THE PATENT SYSTEM IN SPAIN IN THE 19TH CENTURY: THE MARITIME SECTOR

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If there is one thing that distinguishes the human being from all other animals it is his capacity to transform the environment that surrounds him. In practice, this process is called invention or, in other words, the ability to derive benefit from the alteration of natural resources. The capacity to invent, to innovate or "make do", has led, from the beginning of history, to processes of innovation and technological change of which today's advances are only a small part.

THE HISTORY OF PATENT SYSTEMS

After the second half of the 18th century, these processes have reached revolutionary levels of innovation and have radically transformed mankind's environment. As a result of the Industrial Revolution, for example, man has been able to move from a rural world of primitive economic structures to another based on machines and capitalism which has evolved, at an ever increasing pace, right up until today.

In modern times, a basic mechanism to stimulate invention appeared in Europe: the exclusive right to use invented technology in manufacturing (it did not imply exclusive ownership), which often took the form of a temporary monopoly. These are the *privileges of invention.* The oldest privileges that we know of were awarded by the Republic of Florence in the year 1421, and the first law known to regulate privileges of invention was decreed in Venice in 1474 (1).

These privileges often served as *patents of invention* (in the sense that we think of them today) and it's true that they are basically similar –in, for example, the temporary protection they provide the inventor and in the requirement of novelty for new inventions. Of course, as the two documents illustrate two fundamentally different mentalities, they present obvious differences. In the Old Regime, a society composed of estates and based on privilege, the monarchy (absolutist and, therefore, arbitrary) is the institution with the power to award or not what is considered a "favor" and, in the process, becomes a guarantor of the particular invention. In the capitalist system, based on private property and free competition according to the laws of supply and demand, the patent becomes a recognition of a legal right, and the market takes the place of the State as the validator of an invention.

England is the country which first prepared adequate legislation and defined property rights to stimulate economic development. Since 1624, with the *Statute of Monopolies,* the royal privilege over inventions has been distinguished from the rest of the given privileges, forming, in practice, a primitive system of capitalist-style patents which, even today, serves the same function. Such a development did not take place in France until 1762 and, in the rest of the countries of Europe, until much later. But, it always occurred in relation to the economic model of the Old Regime. Look, for example, at the case of Spain, in which we also need to consider the liberalization of the concessions of privileges in the context of enlightened reformation (the reign of Carlos III), not to mention the liberal legislation of both 1811 (Francophile) and 1820 (Liberal Triennium), which, slightly changed, makes up the Royal Decree which from 1826 to 1878 serves as the Spanish patent system (2).

From a purely economic point of view, the objective of privileges and patents is the same: to stimulate invention in order to, in turn, stimulate the economic development of the country. The problem lies, as becomes clear, in devising a system beneficial to all parties. On the one hand, there must be sufficient stimulus for the would-be inventor to invest time and money in an invention. Success must allow

him to earn profits or royalties for his labors, thus making the invention process worthwhile. On the other hand, there must be certain safeguards not only to insure that the inventor's privilege do not last forever but also to insure that society as a whole is not harmed but, in fact, helped by the invention. Essentially, what we have here is the debate over the advisability of an absolute monopoly on the part of the inventor or, on the other hand, the immediate socialization of the results of the invention (3).

In recent decades, Anglo-Saxon economic theory has placed more and more weight on a so-called correct definition of property rights for the development of economic activity since, according to theory, failure to do so would lead to the inhibition of innovation. To the question, "Should I spend energy, time and money in an activity from which I am never going to be able derive profit?" only the most altruistic would give an affirmative answer. As we know from the writings of A. Smith, it is not the feeling of generosity but just the opposite –egoism, i.e. the pursuit of one's own interests– which acts as the stimulus for growth in a capitalist system (4).

The patent system –that is the system of exclusive temporal monopolies– seems to be the best way of establishing property rights over inventions in the capitalist system. This affirmation is based on the idea that the establishment of a patent system is the strategy that brings the fewest costs in the effort to socialize the benefits of the invention (5). In comparison, other possibilities, such as the establishment of total monopoly over the invention, lead to the absence of institutional protection or communal property. Of course, not surprisingly, this opinion is not shared by all those who study patent systems, and serious debates over the worth of the patent mechanism, starting in the 19th century, have lasted until the beginning of our century (6).

The arguments of those who defend patent systems (and, therefore, preach, for example, the natural ownership of ideas, the right to payment for the services of the inventor, the need to guarantee the disclosure of secrets without denying profit to the inventor or preventing the patent from acting as a stimulus to invention) have been frequently criticized. An example is the following critique:

> *"To say that industrial progress depends on patent law is like saying that making music or writing poetry are ways of earning money."* (7)

