upon authority alone. He denies, for instance, a part of the Newtonian theory of gravitation, and holds that motion is an inherent property of matter; that it pushes, finding its way in the direction of least resistance, and is not pulled.

In literature of the imagination, his liking turns to books depending for their interest upon exalted and romantic ideas or ingenious plots,—a kind of work in which one finds a certain resemblance to his own. He is fond of Hugo, Bulwer, Jules Verne—of the latter of whom his own feats go far to make a prophet rather than a rhapsodist. He has an excellent principle in literature. He had rather read one good book a dozen times than a dozen books. He does not profess to be a student of men, either in life or books. Consequently, such writers as Thackeray, George Eliot, Dickens, have a less attraction for him. His machines, the elements that serve his purpose, the constituents of nature, are his characters, and have for him the most engrossing interest. It is one of his axioms that all substances have an intelligence proportioned to their wants. "Else why," he asks, "will a potato-vine travel one hundred and fifty feet in a dark cellar, and rise, against the law of gravitation, to seek a ray of light?" He has great heaps of note-books which, technical and abstruse as they are, send one's thought for a moment to Hawthorne. Engaged as he is, he might be called a Hawthorne whose personages are chemicals. It is the study of both alike to place their characters in unusual circumstances and watch the result. As to the phonograph itself, when he talks to it scraps of German, Spanish, Latin,—for he knows something of them all,—when he shouts to it: "Well, old Phonograph! how are you getting on down there?" And it answers back in its grumbling or spiteful metallic tones, it is difficult to rid one's self of the notion that there is indeed an elfish personality there which has its own views of things and must be considered in its feelings.

Of the men of prominence with whom his position has brought him in contact, Edison speaks with the most respect and warmth of the scientists. He finds them more simple, unselfish and high-minded than any others. He describes his interviews with Sir William Thompson, and dwells with interest upon his bad hat and not very good clothes.

It may be asked how he amuses himself. He invents. What is his object in life? To what is he looking forward when he shall have accumulated an enormous fortune? Simply and always, to invent. If he worked hard while in obscurity, his exertions, now that everything is at hand to make the labor efficacious, are redoubled. It is not luxury that tempts him. He does not indulge in it. Nor is it public approbation, to which he is good-humoredly indifferent. He is a burning spark of inventiveness, and that only. He has called his children, one Dot, the other Dash, after the symbols of the telegraphic alphabet. He wishes to produce something at least as good as the phonograph every year.

It is three in the morning, and a late hour even for so tireless a mind. The flaring windows cease to mock the rural darkness, and the long building is outlined only against the sky. The air is cold, and the tall grass dripping with dew. The inventor circles one eye with his hand, to gaze through it at the stars, and goes stumbling down to his house over the clods.

OUR PATENT-SYSTEM, AND WHAT WE OWE TO IT.

WE are a nation of inventors, and every invention is patented; yet, curiously, there is no subject quite so void of interest to the average "gentle reader," as patents and patent-rights. Why, it is hard to say; for there is no factor of modern civilization that comes home to every one more constantly or more closely. Indeed, in their ubiquity and unresting action, patents have been aptly likened to the taxes which Sydney Smith described as following the overtaxed Englishmen of his day from the cradle to the grave. Does the comparison hold as well, as some assert, in respect to burdensomeness?

It is not to be expected that an institution which enters so potently into our life-conditions as the patent-system does, should be, in all its workings, invariably beneficial. Human interests are very conflicting. The sunshine or the rain that makes my harvest sure may spoil yours; and, as with the forces of nature, so with human contrivances. They must of necessity go contrary to our wishes sometimes. The most we can reasonably ask of any social or govern-

mental plan is that it shall be, in the main and in the long run, clearly beneficent. If the good it does more than balances the evil that attends its working, and if there is nothing at hand that can serve us better, the part of wisdom is to make the best of it, changing, if at all, only with a view to improvement. From this stand-point let us examine the objections raised against this system.

Patents for inventions are based on the theory of intellectual property,—that is to say, the right of men to own and control the creations of their minds, not less than the work of their hands. To this it is objected that there can be no such thing as property in ideas,—that the notion is an absurdity, and the attempt to enforce the alleged right a restriction of common rights. Others say that a patent is nothing less than a monopoly, and monopolies are a relic of barbarism, justly odious to all civilized men; that letters-patent are no better than letters of marque, to allow the holder to prey upon honest industry, and that not the industry of enemies and foreigners, but of his own countrymen. It is further objected that patents increase the price of commodities; that by encouraging the invention of labor-doing or labor-saving inventions, they take from the artisan his only means of earning a living, and by lessening the demand for skilled labor and individual intelligence they tend to sink the man in the machine; that a patent allows one man to step in and say that other men shall not carry on their business in the best way; that by patenting an invention we practically tie up the idea involved and stop the whole course of thought in that direction, thereby interfering injuriously with intellectual activity; that by the conventional reward which patents offer we give an unnatural impulse to the inventive faculty, and so destroy the natural equilibrium of men's capacities, and foster a fanciful turn of mind at the expense of thoroughness and a patient working out of sound ideas. The last very comical objection has been gravely urged by an Englishman, who, for a horrible example, pointed to the United States, where, he said, "the factitious value attached to invention has tended to produce an almost total sacrifice of solid workmanship to flimsy ingenuity."

