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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 251,

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THE RELATIONS OF CHEAP PATENTS TO INDUSTRIAL PROSPERITY.

The factors of American prosperity are many.

We have a magnificent country, to begin with; a territory of continental scope, made fruitful by a climate unsurpassed in kindly adaptation to needs of varied agriculture and the requirements of industrial activity. Our mineral resources are unrivaled in richness and variety. Our complex population embodies no small part of the best pluck and energy and intelligence of all civilized nations. Our free institutions favor individual and associated activity in all legitimate directions. With us men are respected as men and honored according to their deeds; the thoughtful laborer, whose practical sense or constructive ability adds new force or utility or convenience to the common possessions, far outranks in popular estimation the thoughtless inheritor of wealth or social position, however honored or useful his ancestry may have been. The laws are framed to guard the rights and liberties of all; and each man's sphere of action is limited only by the inevitable limitations of his personal force, intelligence, and integrity.

Under such conditions progress and general prosperity would seem to be inevitable, so inevitable that minor conditions might be safely left out in taking account of the great factors of national well being. But other nations, which do not share our present prosperity, are not destitute of like conditions favorable to industrial success. Some in addition enjoy age, the prestige of power, long accumulated wealth, an industrial history covering many generations, and priority in the markets of the world, which unite to give them advantages over the most favorably situated new country with its newly established industries. In the front rank of such countries stands Great Britain, which for many years has been the workshop of the world, and still retains a commercial supremacy which tells immeasurably in favor of her mechanical industries, in giving them a commanding position in the world's markets. Yet the trade of Great Britain languishes under a serious depression, which threatens to become permanent through the increasingly successful rivalry of other industrial nations—Germany, Belgium, France, and pre-eminently the United States.

The causes of this relative if not absolute industrial decline on the part of Great Britain is not far to seek. At a recent meeting of the Institution of Mechanical Engineers a prominent speaker charged the responsibility upon British inventors and engineers. They had failed to keep abreast of the times. They had allowed the inventors of other countries to displace their products even in British markets. The question was taken up at the August meeting of the London Association, and while the inaction of British inventors was admitted and deplored, the blame was traced to the working of the British patent system. Said the essayist of the occasion, Mr. John Standfield: "The chief cause of our commercial suffering and stagnation is a barbarous law, which to a very great extent prohibits science from developing the resources and strength of the empire." Just before Mr. Standfield had attributed the rise and progress of the British empire wholly to the inventive genius of its people, coupled with the manufacturing resources of the country, pointing out the fact that the great and important inventions patented in England during this century have not only contributed more to the greatness of the empire than all that was done during the previous five centuries, but have brought nearly all of the wealth which England now possesses. Even where the sources of national wealth lay underground, in mines of coal and iron and copper, such wealth could never have been developed except for machinery invented for the purpose. But invention is now less active in England than in France, Belgium, and the United States, and England is losing ground in consequence. This loss of trade, says Mr. Standfield, "may be directly attributed to our (*i. e.*, England's) driving abroad or suppressing a very large portion of the seeds of our prosperity. America is the only great country that treats practical science fairly, and she is consequently our principal competitor." Further on Mr. Standfield says:

"The cheap patent law of the United States has been and still is the secret of the great success of that country. . . . The invention we suppress takes root freely in the United States, which, consequently, supplies our marts with large quantities of labor-saving tools, whereas if our laws were fair and equal we should supply their marts, and use the proceeds for purchasing their grain without impoverishing our country by a great loss of capital as at present."

In the subsequent discussion this point was dwelt upon at great length. How can it be expected, it was asked, that English engineers and inventors can compete with their brethren in the United States when the American can get twenty-five patents for the money which has to be paid for one in England? Very few inventors can pay the fees demanded by the English Patent Office. "The result is," said one speaker, "one-third of our inventors are driven to America, and another third are buried, the secret of their invention still with them." And this obviously covers but a part of the national loss, since the possible but never-to-be developed inventors in English workshops probably outnumber many times the actual inventors who undertake to put their ideas into working shape. This was put very clearly by one of the speakers. "He had heard it said in every quarter of the globe that English workmen had little or no inventive genius, although they improved things very well, but upon examination he said it would be found that the names to most of the American patents were English names; and he felt certain that, if the cost of a patent in England were the same as in America, instead of 5,000 patents, the English should take out 45,000 to the Americans' 30,000. If placed on the same footing as the United States, a great impetus to trade would follow. It was evident that there was something wrong when America could pay £9 where England paid £6 per ton of iron, and 9s. instead of 6s. per day for labor, and yet beat the English in the open market. He thought it was the duty of the Board of Trade, when the country was losing its trade, to inquire as to the cause of it. There was only one reason for it, and that was the abundance of labor-saving tools used by the Americans, because their mechanics could get all their appliances protected so cheaply."