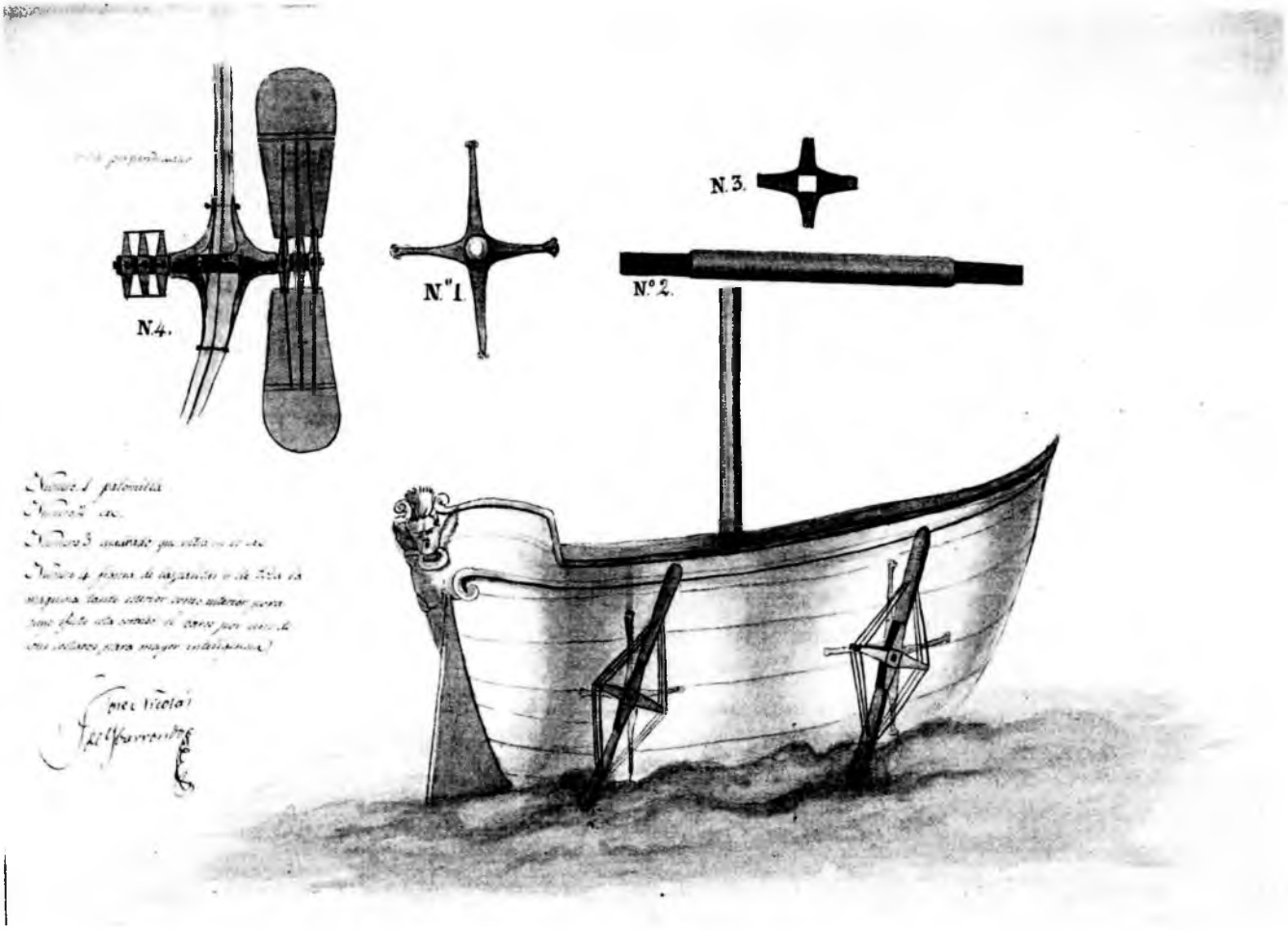
In general, critics of patent systems claim that the market by itself, and without the need for additional protective legislation, can sufficiently reward the inventor while, at the same time, providing the necessary incentives to promote research. Nevertheless, patents have never been abandoned as a legal formula of ownership to govern the invention process in capitalist societies (although it is true that in Switzerland two referendums to institute patent laws were defeated in 1866 and 1882, thereby postponing adequate legislation until 1887).

In conclusion, patents have become an enormously important source of information for the study of economic or technical history of modern society –despite the fact that patent systems do not provide a clear gauge of an activity which is often carried out on the margin of the patent system. Furthermore, the patent is not the only type of technological innovation found in society. Technological innovation can also be achieved by, for example, the transfer of technology from country to country, the movement of scientists and technicians from place to place, industrial espionage, and education and training abroad.

THE SPANISH PATENT SYSTEM

As already mentioned, England was the first country to regulate in a modern fashion the protection of the inventor with the *Statute of Monopolies* of 1624, which remained in force until 1852, the date on which Parliament dictated a new law, in the framework of a profound reform of economic legislation. The reform had the effect of increasing the number of registered inventions due to, among other things, the lowering of inscription costs. Revolutionary France passed its patent law in 1791, establishing and regulating the sacred right of citizens to the ownership of their ideas. Other continental European countries followed the French lead and drafted patent laws in the early decades of the 19th century: Austria, 1810; Russia, 1812; Prussia, 1815; Belgium and Holland, 1817; Bavaria, 1825; Sweden, 1834; Portugal, 1837...

Spain is no exception and also began, at an early date, to organize a modern patent system which would channel the results of invention in a direction that would benefit society in general. The establishment of the capitalist rights to ownership of invention occurred with the wave of liberal ideas which tried to abolish the system of the Old Regime.



Mechanic apparatus used to propel boats with or without wind. José Nicolás de Ibarrondo. Number 40 of the Inventary of Privileges.

As in the rest of Europe, during the modern age, the Spanish monarchy also used favor of privilege as a reward for services provided to the Crown, with the Royal Privilege Document serving as the formal model. These Royal Documents were also awarded to inventors –always as a royal privilege and not as a right of ownership over the idea and without distinction from the rest of the privileges. Still, the inventor received protection from imitators and from exploitation of his invention (such a benefit translates into an economic or social benefit). The first Royal Document known to be awarded for this type of service is dated August 18, 1522, during the reign of Carlos I. The "privileged" receiver of the award was Guillén Cabier, a native of Catalonia and author of an invention by which a ship could sail without wind –an important development for the Spanish Armada.

"I have been informed that you, Guillén Cabier, native of Catalonia, have developed a certain instrument to allow our ships to move without wind, and you have requested that I give you the privilege so that you or whoever is authorized by you, and none other, can, during you entire life, do with that instrument as you will. I promise and assure you that one year starting from the date of my document, if you perfect the said instrument, I will grant this privilege to you for the rest of your life so that you, or whoever acts with your authorization, and no other person, can do in our kingdom and dominions what you like with the said instrument. And so that you are sure of this privilege, I have ordered the concession of this document, signed in my name. Dated Palencia, August 18, 1522. I, the King, countersigned by the Secretary, Cobos, and sealed by the Chancellor, don García e Capata e Carvajal"(8).

While no studies on the privileges of invention during the Modern Age (other than those of Nicolás García Tapia) exist, it may be supposed that although they were granted throughout the period of the Old Regime, they were few in number. The mentioned author details some of those found in the Simancas Archive, some of which refer to marine inventions (we must not forget that Spain was still a naval power in the 16th century), such as the first example, mentioned earlier, or that awarded to Alvaro de Bazán for his fine-lined Tilted Galleon signed in Valladolid on January 25, 1550 (9). We have been able to determine that from the end of the 18th century, as a result of the arrival of Carlos III to Spain, the number of invention privileges and other concessions of favors to stimulate industry began to increase as a result, no doubt, of the technological advances achieved in neighboring countries and the interest of certain rulers in turning new scientific discoveries into practical applications.

