, which is called Spruce, although all types of wood are suitable - as is Hay = Cane, &.*

*I have obtained the patent for 17 years and I have also applied for it in England, but I would very much like to do something with our Beautiful Italy. That is why I ask you to use your Influence to encourage Investors and those Paper Manufacturers that there exist, and I am sure that you will do all that is possible, so that I would apply for the Patent there=? General, it seems impossible that one should become rich when one is old. Thanks to destiny, it is better late than never = I read in the newspaper that you have received a present from the English people, appropriate to your merits, and I rejoice for this.*

*I also enclose two portraits of your Captain Bontempo = one in aristocratic clothes and the other dressed as a fire-fighter, in the company of my faithful dog, a symbol of loyalty =*

*You have never answered the letter that I sent to London, through Negretti's hands, and which contained the Diploma*

*of Honorary Member of the Fire Brigade to which I belong. They are now sending you the Badge they all wear, namely the medal that the Committee awards you.*

*Note/ The process whereby to obtain filaments that I have discovered, which I mentioned above, does not require the use of any machine, unlike the old methods adopted in America as well as in Europe till now, so that setting up a factory does not cost very much.*

*This is all for now. My wife and I send you our very best regards.*

*Believe me, yours*

*Anto Meucci*

[Enclosed is a paper sample and a sample of dry pulp. The following words are handwritten on the sample of paper: *"Paper produced with this pulp without glue from pure spruce wood"* (see photograph on page 225)]

## From Garibaldi

*(10 April 1865)*

[From: L'Eco d'Italia, *Una lettera di Garibaldi*, 16 June 1865]

"When in 1851 Giuseppe Garibaldi, exiled from his country, sought asylum in this land of freedom, he found a brother and a friend in Mr. Meucci from Staten Island: from then on, the Hermit of Caprera never forgot the hospitality given by this generous son of Tuscany.

Garibaldi stayed with Mr. Meucci from 1851 to 1852, working in his candle factory as any other worker, as he always refused the offers of wealthy Americans, supporters of the Italian cause, and preferred to provide for himself through his own work and capability. The cap and apron of the Hero of the two Worlds are kept as relics, and indeed they are relics!

Recently the Hook & Ladder Fire Brigade of Staten Island nominated Garibaldi an honorary member and sent him the medal of the Brigade. It is to the latter that Garibaldi refers in the following letter, which we publish, as we are convinced that the readers will appreciate it.

The word *Boss* with which the most valiant soldier of our days opens the letter is a bitter irony towards the pettiness of those who, once they have achieved success, believe they have reached the apotheosis.

*Caprera, 10 April 1865*

*My dear Boss,*

*Notice how ingratiating I am now that I know you have become a wealthy man. But you are truly a great man, my dear Meucci, and I congratulate you on your wonderful discovery.*

*I shall certainly write about your invention and see whether*

*there are Italian paper manufacturers who might be interested in taking advantage of your useful discovery. Please say a word of gratitude to the Fire Brigade for the honor they have bestowed upon me.*

*Thank you for the portrait, the medal, etc. Speck, who is here with me, and all the family send their warm regards to you and to your gentle wife Esther. I am always*

*Yours*

*G. Garibaldi"*

### To Enrico Bendelari

*(29 August 1865)*

[From: *L'Eco d'Italia, "Nuove Scoperte Italiane,"* 21 October 1865]

*Staten Island, 29 August 1865.*

*Mr. E. Bendelari,*

*New York.*

*I read in the 'Eco d'Italia' of Saturday, 19th inst., an article taken from the 'Diritto' of Florence regarding the discovery of transmitting the sounds and spoken voices by telegraph made in Italy by a Mr. Manzetti of Aosta.*

*Now this discovery being in every respect like the information I gave you four years ago in the house of Vincent Riveccio at the moment when you were going to return to the old country, I would like to know if in Italy you instructed somebody or spoke to somebody in regard to my ideas on such a thing.*

*I beg you to be so kind as to answer, because I wish to publish your letter, together with my system, in the 'Diritto.'*

*Accept my greetings, and believe me your friend,*

*Antonio Meucci*

*P. S. — Don't forget that your answer must testify how I in 1860 spoke to you in regard to my system of transmitting the word by electric wire.*

### From Enrico Bendelari

*(15 September 1865)*

[From: *L'Eco d'Italia, "Nuove Scoperte Italiane,"* 21 October 1865 and also from *Il Commercio di Genova,* 1 December 1865]

*New York, 15 September 1865.*

*Mr. Antonio Meucci,*

*Staten Island.*

*Very dear Friend: — I see from yours of the twenty-ninth August last, that the 'Eco d'Italia' reprinted an article taken from the 'Diritto' of Florence in regard to the discovery made by a certain Mr. Manzetti of Aosta, to transmit sounds and spoken voices by telegraph.*

*I remember very well that before starting for Italy in the year 1860, you spoke to me on this subject in the house of Mr. Riveccio, that you had discovered how to transmit words by the electric wire. But being hurried to go, I had not*

*time to see you again to gather all the information necessary on this subject.*

*I am very sorry to hear that your discovery has been shared by another genius; but know, for your guidance, that my business in Italy did not permit me to speak, hint, or communicate your idea to any person whatever.*

*Accept my distinguished salutations.*

*Your friend,*

*E. Bendelari*

## To Ignazio Corbellini

*(13 October 1865)*

[From: *L'Eco d'Italia, "Nuove Scoperte Italiane,"* 21 October 1865, and *Il Commercio di Genova*, 1 December 1865[150]]

*Mr. Ignazio Corbellini,*
*Arenzano (Genoa).*

*In the Eco d'Italia of the 19th of August last, I read of a new discovery which concerns one of my labors; I enclose it so that you may be able to examine it.*

*I was one of the first who worked with whole assiduity upon the art of electricity as well as that of galvanism, at the time of its first discovery; I was then in Havana. Having abandoned this branch because of the enormous expense, I devoted myself, when I came to the United States, to other branches, but I did not abandon it; on the contrary, from time to time I made some test of this beautiful discovery, and by means of some little experiments I came to discover that with an instrument placed at the ear, and with the aid of electricity and a metallic wire, I could transmit the exact word, holding the conductor in the mouth and pressing it between the teeth, and at any distance two persons could put themselves in direct communication by this, without the necessity of communicating their secrets to others. But on account of my too numerous occupations, I abandoned it with the idea of communicating it to some intelligent compatriot so that the first experiments might be made in our beautiful Italy.*

*In the year 1860 my friend Mr. Bendelari starting for Italy and offering me his services, I communicated to him my discovery, that I have always thought very useful, reserving to myself to give him more ample explanations when he should come to see me again, which he was unable to do on account of his many occupations, and as I did not see him again all remained in oblivion.*

*As I have already told you, I read the article here enclosed, in the 'Eco d'Italia,' and I have wished and I do wish to show that I had made*

[150] *Il Commercio di Genova* specifies the date of the letter, but only contains a portion of the letter, while *L'Eco d'Italia* reproduces the full letter, but without specifying the date.

*this discovery, and because it is identical with that of Mr. Manzetti, I have thought that Mr. Bendelari had disclosed to someone what I had verbally communicated to him. I, therefore, wrote to Mr. Bendelari on the subject and he answered me, which copies I enclose.*

*I do not pretend to deny to Mr. Manzetti his invention, but I only wish to be remarked that two thoughts can be found to contain the same discovery, and that by uniting the two ideas one could more easily reach the certainty about a thing so important.*

*If perchance you meet Mr. Manzetti or any friend of his, I pray you to communicate to him what I have said, and I thank you in advance for doing so.*

*I am answering your letter dated last August 27, which I was not able to do before because I was in Ohio State, in a paper factory, and your letter was only delivered to me upon my return. I have not received any letter from the gentleman whom you say was looking for me to apply my paper patent. As regards asking Prof. Botta, allow me to tell you that I think it is useless, as I have written on this subject only to my friend G. Garibaldi.*

*With the first sea captain sailing for Genoa, I will send you samples in greater quantity, as well, if I have any, something regarding Petroleum; this article is very scarce and many wells do not produce any more of it. Many doubt but that the great volcanic eruption of this year may have had great influence on the subterranean distillations.*

*Regarding what you told me of the article in the Genio Civile* [Civil Engineering Office] *of Paris, I will prove that the author is in error.— The two samples of paper that I enclose are made of pure Wood and of pure Straw respectively. Intelligent as you are, you will notice that I have no need to use rags as the main material. I will prove that all of the discoveries made on this subject have not succeeded in finding the way to disorganize and remove the mineral, resinous and gummy substances which soil wood and vegetable fibers. What they have obtained so far is ground wood and not filaments, and that is why they are forced to add rags to give the paper tenacity and elasticity . Let me know if you have obtained a good result in your enterprise, and* [about] *the visit made to the petroleum wells in the province of Parma and in Tuscany, that I indicated to you in my letters.*

*In your letter I have found a piece of white paper, please tell me what it is and whether you have sent it as a sample.*

*Forgive me for this long letter, I have taken advantage*

*of your kindness, and please do not hesitate to command me, I shall be pleased to serve you, and accept the greetings of a friend.*

*A. Meucci.*

To Baron Ricasoli

*(20 July 1866) with annexes*

[From: Tomasi, S. M.: *The Unification of Italy: Meucci's Views from New York*, La Parola del Popolo (USA), Year 68, Vol. 26, September-October 1976, pp. 179-182]

"FOREWORD

… An example of this new direction of ethnic history can be found in the documents from the Archives of Italian Ministry of Foreign Affairs published here for the first time (translated by Joseph Zappulla).

Antonio Meucci, born in Florence in 1808, had come to settle in Staten Island in 1845 by way of Cuba, where he had worked as a mechanic in the Opera House of Havana. In the letter and speeches reported here, Meucci offers a new glimpse at the response of the New York Italian community to the unification of Italy and the appreciation of freedom as experienced in the United States. Meucci is better known for his claim to the discovery of the telephone which he described in 1857 and for his friendship with Garibaldi, who was his guest in 1851 - 1853. In these pages, Meucci speaks up for justice, freedom, the rights of the oppressed and thus transcends the particular vicissitudes of his life and links two people committed to the same ideals.

**1. Antonio Meucci's letter to Prime Minister Ricasoli**

*To His Excellency*

*Baron Bettino Ricasoli*

*Prime Minister of His Majesty's Government*

*in Florence*

*New York, July 20, 1866*

*Excellency:*

*I regret to take up some of your time, so precious at this period, but knowing the goodness of your heart I hope you will pay attention to the words addressed to you even from New York by one of your fellow-citizens.*

*When we received the news that Italy had declared war on Austria, all those who nourish patriotic sentiments repeated the cry of Parliament: Viva la guerra! Viva l'Italia!*

*Many young men who fought in the regular army or under Garibaldi and who now live in this city or in the nearby communities, have expressed a great desire to return to Italy and contribute with their blood to the cause of our independence — just as those from Alexandria, Egypt, have done.*

*Their desire found a resonant echo in many of our compatriots who formed an Initia-*

*tive Committee in order to organize an expedition of volunteers and collect funds for the passage of these men anxious to return to Italy to fight, after being accepted by the proper authorities and aggregated to the armed forces. In order to avoid any possible complaint of violation of the international law, the Initiative Committee published an appeal to the Italians of New York which I am enclosing.*

*This appeal produced good results and soon 500 of our compatriots, the most numerous group of Italians ever assembled here since the revolution of 1848, gathered at the designated place. I took part in the meeting, although I haven't participated to any such assembly for the past seventeen years*[151]*. Our countrymen, cognizant of my long-standing and cordial friendship with General Garibaldi, and perhaps moved by the desire to demonstrate their esteem and love for that great man, insisted that I accept the chairmanship of a Permanent Committee which was nominated that evening and which was composed of well-liked and popular men. Some resolutions were proposed and adopted, among them one so emphatically worded of sending Italian volunteers to Italy.*

*However, the organization of this Permanent Committee prickled the sensibility of certain members of the well-to-do aristocracy who had not been included in the Committee because some refusals had been foreseen since these persons do not accept a popular vote but want to impose their will on others.*

*A few speeches worthy of the occasion were made; some collectors were nominated, and the collection of contributions was initiated.*

*In the meantime, since the number of the volunteers was increasing, an Enrollment Committee was formed, charged with the task of verifying the certificates of the volunteers, submitting these men to a medical examination and ascertaining that they would qualify for military duty according to the regulations issued by the Ministry in Italy regarding the volunteers.*

*Seeing that those who wanted to return to Italy were too many, it was decided to hold another meeting among the Italians of New York to solicit other contributions.*

*We also sent out the enclosed appeal to the other Italians of the United States, and finally, at the suggestion of several friends of Italy who are not Italian citizens but love justice and liberty, these were invited to attend a third meet-*

[151]This means that Antonio Meucci never took part in political meetings since his arrival in New York.