In the course of his remarks the essayist pointed out that by suppressing native genius through heavy patent fees, England had driven away many national industries in which she had once held a foremost place. The pianoforte trade was one, London being rapidly stocked with instruments made in New York. The watch and silk trades had been driven out of Coventry and Clerkenwell, while machine-made watches were being developed in America, where labor was 50 per cent dearer. Said the speaker: "The American cheap patents and labor-saving tools alone account for Coventry's and Clerkenwell's misery and decay, and for England's serious loss of revenue and national income. If our workmen were allowed to become inventors they would prove quite as well able to design and manufacture machinery for the construction of cheap watches as the Americans. On the present system our best mechanics, if they have any ambition, are compelled to emigrate to America, where alone they can find an opportunity of utilizing their genius."

Further on the speaker said: "The American patent laws have given the inventors of such small but generally useful articles as sewing machines such a good opportunity of universally introducing their inventions that it is now not worth the while of any manufacturer here or elsewhere to attempt to compete with the American houses. There are 4,000 skilled artisans employed in the United States in this small manufacture alone. While American organs of numerous descriptions are not only excellent but cheap, there is not a single cheap English organ known to the public.

"What has occurred to our piano and watch trade is now occurring—if it has not already occurred—in regard to the manufacture of locomotives and many other manufactures, to the partial ruin of our trade, wealth, and empire."

We might continue these forcible and instructive citations, but the limit of our space forbids. The arguments brought forward to prove from American experience not only the sound policy but the absolute necessity of lower patent fees in England are not needed here. The moral of the discussion, however, should not be overlooked by the friends of American industry. While our greatest rival in the industrial world is learning from our experience the wisdom of extending to inventors the encouragement which comes from a just and inexpensive recognition of their rights the American people must not be deluded by specious sophistries into an abandonment of the position taken by the framers of our Constitution with regard to inventions and letters patent therefor. The wisdom of granting patents for invention is no longer a subject for discussion. The sound policy of carefully guarding the inventor's rights, against infringements, and of keeping down the fees for issuing the necessary papers, is equally well established. Yet as soon as Congress meets again we may expect a puzzling variety of covert assaults upon the patent system under the guise of bills for the amendment of the patent laws—assaults which will demand the constant watchfulness of every friend of American industry. Inventors and their friends should see to it that they are not misrepresented at Washington by men uninstructed with regard to the uses and benefits of the patent system. They should take pains not to further the election of candidates known to be in sympathy with those who have sought and still seek to break down the legal safeguards of the property rights of inventors and patentees, as provided by the patent laws. They should take especial pains to lay before their representatives in both houses such information as will enable the framers of our laws to avoid the snares which clever agents of anti-patent associations are sure to weave in bills ostensibly drawn to "promote industry" and "encourage invention," or to protect the "innocent" users of what does not belong to them.

"MALARIAL" FEVER IN NEW ENGLAND.

Undoubtedly "malaria" covers a multitude of sins of ignorance on the part of physicians, almost every malady, the nature of which is not readily understood, being attributed in professional parlance to malaria or malarial complication. Still there is evidently some malefic influence, whether in the air, in the earth, or in the waters under the earth, that has been causing in New England the past summer almost as much suffering as the break bone fever has occasioned along our Southern coasts.