Nevertheless, as has already been said, there were no general regulations of invention privileges until 1811. During the War of Independence (1808-1814) two opposing political systems co-existed in Spain: one, on the invader's side, represented by José Bonaparte and his Francophile government; and the other on the side of the resistance, represented by the Central Junta and the Regencies and, more importantly, by the Cádiz Parliament. This last political institution produced the first liberal revolution in Spain and composed the Constitution of 1812, whose article 335 says:

> *"All of the regional parliaments will be encharged with... Fifth: promote the education of youth according to the approved plans, foster agriculture, industry and commerce while protecting the right of inventors over new discoveries in all these areas."*

In other words, while protection for the inventor was considered by the provincial parliaments, because they were preoccupied with the enormous tasks of winning a war and carrying out a revolution, no law ever was formulated on this subject. However, the subject was addressed by the Francophile authorities, and the 25 articles of the Royal Decree of November 16, 1811 (11) established for the first time a modern patent system in our country based on the sacred right of ownership over ideas.

The return of Fernando VII in 1814 brought the restoration of absolutism and the abolition of both the Cádiz and francophile legislation. The Triennial had recovered the Cádiz legislation and in the decree of October 2, 1820 (12) provided the authority to create some ten *certificates of invention* during the Triennial. The term "certificate" replaced "patents," introduced by the francophile legislation, as well as "privileges," a term with absolutist connotations. It had, nonetheless, the same intention as the patents of 1811.

The absolutist reaction of 1823, led by Fernando VII, annulled the previous liberal legislation, although the certificates awarded under the Decree of 1820 continued to be valid in the midst of the legal confusion of the period. Finally, in 1826, Fernando VII enacted the Royal Decree of March 27, 1826 (13) which regulated the concession of "privileges" of invention and introduction. Despite this denomination, it was a modern patent law, giving the inventor a temporary claim to exclusive rights over the results of his intellectual labors:

> *"... as a natural mechanism for promoting industry and the arts, providing them with the production and improvement of machines, instruments, devices, apparatus, scientific and mechanical processes and methods; and as these agents of production are not able to wait without assuring those who work to create, introduce and improve them the ownership and enjoyment of the works of their intelligence and their application, legal stipulations will provide equality of protection owed to private interest and the benefit of industry and protect it from all usurpation..."*

This law was passed during the absolutist regime, a time in which policy makers followed a general plan of adopting the best possible modernizing practices without affecting the socio-political organization of the Old Regime. For this reason, it was also possible at this time to develop, for example, a *Code of Commerce* (1829) and a Royal Decree on the stockmarket (1831) and disentailment, dissolution, tax reform or, of course, a representative system and a *Constitution* were impossible.

Since March 28, 1826 until the present date, the inventor has not been left unprotected in our country. During the first years of the Restoration, another law was enacted, that of July 30, 1878, but this one, as well as the two of the first third of the 20th century (laws of May 16, 1902 and July 26, 1929), were successive improvements

and adaptations to the evolution and complexity of the economic system as well as to its internationalization. At the same time, laws of new chapters of industrial property such as trademarks –1850–, *commercial names, models of utility*, etc. were introduced.

The continuity of the law, from 1811 to 1929, can be seen in Tables I and II, which show us that, in contrast to the situation during the Old Regime, patents (a term which from this point on would be used to refer to the liberal definition of the concept, most often referring to certificate or privilege) were awarded without a previous test of novelty and without guarantees from the government; also, as we can see, patents were awarded without limitation, and the differences, as mentioned before, followed the evolution of the capitalist economic system. Among the differences, the most important were those that referred to the object and types of patents allowed. Regarding the first, in 1820, 1826 and 1929 a final product could not be patented whereas it could be done in 1878 and 1902; regarding the types (*invention, introduction, improvement, etc.*), there was a slow reduction in number until the limit was reached in 1878, a year in which only "patents of invention" were allowed (although these included, in reality, those of *introduction*), and a slow increase after 1902 (14).

So many years of existence of a patent system has given rise to extensive and rich technical and administrative documentation, stored in different archives, for dates previous to the Royal Decree of March 27, 1826. After this moment, the registers of applications have been kept in the Royal Conservatory of Arts and Crafts of Madrid. The organism which inherited these duties, the Spanish Office of Patents and Trademarks, keeps in its basement documentation containing very few errors, which can be

TABLE I

SPANISH PATENT LEGISLATION

	Concession	Object	Subject	Type	Duration
1811	Without previous exam. Without guarantee	No final product	Any	Invention Introduction Improvement Secret	5, 10 or 15 years indistinctly
1820	Same as 1811	No final product	Any	Invention Introduction Improvement Secret Temporary ownership	10 years 5 years 7 years 6 months
1826	Same as 1811	No final product	Any	Invention Introduction	5, 10 or 15 years 5 years
1878	Same as 1811	No natural product No scientific discovery Final product	Any	Invention	20 years if is own invention If not, 5 years
1902	Same as 1811	Same as 1878	Any	Invention Introduction Secret Temporary ownership	20 years 5 years 6 months
1929	Same as 1811	No final product	Any	Invention Introduction Secret Temporary ownership Patent implementation	20 years 10 years 1 year 10 years