*ing — this time an international one.*

*During this meeting which we had called for the purpose of urging everyone to cooperate with us, many people, including a Mexican and a Frenchman, asked to be heard — as it is the custom here. These men did not limit themselves to talking about the purposes of the Committee, but praised Italy and cursed the man who had oppressed and was still oppressing their countries, that is, the Emperor of the French.*

*I gave a short speech (3) which I am enclosing too. The other Italian speakers limited themselves to the main subject, praised what the other patriots had accomplished, and paid homage to the King and to Garibaldi — who had not only contributed to the cause with money as our local magnates wanted us to do, but also by offering the blood of their sons. Some speakers expressed their admiration for the magnanimity of those of our compatriots who, imitating the ancient Romans, have left their seats in Parliament to join the army as volunteers. Former Minister Sella*[152] *has done so and was highly praised.*

*The following day the Committee was harshly criticized in an article printed in the Courier des États Unis — a newspaper that is very servile to its master. The Committee replied with a dignified letter, and the newspaper admitted that the Committee could not be held responsible for the opinions expressed by some Mexican or French individuals. The American press, which is more used to freedom of speech, reported the proceedings of the meeting faithfully and without any comment.*

*In these days, in order to collect more funds, the Italian opera singers now in America are planning a series of opera performances whose proceeds will be given to our cause. The performances will begin on Monday, July 16 and will end on Saturday with a matinée.*

*While we are making as many efforts as we can to add a link of our great chain of national unity, it is painful to notice that a certain ambitious clique, unable to understand the people, is refusing to join us and is criticizing our plan of sending volunteers to Italy. These persons cannot realize the greatness of this gesture nor appreciate the satisfaction of seeing an Italian banner brought to the battlefield by Italians from New York. They only wanted us to offer money so that they, being wealthy, would be considered the most generous, little caring that they would crush the noble aspirations of so many of our humble*

[152]Quintino Sella, Finance Minister in Italy, from 1862 to 1865 and again from 1869 to 1873.

*men who have already fought for Italy.*

*From what these people are saying we have good reasons to believe that they, having money to spend and being known in Italy, have instigated some members of the Italian legation in Washington, and have written, or induced others to write, to the Minister in Florence in such a way as to put our movement in a very bad light. It seems that in these letters even the most innocent and innocuous facts have been distorted and severely commented, thus trying to ridicule our actions and discredit the purity of our patriotism.*

*I have found a confirmation of the worthiness of our movement in your circular to the Prefects of the Kingdom of Italy whom you urged to encourage all demonstrations of patriotism so that in all foreign countries would prevail the universal conviction that all Italians are united in wanting the independence of Italy as one nation. This conviction would give courage and enthusiasm to our soldiers.*

*Yes, Excellency: it is very painful for me to see that those who should encourage and guide such demonstrations are just the ones who increase our difficulties, reproach those who participate in the movement, disdain to join it and hinder the good-willed people whom they deride and of whom they would make a laughing stock in case our noble efforts should fail.*

*If however we should succeed in sending a group of volunteers to Italy, I would ask Your Excellency to impart in advance the proper orders so that they would be greeted with enthusiasm; and I hope that you will never allow the intrigues of ambitious people and the insinuations of a semi-Jesuitical clique to succeed in disregarding and perhaps insulting the patriots who do not only honor themselves, but add to the glory of our fatherland.*

*Excellency! Every good Italian living in this country rejoiced at the announcement of your appointment as Prime Minister, in the certainty that you will always uphold the honor of our country and distribute praise and blame justly, keeping your soul uncontaminated by the influence of corrupt cliques and of evil individuals who, instead of love for their homeland, nurse in their hearts nothing but ambition, and love for money and for high positions.*

*With the sense of the highest esteem I declare myself*

*Devotedly yours,*

*Antonio Meucci,*

*President of the Permanent Committee of the Italians of New York, during the Italian war of Independence.*

**2. An appeal to the Italians of New York**

*Italians!*

*Your country is going through a very trying period and perhaps at this time is fighting the supreme battles for its independence.*

*We Italians living in New York must set an example for all the other Italians scattered throughout this country. We must give a worthy answer to the appeal of our brothers in Italy who have already aroused the admiration of the entire civilized world. We have a solemn duty to perform for our country.*

*Organized in an "Initiative Committee," we invite you to come at 8 P. M. of the 22nd of June to the Germania Assembly Rooms at 291-293 Bowery, where we all together shall approve those resolutions which will show how determined and united we are in wanting the independence, unification and liberty of our country.*

*For the Initiative Committee*

*B. Massimiliani, President*

*G. F. Secchi De Casali, Vice-Pres.*

*C. Orsini, Vice-Pres.*

*P. Piatti, Vice-Pres.*

*R. Prati, Vice-Pres.*

*Achille Magni, Secretary*

*New York, June 15, 1866*

**3. Meucci's reply to an attack on the Committee**

*Since 'L'Eco d'Italia' did not dare to publish the following letter, I had it printed to demonstrate that in this free country the press is nobody's private domain.*

*A. M.*

*Italians and brothers of Unity and Freedom. We were invited to the meetings by the Initiative Committee organized by the Italians of New York for the purpose of letting us know what the rights of the oppressed people of Europe are — beginning with the signing of the infamous and barbaric Treaty of 1815.*

*The time has arrived in which every living person is entitled to gain his freedom. Italy has been oppressed by foreign nations since 1815 and the hour has struck when we must let all Europe know the infamy and intrigues that have weakened the people which the foreigners torment and despise. Everyone knows that no foreigner has the right to occupy a sacred land which never belonged to him except through political intrigue and the brutal force which compelled us to submit ourselves to him. I want in particular to call your attention to the unjust occupation of the region of Venice by Austria. You know that many partisans of that country — especially the Austrians and those Italians who have made their fortune under that infamous government*

*would like us to believe that that land so dear to us belongs to Austria by right, and would like the occupation to be permanent.*

*It is therefore up to us to demonstrate the opposite. Be united and strong. Cast aside all doubts and form among yourselves a chain tied to an anchor of salvation. This anchor that you will cast will lie held by your chain whose links will not be broken by any imaginable storm. This will save you. Let your cry be: 'Viva l'Italia! Viva l'Unità!' Be united and fight, and everybody will praise you. The time has come to forget the past. Feel all equal among yourselves and look not at the man next to you, for he too is fighting for his own and for your freedom. Then everyone will cry: 'Long live the liberators of united Italy!' Every nation has the same rights we have. Once freedom is obtained, you will go to the Capitol and will debate on the means to be employed to avoid any future betrayal. Defend your spotless banner. Try to show it some day in those far-off regions where your glory and that of ancient Italy has furnished luminous examples. Remember that your leader is a father, a brother, a friend who will never retreat until Italy's unity shall be accomplished.*

*As a friend of this heroic warrior I embrace you all. If united, you shall be strong. Therefore, I cry once more: Hail to the liberators of Italy!*

*Antonio Meucci*
*Staten Island, June 22, 1866*

**4. An appeal to the Italians of the United States**

*Italians!*

*The war that is being fought in Italy has brought a thrill of joy even in the hearts of your countrymen living in America.*

*Many noble volunteers furnished with certificates of honorable discharge and wearing the medals they had earned in past battles for the wounds received in defense of the Italian flag, are presenting themselves to us, anxious to leave for Italy to take part in the supreme battle for the independence and liberty of their homeland.*

*The Italians of New York, meeting in a general assembly, have elected the undersigned as members of a Central Permanent Committee for the duration of the war in order to find the means to send these and other volunteers to Italy to help our country as best as they can.*

*We are doing every possible effort. Italians of the United States: wherever you live and will bear this cry of the fatherland, organize yourselves, spread the word and collect contributions, sending them to the president of this Committee.*

*We have invited to our meetings all the friends of the independence and liberty of all nations, because Italy's cause is the cause of justice and mankind.*

*Act without delay and think that our brothers are already shedding their blood for our country.*

*The Central Permanent Committee of New York*

*Antonio Meucci, Pres., 51 Broad St., N.Y.*

*B. Massimiliani, Vice-Pres.*

*C. Orsini, E. Bandelari, P. Pisani, M. Muzio, P. Piatti, G. Frazza, G. Susini, R. Prati, G. Barbetta*

*M. Vanni, Treasurer*

*A. Magni, Secretary*

*New York, July 7, 1866.*

**5. Meucci's speech at the international meeting**

*The struggle between despotism and liberty began with the battle of Custoza. Our brothers have already shed their blood to free Venice from the foreign yoke. Garibaldi, man of destiny, the leader of a hundred battles, the popular warrior, left his solitary refuge of Caprera to rush to the battlefield. Fighting against the Austrian army, he defeated it and like a flash of lightning will continue his mission. The time has already come to prove that the words Italian Unification are not vain and that we are not unworthy of our ancestors. Do not let yourselves be deceived by the enemies of our sacred cause. Be firm in your resolve, because when the citizens wish to better serve their country with their purse rather than with their body, then the nation is on the edge of ruin. With indolence and money one can only obtain soldiers to enslave the country and representatives to sell it.*

*Italians, lovers of liberty: The hour for action has struck. Let us be united and think that if Italy loses this struggle, our name will be weighted down with a burden of scorn hard to bear.*

*At this time the means of action must be real strength and not historical remembrance.*

*Hatred and difference of opinions must be stilled. The desire to serve our country must unite us all. Let us not hope in the intervention of Napoleon, which we do not want. We must take up the struggle with our own forces and, by our unity, perseverance and courage, we must realize the dream of the past centuries — the unification of Italy.*

*Antonio Meucci"*

## ANTONIO MEUCCI'S PATENTS UNTIL 1870

### List of Patents, Applications and Caveats

[National Archives & Records Administration, College Park, MD - RG60 General Records of the Department of Justice, file 6921-1885, Papers filed in Patent Office, Marked 7: "Printed List Patents granted to and Applications and caveats filed by A. Meucci"]

*Note.*— This list of patents, patent applications and caveats of Antonio Meucci was furnished in 1885 by the US Patent Office, following a request forwarded by the counsel for the defendants at the Bell/Globe trial, Mr. David Humphreys, who exhibited it as the "Defendants' Exhibit 110." However, in the printed records of the trial, the list was reproduced with some mistakes (for instance, it reads: "30,180. 1860. Application for Galvanic Battery" instead of "30,180. September 25, 1860. Appl. Apparatus for molding candles"). Fortunately, we were able to get hold of the original Patent Office's document, kept at the National Archives in Washington, DC (now at College Park, MD), which we reproduce hereafter. Furthermore, as regards Meucci's regular patents, we have found their original text in the files of the US Patent Office. These texts are reproduced in this volume, for what concerns Meucci's patents granted before 1870, and in Vol. 3, for what concerns Meucci's patents granted after 1870, evidencing any difference with respect to the printed records of the Bell/Globe trial.

- *22,739*. January 25, 1859. Appl. November 15, 1858. Candle Mold. Ass'd to Domenico B. Lorini, November 29, 1858. Recorded Feb'y 24, 1859, Z4, p. 29. E. S. Renwick, att'y. W. E. Rider, witness.

- *Caveat.* April 9, 1859. Galvanic Battery.

- *Caveat.* June 6, 1860. Candle Apparatus. E. S. Renwick, att'y.

- *Application.* June 6, 1860. Dry Galvanic Battery. Rejected. E. S. Renwick, att'y.

- *30,180*. September 25, 1860. Appl. Apparatus for molding candles. Ass'd to N. Y. Parafine Candle Co., May 28, 1860, U5, p. 66; W. E. Rider, witness to ass't. E. S. Renwick, att'y. [Possibly the ass't relates to caveat of June 6, 1860.]

- *36,192.* August 12, 1862. Appl. May 7, 1862. Lamp burner. W. E. Rider, witness. Ass'd to Antonio Jané, May 13, 1862, N6, p. 390. E. S. Renwick, att'y.

- *36,419.* September 9, 1862. Appl. June 16, 1862. Imp't in treating mineral oils

for paint. Ass'd to Antonio Jané, June 12, 1862, O6, p. 207. Munn, att'y.

- *38,714*. May 26, 1863. Appl. April 3, 1863. Preparing hydrocarbons for paint. Ass'd to Mrs. Esterre Meucci (wife of A. M.), March 13, 1863, R6, p. 413. Munn & Co., att'ys.