The history of the "malarial wave," as it is called, and its progress eastward and northward, is instructive. For forty years preceding 1865 New England had been practically exempt from the troublesome "chills and fever," "fever and ague," or "malarial fever," which prevailed more or less generally further West and South. There had been an epidemic of it after the war of 1812, and an earlier wave had

passed over the country after the war of the Revolution. As in the earlier instance, so in the later civil war, the return of afflicted soldiers from malarial regions was followed by a slowly developing malarial epidemic. The first cases among the stay-at-homes appeared along the railway traversing the shore of Long Island Sound. Gradually it spread into the interior, most rapidly along lines of public works. The upturning of new soil was supposed to cause the extension of the plague, though the same sort of work during the preceding forty years had never been followed by such results. It will be remembered that just after the war was a period of public improvement; in every thriving town streets were laid out and graded; public waterworks were introduced, and gas pipes were laid down in many villages—all requiring the employment of large gangs of laborers, recruited largely from the ranks of lately returned soldiers. It seems to us altogether more likely that the germs of the succeeding epidemic of "malarial" fever were imported by men who had taken the disease while on duty in the malarial regions of the South and West, than that they were developed or brought to the surface by the displacement of raw earth.

Very probably the interference with lines of natural drainage, incident to the construction of railways, waterworks, and the like, and the ponds and ditches left where earth had been taken out for embankments and roadways, furnished many appropriate places for the multiplication of the imported malarial germs. At any rate the progress of the epidemic was largely governed, if it was not hastened, by the progress of such works. Once widely prevalent, as it became in the course of four or five years along the main line of railway towns near the Sound, the natural movement of population sufficed to carry the epidemic into the interior.

Its progress up the Connecticut and other rivers and along lines of railway communication was traceable year by year, until there came a season, like the past summer, when the climatic conditions seem to have been specially favorable to the spread of the malady, and it became exceedingly prevalent, both as a distinct disease and an element complicating the symptoms of other diseases.

In the early part of the season the State Board of Health of Massachusetts undertook to investigate the subject, and has collected a mass of evidence which can hardly fail to throw a clearer light upon the nature and conditions of the epidemic. From reports in local papers it is clear that the troubles attributed to malaria have prevailed to an alarming extent, particularly along the Connecticut valley. Cases have appeared in every town from Connecticut to Vermont; and in Springfield, Holyoke, and other large places the number of cases has been very great. Heretofore this region has been not only a healthy one, but exceptionally free from troubles of this nature. In the Housatonic valley, in southwestern Massachusetts, around Barrington, for example, hitherto one of the healthiest districts in all the land, the malarial epidemic has been the severest ever known in New England. The disease is described by the visiting physician of the Board of Health as a genuine intermittent fever, many of the cases being very severe. The disease has attacked all classes of persons, some living at considerable distances from supposed malarial centers, and it counts its victims among the old, the middle aged, and the young, among new residents, old residents, and casual visitors.

The manner in which the epidemic sweeps through regions previously proverbial for their salubrity, seems to show that the disease is not of local origin and cannot be "in the air."

Before the results obtained by the inquiries of the Board of Health are compiled and digested, any opinion as to the actual propagation of the epidemic can be little better than a guess; nevertheless it may be safe to express the strong suspicion that wells and water courses, tainted by the fecal discharges of victims of the disease in one form or another, are more likely to prove the distributers of the poison than cold winds, night air, emanations from swamps, or any other purely aerial or malarial agency.

THE REVIVAL OF AMERICAN COMMERCE.

A commercial convention, called by the New York Board of Trade and Transportation, met in Boston, October 6, fifty-one important mercantile associations being represented. The chief subject proposed for consideration was the revision of the navigation laws under which the supremacy of our country in its own carrying trade has been lost. In 1855 American vessels carried $405,000,000, and foreign vessels $131,000,000 of our exports and imports. In 1879 foreign vessels took $911,000,000, and American vessels only $272,000,000. The greater part of our merchant marine is now engaged in the coasting trade, while its aggregate tonnage is more than a million tons less than it was twenty-five years ago.

The great question is, How are we to recover our commercial standing among commercial nations? At this writing but one session of the convention has been held. The problems which the delegates have in hand are of national magnitude, and of the most far-reaching importance. It is devoutly to be hoped that whatever decision they may arrive at may be such as will hasten the restoration of our mercantile marine to the honorable position it held before the war. During the past twenty-five years our mechanical industries have been pushed to the front rank among those of industrial nations. The next twenty-five years should see as marked an advance toward American commercial supremacy.

BENJAMIN PEIRCE.

