

1842

Inaugural Lecture for His Chair in the Collège de France

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Recommended Citation

Chevalier, M. (1842). Inaugural Lecture for His Chair in the Collège de France. (S. W. Rowan, Trans.).
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Translated by Steven Rowan

Excerpts from Michel Chevalier, *Cours d'économie politique fait au Collège de France*, 1841-42, Paris: Capelle, libraire-éditeur ... Charles Gosselin, Libraire, 1842.

[P. 1] [**Inaugural lecture for his chair in the Collège de France**]

Sirs,

The duty that has been conferred on me is such as to intimidate someone stronger and more able than I; I confess freely that I feel frightened. I am currently such for knowing that this chair was inaugurated [2] a few years ago by the eminent man who established in France the study of political economy [Jean-Baptiste Say]. I am not less for having measured the responsibility that weighs on me. For political economy is of an importance that is continually growing with that of material interests. The role that it currently plays in the world is in the first rank. ...

The finest flower of political economy is industry. ...

[3] I choose as my device here the plow as the emblem of industry to show that it cannot be separated from agriculture. Industry is material labor in all its forms. It is agricultural, it is manufacture, it is commercial. Measured by the number of people it occupies, by the value of the products it creates, and for its happy influence on the health of the soul and the body, agriculture is the first of the arts: this is, as you know, the title it is given in official addresses, although acts do not always correspond to the slogans. ...

The power of industry has been revealed for half a century, for it was not improper what Sieyès wrote in his pamphlet on the Third Estate. Barely fifty years ago, in this infamous manifesto, [4] the Third Estate complained that it was nothing. Today it is not satisfied with Sieyès' ultimatum, it is not enough for it to be something, it wanted to be everything, and in France it is everything.

It is a social metamorphosis that the slow but irresistible evolution of centuries has prepared. The ideas, the customs, the mores, all led the human race here. It was an obligatory destination, better described as providential. Religion and politics worked together there: the first by preaching to men charity, fraternity, peace; the second, by the inflexible perseverance of princes to lower the military aristocracy surrounding the throne. In our days, the work appears on the edge of being realized, not only in France but in the universe. ... thus, in France, fifty years ago, the so-brilliant aristocracy vanished like a harvest brought in. ... one saw [the aristocracy] transformed; they committed themselves to [5] industrial interests, and so that the fusion would be more complete, the sovereigns raised commoners to the nobility who have become illustrious in the annals of labor. ...

[6-7] [Two contemporary examples of industry conquering everything are the unification of Germany under the *Zollverein* and the domination of India by the British East India Company.]

[10] Spiritual people, even the most absolute and exclusive, abuse themselves if they oppose the advent of industry. For in no way will it be the triumph of matter over spirit. On the contrary, industry does not rise except when intelligence overwhelms matter. Industry is nothing but intelligence establishing its domination over the material world: it is the human spirit making of the planet a splendid throne. ...

[11] Behold, with the steam engine, the remnants of [12] antediluvian vegetation, enfolded in the entrails of earth, are converted into motive force that is employed to infinite labors from which man is liberated. ... No one may say what applications the extended future of this entirely modern invention, which already produces force infinitely superior to that of the entire population of England. If one plunges into the unknown, just into the probable, what an agent of material power is to be found in electricity! It is not an exaggeration to announce that through industry man will truly become the king of creation, master of the universe. With industry, instead of being oppressed by matter, man will submit it to his will. ...

[13] Industry, by its intrinsic nature, is no less preparatory to liberty. The populations have anxiously searched for liberty for centuries: the industrial regime will give it to them. ...

[20] [Hostility to competition and machinery has led to biting criticism of industry as a destroyer of jobs and livelihoods. M. de Sismondi¹ has emphasized the negatives of the use of capital.] [21] In the current condition of industry, there is no assured future. It is the destiny shared by the master and the worker, with the sole difference that for the master it is a question of a year or six months, for the worker it is a week or twenty-four hours. ... For a man who has no future, intelligence is a dubious gift, and the ability to foresee is torture. ...