TABLE II

SPANISH PATENT LEGISLATION

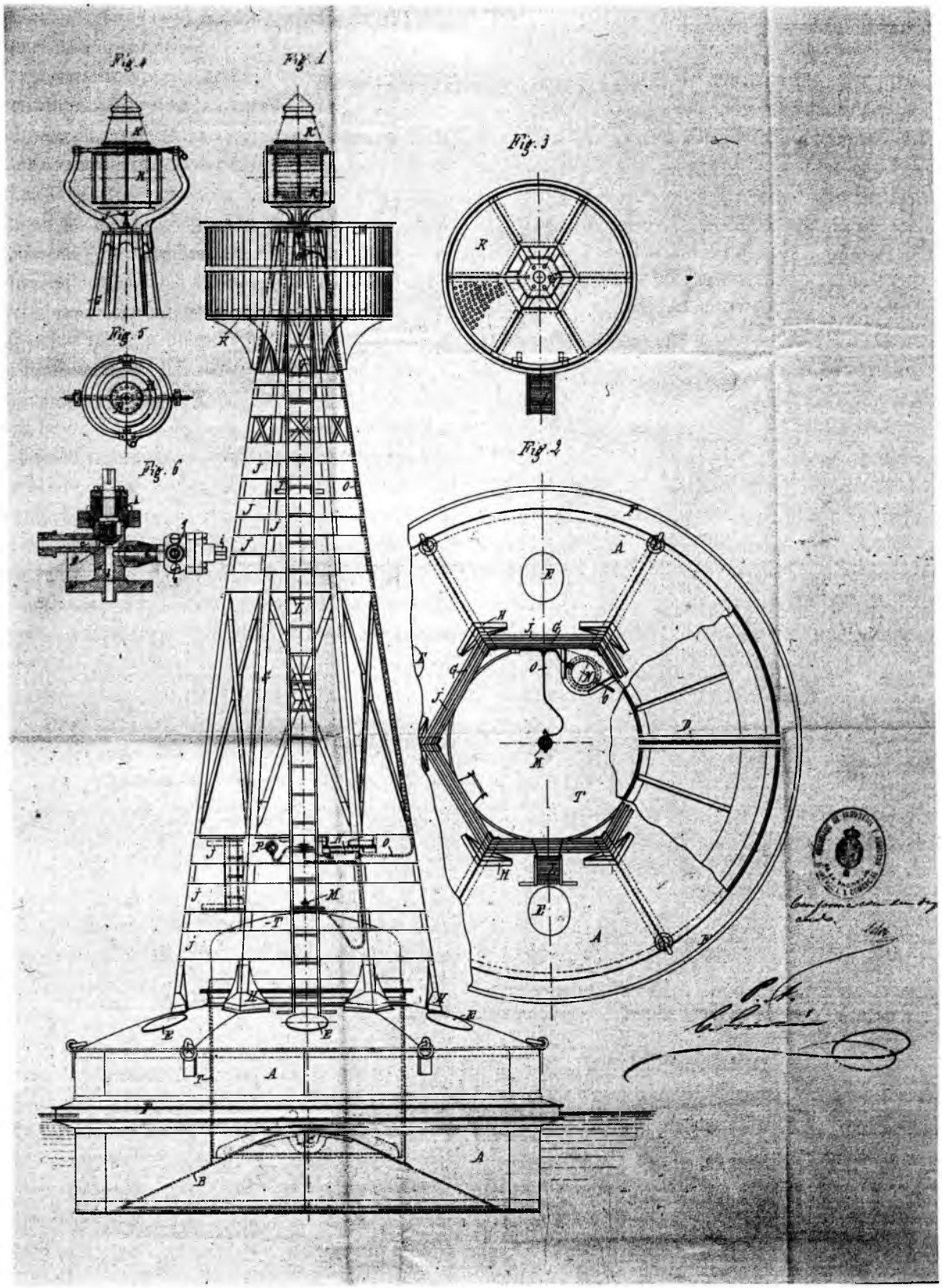
	Type	Fees	Additions	Transfers	Obligatory transfer
1811	Invention Introduction Improvement Secret	Unknown	The Inventor does not have preference	Without restrictions	In 2 years
1820	Invention Introduction Improvement Secret Temporary privilege	2,000 reales 1,000 reales 1,400 reales Free	Same as 1811	Same as 1811	In 2 years
1826	Invention Introduction	From 1-6,000 reales 3,000 reales	Same as 1811	Same as 1811	In one year
1878	Invention	Progressive Annual Fees	Preference for the inventor	Same as 1811	In 2 years
1902	Invention Introduction Secret Temporary privilege	Progressive Annual Fees Temporary privilege was free	Same as 1878	Same as 1811	In 3 years
1929	Invention Introduction Secret Temporary privilege Exploitation patent	Progressive annual fees Temporary privilege was free	Same as 1878	Same as 1811	In 3 years

explained by its technical character and the fact that it is extremely important to an economic system based on private ownership and a free market –a market that never has been questioned by the different groups which have been in power during the 19th and 20th centuries (15).

The benefits which this archive can offer are interesting not only for the economic historian, but also for the engineer, anthropologist and the technical historian. The information offered by invention patents is helpful for the research and understanding of some of the processes of innovation and technological change in our industrial history. At the same time, they also reveal additional information about the companies and inventors of the period. Through the descriptive *Reports* of the inventions on display, one can study techniques no longer in use and even gather the industrial patrimony through the preserved drafts and designs. An example is a Belgian locomotive engine patented in 1861 in Santander, of which 8 units operated along the Santander-Alar del Rey line and which we did not know existed until the patent was discovered (16). With the help of this type of documentation, as has been achieved in the case of the National Conservatory of Arts and Crafts in Paris (National Museum of Technology), it is possible to reconstruct a multitude of instruments and machines of which we have no information other than the draft of the patent.

THE PRIVILEGES AND PATENTS OF THE MARITIME SECTOR IN THE 19TH CENTURY

Between 1759, the first year of the reign of Carlos III, and March, 1826, there was no systematic registration of privileges, and a very small number have been found



Floating beacon. International Society of Oil Lanterns.
Number 515 of the Patent Inventary.

through searches in a number of different archives. This scarcity is the result of the scarce invention activity during this period of time although we must not forget that the inventor during the Old Regime often looked for rewards other than the monopoly over his device. The inventor tried to achieve other "privileges" such as, for example, positions in public administration, payment in currency or the means of support to practice his trade and develop his talent. On some occasions the state offered support to develop a technical solution for a specific need.

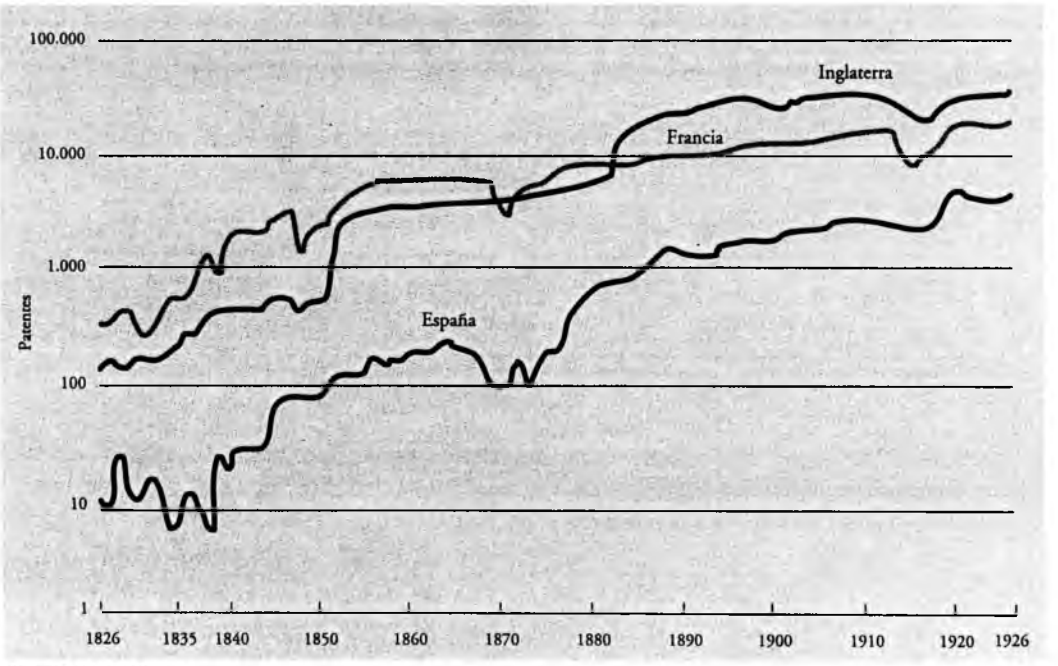
After 1826, the number of invention privileges began to increase although they always remained at a lower level than in countries such as France or England (graph 1).