In the death of Professor Benjamin Peirce, October 6, in the forty-seventh year of his professorship at Harvard College, America loses one of its ablest mathematicians and scientific men. Prof. Peirce was born in Salem, Mass., in 1809. He was graduated at Harvard in 1829; became tutor in 1831, University Professor of Mathematics and Natural Philosophy in 1833, and Perkins Professor of Astronomy and Mathematics in 1842. Between 1836 and 1846 he published a series of mathematical text-books, which, though never widely adopted in schools, have had a marked influence upon the mathematical teaching of this country. The founding of the observatory at Harvard was brought about by his lectures on the comet of 1843. His investigations in connection with the discovery of Neptune in 1846 made his name known and honored the world over. In 1849 he was appointed Consulting Astronomer to the "American Ephermis and Nautical Almanac," for which he prepared a volume of lunar tables in 1852. The results of his labors on Saturn's rings were published between 1851 and 1855. His valuable services in connection with the United States Coast Survey led to his appointment as superintendent of that important work in 1867, an office which he held until 1874.

His "Treatise on Analytical Mechanics" appeared in 1857, and in 1870 was published an edition of 100 lithographed copies of "Linear Associative Algebra," a work remarkable for the power and boldness of its reasoning. More recently he delivered a course of Lowell lectures on "Ideality in Science," in the course of which he made the remarkable statement of problems of cosmical physics printed in this paper about a year ago.

FIREPROOF FERRYBOATS.

The repeated demands of the public for the use of fireproof material in building passenger steamers for inland navigation seem likely at last to be complied with. A company has been formed with a capital of $10,000,000, to build excursion steamers for use in the waters around New York. They are to be not only indestructible by fire, but also impossible to sink. The use of fireproof material for the upper works and water-tight compartments in the hulls should be made compulsory in the construction of all new steamers carrying passengers on the inland waters of the country. In view of the fearful accidents that have happened ever since steam navigation became general, it is strange that such conditions have not long since been required of our shipbuilders; but evidently this greatly-needed reform will be brought about by the operation of that much-abused doctrine, the "survival of the fittest;" for if the public is offered a choice between a floating fire-trap, liable to be sunk like an egg shell, and an equally elegant but fireproof and non-sinkable craft, the fire-trap will soon cease running for lack of patronage.

But the excursion steamers are not the only vessels for which these reforms are urgently demanded. The ferryboats plying in the North and East Rivers, sometimes carrying more than a thousand passengers at a trip, are equally important subjects for radical treatment. It is true that there have been few serious accidents attended with large loss of life on these craft; but the possibility, yes, the extreme probability of such accidents, cannot fail to strike any one; built of light wood, thickly painted, oiled, or varnished, they would burn with great rapidity even with little draught; but when it is remembered that they are so built as to create the strongest kind of a draught throughout their whole length, it will be seen that within 20 minutes of an outbreak of a fire, there would be nothing left to burn. The greater part of the passengers would be burned or drowned, and there would be only a small number saved under favorable conditions; but if, for example, the fire started while the boat was in a pack of heavy ice midway in the river, there would be hardly a score escape alive. Such an accident happened on a Philadelphia and Camden ferryboat several years ago, but by great good luck the fire broke out on an early trip in the morning, when very few persons were on board, so that the loss of life was small.

Even a false alarm of fire would cause many deaths, since the panic that would result on board a ferryboat of the present style would drive a large number overboard. Some would voluntarily spring into the water to escape death by burning, while others would be forced over the side in the struggle of those in the center to get out.