The sole object for which patents are granted is the advancement of the useful arts, through the making and speedy publishing of inventions. The patent-system seeks to secure this double end, not by directly rewarding inventors, but by recognizing their exclusive right to the use and profit of their new ideas for a term of years, in return for which recognition each inventor makes public an explicit description of his invention or discovery. The opponents of the system assert that it is no part of the duty of the state to advance the arts; that inventors do not need to be encouraged in this or any other artificial way; that patents do not encourage inventors either to make or to publish their inventions; that patents destroy natural competition in the arts, and thus tend to weaken the natural impulse of men to make improvements; that patents do not reward inventors uniformly or in proportion to their merits; that they throw difficulties in the way of invention, and so hinder and annoy inventors; and contrarily, that they lead to an excessive development of the faculty of invention, and impel men to waste their time in profitless experiments. But the saddest of all the objections we have met was that of an eloquent and sympathetic Frenchman, who complained that patents give undue advantage to their possessors, "making a golden bridge for him who enters the arena with arms more subtle and more finely tempered than those of his adversaries." This reminds us of the tender-hearted boy that wept over the Bible picture for fear that there would not be enough of Daniel to go around.

It is still further urged against the patent-system that, through its action, we discriminate against native industries and play into the hands of foreign manufacturers; for, having no inventors' royalties or license fees to pay, they can sell so much the cheaper, and thus command markets that otherwise might be ours; also, that many large users of patented inventions—railway companies, for example—find it unprofitable to do without, and very burdensome to pay for, the inventions they need; and that, while the infringement of patent-rights is apt to be expensive, it is a great trouble to manufacturers and others to keep track of the operations of the patent-office so as to know whether the devices they want to use are patented or not. Finally, it is claimed that patents are inconsistent with the spirit of the age; that some of the leading statesmen and savants of Europe have declared against the policy of issuing patents, and that in Switzerland the utmost freedom of trade in ideas—the unrestricted seizure of the inventions of all nations without payment

therefor—has been a winning game for the masters and artisans of that thrifty little state.

In view of all this, does it not seem a little remarkable, to say the least, that, with our extremely liberal patent-system and two hundred thousand patents in force, we should have any industries at all?

Happily, many of these plausible objections are mutually destructive, and we may be sure that the rest will appear less formidable when tested by the logic of fact; for this reason, if for no other: that the industrial progress of modern times has been coincident with inventions, and inventions have coincided geographically with patent-laws; still more, they have been locally numerous or the reverse in proportion to the liberality of those laws.

Assuming—with all proper deference to the pope, the Turk, and the socialist—that our modern civilization is in the main a good thing; and admitting that inventions rank among the chief factors of our civilization, at least in its material aspects, we must further admit that they are in their grand results, if not in all their details, good and worthy of being encouraged. And, as a matter of common honesty, we must also admit that, if inventors have any property rights in the fruits of their genius and toil, such rights ought to be respected. Whether the patent-system provides a proper and sufficient method for encouraging invention and protecting inventors' rights, can be determined only by a study of the threefold influence of patents on invention, on industrial progress, and on public prosperity.

Accordingly, let us inquire how patents affect inventors; how they affect large users of patented appliances and processes, as, for example, farmers and manufacturers; how they affect the laboring classes; finally, how they affect social conditions generally, by changing the scope and cost of the necessaries, conveniences, and luxuries of life. If space permits, a few words may be added with regard to the advantages of a patent-system that favors every grade of inventors, as the American system does, by its accessibility, cheapness, and liberality.

It may not be amiss to say here that a patent is nothing more than an official certificate that the patentee claims to be the inventor of some thing or process that is new and useful, and that, with the evidence in the possession of the patent-office, there is good reason to believe the claim to be a just one. In no sense is the patent a reward for invention, nor is the patent-system in any way to blame if the inventor derives no benefit from his invention. The patent-office merely registers and publishes the claim; the courts must confirm its validity, in case the claim is disputed. In the vast majority of cases, the presumptive right of the patentee to the absolute control of his invention for the specified term of years, goes unchallenged. Does the patent create that right? So the opponents of the patent-system assert; but the truth is quite the contrary. The right exists by virtue of the inventor's act of creation. The patent defines the nature and scope of the ideal property, and at the same time limits the period of its exclusive enjoyment. It is a case of give and take, in which the chief concession is made by the inventor. The time will come when patent-rights will be limited only by the natural life of inventions,—which is shorter than most people imagine,—just as other property rights are; but for the present the status of intellectual property is so insecure that great concessions have to be made by the owners of such property to popular barbarism.

In respect to the rights of intellectual property, public opinion is, in fact, not much above the level of the socialistic plane in respect to material property; and many a man, who realizes keenly enough the iniquity of the chicken-thief or pickpocket, is quite unconscious of any wrong in the infringement of an inventor's or an author's rights. Indeed, very few seem to be aware that, as Professor Shaler has pointed out,* "When we come to weigh the rights of the several sorts of property which can be held by man, and in this judgment take only the absolute questions of justice, leaving out the limitations of expediency and prejudice, it will be clearly seen that intellectual property is, after all, the only absolute possession in the world. The man who brings out of nothingness some child of his thought, has rights therein which cannot belong to any other sort of property." Nor are many aware that, as the same writer shows in another connection, when we consider the circumstances connected with the origin of the title to intellectual property through letters-patent, and compare it with those other property rights which are commonly considered the more real, the proof is convincing that the element of newness is the most noticeable feature concerning its history, and that in its origin it is essentially like the other property rights.

* "Nature of Intellectual Property."

Said Judge Storrow, before the Congressional committee on patents last winter:

"I look upon it as a mark of the highest civilization that a country shall recognize by its fundamental law, the utilitarian effects of pure brain-power; as a mark both of the highest civilization, and of the highest reaches of the law that a nation recognizes as property to be protected, because helpful to the state and to all its people, the pure creations of the intellect; a species of property not inherent in or attached to any particular portion of matter, but which depends for its recognition on the appreciative intellect of the community, and for its protection—that is, for its existence as property—upon the national deference for law and order."

The monopoly which an inventor enjoys under a patent bears no comparison to those monopolies of privilege by which semi-civilized rulers reward their favorites. The inventor's monopoly infringes no man's rights; it diminishes in no wise the world's stock of common possessions; it simply recognizes the patentee's exclusive right to control something which he has discovered or created; something which the world had not before him, and might never have had except for him.