Regarding Spain, the law of July 30, 1878 was a landmark after which the number of patents requested increased 6-fold.

The *Inventories* have collected the 130 privileges and 640 patents which existed in the maritime sector in the 19th century, that is, a total of 770 entries which have been classified, in a preliminary analysis, according to the criteria of the OMPI (International Organization of Intellectual Property, Geneva, 1988). In a second analysis, they have been organized, for better understanding, according to two large, general categories –ships and ports– which include the majority of the entries.

It has been considered advisable to distinguish between privileges and patents because of the change in the legal regulations, which occurred in 1878 and outlined the differences in the two documents. After 1878, a patents register was instituted and serves today as the basis of this study. Previous to this date, by using the data base compiled by P. Sáiz, the entire file for each application has been elaborated. Regarding privileges, additional data, concerning the profession of the applicants, has become available and is explained in the observations about the author. Regarding the differences arising from each regulation, the Royal Decree of 1826 allowed both the presentation of applications for *privileges of invention* and the *introduction* of foreign inventions. In the latter case, the entry includes the country of origin of the invention. Nonetheless, the patents all have been registered as inventions, only differing according to the number of years of validity: twenty years in the case of an original invention, and five when the invention in question either

FIGURE 1
EVOLUTION OF PATENT FIGURES
SPAIN-FRANCE-ENGLAND (1826-1926)



Source: P. Sáiz, 1992.

is not the applicant's or it is the introduction of an invention, without providing the name of the country of origin. Another difference is the form of payment. When the Royal Documents were awarded and the total amount of the annuity was paid, the first part of the inventory does not include information about the paid annuities. With the patents, nonetheless, the payment is made in yearly installments, so that yearly records are important. They also include more detailed information about the implementation and the motives of expiration: the privileges of expiration show whether or not the invention has been implemented or not. When the expiration is the result of the ending of the period of privilege, we may suppose that the practice has been accredited since, the law of 1826 required the taking of this step within the period of one year. The other two reasons for expiration are the failure to pay the rights or the failure to accredit the practice; in neither case does the privilege become *an innovation.* In the case of patents, the payment in installments requires the distinction between the implementation (obligatory three years after the concession) from the motive of expiration, since although the patent is implemented, it can expire because of a failure to pay the rights the year after being accredited.

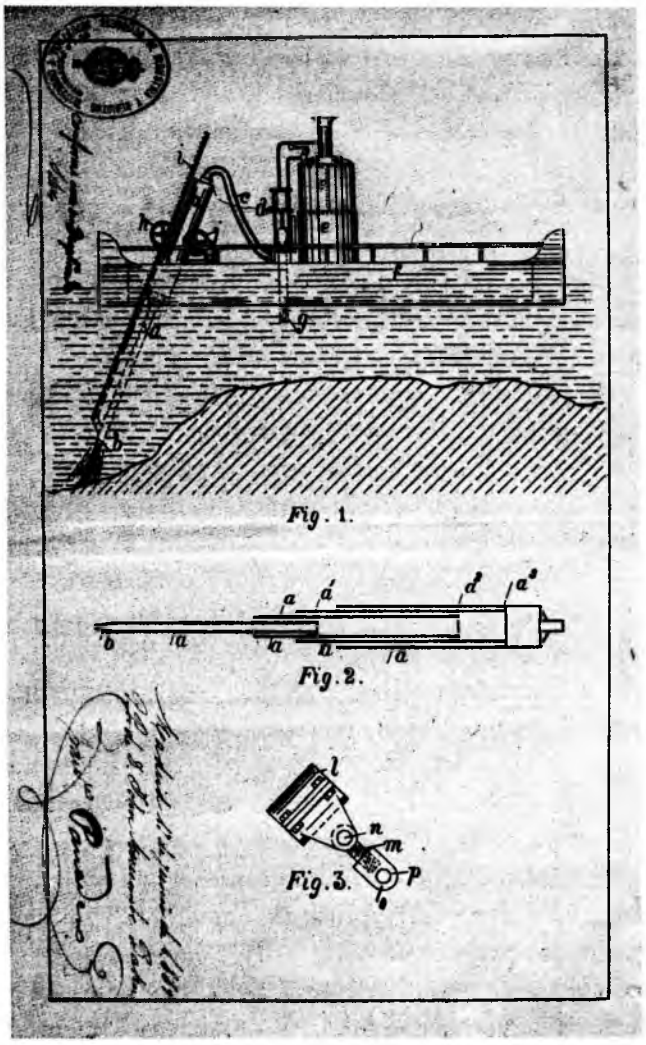
A final distinguishing element between the entries of privileges from those of patents is range of application. In 1826, separate privileges were awarded for inventions from the peninsula and those from Cuba, Puerto Rico and the Philippines. This distinction disappeared in 1878.

The data selected includes the applicant's name and residence, description of patent title (a short note on the content of the invention) the dates of application and concession, the accreditation of practice in those cases that it exists, the reasons for the expiration of the patent, and any transfers of patents.

In most countries, many patent requests are refused. The same occurs in Spain, especially in the concession of privileges. Between the date of application and the date of concession there is a waiting period which varies from 2 to 12 months, depending on the technical and administrative problems which arise. A final consideration is the increase in importance of the figure of the industrial agent who handles the supervision of applications and related procedures (see, for example, privilege no. 2 for C.A. Saavedra to offer services to the foreign investor founded in 1845 with offices in Madrid and Paris).