- *44,735*. October 18, 1864. Appl. September 12, 1864. Removing gum, &c., from vegetable material for paper pulp. Ass'd to Wm. E. Rider, November 26, 1864, S7, p. 17. E. S. Renwick, att'y.

- *46,607*. February 28,1865. Appl. Jan'y 17, 1865. Making wicks out of vegetable fiber. Ass'd to W. E. Rider, Jan'y 12, 1865, S7, p. 344. E. S. Renwick, att'y.

- *47,068*. March 28, 1865. Appl. Feby 21, 1865. Imp't on 44,735. Ass'd to W. E. Rider, Feby 11, 1865, R7, p. 389. E. S. Renwick, att'y.

- *British 758 of 1865*[153]. Same as 44,735 and 47,068.

- *Italian.* November 3, 1869. Ditto.

- *53,165*. March 13, 1866. Appl. August 3, 1865. Treating vegetable fiber for paper pulp. Ass'd to David Whiting, Mch. 15, 1866, A9, p. 307; W. E. Rider and Jas. C. McAndrew, witnesses. E. S. Renwick, att'y.

- *Caveat*. December 28, 1871. Sound Telegraph. T. D. Stetson, att'y. Witnesses, Shirley McAndrew and Fred Harper.

- *122,478*. Jan'y 21, 1872. Appl. November 20, 1871. Effervescent drinks. Shirley McAndrew, witness. Ass'd to Alex. McAndrew, December 17, 1871, C15, p. 103. Ass'd to Mrs. Esterre Meucci (wife of A. Meucci) March 4, 1872, V14, p. 434; B. Bertolino, witness. T. D. Stetson, att'y. Final fee paid December 20, 1871.

- *Caveat.* December 9, 1872. *Caveat* for Sound Telegraph renewed. Stetson, att'y.

- *Caveat*. July 7, 1873. Screw steamer for canals. T. D. Stetson, att'y.

- *142,071*. August 26, 1873. Appl. July 9, 1873. Angiolo P. Agresta and Antonio Meucci, inventors. Sauce for food. T. D. Stetson, att'y.

- *1,503.* October 21, 1873. Appl. July 9, 1873. *Trade mark* for same. Stetson, att'y.

- *Caveat*. December 15, 1873. Caveat for Sound Telegraph renewed. Stetson, att'y.

- *Caveat*. April 23, 1874. Refining, &c., mineral oil. T. D. Stetson, att'y.

- *Caveat.* July 2, 1874. *Caveat* for canal steamer renewed. Stetson, att'y.

- *168,273* September 28, 1875. Appl. July 23, 1875. Lactometer. Ass'd to Giuseppe

[153]After checking at the British Patent Office, it appears that Patent No. 758 of 1865 concerns "Clothing" and was granted to Gerald Ralston. The year is probably wrong, for it should be 1868 or 1869 (like the Italian patent).

Tagliabue, July 17, 1875, O19, p. 431. Van Santvoord and Hauff, attorneys.

- *183,062*. October 10, 1876. Appl. December 1, 1875. Hygrometer. L. D. Cunningham, witness. Ass'd to Esterre Meucci, his wife, November 29, 1875, R19, p. 477; witness Luigi Tartarini. Esterre Meucci appoints Antonio Meucci, "my husband," her atty, about this, November 30, 1875, U19, p. 292; Leonard D. Cunningham, witness. T. D. Stetson, att'y.

- *Application.* Mch. 6, 1878. Ornamental candles for Christmas trees. Ass'd to Mrs. Esterre Meucci Feby 28, 1878, O22, p. 284. Rejected. Munn & Co., att'ys.

- *Application*. August 1, 1878. Preventing noise on Elevated R. R. Rejected. Hughes & Morris, att'ys.

- *Application.* July 2, 1880. Wire for electrical purposes.

- *Application.* July 8, 1880. Marine Telegraph, serial No. 13,140.

- *Application.* January 6, 1881. Postage and revenue stamps, and process for making same. Ass'd to Scott Lord, Jr., December 30, 1880, D26, p. 382. Rejected. Brown & Brown, att'ys.

- *279,492.* June 12, 1883. Appl. March 8, 1883. Plastic paste. A. Meucci & Torello Dendi. T. D. Stetson, and Munn & Co., att'ys.

- *Deed.* September 22, 1880. A. Meucci to W. W. Goodwin, James Work, Robt. K. Dearden & Alfred P. Willoughby. Recites that A. Meucci did, about 1871, make certain inventions for sound telegraphs and telephones, and did thereafter, July, 1871, file a caveat on said inventions, and did subsequently file his applications for improvements upon the same, and renewed the caveat. Grants the same. Refers to application prepared contemporaneously with deed. Agrees to deliver to them all affid., models and evidences in the hands of his attorneys, M. Lemmi & C. Bertolino. Recorded October 3, 1883, P30, p. 63.

- *Deed.* A. Meucci to Goodwin et al., recorded December 7, 1883, Q30, p. 130. Witnessed by Charles Bertolino and G. B. Edwards. Assigns appl. for Marine Telegraph filed July 8, 1880, serial No. 13,140.

- *Deed*. Same to same. December 4, 1883, recorded December 7, 1883, Q30, p. 130. Assigns appl. about to be made for method of and apparatus for transmitting sound telegraphically.

## Manufacture of candles

Antonio Meucci, of Clifton, New York

Manufacture of Candles

*Application filed:* 15 November 1858

*Patent Attorney:* E. S. Renwick

*Patent granted:* 25 January 1859, No. 22,739

*Assignor:* D. B. Lorini, 29 November 1858; Recorded 24 February 1859, book Z4 p. 29

*To all whom it may concern:*

Be it known that I, Antonio Meucci of Clifton, in the County of Richmond and State of New York, have invented a new and useful Improvement in the Manufacture of Candles, of which the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing in which—

Figure 1 represents a side elevation of my improved candle mold, Fig. 2 represents a longitudinal section of the same and of a candle in it and Fig. 3 represents a cross section of the same at the line *x x* of Fig. 2.

My invention relates to the manufacture of mold candles and particularly to those which are formed of paraffin and of wax. Mold candles have hitherto been formed in molds of metal, and in the manufacture of candles of paraffin much trouble and difficulty has been experienced from the adhesion of the candle to the mold, which, so far as my own experience extends, has rendered the manufacture of candles of paraffin unprofitable. A careful study of the matter in connection with a series of experiments led me to the belief that the adhesion of the candle to a metal mold was due to the impervious nature of the metal, which prevents it from retaining the grease or other lubricating material, which may be used to cause the candle to separate from the mold; and I discovered that this adhesion may be obviated by the employment of a candle mold of a material sufficiently porous to retain oil or other lubricating material within its pores.

My invention consists in the method of forming mold candles by means of candle molds of a porous material saturated with a lubricating material, in contradistinction to the method now in general use of forming mold candles by means of candle molds of metal or other impervious material.

The porous metal which I prefer as the material for my molds is ordinary plaster of Paris, such as is used in the manufacture of figures and other ornamental plaster work. I construct these molds by casting them in the manner well known to plaster workers in the shape shown in the drawing.

Candle Mold - Figs. 1, 2, & 3

The mold consists of two parts, the staff A, or mold proper, which gives form to the candle; and the head B, which fits upon the staff, acts as a funnel to facilitate the pouring of the melted candle material, and retains a sufficient quantity thereof to supply the shrinkage in the candle in cooling. The lower end of the mold has a piece of India rubber *c* cast in it, which is perforated to admit the wick, and which by its elasticity pinches the latter so that it may be strained sufficiently to keep it straight in the mold, and also prevents the escape of the candle material in casting. After the molds are formed they are saturated with some suitable lubricating material, after which they are ready for use. The saturating material which I prefer is sperm oil, but linseed oil, wax, stearin, or paraffin may be used for the purpose, the concrete fats being melted before saturation, and the operation being effected by dipping the molds into the material. I have also obtained good results by saturating the molds with an alcoholic solution of soap, in the proportion of two ounces of good white soap to a gallon of alcohol and water mixed in equal parts. I have even found that the molds will answer if saturated with water alone, but in this case the saturation has to be renewed after casting one or two candles while if a concrete fat or an oil be used, a single saturation is generally sufficient to keep the mold in a working condition until it is worn out or broken.

The molds after saturation may be used in a warm or cold state, or may be used singly, or arranged in a series of frames. The upper end of the wick is conveniently held by a slotted strip or bridge of tin plate *d*, which rests upon the staff A, and the operation of withdrawing one candle from the mold draws in the wick for the succeeding one.

In place of plaster of Paris any other suitable porous material may be used, and the mold may be formed by cutting it out of a block of material, instead of by the process of casting; but whatever be the porous material used, it is necessary in all cases to saturate it previous to use with a lubricating material.

I am aware that molds of plaster of Paris or other porous materials partially or wholly saturated with grease have been used in the manufacture of articles of Plaster of Paris and other ornamental objects, and therefore do not claim the invention of such molds or their employment in other arts but

What I claim as my invention or discovery in the candle manufacture and desire to secure by Letters Patent is —

The method of forming mold candles in saturated porous candle molds substantially as herein set forth, in contradistinction to the method in general use of forming them in candle molds of impervious metal.

In testimony whereof I have hereunto subscribed my name.

Anto Meucci.

Witnesses:
Saml. L. Badgley,
Wm. E. Rider.

## Apparatus for Molding Candles

Antonio Meucci, of Clifton, New York

Apparatus for Molding Candles[154]

*Application filed (caveat):* 6 June 1860

*Patent Attorney:* E. S. Renwick

*Patent granted:* 25 September 1860, No. 30,180

*Assignor:* The New York Paraffine Candle Co., Richmond County, New York; recorded 28 May 1860, book U5 p. 66

Candle finishing apparatus - Figs. 1, 2, 3, & 4

*To all whom it may concern:*

Be it known that I, Antonio Meucci of Clifton, in the County of Richmond and State of New York, have invented a new and useful Apparatus for Finishing Candles; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing in which—

Figure 1 represents a plan of my apparatus. Fig. 2 a side elevation of it. Fig. 3 a cross section of it at the line *x x* of Fig. 2, and Fig. 4 represents a side view and cross section of the driver used in connection with the apparatus.

Candles after casting, and particularly paraffin candles, frequently have a surface which is not sufficiently smooth and polished for the market. They are also slightly tapering from the necessity of making the molds tapering to permit the candles to be drawn out of them.

The invention which is the subject of this patent is an apparatus for the purpose of paring and polishing the candles after they are taken from the molds, so as to render them cylindrical and impart an even polished surface to them.

This apparatus consists, essentially, of a combination of a candle guide and circular die so arranged relatively to each other that the candle is guided in a straight line through the die when the candle is propelled forward either by hand or by other means.

The most convenient method of constructing my ap-

[154]The title “Apparatus for Finishing Candles” used by Meucci in the text would have been more correct.

paratus with which I am acquainted is to mount one or more dies upon a base, with a horizontal candle guide in front of them, to guide the candles through the dies, and a similar horizontal guide or bed behind them, to receive the candle as it issues from the dies.

In the present example there are two dies *a* and *b*, which are formed in a steel plate *c* that is supported by a rest D. The die plate is secured to the rest by means of screws *e* passing through slots in the die plate, so that it may be moved crosswise to the base F to adjust in one direction the positions of the dies to that of the guide which precedes them. The rest is supported upon the base F of the apparatus by a pair of brackets H H, to which it is secured by means of screws *s s*, that pass through vertical slots made in it, so that this rest with the die plate may be adjusted in a vertical direction to place the dies in the right positions with respect to the candle guide which precedes them.

The candle guide K in the present example has the form of a block of greater length than the candles to be finished, so as to support the driver that bears against the butt of the candle, and its upper surface has two shallow groves *m m* formed in it corresponding in position with two dies *a, b.* The end of this guide block which is nearer the dies is cut away to permit the parings removed by the dies to escape freely. The dies are followed by a second block L, similar in all respects to that which precedes them, and the office of this block is to furnish a bed to sustain the candles as they issue from the dies. This bed has two elastic straps *n* and *o* of vulcanized India rubber secured to it crosswise, to hold the candles in contact with the bed as they move upon its surface. One of the dies (*a*) is made a little smaller in diameter than the other, and each candle is passed through both in succession. The passage through the first die pares off the surface and reduces the candle to a cylindrical form; the passage through the second die removes a fine shaving of the material and leaves the surface beautifully smooth and polished.