To compare letters-patent to letters of marque is equally unfair and unjust. The idea of a patentee preying upon industry is grotesque in its absurdity. He cannot take to himself a single thing or process that the world has previously enjoyed; nor can he restrain any one from doing precisely as he has always done, if he prefers the old way. True the new way may make the old unprofitable; and that is where invention always hurts. In all progress somebody comes out behind. Shall we therefore worship immobility, Chinese-fashion?

Very often the first visible effect of an invention is the practical destruction of interests involving much of capital, and employing many laborers. Of this sort was the invention of artificial substitutes for vegetable dyes, like madder; in which case an industry almost national in magnitude had to be given up; yet the conversion of the madder-growing lands to food-producing areas proved advantageous, not merely to the world at large but also to the immediate tillers of them. The whaling industry was all but destroyed by the inventions which raised petroleum from insignificance to one of our most valuable resources. Sooner or later the manufacture of gas for illuminating purposes will receive its death-blow from inventions perfecting the electric light. And think what a crushing blow would be given to the greatest manufacturing interest in existence, should some one succeed in producing aluminium at the present cost of iron; or to the coal-mining interest, should there be devised an economical method of utilizing the enormous power of the tides, or the solar forces now squandered upon tropical deserts! Yet who would seriously argue that the ultimate effects of such inventions would not be enormously advantageous to the race? Or who would expect the owners of superseded establishments to submit cheerfully to the new order of things?

At a time like the present, when inventors are so numerous, so active and so fertile, it is not at all surprising that there should be many who feel that, after all our boasting about nineteenth-century progress, we may have rather too much of it. Nor is it surprising that in many cases the strongest opposition to inventors' rights should come from men who have reaped large benefits from the patent-law. The moment an inventor ceases to invent and becomes a manufacturer and merchant, that moment, if he is a self-seeker only, his opinion of the patent-system may undergo a radical change. The moment the owner of a profitable patent is confronted by a man with a better invention which he cannot get control of, he is apt to become a little dubious. So long as the system conserved his interests, he could look upon it as a good thing; but he is not so sure of it when it permits another to entice away his customers. However, in justice to our inventors and manufacturers, it must be said that opposition to the patent-system very rarely comes from them. That ungrateful work is almost entirely monopolized by the railway companies, or rather a few of them. Forgetting the important circumstance that it is to inventors that they owe their daily successes not less than their original existence, they foolishly think that they can succeed indefinitely without them; at any rate they adopt the course best calculated to drive invention into other channels; and not satisfied with boldly invading inventors' rights, they have the assurance to appeal to Congress for an amendment of the patent-law, which shall put inventors completely under their thumbs. Foremost in this effort has been the Western Railway Association, the temper of which is fairly illustrated by the cool avowal of one of its prominent members, that "whenever our attention is called to a patent of

value, we use it, and in a few cases we are made to pay by plucky inventors; but in the aggregate we pay much less than if we took licenses at first."

In course of time the moral development of the community at large will rise to such a level that it will not be prudent for any man or set of men to undertake to carry out so boldly

"the good old plan,
That they shall take who have the power,
And they shall keep who can!"

As yet, however, even in the most enlightened countries, the rights of intellectual property are but feebly respected. "The great protection of property," says Judge Storrow, "the strong arm of the law, the power of the police and the criminal courts, the right of every man to defend his own by force, is utterly denied to the patentee in this country. For one who steals the machine of the infringer, there is the summary arrest and the prison; but for the infringer who has wantonly stolen my invention, there is no policeman, no prosecution at government expense, no terror of punishment." The wronged patentee may sue for loss or damages, but that is a slow and often fruitless process, particularly if the defendant has money and the plaintiff none.

The assertion that the patent-system interferes injuriously with intellectual progress by blocking the course of thought is curiously at variance with the evidence of history. As soon as a patent is granted, the invention is made public and the new idea passes into the mental capital of thinking men. The better the idea, the sooner it bears fruit. At once a score or more of ingenious men say, "Here is a good thing;" and straightway they set to work to develop the idea, to apply it in new ways, or to compass the same or a similar end in a different way. Hence the swarms of kindred inventions that follow every important excursion from the beaten line of thought. Generic inventions are particularly prolific in after patents; witness the steam-engine, the telegraph, the sewing-machine, the telephone. So far from blocking the course of thought in their direction, such patents open flood-gates of useful invention. What miracles of previously undreamed-of invention have been called out by the telephone within a year! What worlds of unexplored fact and thought have thereby been laid open for scientific investigation!

The assertion that patents over-stimulate invention, to the destruction of honest and solid workmanship, is simply preposterous. When that charge was made, the Centennial Exhibition had not opened the eyes of the world to the real condition of the industrial arts in America; and English readers were less familiar with our "flimsy inventions" than now, when American products have invaded every market in Europe, to the consternation of local producers. One of the Swiss commissioners, a large manufacturer, wrote as follows: "For several years the Americans have set themselves to work to equal and outstrip Europe. * * * They have not failed. The world has never seen so considerable a sum of new ideas and of applications of those new ideas as was presented by the exposition at Philadelphia." In another connection, after saying that if a Swiss manufacturer wished to contend only against competition, he was obliged to bring his machinery from America, he asked: "Who does not know American sewing-machines? and who has not already become satisfied that even when machines of the same kind are made in Europe in enormous quantities, the somewhat higher price of the American machines is largely compensated for by their construction, their solidity, and their convenience? Have you ever compared a rake, a knife, a hatchet, made in America with tools made here? How much is Europe left behind! I do not speak of special articles of which many are not known to us. While our makers aim generally at products heavy, massive, solid in appearance, and save rather in the quality of the metal than on the weight, American workmanship is light, pleasing to the eye, and almost always employs good material." A little further on, the same critical observer sums up the characteristics of American manufactures in the five words, —handsome, solid, practical, light, and good. That American inventiveness has not injured the quality of American workmanship, is equally evident in many other departments of production. Witness the favor with which European and other foreign markets have received our leather and leather goods, watches, light hardware, carpenters' and other artisans' tools, saws, agricultural implements and machinery, cheese, canned goods, carriages and carriage materials, railway and tram-way cars, locomotive engines, chilled rollers for sheet metal, rubber and paper making, wood and leather working machinery, paper and paper-hangings, tinware, toys, hard rubber goods, sewing and knitting machines, and a long list of less important articles, the superior quality of

which enables them to compete with European products, even when to their higher cost is added a heavy percentage for transportation.