[23] To emerge from this labyrinth, there are only two exits. One would lead to an industrial feudalism where the working population would be treated as troublemakers, once more condemned to servitude. [24] One would command them to forget forever the law of equality for which they have filled Europe with their blood and scattered their bones across the world, and hold them barricaded in the jails of industry, as in Dante's hell, without hope. The other exit, little explored up to now, leads to the intimate association of the rival interests that today observe one another with a hostile eye, that of the bourgeoisie and that of the workers. ... This is the way that must be taken, since only the senseless would choose the first way. ...

[25] Time presses us. Religion, which embraces man in the perpetuity of its infinite existence, was able to pronounce the word "equality" without risk in the face of the most revolting inequalities that feudal society presented. It is because religion has eternity to wait ... But since the French Revolution, equality has descended from heaven to earth, and from religion it has passed to politics. Unlike religion, politics does not have eternity to harmonize reality and principles. Its kingdom is of this world, it lives in the present. It is necessary to have it as soon as possible, within the limits of the present. ...

[28] [The perpetual threat of war drains the economy and distorts all efforts]. [29] one may say that the military attitude of the European powers has become an effect without a cause once the kings have definitely subjugated the aristocracy that lived from war, and only had war to stand for anything in the world.

The purpose of these generalities is to let you know the sentiments that guide me in the teaching I am commissioned to do. As you see, these are ideas of order but also of emancipation. It is not the desire to see humanity kneel before materiality, but rather to liberate it from the material yoke under which it is loaded in its secular misery. It is an

¹ Jean de Sismondi, 1773-1842, of Geneva, was a follower of Smith and Ricardo, but was suspicious of machinery and the tactics of the bourgeoisie; he opposed Jean-Baptiste Say and was a pioneer social democrat.

ardent vow that with the aid of industry, and invoking the supreme thoughts outside of which there is no well-being for individuals, social reality will be brought gradually but as quickly as possible into harmony with our political agreement. I will seek to determine how positive institutions that are in the domain of public economy may aid industry to assimilate the moral principle more and more. We shall examine together within what limit it is to use its credit to cement the peace of the world. [30] Organization of labor our main interest.

[31] No science is as much called to guide by observation than political economy. Further, instead of opposing new solutions, I will be in search of them. ... In the present situation of society, innovation is one of the first needs of peoples, since things cannot remain as they are, and they cannot be allowed to deteriorate. ... Modern political economy must adopt as its motto this thought of Bacon: he who rejects new remedies prepares new calamities! I will neglect no effort, believe me, to be faithful to it.

[33] **Speech opening the course for the year 1841-42**

SUMMARY. — Growing importance of political economy. — Definition. — Limits of its domain. Supremacy of politics and religion. — It does not pose social questions. — The social and political work assigned to our century consists of founding liberty. — Periods of the work that have been accomplished. — New Period since 1830: the completion of the emancipation of the second half of the Third Estate. — Role of political economy in this enterprise: fundamental principles of society to which it must conform: property, family, principle of equality, principle of order or of organization. — Definition of liberty. — Liberty is tied to material interests. — Why liberty is seen differently in 1789 than in 1830. — Since 1830, it is a matter of the working classes, liberty has an entirely different aspect, and industry is indispensable to liberty. — Industry is not enough for liberty, or the moral attribute of men, but it is an essential condition when it is a question of the greater number. — Historical demonstration: Antiquity, Middle Ages, the poor condition of the working classes has always depended on insufficient production. — It is the same today. — In consequence, it is necessary to work to increase production. — This growth is possible. — Resources that produce this effect in modern industry. — Opinion of Aristotle on the cause for slavery. Then man was dominated by the material world, but today the material world has been mastered. — State of future societies. — Well-being and liberty under the rule of morality.