In using the apparatus above described the candles are laid in succession upon the candle guide K and are pushed through each die. This operation is conveniently effected by means of a driver such as is represented at Fig. 4, whose lower face fits the groove of the candle guide. This driver is pushed against the butt of the candle lying upon the candle guide, and when the candle is pushed forward as far as possible by the driver, the latter is

drawn back and a second candle is laid between it and the butt of the first, so that the propulsion of the second into the die expels the first. The candles as they issue from the dies are received upon the bed and are maintained in contact with it by the elastic straps. Two dies are sufficient to pare mold candles to a cylindrical form and impart a handsome surface to them, but more may be used if found expedient, each succeeding die being made smaller than the preceding one.

The apparatus may be modified in form and construction as deemed expedient, and may be arranged to act upon the candles while in horizontal positions or at any angle of inclination, the construction of its parts being adapted to the change of arrangement as found necessary.

I do not claim a circular die for the purpose of reducing an article in size, but —

What I claim as my invention in candle machinery, and desire to secure by Letters Patent, is —

1. The combination of die and candle guide substantially as herein described for the purpose of finishing candles.

2. The combination of an elastic strap with the receiving bed for the purpose of holding the candle in contact therewith.

3. The combination of die, candle guide, and candle receiving bed, substantially in the manner and for the purpose herein described.

In testimony whereof I have hereunto subscribed my name.

Antonio Meucci.

Witnesses:
Eugene Sieber,
David Whiting.

## Improved mode of making wicks

Antonio Meucci, of Clifton, New York

Improved mode of making wicks

*Application filed:* 17 January 1865

*Patent Attorney:* E. S. Renwick

*Patent granted:* 28 February 1865, No. 46,607

*Assignor:* Wm. E. Rider, of New York, N. Y.; recorded 12 January 1865, book S7 p. 344

*To all whom it may concern:*

Be it known that I, Antonio Meucci, of Clifton, in the county of Richmond and State of New York, have invented a new and useful Wicking for lamps, and for other purposes to which it may be applicable; and I do hereby declare that the following is a full, clear, and exact description of my said invention and of the mode of making the same.

Lamp wicks have usually been manufactured of fibrous material—such as cotton—by

spinning it into yarn and weaving or plaiting the yarn into the required form. The raw material required for such a mode of manufacturing is costly and the labor involved in the manufacture is considerable.

The object of my invention is to produce a lamp-wick which will cost a materially less sum than the woven or plaited wicks; and my invention consists of a wick or wicking of recomposed vegetable fiber prepared and agglomerated by a process similar to that used in manufacturing paper from vegetable material.

The several modes in which I have contemplated the application of the principle or character by which my invention may be distinguished from other inventions are as follows: The vegetable fiber which I employ in the production of my new manufacture is paper pulp made from wood or any other suitable material—such as straw, cotton, or linen rags and paper clippings. I employ this pulp in the wet state, in which it is used for the manufacture of paper, and I spread a quantity of it evenly upon a sheet of metallic gauze, in the same manner as is practiced in the manufacture of paper by hand, the metallic gauze being sustained by a frame of wood or in any other suitable manner. If flat wicks for kerosene-lamps are required, the quantity of pulp should be sufficient to produce (when drained and dried) a sheet of a thickness of about one-eighth of an inch, more or less, which is the usual thickness of woven wicks. The sheet of wet fiber is drained of water and is permitted to dry without pressure. It is then cut into strips of the required length and breadth for wicks.

Wicks produced in the above mode are not as tenacious as is desirable. In order to impart to them the desirable tenacity, I envelop them with bobbinet or similar gauze made of cotton by cutting the bobbinet into strips of sufficient breadth to encircle the wicks and permit their edges to be slightly overlapped, dampening the strips, wrapping the wicks in them, and permitting them to dry; or, I dampen the wicks and envelop them in the bobbinet and permit them to dry; or, I cut the damp sheet of recomposed fiber into strips as soon as it is sufficiently dry to permit this operation and envelop them in the bobbinet and permit them to dry. The gum or starch with which the bobbinet is dressed, as found in the market, is sufficient to cause the wicks and bobbinet to adhere to each other.

Another mode in which I contemplate the application of the principle of my invention is

as follows: I spread, as before described, a sufficient quantity of the pulp upon the wire-gauze to form when dry a sheet of a thickness about half of that of the wick to be made. While the sheet of pulp is wet I cover it with a sheet of thin bobbinet or similar gauze made of cotton, and I cover this gauze with an additional quantity of pulp equal to the first deposit, so as to form a compound sheet of pulp and gauze, the latter within the former. The compound sheet, when thoroughly drained of water, is permitted to dry without pressure, and is then cut into strips of the required length and breadth for wicks.

I sometimes combine silica with my wicking, the effect of which is to lessen the formation of crust while burning. The silica may be combined with the wicks in the process of manufacture in either of the following ways: First, by mixing powdered asbestus with the fiber in the pulp state before it is spread upon the wire-gauze in the proportion of about one or two per cent. of the weight of the fiber when dried; secondly, by dipping the wicks or wicking in a saturated solution of the silicate of potassa or soda and permitting them to dry. I also sometimes combine powdered charcoal with my wicking, the effect of which is to make the light more brilliant when the wick is employed in kerosene-lamps. The powdered charcoal may be combined with the wicks by dusting the wet sheet of re-composed fiber with the powdered charcoal before the bobbinet is applied to it, and when charcoal is used I prefer to apply it in such a manner that it is within the wick, which may be done by making the wicks of two thicknesses in the mode above described, and dusting the first thickness of fiber with the charcoal before or after the bobbinet is applied and before the second thickness of pulp is applied to the first.

Wicks or wicking made substantially as above set forth may be used for lamps or for any other purpose to which they are applicable; and, as they are not solidified by pressure or by a glutinous sizing, their highly-porous and open structure adapts them admirably to the transmission of the burning fluid from the reservoir to the aperture of the wick tube, where the burning takes place. Their form may be varied to suit the particular purpose required. As the wicks are composed of paper-stock, the cost of which is greatly less than that of a fibrous material which is suitable for spinning and weaving, the cost of the article is considerably less than a plaited or woven wick of the same size.

What I claim as my invention, and desire to secure by Letters Patent, is—

The new manufacture of wick and wicking of recomposed vegetable fiber, substantially as herein set forth.

In testimony whereof I have hereunto set my hand this 12th day of January, A. D. 1865.

Antonio Meucci.

Witnesses:
David Whiting,
E. S. Renwick.

## Improvement in Kerosene-Lamps

Antonio Meucci, of Clifton, New York

Improvement in Kerosene-Lamps

*Application filed:* 7 May 1862

*Patent Attorney:* E. S. Renwick

Lamp burner - Figs. 1, 2, 3, & 4

*Patent granted:* 12 August 1862, No. 36,192

*Assignor:* Antonio Jané, of Brooklyn, New York; recorded 13 May 1862, book N6 p. 390

*To all whom it may concern:*

Be it known that I, Antonio Meucci, of Clifton, in the county of Richmond and State of New York, have invented or discovered certain new and useful Improvements in Lamps for Burning Kerosene and Cognate Oils Rich in Carbon; and I do hereby declare that the following is a full, clear, and exact description of my said invention, reference being had to the accompanying drawings in which—

Figure 1 represents an elevation of a small lamp fitted with my improvements and with the wick-tube edgewise to the spectator. Fig. 2 represents a similar view of the lamp with the wick-tube flatwise to the spectator. Fig. 3 represents a side view of a lamp-top with two wick-tubes, and Fig. 4 represents a view of the same with the tubes edgewsise [edgewise] to the spectator.

The object of my invention is to enable kerosene and the cognate oils which are rich in carbon to be burned in lamps without chimneys, so that small hand-lamps for burning these oils can be constructed which can be carried about and used to light other lamps.

To this end my invention consists in combining a plate of platinum or other metal having the same qualities with the wick-tube in such manner that when the lamp is lighted the platinum is in contact with the base of the flame, by which means I have discovered that the kerosene will burn without appreciable smoke even when no chimney is employed.

My invention is embodied in the lamp represented in the annexed drawings. In this lamp there is a single flat wick-tube, *a,* which is secured to a wooden base, *m,* that rests on a

shoulder formed in the cap B, upon the body of the lamp. The upper surface of the wooden base is covered with a thin plate of metal, *c*, to make a neat finish and prevent the defacement of the wood.

The flat wick-tube *a*, is fitted with a sleeve of thin platinum, *d*, whose upper extremity terminates in a pair of tongues or plates *e e*, which stand at the opposite sides of the flame and are inclined toward each other. The platinum sleeve is constructed to grasp the wick-tube by the spring of its opposite sides, so that it can be slid up or down to adjust the position of its tongues, and will remain in the position in which it is set.

When the lamp is to be prepared for use, the sleeve is slid upward and a wick is applied to the wick-tube, care being taken that it does not fill the wick-tube so tightly that the kerosene cannot rise freely. The lamp is then filled with kerosene, and the wick is cut off evenly at short distance—say about one thirty-second of an inch—above the upper end of the wick-tube. The lamp is then lighted, and the sleeve is slid upward until its tongues embrace the base of the flame and are in contact with it a short distance above the wick-tube, when it will be found that the flame, which smoked when first lighted, will burn brightly.

If deemed advisable, two or more flat wick-tubes may be used in the same lamp, each flat wick-tube being provided with an appropriate sleeve having platinum tongues, as shown at Figs. 3 and 4, which represent views of the burner of a lamp with two wick-tubes, and in place of making the whole sleeve out [of] platinum it may be made, mainly, of some cheaper metal, with platinum tongues brazed fast to it. I have also discovered that the desired effect can be produced with a single platinum tongue at one side of the flame, and that the tongue or tongues may be rounded or pointed at their upper ends. The non-conducting wooden base *m* effectually prevents the conduction of heat to the body of the lamp, and thus diminishes the chance of explosion. It may be made of cork or other non-conducting material which is not affected by contact with the kerosene.

I do not confine my invention to the use of platinum, as I believe that some other metals, when combined in the same manner with a flat wick-tube, will produce the same effect in preventing smoke, although I have not discovered that any other metal is as good in all respects as platinum.

What I claim, therefore, as my invention, and desire to secure by Letters Patent, is—

The combination of a plate of platinum (or other metal having the same qualities) with the wick-tube of a lamp, substantially as set forth, the said plate being adjustable vertically.

In testimony whereof I have hereunto subscribed my name.

Antonio Meucci.

Witnesses:
Wm. E. Rider,
David Whiting.

## Mineral oils for paint

Antonio Meucci, of Clifton, New York
Improvement in treating petroleum and other oils to produce a vehicle for paints and varnishes

*Application filed:* 16 June 1862

*Patent Attorney:* Munn & Co.

*Patent granted:* 9 September 1862, No. 36,419

*Assignor:* Antonio Jané; recorded 12 June 1862, book O6 p. 207

*To all whom it may concern:*

Be it known that I, Antonio Meucci, of Clifton, in the county of Richmond and State of New York, have invented a new and Improved Process for Preparing Hydrocarbon Liquids for Paints, &c.; and I do hereby declare that the following is a full, clear, and exact description of the same.

The object of this invention is to render siccative and consistent such hydrocarbon liquids as petroleum and kerosene, so that the same, when mixed with paints, act as thinners and driers, the same as turpentine.

The invention consists in treating petroleum, coal-oil, or other hydrocarbon liquids or oils with hyponitric gas, substantially in the manner hereinafter described, for the purpose of rendering said oils siccative and fit to be used in paints.

It also consists in mixing with petroleum, kerosene, or other oil, after the same has been treated with hyponitric gas, an extract of the cakes obtained in the manufacture of linseed-oil or of farina of linseed, together with a certain quantity of fish oil, for the purpose of giving to said liquids the required consistency for painting purposes.

To enable those skilled in the art to fully understand and use my invention, I will proceed to describe it.

The petroleum or other oil to be treated with hyponitric gas is put in a vessel which communicates by a suitable pipe with a balloon or retort of glass or other suitable material, in which the hyponitric gas is produced. The preparation of the hyponitric gas can be effected by charging said balloon or retort with three (3) parts of nitric acid to one (1) part of

starch, and heating it slowly with steam or in any other desirable manner. After the oil has been exposed to the current of hyponitric gas for about two (2) hours it assumes a dark-green or a reddish-yellow color, which indicates that the operation is finished. The oil must now be repeatedly washed with clean water until all traces of the acid disappear, and after this is accomplished the oil is heated in a suitable vessel or still by means of a steam-coil or in any other desirable manner for the purpose of expelling the water. By this process petroleum, kerosene, or other oils are rendered siccative, and they can now be used with advantage in paints. After I have treated the petroleum or other oils with hyponitric acid, and in order to increase their consistency or "body" I add to each one hundred (100) gallons of said oils about fifty (50) pounds of linseed or from one hundred (100) to one hundred and fifty (150) pounds of linseed "cakes" (obtained in the manufacture of linseed oil,) and from twenty (20) to twenty-five (25) gallons of fish-oil, heating the mixture to about 150° to 200° Fahrenheit for from six (6) to eight (8) hours, and stirring it well during the whole operation. It is then left to stand, and after a long rest the oil is drawn off and the residue is pressed.