Whether or not it is the duty of the state to encourage the industrial arts, it is superfluous to argue; it pays to do so, and that is enough. Besides, if civilization is worth having, it is worth perfecting by all legitimate means. But, say the objectors, inventors do not need to be encouraged, and, if they did, patents would not be a proper means for reaching the desired end. Inventors do not say so; on the contrary, their testimony is uniformly in favor of the patent-system. Not that the system as developed in this country or anywhere else is perfect; no one claims that; but it is infinitely better than any substitute for it that has ever been proposed. Imperfect as patent-laws have been in many of their details, they have offered to inventors a degree of protection without which, they tell us, they would rarely have had the heart, even had they felt the inclination, to devote to their ideas the time and money required to put them into practical working order. Very often the profits of one unimportant patent has put into the hands of an inventor the money required to work out an invention which has marked an era in the world's industrial progress. Such was the case of Bigelow, of the carpet loom; and with Lyall, the inventor of the positive-motion loom. The greatest of all our recent inventors, Edison, furnishes another illustration. His patents are his capital, and they bring in the money required to keep up the costly laboratory at Menlo Park. Patting the phonograph, when it was the latest offspring of his brain, he said, "This is the boy that is to take care of his father in his old age!"

No one can study the lives of Watt and Stephenson, Fulton, Wood, Whitney, Nott, Colt, Howe, Blanchard, Goodyear, Morse, McCormick, and the thousand other inventors who have given to our modern civilization its character, without being impressed by the fact that the protection offered by patent-laws has been, if not their greatest incentive to invent, at least an essential condition of their devoting their lives to this beneficent work. And though many inventors have been grievously wronged by unscrupulous infringers, while the public which owed so much to them looked on with indifference or applauded the robbery, yet it is to be doubted whether a single inventor could be found who would have the patent-system abolished. The gross injustice done to inventors, as in Whitney's case, is to be charged to corrupt courts and an undeveloped moral sense on the part of the community, and not to any radical defect in the patent-system. Even material property is not yet entirely secure against invasion among us.

The substitution of specific rewards for invention, as proposed by the grangers and a few others, finds favor with no one who has fairly investigated the conditions of the case. In the first place, it is no part of the duty of the state to reward inventors; but it is the duty of the state to protect the rights of all its members, inventors not less than others. The recognition of their rights is a matter of justice, not an act of charity. Again, admitting that inventors would be willing to surrender their rights for a cash payment, it would require something like official omniscience to determine, in any case, the just equivalent for an invention, and that is hardly to be expected. But granting that, there would still remain an insuperable objection to the plan, in the lack of any provision for the industrial development of inventions. Usually the inventor's task has barely begun when his invention is apparently completed; the hardest part is to introduce it and make it a financial success. For this, much time and labor and ready cash are demanded; and who would be willing to meet the demand, if, when all was done, any one could step in and reap all the profit, without trouble or risk?

Here comes in the advantage of the patent-law to manufacturers. To produce cheaply usually requires an expensive plant, and generally a long series of preliminary experiments, and it would be downright folly to sink capital in that way in the absence of the protection which patents afford. The charge that patents destroy natural competition and so arrest the desire for improvements is refuted by all experience. It is in this country, where patents are numerous and easily obtained, that improved machines and processes are most rapidly introduced, as in textile manufactures, in watch-making, and shoe-making; and not in Switzerland, where until recently no patents have been granted, or in England and Germany, where patents have been hard to get. In the agitation of this question in Switzerland, after the Centennial Exhibition had revealed to the manufacturers of that country the secret of their failing trade, the prominent manufacturer, Edward Dubied, said:

"Messrs. Favre-Perret, Bally, and David,

our commissioners to the Philadelphia Exhibition, call for a patent-law in Switzerland, as a means for perfecting our industries. The author of these lines regards the institution of patents as the first and indispensable measure, without which any other will be utterly useless, for reaching the end we all have in view. If he especially insists on this point, it is because he has the advantage over the gentlemen he has named, of spending twenty-five years as engineer and machine-builder in a patent-granting country, —namely, France,—before he established himself as manufacturer in Switzerland. He can, therefore, bring his own experience to the support of their demand, and he assures his fellow-citizens that a law for the protection of property in inventions would be a true magician's wand among us, completely transforming our system of manufactures, and raising us in a short time, in a natural manner and with less effort than we should expect, to a level with the nations most advanced in the arts."

Some six or eight years ago a strenuous effort was made in England to secure a radical change in, or the abolition of, the English patent-law. The Parliamentary committee had before them a large number of inventors, manufacturers and others, and collected nearly 500 closely printed quarto pages of testimony. In the final report of the committee, it was set down as established by the inquiry that the privilege conferred by the grant of letters-patent promotes the progress of manufactures, by causing many important inventions to be introduced and developed more rapidly than would otherwise be the case; that the same privilege leads to the introduction and publication of numerous improvements, each of minor character, but the sum of which contributes greatly to the progress of industry; and that it does not appear that the granting of pecuniary rewards could be substituted, with advantage to the public interest, for the temporary privilege conferred by letters-patent.