First Lesson p. 57

SUMMARY. — Object of the lesson: liberty is tied to industry. — 1st example, cereals. — Primitive state of the human race; cannibalism. — Nuts. — Discovery of wheat; civilization appears. — Causes of the influence of this culture: regularity in production; ease of conservation; proofs. — Historic view. — Antiquities: civilization advances in concert with the cultivation of wheat. — Orient: rice. — New World, maize. — Modern times; savage peoples of America and Africa do not cultivate. — Explanation of a decree of Alexander the Great. — 2nd example, the plow. — All civilized peoples have it, savages do not know it. — Historical proofs. — Its role in societies. — Digression on the subdivision of lands. — 3rd example, iron. — Savage peoples do not know metals. —

The first to be discovered are gold, silver, and copper. — Reasons drawn from the natural order. — The peoples of antiquity principally used bronze (alloy of copper and tin). — Proofs: historians and poets. — Renaissance: discovery of the current process for fabricating iron. — Role of iron in modern civilizations. — What would happen if it were taken away. — 4th example, domestic animals. — State of societies where they are rare: India and China, Mexico in the time of Cortez. — Review. — Reprise of the subject. — Rational demonstration. — Instruments invented by industry are like supplementary organs of man added to their natural organs. — Conclusion: liberty is of the moral order, but it has to fulfill material conditions.

Second Lesson, p. 80

SUMMARY. — The rise of all classes is tied to the development of the productive power: this power is extraordinarily greater today than in earlier societies. — Definition of the productive power. — Its increase. — 1st example, the iron industry: over the last four or five centuries, is from 1 to 25 or 30. — 2nd example, milling wheat: progress since Homer was from 1 to 144. — 3rd example, cotton cloth is from 1 to 320 over 70 years. — Consequence of this progress for England. — 4th example, linen thread: progress over just a few years is 1 to 240. — 5th example, transport industry, the railroad constructed from the Schuylkill to Philadelphia: compared to what it was under the empire of Montezuma, the productive force is 1 to 11,500. Compared to cartage in France, the relationship of 1 to 171. — Remark applying particularly to the last example, on the cost of maintenance, operation and interest of capital engaged. — Conclusion: one may hope for a great improvement in the material destiny of all men without exception. — Preliminary conditions. — In Antique societies, the growth of production did not benefit everyone. — It is different with modern societies. — Reason for this difference. — Christian sentiment of universal fraternity. — before all else, it is necessary to develop our morality.

Third Lesson, page 102

SUMMARY. — Refutation of objections raised against increases in production. — Two principal objections. — First objection: production is too great. — Problem with this objection: one takes the exception for the rule. — One particular branch of the industry could produce too much, but harmonized production of all the branches cannot be excessive. — It is necessary to increase production. — But it is necessary to increase the productive power. — Condition of this increase: savings. — Ancient societies were unable to save. — It is different with modern societies. — Shows that France dedicates annually to routes of communication. — Individuals save to improve the instruments of labor. — Saving is inferior to what it could be. — War causes this inferiority in part. — Consequences: it is necessary to be patient; savings join material progress to what is most elevated in human destiny. — Second objection: the productive power diminishes, specifically in the production of cattle. — Statistical tables published by the minister of commerce on the consumption of meat. — These tables have been criticized, but they are exact: gate of Paris. — Reduction of consumption. — Gravity of this result. — Insufficiency of this food produces from one nation to another industrial inferiority. —

Proofs. — But the reduction of consumption of meat as a result of the production of cattle is an accidental fact, particular to France. — French agriculture could produce a great deal more than it does. — Production of a thousand families of cultivators in France and in England. — The diminution of cattle is not general even in France. — Memoire of Monsieur H. Passy on the département of the Eure. — Cause of the inferiority of French agriculture. — Extreme subdivision of cultivation, not of property. — Lack of concern and ignorance of the country concerning agricultural interests. — They have made many canals, but no irrigation canals. — Local roads; the law has barely been in existence for six years. — Imperfections of the law. — Maxims of Sully and of Henri IV. — English ideas on the employment of capital concerning land. — It will be necessary to return to one or adopt the others. — Conclusion.