The oil obtained by this process can be used with advantage for paints. It is very cheap, it has a body equal to linseed-oil or nearly so, and it dries in a short time.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The employment or use of hyponitric acid in treating petroleum, kerosene, or other oils, substantially in the manner and for the purpose described.

2. Mixing petroleum or other oils after they have been exposed to a current of hyponitric acid, as described, with linseed or with linseed cakes and fish-oil, substantially in the manner and about in the proportions herein specified.

Antonio Meucci

Witnesses:
R. Gawley,
Timothy Shine

## Preparing hydrocarbons for paint

Antonio Meucci, of Clifton, New York

Improvement in preparing hydrocarbon liquids to serve as vehicles for paints

*Application filed:* 3 April 1863

*Patent Attorney:* Munn & Co.

*Patent granted:* 26 May 1863, No. 38,714

*Assignor:* Esterre Meucci; recorded 13 March 1863, book R6 p. 413

*To all whom it may concern:*

Be it known that I, Antonio Meucci, of Clifton, in the county of Richmond and State of New York, have invented a new and Improved Process for Preparing Hydrocarbon Liquids for Paints, &c.; and I do hereby declare that the following is full, clear, and exact description of the same.

The object of this invention is to prepare petroleum, kerosene or other hydrocarbon liquids, so as to render the same fit for vehicles of paints, varnishes, &c., and also to decolorize said hydrocarbon liquids.

The invention consists in treating petroleum, kerosene, or other hydrocarbon liquids with hypochloronitric acid, ($NO_2Cl_2$,) which is obtained by mixing one part of nitric acid with three parts of muriatic acid and a sufficient quantity of starch to produce the desired reaction in such a manner that said hydrocarbon liquids are rendered siccative and consistent, and that they can be used as vehicles for paint and varnishes.

The invention consists, further, in uniting with petroleum, kerosene, or other hydrocarbon liquid a certain quantity of linseed, linseed-cakes, or linseed-oil, for the purpose of giving to said liquids the required consistency to render them fit for vehicles of paints, varnishes, &c., after treating with hypochloronitric acid.

To enable those skilled in the art to fully understand my process, I will proceed to describe it.

Petroleum, kerosene or other similar hydrocarbon liquids, when mixed with paints in their natural state, cause the same to curdle and the paint is spoiled. This difficulty is obviated by treating petroleum, kerosene, &c., with hypochloronitric acid — a composition obtained by mixing one part of nitric acid with three parts of muriatic acid and a sufficient quantity of starch to produce the reaction. The chemical composition of this acid is expressed by the formula $NO_2Cl_2$, and its action on the hydrocarbon liquids is such that it renders the same siccative and consistent and fit to be used as vehicles for paints. It acts also as a decolorizing agent, so that the oils prepared by my process can be used for fine as well as for coarse work.

The consistency or body of the petroleum or kerosene can still be further improved by adding linseed-oil, or an extract derived from cakes that are obtained in the manufacture of linseed-oil. These cakes, on being taken from the oil-press, retain a certain

gummy substance which readily dissolves in petroleum or kerosene and imparts to the same the desired consistency.

What I claim as new, and desire to secure by Letters Patent, is—

1. The employment or use, in treating petroleum, kerosene, or other hydrocarbon liquids, of hypochloronitric acid, substantially in the manner and for the purpose described.

2. Mixing petroleum, kerosene, or other hydrocarbon liquid after treating the same with hypochloronitric acid, linseed oil, linseed, or linseed-cakes, substantially as and for the purpose set forth.

Antonio Meucci

Witnesses:
J. W. Coombs,
M. S. Partridge.

## Removing undesired substances from vegetable material

Antonio Meucci, of Clifton, New York

Improved process for removing the mineral, gummy, and resinous substances from vegetable material

*Application filed:* 12 September 1864

*Patent Attorney:* E. S. Renwick

*Patent granted:* 18 October 1864, No. 44,735

*Assignor:* William E. Rider; recorded 26 November 1864, book S7 p. 17

*To all whom it may concern:*

Be it known that I, Antonio Meucci, of Clifton, in the county of Richmond and State of New York, have invented a new and useful process for removing the mineral, gummy, and resinous substances from wood and other vegetable materials, so as to leave the fibrous portion thereof in a suitable condition for the manufacture of paper and other articles to which such fiber is applicable; and I do hereby declare that the following is a full, clear, and exact description of my said process, which consists essentially in treating the vegetable material while wet with the substances produced by the action of nitro-muriatic acid upon carbonate of lime and iron, or their equivalents, and then subjecting it to the action of an alkali.

The best mode which I have essayed of practicing my invention is to exhaust the air, as completely as possible, from the wet vegetable material, and then treat it with the substances produced in gaseous form by the action of the compound acid upon oyster shells and iron. If wood be the vegetable material to be operated upon, I split it in the direction of the grain to a thickness of about one-sixth of an inch, more or less. I then soak it in clean water for twenty-four hours,

and afterward pass twice between a pair of crushing rolls, by which it is partially crushed and the grain is opened, washing it thoroughly with clean water after each passage through the rolls. The wood thus prepared and drained from the water, but in a wet state, is placed in a vat or vessel that can be closed air-tight and is of suitable form and strength to sustain the pressure of the atmosphere when the air within is exhausted. A suitable vessel for this purpose is a cylinder with bulging heads, one of which is made removable to permit of the ready insertion and withdrawal of the material. The cylinder should be coated on its interior with a material which is not affected by the chemical substances used — such, for example, as shellac. It should be connected by a pipe fitted with a valve or stop-cock, with an air-pump or other means of exhausting the air within it, and by a second pipe also fitted with a valve, with a close vessel constituting the gas generator, in which the nitro-muriatic acid is permitted to act upon the oyster-shells and iron. The gas-generator should also be fitted with a funnel-pipe extending to the vicinity of its bottom for the introduction of the acid, and fitted with a stop-cock or valve to regulate that introduction. The oyster-shells and iron are charged into the gas-generator, and as soon as the vegetable material shut up in the cylinder is exhausted as much as practicable of air by the operation of the air-pump, some of the acid is permitted to enter the gas-generator, and the mixture of gases produced by the action of the nitro-muriatic acid on the oyster-shells and iron, and consisting of carbonic acid, chlorine, oxygen, and nitrogen, is permitted to enter the cylinder containing the wet vegetable material. As fast as the gas is absorbed, fresh quantities of acid are permitted to enter the gas-generator until the charge of acid required for treating the charge of wood is exhausted and the wood is saturated with the gas produced. The vessel is then opened. The wood is removed from it, and placed in a bath of caustic alkali for about twenty-four hours, more or less. At the end of this period the wood is taken from the alkaline bath, and is passed again between the crushing rollers, after which it is washed with clean water and macerated either in a stamping mill or in an ordinary cylinder pulping-engine used in the manufacture of paper. The washed material is then soaked for two or three hours in a bath of water containing from two to five per cent of acid, (muriatic acid being preferred for this purpose,) after which it may be pressed and dried, if it is to be used in a dry state, or

may be bleached with chlorine in the usual manner before pressing, if the purpose for which it is to be used requires bleaching.

The quantities of acid and other materials which I have used with success to produce the mixture of gases are, for each one thousand pounds of wood, twelve pounds of commercial muriatic acid, thirty-six pounds of commercial nitric acid, twelve pounds of iron, two pounds of oyster shells, and two pounds of water.

The alkaline bath which I have used with success is composed of one thousand pounds of water, one hundred pounds of soda or potash, and fifty pounds of quicklime for each one thousand pounds of wood. These proportions may, however, be changed as circumstances render expedient.

Another mode in which my invention may be practiced is by dissolving the mixture of gases in water, and then subjecting the crushed wood to the action of this watery solution previous to placing it in the alkaline bath; but in order that this mode may be practiced with success the water in which the gas is dissolved must be kept cold by ice, and this mode of practicing my invention is not as effectual or economical as that first described.

My invention may also be practiced by steeping the crushed wood for about forty-eight hours directly in a bath composed of water containing from five to twenty per cent. of the nitro-muriatic acid and one or two per cent. of oyster-shells or mineral carbonate of lime before placing the wood in the alkaline bath; but this mode of practicing the invention has the effect of rendering the fibrous material brittle and impairs its elasticity.

The process is applicable to other substances than wood — as, for example, to hay, straw, and rushes — and the fibrous material obtained may be used for any purpose to which it is applicable.

Having thus described the several modes in which I have contemplated the application of the principle or character by which my invention may be distinguished from others, I declare that I do not claim broadly the treatment of vegetable materials by a gas, nor the subsequent treatment of it by a caustic alkali; but

What I claim as my invention, and desire to secure by Letters Patent, is —

The process of treating a vegetable material in a wet state with the substances produced by the action of nitro-muriatic acid upon carbonate of lime and iron, or their equivalents, and then subjecting the vegetable material to

the action of caustic alkali, substantially as set forth.

In witness whereof I have hereunto set my name this 31st day of August, 1864.

Antonio Meucci.

Witnesses:
Wm. E. Rider,
John S. Clark.

## Removing undesired substances from vegetable material (2)

Antonio Meucci, of Clifton, New York

Improvement for removing mineral, gummy, and resinous substances from vegetable fiber

*Application filed:* 21 February 1865

*Patent Attorney:* E. S. Renwick

*Patent granted:* 28 March 1865, No. 47,068

*Assignor:* Wm. E. Rider, of New York, NY; recorded 11 February 1865, book R7 p. 389

*To all whom it may concern:*

Be it known that I, Antonio Meucci, of Clifton, in the county of Richmond and State of New York, have invented certain new and useful Improvements in the Process of Removing the Mineral, Gummy, and Resinous substances from Vegetable Material, (for which Letters Patent, No. 44,735, were granted to me the 18th day of October, 1864;) and I declare that the following is a full, clear, and exact description of my said improvements.

My present improvement consists in treating the vegetable materials, first, while in a dry state, with the gases produced by the action of nitro-muriatic acid upon iron and carbonate of lime, or their equivalents; second, while in a wet state, with the same gases; and, third, with a caustic alkali, these three operations constituting one compound process.

My improvement consists, further, in treating the vegetable material subjected to the first two of the above-recited operations with a mixture of caustic alkali and oil, the effect of which is to give elasticity to the fiber produced.

In order to practice this process, I make use of a vat to contain the vegetable material, and a gas-generator to generate the gas. The vat may be a cylindrical vessel with a perforated cover, and with a perforated diaphragm at a short distance above its bottom to hold the vegetable material. The vat should also be provided with a cover which fits it tightly, and which may be substituted for the perforated cover. This vat should either be made of some material which is not affected materially by the gases or should be coated with such a material. In the latter case it may be coated with shellac in

the form of varnish. The gas-generator may be made of glass. It should be fitted, at a short distance above its bottom, with an iron grating to support the carbonate of lime. It should also be fitted with a funnel-pipe, the end of which terminates in the vicinity of the grating for the purpose of introducing the acid, and with a pipe connecting its upper part with the vat beneath the perforated diaphragm thereof, so as to conduct the gases from the generator to the under side of the diaphragm of the vat. If wood be the vegetable material to be treated, I saw it crosswise to the grain into pieces about three inches thick, and then split in the direction of the grain into pieces of about the size of match-splints. The splint wood, which, if not already dry, should be dried by stoving it, is placed in the vat upon the perforated diaphragm and is covered with the perforated cover. The gas-generator is charged with oyster-shells or other form of carbonate of lime, and sufficient water is introduced to cover them. The acid is then poured little by little into the funnel-pipe, and the mixture of gases produced by the action of the acid upon the oyster-shells and the iron of the grating passes through the connecting-pipe to the under side of the mass of dry split wood and rises among it. This operation or dry-gasing of the material is continued until the gas begins to escape at the perforations of the cover of the vat. Then water at the temperature of the atmosphere is poured into the vat until the wood is covered. The tight cover is then applied to the vat, and the introduction of the gases from the generator is continued, so that the wood is subjected, while wet, to the action of the gases, and this wet-gasing is continued until the wood becomes yellow throughout its entire substance, the result being better the longer the wood is subjected to this second operation. The wood is then withdrawn from the vat and is drained of the liquid, after which it is steamed until it becomes tender, this operation being conveniently effected by placing it in a covered vat and admitting steam from a steam-boiler. After it is steamed it is wet with the caustic alkali, or with the compound of the caustic alkali and oil and is crushed in an ordinary putty-mill until it is reduced to a fibrous mass, the wetting with alkali being continued during the crushing.