The site of the patent award is not given (Madrid, Barcelona, Seville, Bilbao and Paris) because a high percentage of the total is absorbed by Madrid (75%), even for Catalan and foreign investors. The reason is to try to save time and formalities; although the applications could be made to any regional government, these had to send all documentation to Madrid.

To perform these inventories through restrictive selection, all applications whose title referred to general processes applicable to any sector have been excluded. For example, a *Pump to extract water* was excluded while another which refers to a pump to extract water from ships (no. 58 of the patent inventory) was included.



Improved apparatus for the separation of sand, mud and similar materials from the bottom of rivers or tide channels to deepen them. John Morecombe Baker. Number 544 of the Patents Inventary.

For the period previous to 1826, only three privileges making reference to this sector have been found (nos. 37, 87 and 123 of the Privilege Inventory). From 1826 to 1878, 127 licenses were requested which account for approximately 2.5% of the 5,133 total applications. Between 1878 and 1900, there was a total of 640 invention patents in the sector, which of the approximately 27,000 total, continues to be a similar percentage to the previous period (2.4%) which shows, at first sight, that we are not dealing with a sector which used the patent as a system of innovation (17).

As has already been mentioned, the inventories have been ordered under two main chapter headings, *ships* (privileges, numbers 1 to 90 and *patents*, numbers 1 to 492) and *ports* (privileges, numbers 96 to 122 and patents, numbers 493 to 590), which bring together most of the registers and which should conserve a certain balance, since these two sectors are, technologically speaking, closely related: the increase in size of the ships with the introduction of the steamship (1865-1885) demanded larger and deeper docks, more efficient means of loading and unloading, better-equipped store-houses, etc. On the other hand, in a third section called *various*, those inventions which are only indirectly related to the above have been included, such as the use of sail-generated energy as a motive force (privileges, numbers 123-130 and patents, numbers 591-640).

The classification has been difficult. Not only is it a long period but, during this time, the sector underwent a profound transformation because of the technological change from sails to steam as the form of propulsion. As a result, the patents began to diversify and, even, the vocabulary (scientific, technical and economic) radically changed.

An additional difficulty comes from the financial benefit the inventor aimed to derive from the patent system. When labelling their creations, the inventors gave them the most general name possible in order to protect themselves for the largest possible number of competitors and used ambiguous language in his description in order to protect his secret.

The evolution of the patents of the maritime sector is shown in Table 2.

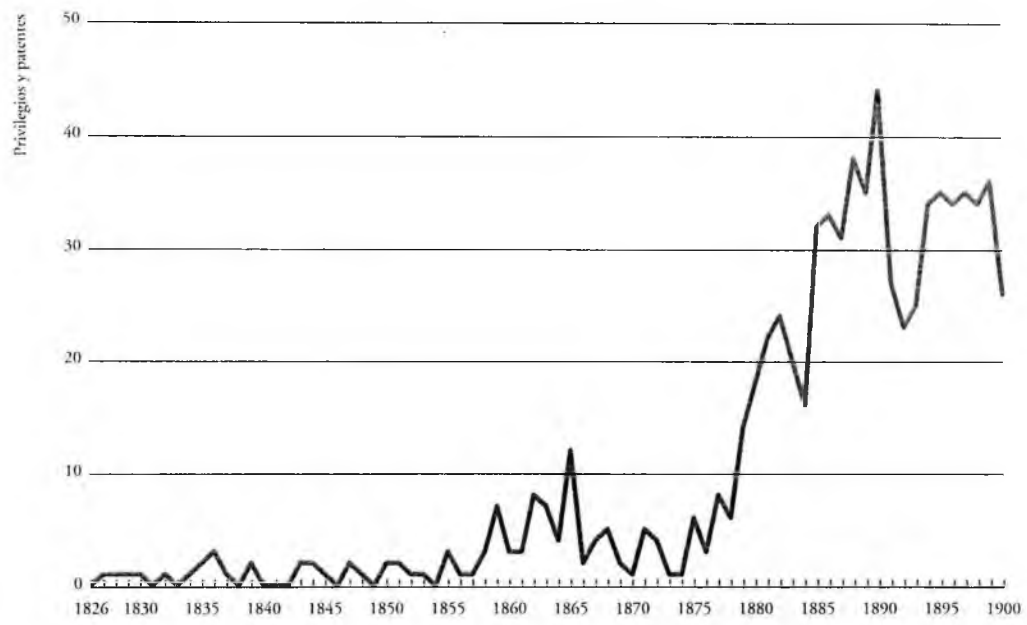
Between 1826 and 1878, the annual average is of little more than 2 applications and there are even ten years where none are registered. After 1878, on the other hand, a considerable increase occurs which raised the annual average to 28 patents, a figure which represents a ten-fold increase over the previous period. This quantitative jump is important because it began from low levels, although it is insignificant in comparison to the figures of patents in countries like England or France, the leaders of technological innovation during the 19th century.

The possible reasons for this change can be found, first of all, in the evolution of the maritime sector. The merchant and military fleets which experienced minimal technological development in the first half of the 19th century, during the second half, and especially after 1870, began to modernize and evolve rapidly towards steam-driven mechanisms. Nevertheless, the transformation led to the purchase of foreign ships, not in the development of a national naval industry. The complementary sector is that of ports which had to modernize in order to adapt to the new ships. Nevertheless, Spanish ports underwent few changes from the 18th century to the last decade of the 19th century (18), an assertion supported by the fact that the number of patents under the generic title, "ports" was only 125. In fact, the quantitative jump in 1878 occurred as a result of a series of secondary factors concerning ships –really, innovations which either had little technical importance or already had been tested abroad.

In terms of institutional factors (i.e. new laws and socio-political situation), we can also find explanations for the mentioned phenomenon. While the Law of 1878, for example, maintained the same spirit of the previous regulation in its most important aspects, it also lowered considerably the cost of patents. Under the Royal Decree of 1826, one payment was made before the signing of the Royal Document of concession of a maximum quantity of 6,000 *reales de vellón*. After 1878, the awardee paid annual quantities which progressively increased from 10 to 200 pesetas in the 20th year. This allows the awardee to stop paying and, therefore, to save money if his invention is not successful, thereby reducing risk and providing greater liberty to the inventors.

Meanwhile, the political stability brought by the Restoration, in combination with the transformation of the national economic structures in existence since 1850, acted as a stimulus for not only the domestic inventor but, also, the foreign inventor. The foreign inventor, especially, found in Spain favorable conditions to convert his invention into innovations and, as a result, to carry out his business (19). It is important to note here that Spain was among the signees of the first *International Convention on Patents* in 1884.