Fourth Lesson, Page 125

SUMMARY — On machines. — Their role in industrial work. — Effect of machines relative to production. — Adversaries of machines. — Monsieur de Sismondi. — Principal objection: machines deprive the working classes of work. — Experience shows the opposite. — Proofs. — Cotton industry in England: why this example is chosen. — Number of persons employed in this industry before the invention of the Arkwright machine in 1769: 7,900. — Improvements to this machine: discovery of Watt in 1774; mechanical manufacture of thread powered by steam commenced to spread. — Number of persons employed in the manufacture of cotton in 1787, 352,000. — Improvement and multiplication of the machines. — Number of persons employed in cotton manufactures in 1833, 800,000. — Dependents to industries, children, elderly. — Number of people drawing their support from the cotton industry in 1833, 2,000,000 (according to Mr. Baines). — Today it has risen to 2,500,000. — Salary. — Capital spent on salary in 1760 was from 3 to 4 million. — In 1833, it was around 455 million, only for the 800,000 workers employed in cotton manufacturing. — Rise in the level of salaries. — Sayings of Colbert. — The example of railroads similarly contradicts parallel objections. — Thus this objection that machines deprive the working class of work is disproved by experience. — Error of economists who sustain this. — Result of the use of machines: savings, drop in prices, rise in consumption. — The adversaries of machines have misunderstood this result. — Sayings of Monsieur de Sismondi. — Sayings of Montesquieu. — Review.

Fifth Lesson, page 145

SUMMARY — Response to the objections raised against machines. — The adversaries of the machines have confused well-being with wealth. — It is said that machines make industrial labor irregular: the reverse results from the nature of things; machines presume the investment of an enormous capital that must support interests even when the work is interrupted. — They pretend that the worker, a weak dependent of the machine, should undergo terrible fatigues that this dependence imposes: machines obviously spare men of tremendous labor that they accomplish by their elements. — They accuse the machines of prolonging the work day; beyond a certain limit the worker's labor ceases to be productive. — The adversaries of machines have attacked the division of labor; they

argue that it is offensive to the intelligence of the worker. — The division of occupations favor the discovery of machines that accomplish works of force and leave to man the part of initiative and intelligence. — The condition of societies deprived of machines. — Without them, what would become of England whose consumption represents the labor of 250 million people? — The nations of Asia. — If the adversaries of machines had the power to destroy them, they would not dare. — Without machines there are not means of increasing production, and thus it is a commanding necessity of our epoch. — Those rejecting machines should vow to preach against wealth. — Political economy has another duty to fulfill. — Last consideration in favor of the machines: they free women from hard labor. — Example of England and the United States. — Machines contribute by this to the morality and grandeur of states.

Sixth Lesson, page 163

SUMMARY. — Machines have one inconvenience, which is that they often lead to a temporary suspension of employment. — General means by which they seek in various countries to remedy the interruption of employment. — The cotton industry in England: deplorable condition of the hand loom weavers. — Misery and lack of work. — Investigations on this subject. — From the report published by the commissioners of the last investigation. — The number of hand loom weavers, far from declining, rather tends to grow: reasons for this tendency. — Remedies indicated in the report: growth of the export market, modification of the customs tariff, reform of legislation on cereals, expatriation and colonization, education. — Observations. — On English legislation on the poor. — Principal elements of the fundamental statute of Queen Elizabeth (1602). — Society owes aide to the poor, the healthy poor person owes his labor in return. — Establishment of a tax. — Peculiarity of this impost. — Progressive rise of the tax (in 1750, 20 million francs, in 1800 100 million, in 1818 more than 200 million. — Absence of centralization and control, abuses that resulted. — Further, they turned away from the practice of one of the essential principles of the law in that they did not make the healthy poor work. — Reform of the Poor Laws under the ministry of Lord Grey (1834). — Establishment of a central commission. — Return to the principle of work. — Patronage of parishes to benefit the children of the poor. — Financial results of the new law. — On the commission of oversight and labor of the city of Lyon. — Conclusion: it was only through work that one could remedy misery in general, particularly what results sometimes momentarily from machines. — It is a duty of the government to have plans for work prepared in advance where one could occupy arms suddenly unemployed. — The crises provoked by machines are not the necessary result; it is only a contingent effect arising from the failure of the organization of industry. — But industry should be organized as in war, and then the use of machines could be expanded without crises for the constant well-being of each and all.