The experience of the British colonies adds practical demonstration of these truths. The colonies of the southern hemisphere began with what is called free trade in ideas; but it proved a losing game. A patent-law had to be adopted, because, as its proposers said, they could not get inventions without a patent-system, and without inventions no rapid development of their industries was possible. Canada tried a shrewder plan, and gave patents to native inventors, but denied them to outsiders. It was thought that Canadian manufacturers would gain by exemption from the charges of Yankee inventors, and would yet have all the advantage of their improvements. But the plan worked badly; Yankee inventions were free to all, and for that very reason no one dared to put his money into them. The law was changed; the rights of all inventors were respected; and now the manufacturing industries of Canada are progressing wonderfully.

From the replies received to a letter of inquiry widely circulated by our Department of State a few years ago, it appeared that from three-fourths to nine-tenths of the capital invested in manufacturing establishments in this country had been attracted by the protection offered by patents. And the progress of our manufactures has been exactly coincident with the activity of our inventors. In 1850, the products of our mechanical industries were valued at $100,000,000. In 1860 they amounted to $1,800,000,000. By 1870 they had increased to $4,200,000,000; and, in spite of financial disturbances, the census of 1880 will show an increase not less remarkable. The number of patents issued furnishes a safe basis for this prediction. About 1850 they averaged less than 1,000 a year. In 1860 they had risen to 3,000 a year. In 1870 they had jumped to over 7,000; and now they exceed 16,000 a year. The progress of manufactures westward coincides with the geographical distribution of the patentees. In 1850 the mechanical industries of the six great western states produced considerably less than half as much as those of New England. In 1871 they were nearly equal; to-day they are unquestionably far ahead.

We are apt to think of our country as primarily an agricultural country; we do, indeed, excel all other lands in that direction, thanks chiefly to our inventors; yet the value of the products turned out by our manufacturing establishments last year was very nearly double that of our agricultural products. Even the states which are above all others agricultural in character—the states next north of the Ohio River—are remarkable rather for the magnitude of their manufacturing interests. As long ago as 1870, as may be seen by the census statistics of that year, the manufactured products of the seven leading agricultural states—Ohio, Indiana, Illinois, Wisconsin, Minnesota, Iowa and Missouri—exceeded in value their agricultural products. And the development of mechanical industries in those states has been amazingly rapid since that date.

In Ohio, for instance, the manufactured products in 1870 reached the enormous sum of $269,713,000; in 1875 they were worth $400,000,000. Will anybody be so foolish as to say that the agricultural interests of Ohio were not directly advanced by her growth in mechanical industries,—by the home markets for farm products created by the thousands of artisans added to the ranks of consumers?

There remains to be considered the influence of the patent-system upon the working classes, and upon the community at large. How do inventions affect the laborer? Take the case at its worst, where the substitution of machinery for muscle has been most rapid,—as in agriculture, textile manufactures, shoe-making, sewing, and so on. The logic of uncritical thinkers on this point runs somewhat in this wise: Before the introduction of machinery, or of improved machinery, so many hands turned out so much work. Now, the annual product is ten times as great. Therefore there ought to be ten times as many hands employed. But there are only twice as many. Behold what a deadly blow machinery has given to labor! It never occurs to such distressed labor-lovers to ask where the extra hands they say should now be employed could have come from. In every instance where an industry has been modified by the introduction of machinery, the demand for labor has been increased beyond anything that could have been possible without machinery. Machinery reduces cost; cheapness multiplies consumers; to supply the widened market a larger annual product is necessary; then comes an increased demand for labor. That is the universal rule. In most cases a thousand years of machineless progress would not suffice to provide for hand-labor the employment which machine-fearing critics falsely assume to have been taken away by machinery from—operatives unborn!

In estimating the influence of machinery upon farm-labor, it will not do to calculate the number of men it would take to sow by hand and reap with a sickle the millions of bushels of wheat and other grain the country produced last year, and then say that the excess over the number actually employed was so many men shut out from farm-work by patent seeders and reaping-machines. It is to machinery that we owe the possibility of any grain crops at all throughout the larger part of the grain-producing interior,—certainly any crop that would bear transportation to market. Without machinery for saving time and labor, for doing work that man's unaided hands could never compass, nine-tenths of our broad land would still be a wilderness. And as with agriculture, so with all our industries; they could have but a feeble existence, or none, in the absence of the inventions that have given them life and character.

How much of the wealth and prosperity of our country, north and south, has been based on cotton! Yet how few realize the indebtedness of the cotton interests to two inventors—Lowell and Whitney. The one created a demand for American cotton, the other made it possible to meet that demand. Arkwright's machinery could do nothing with the American staple, and only an insignificant quantity was called for by the hand-spinners. Not until Lowell's machinery was set up here and subsequently in England did the American staple become an article of commerce. When Whitney invented his gin for separating cotton-seed from the fiber, eighty-five years ago, four pounds of cleaned cotton was accounted a day's work for a man. With Whitney's first machine a man could clean seventy pounds. To-day the perfected cotton-gin will do that work in ten minutes! Fifteen hundred thousand men, working all the year, could not have cleaned by hand our last year's crop. At what rate of wages could they have done the work and left a margin of cost which would allow the product to be transported to New Hampshire, and converted into cloth to be sold at from three to four cents a yard? It is estimated that 200,000,000 people are now reached by machine-made cottons. Three times as many more remain to be reached, the only barrier being the cost of production. The invention of a cotton-picking machine would effect a large part of the required reduction in cost. Will any one say that the amount of labor employed upon cotton would be diminished in this country, if a cotton-picking machine should displace ninety-nine out of every hundred cotton pickers now employed? The increased demand for cotton, owing to the diminished cost, would give them plenty to do, even in the cotton-field in picking-time.