The fibrous material produced by the above operations should be well washed with water, to free it, as much as possible, from the alkali. If it is required to be white, it should be bleached with chlorine in the following manner: The fiber is steeped and stirred in a

solution of muriatic acid in water in the proportion of from two to five parts of acid to one hundred of water. A solution of chloride of lime in the proportion of from one to five pounds of chloride to one hundred pounds of water, in water, is gradually added, the stirring being continued during this operation. The fibrous material, when sufficiently bleached by these operations, is drained, washed in water, drained of water, pressed and dried for use; or, if required, it may be used in the wet state.

The nitro-muriatic acid employed by me with success in practicing the above process is a mixture of four parts, by weight, of commercial nitric acid of 24° of Baume's hydrometer with one part by weight of commercial muriatic acid of 20° of Baume's hydrometer.

The caustic alkali used by me with success is a solution of caustic soda in water of from 2° to 5° of Baume's hydrometer, and when oil is used the alkaline solution is mixed with three per cent. of a non drying oil, such as cotton-seed oil or olive-oil. This mixture should be used in a warm state — say at a temperature of not less than 150° of Fahrenheit. The water in which the material is washed and the bleaching solutions should also be warm, the temperature being not less than 150°.

The kinds of wood which I prefer to employ, when the fiber produced is to be used for the manufacture of paper, are white pine and spruce, the branches being preferred, as they contain less resin and are more readily split.

Having thus described the best mode with which I am acquainted of practicing my improvement, what I claim as my invention, and desire to secure by Letters Patent is —

1. The improved process of treating a vegetable material by treating it first, in a dry state, with the gaseous substances produced by the action of nitro-muriatic acid upon carbonate of lime and iron, or their equivalents; second, in a wet state, with the same substances; and, third, with a caustic alkali, substantially as set forth.

2. The process of treating the vegetable material which has been subjected to the first two operations above recited with a mixture of caustic alkali and oil, substantially as above set forth.

In witness whereof I have hereunto set my name this 11th day of February, A. D. 1865.

Antonio Meucci.

Witnesses:
E. S. Renwick,
W. L. Bennem.

## Treating vegetable fiber for paper pulp

Antonio Meucci, of Clifton, New York

Improved process for making paper-pulp from wood

*Application filed:* 3 August 1865

*Patent Attorney:* E. S. Renwick

*Patent granted:* 13 March 1866, No. 53,165

*Assignor:* David Whiting; recorded 15 March 1866, book A9 p. 307

*To all whom it may concern:*

Be it known that I, Antonio Meucci, of Clifton, in the county of Richmond and State of New York, have invented certain new and useful process of treating vegetable materials for the purpose of separating the vegetable fiber from the substances with which it is found combined in nature; and I do hereby declare that the following is a full, clear, and exact description of the said process, which consists in treating the vegetable material with a mixture of dilute nitric and muriatic acids and then subjecting them to the action of an alkali, substantially as hereinafter described.

When wood is the vegetable material to be operated upon my process may be practiced as follows: Pine or spruce wood is preferred, and it should be sawed into short lengths and then split into pieces about the dimension of match-splints. The wood should also be dry, but this is not essential. The wood thus prepared is steeped in acid liquor or bath composed of dilute nitric and muriatic acid in the following proportions, viz: commercial nitric acid, five pounds by weight; commercial muriatic acid, five pounds by weight; water, one hundred pounds by weight. The most convenient mode of applying this acid liquor is to place the wood in a suitable vessel, to confine it in place by a perforated diaphragm, and to pour the acid liquor upon it in sufficient quantity to cover it. The wood is permitted to steep in the acid liquor until it becomes brittle and will break easily, which generally requires a period of from three to five days. It is then removed from the acid liquor, drained and washed in the water, so as to cleanse it as much as possible of free acid. The washed wood is drained, and is then boiled for from three to five hours (according to its condition) in a strong solution of caustic soda containing from thirty to forty pounds of soda for each one thousand pounds of wood. The boiled wood is then placed in one of the ordinary pulping engines used by paper-makers, and is washed, pulped, and bleached, if necessary, in the usual manner practiced with

rags, until it is in a suitable condition for the manufacture to which it is to be applied. Afterward it may be drained and dried if it is to be sent to market in a crude state.

When straw is the vegetable material made use of it is expedient to boil it for two or three hours in a solution of soda-ash in the proportion of two or three pounds of soda-ash for each one hundred pounds of straw, the effect of this preparation being to open the joints. It is then drained and washed to remove the free alkali as much as possible. The washed straw is steeped in sufficient quantity of the acid liquor to cover it, the said liquor consisting of commercial nitric acid, one-half pound by weight; commercial muriatic acid, one and one-half pound by weight; water, one hundred pounds by weight. When it has remained in this bath for twenty-four to thirty-six hours it is sufficiently prepared for the action of the alkali, and it is then taken from the acid-bath and treated in the same manner as I have above described for wood, the alkali being of the same strength and the treatment being the same as for wood.

Although the above-mentioned proportionate quantities of dilute acids and alkali have been found by me to produce satisfactory results, still I do not limit my invention to such precise quantities and proportions, nor to the precise periods above stated for the duration of the treatment, as these may be varied as circumstances may render expedient.

The process is applicable to hay, the leaves of trees, and Indian corn, weeds, old rope, and various other vegetable substances. It may also be practiced by the use of a single vessel; but it is preferable to have a special vessel for each operation, and it is economical to subject each lot of material to the action of the spent acid liquor of a preceding charge before subjecting it to fresh acid liquor, as by this means acid is economized.

In some cases it may be expedient to cut the vegetable material into very short fragments, and even to crush it between rolls, before subjecting it to the acid liquor, and I propose to do so as occasion may require.

What I claim as my invention, and desire to secure by Letters Patent is —

The process of treating vegetable material with dilute nitric and muriatic acids, and then subjecting it to the action of an alkali, substantially as set forth.

In witness whereof I have hereunto set my hand this 27th day of July, A. D. 1865.

Antonio Meucci.

Witnesses:

John S. Clark,
Francis J. Rayé.

## Paper pulp making (from Antonio Meucci's Memorandum Book, pp. 6 to 33)[155][156]

[*Deposition of Antonio Meucci*, Records of the US Circuit Court, Southern District of New York, *The American Bell Telephone Co. et al.* vs. *The Globe Telephone Co. et al.* - Defendants' Exhibit 109, New York Public Library, New York, NY]

"[Page 6.]
1st Patent, October 18, 1864. No. 44,735

*Method to disorganize and separate all the substances — mineral and resinous — from any vegetable and woody substances.*

This process has its theory based on the gas acids formed by nature in the marshes, or marshy grounds, and by means of these destructive elements, peat and coal are formed, because these acid gases destroy and dissolve the vegetable and mineral substances, leaving for a longer time the fiber and the filaments, these being harder to digest — these acid gases producing much destructive effect are carbonic acid, azote-oxygen, from which having for this purpose examined for long years said operation in the marshes, I determined to produce by means of decomposition of the *aqua-regia*[158] (Hypo-chloro-nitric acid) soft iron, and a small quantity of carbonate of lime and unite these three gases together, and heat with them the vegetable or woody substances, and render their filaments adapted for the different branches of industry, be it for weaving or for the manufacture of paper, and so forth.

*No. 1. Manner to operate with the gas with dry or wet substances.*

[155]We deemed it opportune to include, among Meucci's patents reproduced in this volume, the explanations that he gives in his Memorandum Book for their implementation. As can be seen, a considerable part of the notes (some 23 pages out of total 63 pages) concerns the preparation of pulp for papermaking.

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[158]In everyday language, *aqua regia* is a mixture of nitric acid and hydrochloric acid, which melts gold and platinum.

If you take wood of any quantity and hardness, it is cut of a convenient length, and it is chopped, following the veins, as thin as possible, and so that it shall be all of one thickness, because if it is not the finer would be operated upon sooner than the thicker, and this last would not be disorganized in its interior, and so it would form a bad pulp, and it is for that I recommend as much equality as is possible. When that is done, as I said above, it is put in a room, and if wanted it is wetted, and if not it is introduced in a vase that is not to be affected by the gas — this vase is furnished with a double bottom and a cover as shown by the figure of the gas apparatus, Fig. No. 1[159]

[Page 7]

When this vase containing the wood is full, the tube communicating with the retort is introduced, and the current of gas is turned on — as the vase is covered above, and the cover is provided with several holes, so when the said gases C. N. O. are introduced, they force out the air contained in the vase, and at the same time that existing in the pores of the wood, and take its place saturating the wood. When it is seen that the gas begins to come up through the holes in the cover the vase is uncovered, and with a sprinkler of common water the wood is wetted; when it is thought that it is all wet to the bottom, the cover is put on again, and the holes are closed with chalk, and the current of gas is turned on again after some time a sample of the saturated wood is taken, and if it is seen that it has become of a light yellow color, outside as well as inside, the operation is finished. If the contrary is the case, the current of gas is continued until the saturation is complete.

*No. 2.* If instead of wood there are other vegetable substances, such as straw, hay, grass from the marshes, hemp, flax, and the other correspondently delicate substances, it is necessary to pay much attention, because, when a too strong current of gas is passed for too long a time it would destroy everything and make it into jelly; so I adopted the bath of water saturated with said gases, or a bath of water saturated with *aqua regia*, obtaining the fermentation by means of heat, because it is very difficult when it is wanted to use its filaments for spinning; and fur-

[159]Unfortunately, as was mentioned previously, all the drawings of Meucci's Memorandum Book were left out in its English translation (*Exhibit no. 109*), which was put in evidence at the Bell/Globe trial. The only drawings that were saved were the ones contained in Meucci's notes on the telephone, which were reproduced in an affidavit by Michael Lemmi, sworn on 28 September 1885.

ther down I will give the explanation for each substance in particular.

*No. 3. Method to heat the Wood after the saturation of aqua regia or of gas for the alkaline caustic, the solution as well with steam as with naked fire*

Once that the wood is well saturated with gas, it is taken from the vase and put in a storeroom

[page 8]

keeping it piled so as to augment its fermentation and goodness; for that reason it is convenient to have always a large quantity of it before beginning to treat it with alkali.

*No. 4.* To treat it with the alkali, a large vessel of iron or wood, the latter furnished with steam, the former with naked fire, is used; in it is put water containing 5% of its weight of caustic soda of commerce, so that the alkaline solution marks five degrees Baumé. This is made to boil, and when boiling, little by little the wood saturated with gas is introduced into it, the mass is stirred continually, either by steam or by hand, in order to divide the fibres of the wood, which does not take long. When the vessel is full, if it is seen that it needs liquid it is added, and if not, it is boiled for about an hour, and then it is left in this bath until the next day.

*No. 5.* The next day the solution is drawn from the vessel by means of the large faucet at the bottom, the pulp is washed with water in the same vessel, heating it always with steam or otherwise, until almost all the alkali is gone; if this vessel is furnished with a double bottom, it will be very advantageous, as the liquid comes out with more facility and strength, exhausting the caustic soda contained in it. The last water that is introduced must contain from 1 to 2% of sulphuric or muriatic acid, so that the pulp becomes of a very light color, and will be ready to be sent to the mill to make paper with.

*No. 6. Method to heat the pulp in the mill.*

This pulp is put in the usual mill, is washed well, ground to divide well its filaments, so that the solution of chloro[160] operates with more facility on its fibres; and when it is so obtained, all the water that is possible is taken out with the same machine of the mill, that is, a cylinder of metallic tissue. When the pulp

[page 9]

[160]The word ‘chloro’ or ‘cloro’ (which, in Italian, means ‘chlorine’) is used here and in the following by Antonio Meucci to indicate chloride of lime.

has been freed from a large portion of the water, a solution of Chloride of Lime prepared in advance clear and strong, marking from 5 to 7% Baumé is added in sufficient quantity, which is indicated by the color and experience. This done, the pulp is kept in motion for some time and then is passed into a basin called Dreen for 12 or 24 hours; when this basin is full of pulp and the indicated time is passed, the liquid is extracted from the double bottom and it is well drained; and so the pulp obtained in this way and bleached, is taken a second time to the mill, is washed again with much water, and when the Chlorine is washed away, the pulp is completely ground to the necessary point and is put in the trough that feeds it to the machine to make it into paper.