Seventh Lesson, page 190

SUMMARY. — It is necessary to increase production. — Prior condition: property must be respected. — The general means of increasing production: 1) routes of communication; 2) institutions of credit; 3) professional education. — People superior in wealth are the most advanced in these triple categories. — Order in which these matters will be dealt with in this course: before the routes of communication, an exposé of the general principles of institutions of credit in the formation of wealth and an examination of our monetary circulation in relation to credit. — These institutions have two objects: they render capital or the fruits of previous work disposable for future work: they serve for the creation of a future capital of conventional values that are only representative of the capital itself. — In the second case, they are sometimes useful and some times dangerous. — they have another use, which is to centralize capital. — Institutions of credit, taking this term in the most general sense, give solidity to values, contributing to the security of business and hence serving to conjure commercial crises. — It is necessary to range among institutions of credit all systems of insurance. — France must develop domestically these useful institutions. — Obstacles to this development: mores, laws on real property. — Of all matters composing economic science, that of credit is the most difficult; reasons for this difficulty. — Establishments of credit in France must consider the interests of agriculture.

Eighth Lesson, page 207

SUMMARY. — Of the *balance of commerce*. — Ancient prejudices on precious metals have not entirely lost their power. — Monsieur Barbé-Marbois, minister of the treasury. — On currency. — Everything a country possesses in coin beyond what is needed for exchange is an absolutely unproductive capital. — Monetary situation of France. — The coin circulating in Europe is about 8 billion. — France alone has from 3 1/2 billion to 4 billion. — England has 1 billion or 1,200 million (not counting its paper money). — The United States in 1834 and 1835 (at that time it appeared to offer all the desired conditions for good circulation) possessed barely 450 million. — Thus France has about 2 billion too much in coin. — Consequence. — This situation is getting worse. — Since 1830 France strikes in a common year 80 million in francs, and keeps at least part of it. — Tables of customs. — This accumulation is disastrous. — It makes us tributaries of the governments of South America, which raise a duty of 16 % on the product of their mines, and from some speculators who have cornered the mercury mines. — Summary. — Means for amending our situation. — Individuals love to abscond, to hoard; each his own racket. It is necessary to renounce these habits. — While the English appear to studiously operate in the exchanges, in commerce, by means of money, they say that we have taken the opposite position: it is necessary for us to adopt the commercial practices of England. — We should put into our circulation a corresponding quantity of paper money. For this purpose, giving bank bills the character of legal currency, at least for paying taxes, and to issue bills of low denomination (from 100 francs). — Another means would be to have a customs system opening the way a bit wider for foreign goods. — Finally, one could limit the power of issuance that the directors of currency issuers currently enjoy.

Ninth Lesson, page 226

SUMMARY. — The currency situation of France will lead to certain loss; — it further exposes it to probable loss that will result from a depreciation of silver. — The scarceness of precious metal in the fifteenth century. — Its abundance and depreciation after the discovery of America. — From 1570 to 1630 its value declined by two-thirds. — The richness of the mines of Peru. — The richness of the mines of Mexico is even more extraordinary. — The total production of the mines of the New World since the beginning of their exploitation by the Spanish represents a value of 35 billion francs, of which 27 1/2 billion is in silver and 7 1/2 billion in gold. — For silver, that is a mass whose volume would be a sphere with a diameter of 29 1/2 meters. — For gold, it would be 5 meters in diameter. — Weakness of this result in mineralogical terms. — The mines of Peru and Mexico cover an area of nearly 1000 leagues. — The richness of the seams of silver in Mexico. — Production could some day be even more considerable. — The opinion of Herr von Humboldt. — Earlier, silver ore was treated by fusion. — The Spanish discovered treatment with mercury. — Imminence of the discovery of a new process, application of Voltaic electricity for the extraction of silver. — Probability of a new depreciation. — Yet the production of the mines of the New World has declined since the beginning of the century. — But this result is tied to the political circumstances found in Mexico. — Also, production has increased in Europe. — Further, Europe sends Asia 100 million per year, while a similar sum comes from Asia itself. — The accumulation is rapid. — In South America a movement is underway that renders even more probable a surplus of silver, which is the successive invasion of the continent by the industrious race of the United States. — Conquest of Texas. — Sayings of Jefferson. — Conclusion.