It is not denied that the introduction of machinery into an established industry often seriously affects the laborer. To those who are able and willing to adjust themselves to the new conditions, the change is almost invariably beneficial.

Those who cannot, or will not, fare hard. Sometimes an invention wipes out a previously profitable industry; the only thing its followers can do under such circumstances is to try something else. Art is but little less merciless than nature; and with every step forward in civilization, the harder becomes the lot of those who lag behind. We have seen how inventions of the highest utility to the race may bear very heavily on moneyed interests for a time. It is equally so with labor interests. Take the supposed case of cheap aluminium. It would necessitate not only a large re-adjustment of capital, but a radical change of occupation on the part of thousands of more or less skilled workers in iron. Should any large body of them say, as they would be likely to: "We belong to the iron-founders' union; our business is to make iron; we wont have anything to do with your new-fangled metal, and we will destroy every clay-bank foundry you dare to put up," is it not certain that sooner or later they would go to the wall severely,—and deserve to?

The complaint that machinery robs the laborer of his only capital is entirely unfounded. Machinery never lessened the amount of work to be done, though it has constantly changed the character of the work. The labor-saving machinery employed in agriculture is almost entirely the product of the inventions of the past thirty years. In no part of the world has the introduction of such machinery been more general or more rapid than in the grain-growing states of the West. The result is shown in the census reports. During the ten years ending in 1860, the farm hands of those states increased in number more than fifty per cent. During the next ten, in spite of the losses of the war, the increase was about thirty per cent. During the same twenty years, the population of the country as a whole increased only sixty-seven per cent.

When Walter Hunt invented his sewing-machine in 1838, his wife protested that it would throw all the sewing women out of employment, and persuaded him to suppress it. Howe's and Singer's and no end of other machines have come since then, and yet there is work for women to do. Notwithstanding the thousands of family machines in use, the number of persons earning a living with the sewing-machine in this country is to-day much greater in proportion to the population than was the number of tailors and sewing women before the invention of the machine, which a recent pretended labor-lover has classed with the steam-engine as one of the two worst evils that ever befell mankind. In noting its influence upon labor, we must not forget the 20,000 or more mechanics employed in our sewing-machine factories, and the thousands of others engaged in mining and making the iron, cutting and sawing the lumber, and in transporting and preparing these raw materials for the machines and their cases; nor the men employed in making the machinery used in the construction of sewing-machines, and in transporting and selling the finished product. Counting these, the invention appears in its true light as a great creator of labor; and the average wages of the persons directly or indirectly employed by the sewing-machine is doubtless four or five times that of the old-time sewers.

It is but a little while since a metropolitan paper of high rank pointed to the shoe business as furnishing a forcible illustration of the disastrous competition of machinery with men. The truth is that while within twenty years, not less than eighty-five per cent. of the work done on factory boots and shoes has been turned over to machinery, there are to-day more men at work in shoe-factories than then, and more than would now be employed except for machinery. It is but another illustration of the old industrial paradox. During these years of rapid progress in invention, the cost of materials has advanced, wages have nearly doubled, and the quality of factory boots and shoes has been improved twenty-five per cent.; yet the cost of manufacture has been so much reduced by new and improved machinery that American shoes have not only excluded the foreign-made from our market, but have successfully invaded the markets of the whole world. As a natural consequence, many more shops are required not only in New England, but throughout the middle states and the West; more workmen are employed in shoe-factories; higher wages are paid; and a great multitude of other men are furnished with employment in tanning the additional leather used, in packing and transporting and selling the additional product, and in making shoe-makers' machinery and implements.

One of the prime conditions of our being able to manufacture for ourselves, let alone the outside world, is the improvement of mechanical processes due to our inventors. At least four-fifths of the industries of the country have been made possible by such means. Thirty-five years ago all carpets

were made by hand, and there was no labor so ill-paid in this country as to make carpet-weaving profitable among us; to-day our production of carpets is larger than that of any other nation. Then it took a man and a helper all day to make seven yards of Brussels carpet; now a girl tending an American loom will weave fifty yards in a day. Machinery does what hands could not; and so we owe to it an industry that yields over thirty million dollars' worth of useful and ornamental products a year; keeps at home many millions that formerly went abroad; and furnishes profitable employment to hundreds of native operatives.

Then think of the many labor-creating inventions, and the novel industries founded on them,—the printing press, the telegraph, the photograph, hard rubber, vulcanized fiber, artificial stone, building paper, electro-plating, the sand-blast, and a thousand other operations and products, which in the aggregate add enormously to the demand for labor. "New England has invested a great deal of capital in her leading manufactures," said a prominent eastern man, not long since; "yet her real strength lies in the numerous small things in which she stands unequaled. So many things are required in our civilization, that the absence of the very smallest of these 'Yankee notions' would be missed by thousands, both here and abroad." And by none would they be more missed than by the thousands of skilled artisans to whom they furnish steady and profitable employment. These Yankee notions are invariably patented; and they are an especial product of the American system. In Europe the same inventions could scarcely be patented; and, lacking the protection which a patent affords, they would never be largely or cheaply produced or generally adopted.

To the common assertion that machinery lessens wages and subordinates mind and muscle to brute matter, the proper reply is, where is the proof? It is only in machine-using countries that labor is at all well paid, and the pay is best where machinery is most used. The reports of our United States consuls may be studied with profit in this connection. A comparison of the wages paid to-day in our home industries of every sort, compared with those paid before machinery was introduced, and the purchasing power of such wages, will be equally instructive.

The complaint that machinery lessens the dignity and worth of industrial manhood has been conclusively answered by Professor Shaler. Says the Swiss centennial commissioner, Bally, in his pamphlet "Look out for yourselves," addressed to his fellow-manufacturers: "I am satisfied from my knowledge that no people has made in so short a time so many useful inventions as the Americans; and if to-day machinery apparently does all the work, it by no means reduces the workman to a machine. He uses it as a machine, it is true, but he is always thinking about some improvement to introduce into it; and often his thoughts lead to fine inventions or useful improvements."