*No. 7. The solution of chloride of lime.*

I use 100 lbs. of water, 10 lbs. dry Chloride of good quality and well dissolved in water, by means of a machine or with a mixer, and when this solution is clear it marks from 5 or 6 deg. Baumé, so that when the solution is put in the pulp, count exactly how many buckets you put in the paste; you will know then to a point how many pounds of Chloride of Lime you have used; every bucket of 20 lbs. of liquid that you put in the pulp contains 2 lbs. of Chloride of Lime dry.

*No. 8.* All the other substances will pass said operation when it is wanted to make paper with them, being of a quality much more fragile, as cane of any kind, any herb from marshes, straw of every quality, hemp, tow, and so forth, by paying much attention as I said above in No. 2.

*No. 9.* All the qualities of wood are good for this purpose, but I prefer fir or poplar, because its cost is less, the loss of weight if it is dry, before commencing operations, is about one-half and so all the other vegetable substances.

[Page 10.]

*Apparatus to make the gas.*

[*Drawing*.]

No. 1, Vessel of the most convenient shape made of a material not attackable by the acids.
No. 2, cover provided with some small holes and a valve to be opened to see when the wood or other material is saturated by the gas.
No. 3, wood or other substance.
No. 4, double bottom provided with many large holes.
No. 5, bottom of the apparatus.
No. 6, tube of crystal taking the gas from the retort where it is generated.

No. 7, stopper of the retort where are introduced the acids I. C. N.
No. 8, retort on brazier without fire.
No. 9, scrapings of soft iron with above them some pieces of Carbonate of lime and a small quantity of water.

*To put into operation*

Prepare from 5 to 10% of the weight of the material to be saturated with *aqua regia* composed of four parts in measure of nitric acid at 38 commerce and one part of muriatic acid, put into Retort No. 8 a quantity of filings of soft iron with above it a few pieces of carbonate of Lime and at the bottom a little water; thus prepared, begin by introducing the *aqua regia* by the stopper, No. 7, trying to put in a small quantity at a time; this immediately begins to form the gases of a dark yellow color; these pass immediately through the glass tube No. 6 into the vessel and through the holes in the double bottom No. 4, carrying the gases to the material which is inside the vessel No. 1. When you see the gas diminishing add some more *aqua regia*, and continue said operation until all the *aqua regia* has been put in

[page 11]

said retort, and then continues constantly for a long time (the retort gets very warm but there is no danger whatever); after a long time, if you see that no more gas is formed, it is possibly for the want of iron, and so a few more scrapings are added through the stopper or orifice through which the *aqua regia* has been introduced, or also you light the carbon under the retort and then the acids left in it are distilled and passed as vapors through the material.

The Carbonate of Lime (oyster shells being preferred by me, they being pure carbonate of Lime) not only forms carbonic acid, but it produces a strong reaction in the retort, and so compelling the gas to pass with great velocity into the vessel.

Cost of a ton of pulp, $22.00.

To obtain a ton of dry pulp are necessary to have 2 tons of dry material, which cost, —

Acids or *aqua regia* $
Caustic Soda $
Chloride of Lime $
Men, or working hands $
Tools, &c. $
Steam and coal $

[Page 12.]

*Straw of any quality*

Take the straw and wet it with water cold or warm, and then leave it for a few hours in a pile; when this has taken the moisture all equally it is passed through a machine where first it passes between two iron cylinders which break the hol-

low part of the stem and at the same time crushes the joints or knots; in this condition it is put in the vessel the same as the wood, and then it passes through all the other operations same as the wood, as in the first patent.

The thin cane of the marshes is treated like the straw as well as hay and any other grass growing near the sea and called salt grass.

[Page 13.]
*2nd patent No. 47,068,*
*March 28th, 1865*

This Patent is similar to the first, only that to the alkaline solution when it is boiled before putting it in the pulp from 1 to 5% of a vegetable-oil, not drying, or any other grease forming a very weak soap should be added, so that when the fibres are put in this lather, be they of wood or any other substance, when they are entirely disorganized they remain very flexible and elastic like those of cotton.

[Page 14.]
*Patent No. 46,607,*
*February 28th, 1865*

For a method of fabrication and manufacture of unwoven wicks for use in any lamp for vegetable or mineral oils, alcohol and so forth.

*Method to construct said wicks*

Take the pulp made by my method, as shown in the patent No. 44,735, keeping the fibres longer than those used to make the paper, be they of wood or any other substance; make a filter of one half the calculated thickness of the fuse or wick, this is obtained by taking the pulp, as it is done in manufacturing the paper by hand on a sieve above the vessel containing the pulp somewhat thick, so it remains on the sieve of the required thickness; when it has drained a moment it is turned out on to a piece of plaster of Paris formed like a table and dried, that is to say, any substance absorbing the water contained in the pulp; when you see that said pulp is dried, you take it from the plaster of Paris and you hang it on a rope in a warm room to dry. When it is dry there is passed, on one side of it, a coat of glue made of flour not very liquid mixed with a soluble silicate, or a carbonate of alum, or any other substance which renders the pulp incombustible, so that it would not carbonize much.

When this pulp is wet on one side with the above-described glue, it is doubled up and so the composition remains in its center, and then it is dried.

Once the pulp so doubled is dried, it is passed between two bevelled cutting rollers, marking the width of the wick like a ribbon, cutting it at the same time. If it is desired to make

round wicks, this pulp is put on a cylinder of the required thickness, and so it remains hollow inside.

If a round, solid wick is required, then the pulp is rolled round itself up to the desired thickness, soldering it with the above indicated glue.

Adding to this pulp some powdered charcoal or any metallic carbonate,

[page 15]

the flame obtains a great brilliancy, more than the gas, and puts in combustion all the oil that is brought to the wick, and does not make any smoke, and has the property of not blackening the chimney; these wicks are very economical and last a long time, not carbonizing much, and it is not necessary to cut the wick, it being sufficient to lower it and take off a little dust that forms at the end, (using a toothbrush for the purpose.)

The carbonate preferred by me is of alum mixed with the Carbonate of Zinc.

As well as the soluble glass or silicate of soda in the proportion of 1 lb. to 10 lbs. of paste or glue as thick as honey.

The plaster of Paris used to dry the pulp, or any other absorbing substance, makes the pulp spongy, giving it a great capillarity to absorb the liquid; otherwise, the pulp being prepared as for a paper-making machine, it would not absorb enough liquid to feed the flame and then the flame would not produce the same brilliancy.

[Page 16 is blank.]

[Page 17.]

*Method of the bath for wood or any quality of vegetable material .*

*Wood, Cane, reeds, or other woody substance.*

Prepare a number of wooden vessels in which it is possible to apply steam at the bottom by means of rubber tubes from the exterior, so that they will not be destroyed by the bath of acids; when all these vessels are put in a room where the temperature is not less than 80 degrees Farh. and they are filled with wood cut as thin as possible and dried, three or four of them are filled with a solution of water saturated with *aqua regia*; that is to say, hypochloro-nitric acid, in the proportion most suitable for the rapidity with which you want to make the operation, say from 5 to 25 lbs. *aqua regia* in 100 lbs. of ordinary water. This solution is introduced in the first vessel until it covers the wood and so with the others; the wood is kept under the bath by means of cross bars. As it was said before, from the bottom is introduced some steam until it reaches the boiling degree, keeping the vessels covered, and so will be done with the other vessels containing the

same above-described liquid. The steam is kept up and the heat maintained and so, after 48 hours a sample of the wood is taken to see if it is saturated; and if not, it is left for some other days until it is ready to be treated with the alkali.

When the wood is ready, all the liquid contained in the vessel is abstracted, letting it fall into a basin put in the floor of the room, where also must be a wooden pump. To this liquid will be added a quantity of acid

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solution, equal to the one that has been absorbed by the wood of the first vessel, which will not be more than the weight of the saturated wood.

By means of the pump this liquid is passed into one of the vessels containing wood without liquid, and so following every day, repeating all the operations above described of the steam and so forth, so that the acid liquid of *aqua regia* after the first time will always serve, and will not consume more than what can be absorbed by the wood in the vessel.

When the wood so saturated is well drained, it is put in a store-house piled up, as was said, for the one of the gas, and is treated with caustic alkalias [alkalies].

If the wood is well dried, and thin, in 48 hours of immersion in the acid at 10 per cent are sufficient.

The *aqua regia* of said bath is composed of two parts in measure of muriatic acid at 18, and one part in measure of nitric acid at 38, both of commerce.

*Flax or hemp*

In a wooden vessel of rectangular shape, provided with a double bottom, and at the exterior with rubber tubes, as was said above, is put a solution of water saturated with aqua regia, of 100 of water, 1 to 5 aqua regia (hypochloro-nitric acid). It is brought by means of steam to 150 degrees Fahrenheit, and you begin to introduce in it the flax or hemp as it is extracted from the ground, well dried. The whole quantity is introduced until the bath covers it, and when it is so done the heat is kept up, and all is left in the bath until it is well saturated in the interior, and this will be obtained in from 4 to 5 hours.

That done the liquid is drawn from the lower part of the vessel and the vessel is filled with fresh water in order to wash off the acid from the mixture, and then it is drained and a new bath is introduced with caustic alkali containing from 1 to 3 per cent. of any grease. It is made to boil about one hour, and when it is seen that the interior part is very tender, the boiling is stopped,

the mass is taken from the bath and washed with warm water

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until it is believed that it does not contain any more alkali, and then it is left to drain. The first bath of acid, as well as the one of alkali, can pass into another vessel placed below the first to be used for another quantity of flax or hemp, strengthening always, it is well understood, the quantity of liquid acid that was lost in the first solution or operation. The vessels will be placed in this way.

[*Drawing*.]

The last vessel, No. 3, passes the liquid to a depository No. 4, where there is a wooden pump, as we have said, and this carries back the liquid to the first tank, No. 1, when a new operation is commenced.

When the hemp or flax is well washed and drained, it is passed through two strong cylinders of rubber for one or two times, and then it is put in a bath a little warm, composed of 1,000 pounds of water and 5 about of sulphuric or muriatic acid, and when it has been in this bath half an hour, it is passed into another bath of weak soap, and then is passed anew through the two cylinders of rubber, and is dried in order to be passed to the ordinary usual machines. If a more violent operation is wanted before putting the flax or hemp in the bath of aqua regia, it is passed before between two cylinders of hard wood or iron, so that the interior stem is broken and the acid penetrates with greater facility.

*Note*. — The aqua regia for this material, or for all the vegetable substances, is formed of 3 parts muriatic acid at 18, 1 part nitric acid at 36, both of commerce.

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*Note*. — The alkaline bath of caustic soda: 100 pounds water, 2 pounds caustic soda, 1 to 2 vegetable oil; the whole thing made to boil, forming a soap.

The last bath, when the operation is finished, is of pure soap of oil; that is to say, soap called *Soptop* [mixed with oil], but the one of good soap for flax is preferred.

This operation is obtained in about 12 hours.

*Herbs from the marshes, or other qualities, to obtain long fibres for spinning or making ropes*

The herbs from the marshes, called in Italian *Sala* or *Erba spada* or *Borsa*, known for being used by coopers, is cut and left to stay one day or more in the air, and so it becomes a little drained.

Then it is passed through two iron cylinders that must be smooth and corrugated. This operation squeezes out a large part of its glue, and at the same time separates and divides the filaments, procuring that the leaves be not crossed with each other in order not to cut its fibres.

When so obtained, it is put in a large vessel of wood made the same as was said for the other operations of the hemp or flax — when this is full, pour in an alkaline solution composed of 1,000 parts of water and 1 of lime or any other alkali, seeing that the lime water be well clear. This remains in contact with this bath one night. The following day, steam is introduced by the side indicated, and it is made to boil for six to eight hours about, and more if it is thought necessary. This time passed, everything is taken from the bath that contains it, and is washed in water and is made to drain. When this is done, a new bath is prepared to cover the herb, composed as the one for the flax or hemp, and is made to boil in the same way and time as for flax, and is left

[here one leaf of book is missing]

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in contact with this bath for six to eight hours. This changes the color, and the solution takes all the mineral substances, and separates them from the fiber.

This time passed, the acid bath is drawn passing much water through it to wash, and it is left to drain. There is introduced a (new) alkaline solution (that covers it) strong, of one hundred pounds of water and five pounds of caustic soda and three to five in oil or grease, and it is made to boil in this soap-suds for eight or 10 hours; that is to say, until it is seen that it has become very homogeneous.