Tenth Lesson, page 246

SUMMARY. — On the routes of communication. — They are one of the conditions of civilization, of liberty. — Liberty, effectively, as man, who is one of its principal attributes, is subordinate to conditions of the physical order. — All peoples who have aspired to one without fulfilling the other have failed miserably. — The republics of South America compared to the United States. — Importance of the transport industry. — It is primordial and all the others depend on it. — It is the service that costs the most time and effort. — To improve it is to realize an enormous economy of forces. — Definition of man in economic terms is as an unquiet being, that is, little inclined to rest. — Man studied in his acts and in the most ordinary things of life. — The dinner of a simple bourgeois of Paris: all the countries of the globe have contributed to furnish what it contains. — The same goes for his clothing. — Examples of the results perfected routes of communication produce. — United States. — Influence of the Erie Canal on the prosperity of the state of New York. — Influence of the steamboat on the Mississippi Valley. — This valley, five or six times larger than France, had only one and a half million inhabitants in 1810. — Today it counts eleven states of the twenty-six that compose the American Union. — The mythological sense of the fable of Cadmus. — Routes of communication are the instruments of well-being. — They are the instruments of government: Scotland and the Vendée. — Rapid routes of communication are

destined to change the conditions of empires and the equilibrium of the world. — Example of the United States. — Preoccupation of populations and zeal of governments for routes of communication. — That is the title of grandeur and glory of the present century.

Eleventh Lesson, page 272

SUMMARY. — There are three types of routes of communication: paths and roads, navigable routes (rivers and canals), and railroads. — Principal characteristics, from the point of view of public economy, of these three modes of transit. — Roads; — in what proportion they apply the force necessary for traction. — Rivers; — on their inconvenience. — Canals; — parallel to rivers; — they save force to a more considerable degree than roads; — their destiny is to serve the transportation of bulky merchandise; — this is what France should expect from them. — Railroads; — they save force to a greater proportion than roads and, at present, less than canals; — advantage they have for the application of steam engines; — for speed they exceed all other modes of transit. — Consequences for the rapidity of movement for people and products. — The effort needed for traction can be less for a railroad than for a canal. — Railroad from the Schuylkill to Philadelphia.

On roads, — their rarity. — China, — India, — Russia, — Corsica, — Mexico; circumstances of a journey in this country.

On roads in France. — Extent of royal, départemental roads, roads of large communication and local roads. — Sums of money that France consecrates annually for them. — Progress in the art of building and maintaining roads. — France, by improving its roads, could realize an annual saving of 250 million per year. — Consequences that the improvement of roads achieves in the social order, particularly for local roads.

Twelfth Lesson, page 301

SUMMARY. — On the tariffs of canals. — Comparative development of artificial navigation in England, the United States, and in France. — Canal tariffs only extend to the toll; it does not include the cost of traction. — English tariffs. — American tariffs; they are less elevated than the first. — Reasons for this difference. — Tariffs for the main lines: the Erie Canal, canals of the state of Pennsylvania, the Ohio Canal. — Tariffs of medium lines: Schuylkill Canal, Canal from the Delaware to the Chesapeake. — French canals; — one must distinguish between those open to commerce in 1814, and those continued or begun in 1821 and 1822. — Tariffs of the canals of Briare, of Loing, of Orléans, of the Center, of Saint-Quentin, of the South (*du Midi*). — Unique tariff for all the canals of 1821 and 1822. — Tables. — The reduction of tariffs for all French canals is imminent. — Use of the canals of 1821 and 1822. — Discussion between the company and the state. — It is not enough to reduce tariffs; it is necessary to keep the canals in good repair and well administered. — Superiority of English and American canals in this regard. — Example of the slowness of crossing French canals. — The Canal du Midi is the sole one in France that is well kept in all aspects. — Practical conclusion.