In an appendix to the same pamphlet, after noting several lines of production in which American competition has become a serious matter to European manufacturers, and showing that in intelligence and productive capacity the Swiss workman compares with the American as one to four. M. Dubied says: "Our readers are perhaps astonished that we insist upon a patent-system as of the first necessity; but we shall justify this by showing that the protection of property in inventions develops the desire for technical instruction; while the absence of such legal protection is nothing less than a premium given to ignorance to the detriment of inventive talent."

Some years ago the writer described our Patent-Office as an industrial university of the best sort, doing true university work in examining and certifying the results of practical study. He has seen no reason for changing the opinion. No student ever prized a degree more highly than our mechanics do a patent; and the granting of a thousand or fifteen hundred patents a month means that no small portion of our industrial population are hard at work exploring "the untried possibilities of nature," as Professor Shaler happily expresses it. "So long as we can have this sort of training applied each year in larger and larger share to our trade life," he says, "we may feel the more hopeful of the educational influences at work in that part of society, we have therein something that gives in large part the character of results attained in scientific training of a high grade, as well as the general results which are attained by all well-directed training,—the habit of, and desire for, continuous, absorbing mental labor."

We have studied the patent-system with reference to the inventor, the manufacturer and farmer, and the laborer; and have found it, in the main, of vast and positive advantage to each. How does it affect society and social conditions generally?

Our answer would be: by extending the scope and capacity of life; by multiplying the comforts and conveniences of living; by cheapening and improving the necessities and attainable luxuries of all classes. It is invention, more than any other social factor, that makes it possible to say,—

"Better fifty years of Europe than a cycle of Cathay!"

How often do we hear the remark, such or such a thing is dear, because it is patented; when the real state of the case is, that if it were not for the patent, the thing would be unattainable at any price. In a speech against the patent-system before the Congressional committee already referred to, the attorney of the Western Railway Association said: "Even so simple a thing as a loaf of bread pays tribute to twenty-one classes of patents, in each of which many patents are now alive,—the plow-share, point, handles and tackle; the harrower, the seed-sower, the cultivator, the harvester, the thresher, and the separator; the bag, the holder of the bag, and the strap or string with which it is tied; the bolts, the hopper, the stones, and the gearing of the mill; the yeast or baking-powder, the oven, the extension table, and the dishes, are each subject to patents to which tribute is paid."

The inference he would have drawn from all this is, that the bread we eat costs more than it ought to by its share of each and all the alleged tributes. But that is arrant nonsense, as no one knows better, probably, than the clever advocate himself. A patent cannot touch what already exists except to improve or cheapen it. The only way in which it can be of advantage to the holder—except in rare instances where an invention may be suppressed to prevent costly changes in the holder's plant or processes—is by enabling him to offer an entirely new and useful article at a price the world will pay; an improved article at or below the current price; or a standard article below the current price. Otherwise there is no chance for him to compete with what already exists, and his patent is pecuniarily worthless. The possibility of any basis for the tribute-taking charge rests entirely on the assumption that the progress of invention would be the same in the absence of the patent-system,—an assumption which all experience refutes.

That the cost of our bread is affected by patents is most true; but not in the direction Mr. Raymond would have it thought. Note the general effect of two or three of them. The patented improvements in plows are many; those of Nourse in lines of draught, now generally adopted by plow-makers, reduced the cost of plowing, according to the practical tests of the New York Agricultural Society, forty-two per cent. Rating the cost of plowing at one dollar an acre, a low figure, this one improvement saves our bread producers not less than $50,000,000 a year. Another improvement, the substitution of chilled-iron for cast-steel in the mold-board of plows, lessened their cost considerably, and, it is said, doubled their durability. Taking the average life of the 5,000,000 plows in use throughout the country at five years, their annual depreciation from wear must be between ten and fifteen million dollars; half this sum saved in addition to the saving in cost, helps still further to cheapen bread. There have been many improvements in seeders during the past twenty years, in which time their price has been reduced some fifty per cent. One of the advantages of these machines is a regular placing of the seed at a depth sufficient to prevent winter-killing, making a gain, or preventing a loss, of from one-eighth to one-fourth of the crop of winter wheat. The lowest figure gives a gain of forty million bushels on a year's crop. By the celerity and cheapness of its work, the combined reaper and binder, which the "bread or blood league" object to, has proved its capacity to save the country $100,000,000 on the cost of a single years' crop,—another tribute which our bread not pays to, but is relieved from paying by, machinery. An Ohio farmer, as reported by Mr. Coffin, kept exact account of the cost of raising corn for three years, when approved double-shovel cultivators were used. The highest cost was twelve cents, and the lowest nine cents a bushel. Any one who has hoed corn by hand can estimate the probable saving per bushel by the use of machinery, and the aggregate saving on a crop of thirteen hundred million bushels. But that is not what attention is specially called to here. There are cultivators and cultivators. Using an improved machine, the same farmer kept account of cost for three more years, during which the highest cost was eight and a half cents, and the lowest seven cents a bushel. The difference between the use of a good machine and a better, would therefore appear to lie somewhere between $25,000,000 and $50,000,000 in the cost of one year's

crop. Any one who desires more abundant evidence on this and related points is respectfully referred to the arguments of Mr. Coffin and his associates, before the patent committee last winter. (Government Printing-Office: Washington, 1878.)