Drain the alkaline bath and pass between two cylinders of hard rubber, and put in warm water to wash off the soda, and passing anew between the two cylinders of rubber, repeating this operation until it is believed that it does not contain any more alkali.

It is put in a bath of water containing from one to two per cent. of sulphuric (muriatic) acid, and passing it from this bath to another of soap (warm) and repeating this operation for two times or more, and then it is passed anew through cylinders of rubber (it is shaken) and dried. The longer these herbs are made to boil in this alkaline solution the better they become and whiter, only they must never be touched by the cloruro [chloride, Editor's Note] of lime, because this attacks them and they lose their strength. Any other chlorate is

good, but they are of a high price *chlorate of potash*.

If you want to make wrapping paper from it like manilla, then the operation is very violent, and there is not much loss; and this method is used also for straw, hay, &c., when dry.

*Method*

The straw or other herb is wet, as usual, and is put in this bath through two cylinders, and is cut, and then is put in the vessel above mentioned, and there is introduced the acid solution, and is made to reach the degree of boiling. The steam

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is stopped and it is left in this bath until the next day; and after being washed it passes through all the other alkaline operations.

To the weight of the straw or grass is added 10 per cent. of old rope of manilla [or other] before being put in the acid bath and this is used only when one wants to make wrapping paper — and instead of treating it with the cloro it is treated with one to two per cent. of sulphuric [or muriatic] acid.

But when one wants to make white paper, instead of acid it is treated with the cloruro of lime, as was said in the first method of the gas, and the manilla is not added.

*Improvements in the working of the fibres for paper or for spinning*

The bath, is composed of saltpetre, sea salt, sulphuric acid of commerce, and common water, in the proportion more or less concentrated.

*First solution*

Sulphuric acid 6 pounds,
Common Saltpetre 3 pounds,
Common water 3 pounds;
mixed together they form acid S. Az.

When this mixture is made there is added a second.

*Second solution*

Common water 3 pounds,
Common or sea salt 12 pounds.

When the common salt is well dissolved the two solutions are mixed and the whole is stirred. This solution will mark 5 degrees Baumé, and is called Sulf-nitro-muriatico, that is to say, S. Az. Cl. This can be made more or less concentrated, increasing or diminishing the solution of sea salt, No. 2, or adding the double of solution No. 1.

But with these proportions it is adapted for hemp, flax, and all the herbs in general, to obtain a good result.

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*Grass of the marshes — Sedge— Sea weeds* (in English)

When this is dry it is passed through a machine invented by me, composed of a pair of rub-

ber cylinders, and through these two cylinders there is a comb composed of blades of steel cutting; the first cylinder forces the herb to pass the head in the comb that cuts it, following its vein, and compels it to pass back to the cutting blades, that when the other two cylinders take the herb and [draw] it pressing it so that it is split in large filaments to the point of the leaves, as shown by the figure here marked.

*Drawing.*

This obtained, these filaments are put in the solution above indicated of acid S. Az. Cl., and made to boil. Experience indicates the length of time that it must remain in this solution.

When it is taken from the acid solution, it is washed with much warm water, and then it is boiled in another alkaline solution for from four to eight hours.

It is washed again, squeezed by means of the rubber cylinder and treated with the acid sulphuric[161] [muriatic] and the soap-suds, and is put to dry.

If you want to color this grass with light colors, pass it, before drying it, in a bath of cloro very light, and then wash it in water and add the color. If any grass from the marshes must be used to make paper, then, after being treated with alkali, it is put in the mill and is washed. It is bleached and reduced to the length of the pulp, as is indicated in the previous operations of the other methods.

But remarking that it must remain longer in contact with the acid and also with the caustic soda, in order not to consume much cloruro [chloride] in bleaching; but if it must be used to make paper

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like the manilla, the same system as for the fiber for weaving.

*Wood and cane*

This is treated the same as the herbs from the marshes, only the acid solution must be more concentrated, that is to say, 12 pounds of sulphuric acid, 6 of nitrate of potash, and 6 of water, added to the 100 pounds of water and 12 of common salt. This acid solution is like the other previous, and will last indefinitely, only adding from time to time the quantity of acid lost in the material treated, that will be about the same weight as when it was put in the bath.

*Flax, hemp or other equivalent*

First the flax or hemp is passed through two cylinders or the well-known machine — then it is immersed in the cold acid solution for one hour or two; then it is washed with

[161]The word “sulphuric” crossed out in the original.

much water, and is immersed in an alkaline solution (caustic soda or potash with oil or grease) and brought almost to the degree of boiling, and is left in for eight or ten hours about, and then is washed with much water (with muriatic acid at the end and warm soap-and-water) and it is passed through the two rubber cylinders (washing it again with clear water), and it is dried — and after it is dried it is combed as usual (Cotton). If you want to force the operation, boil the flax or hemp in the two solutions; but I prefer the method by me indicated above (cold), not having any risk of losing the strength of the filaments; for the nature where hemp or flax has been planted or not cut in good moon.

For a ton of flax, hemp or tow the cost of the solution is as follows:—

| | |
|---|---|
| Pounds 2,240 of raw flax, | $25.00 |
| A man to pass it to the machine that breaks it | $2.50 |
| Steam used for the machine | $2.00 |
| Pounds 2,000 acid solution that can absorb the first bath | $5.00 |
| Pounds 2,000 alkaline solution mark 3 B°, that is to say, 100 pounds water, 3 pounds caustic soda at 4c. pound (one quarter per 100 caustic soda added to this solution produces a good effect on the flax), | 2.40 |
| | $36.90 |
| [Page 25] | |
| Previous sum | $36.90 |
| Animal or vegetable oil 1 per cent on 2,000 pounds alkali | 2.50 |
| Work of three men at 2.00$ | 3.00* |
| Steam and coal | 3.00 |
| | $45.40** |
| Received pounds raw flax, at $ | |
| Received pounds clean tow | |
| Received pounds tow and wood for the pulp. | |
| Received pounds white pulp for paper. | |

* "6" is written over "3" in pencil.
** Corrected in pencil to "$48.40."

*To prepare hemp or flax imitation of cotton*

Take the flax or hemp and treat it as was said above, only it must be boiled a long time in the alkaline solution, and also it must be put in the acid solution very warm, and then it is washed in many warm waters, in order that it may be well cleaned from the alkali, and at last pass it through the bath of sulphuric[162] acid, (muriatic and put in the warm suds) and then washed again (and put to dry.)

So obtained, it is put in a solution of cloro marking from 2 to 3 Baumé. This, when it becomes white, when you see that it is all equally white, is drained and put into a warm solution of soap and left in

[162]The word "sulphuric" crossed out in the original.

contact with this for some time, and then it is (washed) squeezed and dried.

When it is dry it is put into the carding machine and is reduced to the length needed for spinning. The jute from India is treated in the same way.

The acid preferred for this purpose as well as for the first operation is Oxidized muriatic acid.

[Page 26 is blank.]
[Page 27.]

**Schedule of the expenses to be made <u>in Africa</u> and given by me to Mr. Chindinico**

| | |
|---|---|
| One steam boiler of 100 horsepower, | $2,000 |
| One steam engine of 24 horse-power, | 1,000 |
| One steam pump, | 300 |
| 15 tanks of hard wood, with rubber tubes in the holes, furnished with double bottom,—of the capacity of a ton, —surrounded by iron hoops, and the thickness of wood from 2 to 3 inches | 1,500 |
| A wooden pump | 100 |
| 2 Machines with two iron cylinders like those for crushing sugar cane | 400 |
| 3 Machines to separate the filaments from the mid-rib of the date, at 300$ each | 900 |
| | $6,200 |
| Expense for chemicals for one ton of material, | $30. |

You can adopt the system of using large iron boilers to warm the water needed, and a greater number of vessels, so that the operation is longer, and with this you can save the two thousand dollars of the steam boiler; but I do not advise this, because with the steam everything is done more quickly, and you are sure of the good result, and two thousand dollars more or less does not make much advantage for a new speculation that can give you many millions of interest.

I have asked the last price of $5000 cash.

[Page 28 is blank.]
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*Improvements in the work of treating hemp, flax, &C*

Take the hemp as it is found in commerce, put it in a square tank of the capacity,

suppose, of 2,000 pounds —when the tank is full put its cross-bars above, for with these you prevent the hemp from rising when the liquid is introduced into the double bottom.

*First Operation*.

Prepare a sufficient solution of water containing 3 per cent. above the weight of the hemp of aqua regia, composed of 2 acid S° and 2 common salt; 1 of saltpetre or nitrate of soda — When all is well dissolved put said liquid, by means of a wooden pump, into the tank where the hemp is, covering it up to the top. This obtained, introduce a current of steam into the double bottom. When all the bath covering the hemp has reached the degree of ebullition about 210, the steam is stopped and everything is left resting for 6 to 12 hours.

When this time has passed, the liquid is drawn into the second tank, which is situated below the first, adding new liquid in the place of what has been lost in the first tank, in order to cover all the hemp in the second, as was done to the first. The steam is again introduced into the double bottom of the second tank, bringing it to the degree of ebullition, as in the operation of the first; and so on until the whole quantity of tanks have been prepared and filled with hemp.

But the best manner is to prepare and fill three large square tanks, or of other form, and put them one above the other, as is shown by the drawing here following, because it is more economical, and better results.

[*The Drawing*.]

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A. A. A. These are three boxes of the capacity of a ton of hemp, and of the most convenient shape, furnished with a double bottom, *b. b. b*. In the double bottom a tube *f f f* discharging the liquid from the first box or tank to the last, which then discharges into a pipe, from which is fed a pump, which re-conveys the liquid to the box No. 1.

When the three boxes are full of the acid solution, steam is introduced into it from the double bottom, and all is brought to the degree of ebullition. When this done the tube *f f f* is opened in every box, so that at the moment that the solution is drawn from one to the other the last is drawn into the pipe C, that brings it to the box D, where there is a wooden pump E, that re-conveys it into box No. 1, so that this movement is maintained for 5 or 6 hours. In this manner all the parts of the hemp are disorganized and

mixed with the acid solution (aqua regia).

This done, there is passed through the three boxes a quantity of water, which extracts a large part of acid from the hemp as well as from the boxes.

Afterwards it is treated with an alkaline caustic solution, either of with olive oil, soda or potash, using the same method as with the acid solution, only that the pump carrying the solution to the tank No. 1 must be of iron or metal, and this is discharged from pipe L into the box G. This operation does not last more than two or three hours, only the time sufficient to separate the acid from the hemp, and then it is washed in water many times, always discharging from one box into the other, and being well drained it is passed to the bath of cloro.

The bath of cloro is prepared in a large tank of bricks covered with cement in the interior, or of hard wood, furnished with a

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double bottom to introduce the steam when the time comes. The solution of cloro is composed of 200 pounds of water, 5 per cent. cloro, 1 per cent. caustic soda, or passing a current of cloro in a solution of caustic soda of one%.

The hemp is passed by hand, or by means of a machine in the cloro, in the solution of cloro apart, and when it is seen that it has taken a leaden gray color, it is put, well distended, into the large tank above the double bottom with all the solution of cloro the steam is introduced and it is heated almost to the degree of ebullition. In the course of some hours it becomes white; this obtained, all the liquid of cloro is drawn off by the double bottom, and it is washed with clear water, which is introduced through the double bottom, and this is repeated several times until it is all free from cloro, and it is made to dry under cover.

(Page 33)[163].

| | |
|---|---|
| Shop | $ 600 |
| One hydraulic press | 1000 |
| Two tanks for the oil, at $75 each | 150 |
| Two tanks for paraffine, at $45 | 90 |
| 4 Serpentine 400 pounds | 40 |
| Iron pipes and metallic faucets | 100 |
| 3 Pieces of wool for the press | 260 |
| 2 Pieces of cotton cloth for the oil | 24 |
| 1 for water and rubber tubes | 50 |
| Fixtures, carpenter and tools and scales | 200 |
| Box and press, and put in place | 1000 |
| Truck and horses | 500 |
| Extra things not calculated | 200 |
| 230 tin plates | 100 |
| | $ 4374 |

2000 pounds pª can be worked and the product be 1500 pounds. 1000 gallons oil, 25 Baumé, can be worked— loss 2 per cent, 960 gallons remain.

**Editor's note:—** The latter table - which is followed by notes on the telephone, dating 17 August 1870 - seems to refer to a new plant for another type of production (perhaps of paraffin candles).

[163]All this page is written in pencil