FIGURE 2
MARITIME SECTOR PATENTS
SPAIN (1826-1900)



Source: Own production from Inventory Figures.

From another viewpoint, the change in the number of applications which occurred in 1878 does not imply an increase in their implementation since the percentage of patents that actually were put into use is about 21% of the privileges and 23.5% of the patents. We should point out that even though these figures seem low, in the 1980s the percentage of patented inventions which were put in use was not greater than 5%.

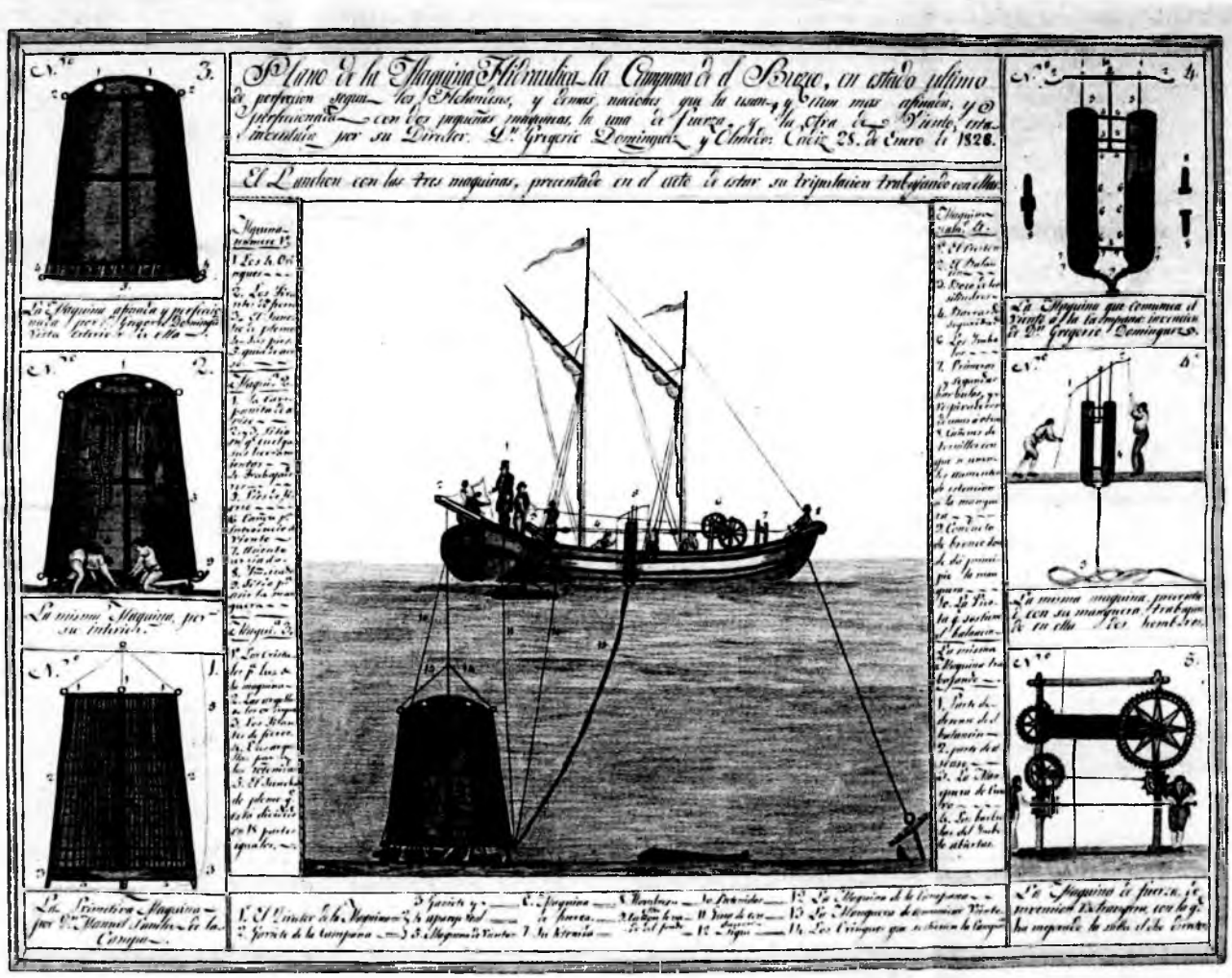
It is also interesting that, in the first period, the proportions of Spanish and foreign inventors were practically equal, half and half, while during the second half the percentage of foreigners increased to 75%. This could be explained by the lower cost of patenting in our country as well as the political-economic situation already described. On the other hand, while until 1878 Spanish inventors obtained a higher rate of success, putting into practice 30% of the times as opposed to 10% of foreign applications, during the second half of the century the tendency is inverted: 15% of the Spanish inventions were put into practice as opposed to 27% of the foreign inventions.

Because of the low number of applications made before 1878, only after this point can some additional analysis be made. Regarding the privileges, it only remains to say that the number of patents presented by companies is only 11, of which 9 are Spanish and 2 are foreign. Of these, only the Spanish companies implement 5 of the patents.

Table III shows the aspects of the maritime sector that produced the greatest number of innovations channeled through the patent system: Ships. The 492 applications registered for ships between 1878 and 1900 represent 76.9% of the total.

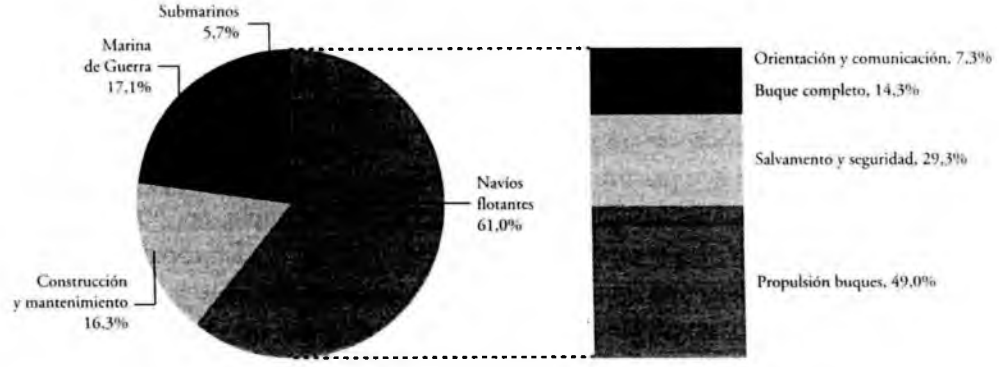
This fact serves to confirm and, in a certain sense, strengthen the above assertion of the low number of transformations and investments received by ports until the end of the century. In addition, the number of implementations in the segment is 10, all of which are in categories which would tend to confirm this assertion (for example, in the categories of buoys, reflecting bodies, etc.). See, for example, no. 500 of the patent inventory, applied for and implemented in Catalonia, for a *New Apparatus called Underwater Light.*

In focusing the analysis on the segment Ships, we can see that the group which received the largest number of ships is that of "floating ships", which with a total of 300,



Diving helmet. Gregorio Domínguez de Olmedo.
Number 88 of the Privilege Inventary.