All these dangers would be avoided if every passenger knew that the boat could neither burn nor sink; under such circumstances the cry of "fire" would produce no panic, and even in the most serious collision the passengers would know that there was no danger after the first shock. For these reasons it is evident that the proposed reforms in excursion steamers should be hastened into effect upon the lines of ferryboats also. But it is here that they will be slowest to make their way. The ferry routes are monopolies; their proprietors fear no competition such as threatens the owners of excursion steamers; they have large amounts invested in their present craft, and they will not voluntarily abandon these boats and go to great expense for others unless compelled to do so. If resort be had to Congress or the State Legislature to compel the needed change by statute, the companies have both money and influence enough to delay long, if not wholly to prevent, the passage of the requisite laws; consequently they can be reached only through their pockets or through the influence of an overwhelming public opinion. As before stated, they are independent of competition, and therefore it is difficult to touch their pockets; hence public opinion alone is likely to bring about the desired change. Now, if they are called upon to abandon their present boats and build others of far more expensive types, they will stand a great deal of pressure from that indefinable force known as public opinion before they will yield—the great loss and expense involved will have the greater weight; but if any one can devise a plan by which their present fleet of steamers can be rendered fireproof and non sinkable for a moderate outlay, there is little reason to doubt that they would be apt to regard such an improvement favorably. For example, the light woodwork of these boats has one advantage over iron; it will float if detached from the hull containing the boilers, engine, etc. Hence, if it can be rendered fireproof, the problem is solved at once. All that will be necessary will be to have all that portion containing the cabins, roadways, etc., detached from the hull, so that, no matter what might happen, the most important portion would readily float with all the passengers. Panics could be averted by numerous signs: "This boat can neither burn nor sink." The hull of the ferryboat should extend to the guards, which should project, as at present, beyond the upper works. These latter could be removed, made fireproof, and replaced at no great cost. The upper portion should then be built upon a heavy flooring, which should be wholly detached from the hull. To prevent displacement of one upon the other, vertical bolts should be used which would keep the two parts in position, but offer no resistance to as eparation on account of a downward strain. The shafts, wheels, and walking-beam should be so arranged as not to have any connection whatever with the upper works, and in case anything should happen to cause the hull to sink, it would go to the bottom, and leave the great box containing the passengers floating on the surface.

The inventor who can render wood fireproof without seriously impairing its buoyancy, will have not only the ferryboats, but the whole fleet of wooden passenger steamers, to remodel. If the new company successfully carries out its present programme, the old craft must conform to the new condition of absolute safety or go out of business. There is no more profitable field open for an inventor than a solution of the problem: How can a wooden steamer be rendered fireproof and non-sinkable at the least cost?

DESIGNS PRODUCED BY CRYSTALLIZATION.

A French inventor noticed the manner in which watery vapor in a warm room congeals against the glass during frosty weather and forms needle-like crystals, interlacing one another like the threads of a tissue. This observation gave him the idea of producing designs for textile fabrics by crystallizing various salt solutions on a sheet of clay. He first tried the sulphates of copper, zinc, iron, alumina, and magnesia. He covered five clean glass plates, each with the solution of one of these salts, placed them in a horizontal position, and allowed them to crystallize slowly by evaporation. He found further that the crystal form became more suited for his purpose when he added albumen, gum, starch, or gelatine to the solution, while at the same time the crystals became more resistant. He found also that different temperatures influenced the forms of the crystals, and that he could produce fantastic trees, flowers, stars, arabesques, roots, and even insects of interesting design. He went through many experiments, and ended by making the figures obtained permanent by electrotyping, for which purpose he caused the solutions to crystallize upon strong plates of copper or German silver. A clean sheet of lead, placed on the finished crystallization, gave, by hydraulic pressure, a metallic counterpart of the same. Or he used sheets of softened gutta percha, which received the impression and could be used in making a copper deposit in the electric bath.

The great problem, however, was to produce a continuous design which would fit around the rollers with which the patterns are printed on woven fabrics. The detached productions of the crystallization on his plates did not satisfy this condition. He substituted, therefore, in place of his flat plates, metallic cylinders similar to those used for producing the rollers for calico printing. By slowly turning them around their axis, while the solution on their surface evaporated, he obtained a design which satisfied the wants of the printer and the weaver for a continuous design without break in the whole length of the cloth.

There are, however, some objections left. The crystallization is capricious and not sufficiently even and uniform, often leaving blanks which are larger than are agreeable to the purchaser of the fabric; but this may be overcome by experience and precaution. Another objection, however, appears impossible to correct. The two sides of the patterns do not match when different widths are joined at the selvedge of the cloth. It is argued that this is of minor importance, as generally dressmakers and tailors pay no attention to it.

Jacob Boll.

Prof. Jacob Boll, of Dallas, Texas, died September 29, while engaged in scientific exploration in Wilbarge County, of that State. Prof. Boll was a Swiss naturalist and geologist, a favorite pupil of Agassiz, and a man of distinguished scientific reputation. His name is honored in the Harvard Academy of Science, in Philadelphia, Paris, Geneva, Berlin, Zurich, and other seats of learning in Europe. In Texas, in the absence of a State geologist, for six years past his labors have been of great value to science and to the State.