Thirteenth Lesson, page 328

SUMMARY. — On the tariffs of railroads. — This tariff consists of two parts, toll and traction. — Reasons for this distinction. — At its origin, it was believed that railroads should be submitted to a regime of free circulation. — The impossibility of this system, which is not continued anywhere. — The legal distinction established in the tariffs has in fact been abolished. — Tariffs for merchandise. — Up to the present time railroads have been almost exclusively considered for the use of passengers. — Tariffs for merchandise are then essentially provisional. — English tariffs: — in general not the maximum. — Exceptions: maximum prescribed on the railroad from Edinburgh to Glasgow. — This maximum is extremely high. — Tariffs actually collected by English companies. — United States. — The variety of legislative dispositions in the matter of tariffs. — In the states that have better preserved the English style, such as those of Massachusetts, New York, Virginia, South Carolina, there is either no maximum or a very high maximum. — Reserves made by the legislations of these states for revision and reduction of tariffs. — State of Pennsylvania. — Limit assigned for tariff and for dividends. — Genuine tariffs collected on American railroads in the various states. — French tariffs. — Legal tariff prescribed for companies formed in 1838. — Weakness of this tariff. — A law of the end of 1839 authorized the administration to raise it. — New tariff accorded to companies from Basel to Strasbourg and Orléans. — Belgian tariffs. — Services that the railroads used to transport merchandise are destined to render in certain cases, such as in case of drought.

Fourteenth Lesson, page 357

SUMMARY. — Tariffs of seats for passengers on railroads. — England: legal maximum, unique and very high. — Actual tariffs, 3 categories, with the price collected. — United States. — States of New England, New York, not the maximum. — State of Pennsylvania, various maximums. — Maryland, rather low maximums. — Virginia, higher, varied maximums. — Examples of the maximums prescribed to the companies. — Genuine tariffs: prices collected by railroads in the various states of the Union. — French tariffs. — Various clauses imposed on companies in France: limited concessions; right of a tenth, transport of the military in active service; transport of dispatches. — Belgian railroads. — Comparison of services that railroads provide, depending on their system of exploitation, for various classes of citizens. — English and Belgian railroads: companies and the state. — Exclusive character of the English. — measures adopted on the main lines to separate the passengers of the last category. — The exploitation of the English main lines is deplorable. — Other English railroads follow a more liberal system of exploitation. — Railroad from Manchester to Leeds. — The third class of passengers predominates there. — Use of carriages called *Stanhopes* (seats below). — The economy that they procure in the cost of traction. — They permit the adoption of a very low price. — The French administration, in prescribing graduated tariffs, has rendered impossible in our country the system of aristocratic exploitation used on the English main lines. — We are in the way to a good equality.

Fifteenth Lesson, page 387

SUMMARY. — On railroads in wartime, especially on their application to the transportation of troops. — Utility of this point of view; the role of war. — The art of war is being modified; it has been entirely transformed over the last three centuries: arms, fortifications, the art of sieges. — Railroads will have an influence on the conditions of war. — Strategy; rapidity of movements. — Transport of troops making up the Mobile National Guard. — Defense of the passage of rivers; railroad from Strasbourg to Basel. — Other service that the railroad renders to the country in the case of defeat on the Rhine. — Strong fortifications. — Defense of the country with a reduced army: ability to summon at every moment troops not engaged at one point to another. — Response to some objections. — Examination of the question whether the means of transportation available on the railroads could permit the movement of an army. — A steam locomotive on a railroad represents 60 horses on ordinary roads. The machines of the company between Saint Germain and Versailles (right bank) represents a collective force of 5,000 horses, which is 300,000 horses in stables. — Each of the seven main lines that form the network of railroads in France would have a power at least double, or 10,000 steam horses, for a total of 70,000 horses representing 4,200,000 horses in stables. — To transport an army of 25,000 men, infantry, and cavalry, 5,000 horses and 10 batteries (of six pieces of 8), with their accessories and around 1,500 horses, it would require a force of about 12,000 steam horses. — Wagons, using transportation materiel at the disposition of the war administration. — Concentration of the materiel of the main lines into one single route; circumferential railroad joining the lines that end at Paris. — Urgency of the railroad from Paris to Lyon, and then from Lyon to Strasbourg, in view of the eventuality of war. — Railroads are before all else the instruments of industry and of peace. — General conclusion.