FIGURE 3
DISTRIBUTION OF PATENTS FOR SHIPS
SPAIN (1878-1900)



Source: Own production from Table III data.

TABLE III. DISTRIBUTION OF PRIVILEGES AND PATENTS IN THE MARITIME SECTOR

		Privileges		Patents		Total	
		Applications	P.P.	Applications	P.P.	Applications	P.P.
1 SHIPS	1.1. Construction and maintenance	21	5	80	22	101	27
	1.2. Floating ships	64	12	300	61	364	73
	1.3. Submarines	8	3	28	4	36	7
	1.4. War ships	2	-	84	33	86	33
	Total	**95**	**20**	**492**	**120**	**587**	**140**
2 PORTS	2.1. Construction	4	-	36	10	40	10
	2.2. Maintenance	23	6	62	13	85	19
	Total	**27**	**6**	**98**	**23**	**125**	**29**
3 VARIOUS		8	1	50	5	58	6
TOTAL		**130**	**27**	**640**	**148**	**770**	**175**

represents 61% of the applications with a 20% rate of implementation.

Patents are often used to renovate elements of less technical complexity. Of the 300 applications, 49% are related to the propulsion of the boats, 29% to rescue and safety, 14% to the ship in general (for example, no. 94 of the patent inventory is for *A boat called a gabarra),* and 7% to guidance and communication systems. If we had to summarize the technological innovations featured in the patents system for floating vessels during the last 25 years of the 19th century, we might say that they were mostly improvements in propellers and life-saving equipment (life-boats, etc), with little progress made in relation to the ship as a whole or in the complicated communication and navigation systems. In general, the majority of the applications are made by foreign inventors, who also are responsible for the majority of those patents which are implemented.

The second most important segment in the group, Ships, is that of construction and maintenance, which has 80 applications, 22 of which were implemented. What should have been the most important element of naval construction –that is, everything related to dikes– only had three implementations in 22 years, a fact which reinforces even more the idea of scarcity of naval construction in Spain during this period. This data is in accordance with the process of importation of ships, the inventions centering around the necessary elements for their maintenance. As illustrated, the patents are related to paints, cleaning systems, berths, beds, doors, etc. In summary, the inventions are more related to the craft than the industrial processes of ship-building.

We have left for last the group called War Ships, which became, with 33 implementations (39%), the segment of most effective inventions in the entire maritime industry. The reason for this situation lies in the political situation of the time in the Antillean Colonies as is shown by the fact that during the time around 1898, the curve reaches its highest point before dropping again in the following years. This sector must have been of special interest to the government since the majority of the patents refer to torpedoes (which became the preferred weapon against the new iron-hulled ships.) As in previous cases, foreign inventors are the most numerous.

NOTES

(1) GARCÍA TAPIA, N. (1990): pg. 8

(2) For England, MACLEOD, Ch. (1988); for France, Perez, L. (1991); for Spain, SAIZ, J.P. (1992).

(3) The common objective is to socialize the benefits of an invention. On the problem of socialization, see, for example, Burton, J. (1980); COASE, R. (1960 and 1980); KUZNETS, S. (1962) or the collection of articles contained in *Hacienda Pública Española.*

(4) Some of the most interesting studies on economic theory of the rights of ownership are those of ALCHIAN, A. (1981); Coase, R. (1960); DEMSETZ, H. (1981); FURUBOTN, E.G. (1981); NORTH, D.C. and THOMAS, R.P. (1981). An explanation of the rate of development of Western Europe as a whole, and of each of the countries which comprised it up to the middle of the 18th century, in the light of the various property right definitions, in NORTH, D.C. and THOMAS, R.P. (1981).

(5) DEMSETZ, H. (1981). The new rights of ownership rose to socialize the benefits only if the benefits of the institutional arrangement are greater than the costs.
(6) A summary of the opposing points of view in these debates can be found in PENROSE, E.T. (1974), pgs. 23-37
(7) TAUSSIG, F.W. (1915): pg. 17. Quoted by PENROSE, E.T. (1974): pg. 36.
(8) GARCÍA TAPIA, N. (1990): pgs. 39-40.
(9) GARCÍA TAPIA, N. (1990): pg. 42. Must take into consideration that for the Modern Age no centralized register exists.
(10) In addition to the privileges of invention, in the second half of the 18th century it is common to find to different privileges or exemptions granted for different industrial activities which the government wanted to promote (the right to import machinery without taxes to use fuels without paying taxes, etc.)
(11) *Gaceta de Madrid*, 24-09-1811, no. 267, pgs. 1,103-1,104.
(12) Archivo Historico Nacional, Section: Estado, legislation 134, file 9
(13) *Colección de Decretos del Rey Nuestro Señor D. Fernando*, volume XI, 1826.
(14) The gathering and analysis of legislation related to invention privileges and patents, in SAIZ, P. (1992)
(15) The historical documentation has been passed to all the institutions encharged with in the 19th and 20th century with the task of the register begun by the Royal Conservatory (Royal Industrial Institute; Special Directorate of Patents, Trademarks and Industry; Register of Industrial Property), ending up at the Spanish Office of Patents and Trademarks, denomination which dates from 1992. The files are saved in an orderly fashion but not classified.
(16) MATILLA, P. and SAIZ, Mª J. (1992)
(17) The early modernization of the Spanish merchant marine is done through the purchase of ships from England (VALDALISO, J. Mª, 1991)
(18) As is shown by the low number of investments made in ports until the end of the 19th century. *Memorias de Obras Públicas 1850-1923.*
(19) In contrast, in Portugal, for example, during the same period the level of patents is much less than in Spain.

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