There remains to be noticed briefly the objection to patents which most people think they feel severely, and that is that they add to the necessary cost of industrial products a certain amount known as the inventor's royalty. Sometimes this is the case; but even at its worst the increase of cost is nothing like what is currently believed. On sewing-machines, for example, the royalties on all the patents used in a machine would not amount to a quarter of the fee of the agent who sold the machine; a charge that was not excessive, when we take into account the fact that the seller had not only to find his customer and persuade him to buy a machine, but also teach him how to use it. The cost of introducing new inventions is, indeed, one of the chief causes of their expensiveness compared with standard articles. This appears very strikingly in the case of agricultural machinery, the salesman's fee exceeding the inventor's aggregate royalty many times. The license fees covering all the patents on reapers have rarely exceeded $10; on the more expensive automatic binders they have been about twice as much,—not two per cent. of the saving effected by their use. The patents on all the great reaper inventions have run out. Any one is free to make machines like those which were considered almost perfect twenty years ago; but no one can afford to make them, because no farmer can afford to use them in competition with improved machines. The same is true in many other departments; in most textile industries, for example. Since 1860, there has been an entire revolution in cotton manufacturing; and if we may believe the testimony of Governor Swan of New Hampshire, himself a great manufacturer, machines in use ten years ago are obsolete to-day, and are broken up for old iron. Crompton's fancy-woolen loom marked an era in the history of that industry. In 1850 it threw the shuttle fifty times a minute; to-day the shuttle is thrown one hundred and eighty times a minute. The improved loom of 1876 produces sixty per cent. more than the loom of 1850, with a saving of fifty per cent. in labor, and more than that in repairs; yet Mr. Crompton says that as regards capacity the power-loom is still in its infancy. His pay as an inventor would add but a fraction of a cent to the cost of each yard of the product of a loom,—or a small fraction of the saving effected by the improvement.

From the inquiries made by our State Department, already referred to, it appeared that inventors' royalties would not average five per cent. of the cost of patented articles, most estimates falling far within this limit. The aggregate royalties on all the machinery used in shoe-factories was given by the representative of the Shoe and Leather Association before the patent committee, as three and a quarter cents a pair for fine sewed work, and two cents for pegged work; and a prominent manufacturer assured Mr. Storrow that the royalties on all the machines used in the best equipped shops were less than would be the rent of the additional room that would be required to do the work by hand. In multitudes of cases, where the inventor is also the manufacturer, the advantage of the patent lies solely in enabling him to produce a better article than his competitors, at or below the current rate.

It is needless to pile up evidence of the value of inventions as factors of individual and national prosperity. They are the mainspring of industrial progress, and to a large extent they furnish the motive power as well as the means and conditions of our modern civilization. If the world still remains a hard place for the incompetent, the thriftless, the uncivilized, it is no worse than it always has been, though its contrasts may be greater. The inevitable struggle for existence never has been, nor is ever likely to be, very pleasant to those destined to go under. On the other hand, life is on a higher level now than ever before; more can enjoy it, and the facilities for, and the scope of, human comfort and happiness to-day are infinitely beyond what was possible before the age of invention set in.

For a very large share of all that makes life better worth living now than a century ago, we are indebted to American inventors; and if American inventors are more active and fertile than those of any other nation, as all nations admit, it is because our patent-system reaches a larger proportion of the population. It is this feature of the system that the thoughtful of other lands were quick to appreciate when they saw its effects at our Centennial Exhibition,—the feature which all have promptly imitated in their new or amended systems. Said one of the

commissioners from Switzerland,—which has since substantially adopted our system,—"Many European states have also a patent-system; but as they see in it, first of all, a source of revenue to the state, those of moderate fortune can hardly obtain a patent. In Europe the inventor anxiously hides his secret from all eyes until he is in possession of a patent. The Americans do not know this uneasiness, for there an inventor alone can take a patent, which he afterward has the right to sell if he pleases. Every intelligent man has thus before him the possibility of a fortune, often by a very slight improvement, and this keeps in ceaseless activity the intelligent part of the population."

Said one of the English commissioners, Sir William Thomson: "Judged by its results in benefiting the public, both by stimulating inventors and by giving a perseveringly practical turn to their labors, the American patent-law must be admitted to be most successful, and the beneficence of its working was very amply illustrated throughout the American region of the Exhibition, where indeed it seemed that every good thing deserving a patent was patented. I asked one inventor of a very good invention, 'Why do you not patent in England?' the reply was, 'The conditions in England are too onerous.' * * * England undoubtedly loses much of the benefit which might be had from the inventiveness of Englishmen, through the want, in English patent-law, of encouragement and protection to inventors unsupported by capitalists."

Stress is laid upon this point here, and upon the merits of our patent-system as a whole, that popular attention may be sharply called to the general excellence of the system, and the need of watchfully guarding it from the attacks of those who mean it harm.

Very few are aware how seriously the integrity of the system was assailed in Congress last winter, or how near the assault came to success, owing to the ignorance of many members from the West and South with regard to its nature, purpose, and influence. The attempt is sure to be repeated; and though the unjust and destructive tendency of the more obnoxious amendments proposed was well exposed in committee, the work may have to be done over again the coming winter. The subject deserves thorough discussion; and it is hoped this paper may be instrumental in provoking such discussion.

THE POET'S FAME.

MANY the songs of power the poet had wrought,
To shake the hearts of men. Yea, he had caught
The murmuring and inarticulate sound
That comes at midnight from the darkened ground
When the earth sleeps; for this he framed a word
Of human speech, and hearts were strangely stirred
That listened. And for him the evening dew
Fell with a sound of music, and the blue
Of the deep, starry sky he had the art
To put in language that did seem a part
Of the great scope and progeny of nature.
In woods, or waves, or winds, there was no creature
Mysterious to him. He was too wise
Either to fear, or follow, or despise
Whom men call Science,—for he knew full well
What she had told, or still might live to tell,
Was known to him before her very birth:
Yea, that there was no secret of the earth,
Nor of the waters under, nor the skies,
That had been hidden from the poet's eyes;
By him there was no ocean unexplored,
Nor any savage coast that had not roared
Its music in his ears.