

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.

(Established 1845.)

One copy, one year, for the U. S., Canada or Mexico.....\$3 00

One copy, six months, for the U. S., Canada or Mexico..... 1 50

One copy, one year, to any foreign country belonging to Postal Union 4 00

Remit by postal or express money order, or by bank draft or check.

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

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(Established 1876)

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NEW YORK, SATURDAY, MARCH 28, 1896.

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THE PROPOSED INCREASE IN OUR NAVY.

It is announced from Washington that the House Naval Committee has recommended that an appropriation of over \$30,000,000 be made for the addition to our navy of four battle ships and fifteen torpedo boats. This would be double the amount of any previous naval appropriation.

The SCIENTIFIC AMERICAN has for many years realized that our national defenses, both on sea and land, were not keeping pace with our commercial growth. We have been favorable to such a reconstruction of both forts and navy as should enable our country to present an impregnable line of defense against the attack of any enemy or possible combination of enemies.

We have always felt, moreover, that such efforts of reconstruction should be directed toward this one single object of defense; and that the sums of money appropriated for this purpose should be distributed between land and sea defenses in such proportion as to secure the most effective results.

In view of the fact that we are a Republican and not an Imperial people, whose interests are domestic and not colonial, we have always felt that the sphere of our naval and military operations lay, or should lie, within our own shore lines, and that therefore our coast fortifications should be regarded as being practically our first line of defense; and that our navy should be considered as complementary to our land defenses, and should be designed strictly with a view to co-operation with the forts in our various roadsteads and harbors.

We have noticed with regret, and some measure of apprehension, that, while naval appropriations have been forthcoming at a rate that has created a complete modern navy in a few years' time, the land fortifications, which, as we have seen, should be considered as our first line of defense, have been practically neglected. So antiquated are the old fortifications, and so incomplete the new, that for purposes of co-operation with the navy they are of very limited value.

Now, in view of the foregoing considerations, we think the time has come for the government to bend its whole energies to bringing our land fortifications up to their proper strength relative to the new navy.

While fully appreciating all that has been done in the past, we cannot help thinking that the government has attacked the problem of national defense at the wrong end. If only a part of the money which has been expended upon the navy had been devoted to constructing a system of land defenses, this country would to-day have been impregnable against attack from the sea and would have possessed the nucleus of a very respectable navy besides.

The Endicott Board of 1885 devised a complete system of land defenses, which included every maritime city of importance. The total estimate for this scheme was about \$100,000,000. We have spent upon the new navy about \$110,000,000 up to date. If the above scheme had been carried out, there would now have been mounted at our various seaports no less than 1,576 guns of 8 inch caliber and upward, as against the present 136 guns in the navy, and 360 rapid fire guns against the navy's 187.

Such a comparison as this calls for no comment, further than to say that a gun mounted within the shelter of a fort is worth at least two mounted on the unstable and exposed platform of a ship's deck.

The arguments in favor of concentrating our energies upon our land defenses rather than upon our navy are both practical and ethical—these latter being based upon the spirit of our constitution and upon those broad principles which dominate our national life, and give us our strong national individuality.

The practical arguments were admirably classified by Senator Proctor in a recent speech before the Senate, and we give them in full:

First. That a proper system of land defenses will make our great cities safe from any naval attack.

Second. Such a system can be constructed for a sum many times less than the cost of a navy like the great navies of Europe, and for a sum that may reasonably be expended.

Third. Land fortifications are much more efficient for coast defense than a navy, and when once constructed are durable, cheaply maintained and easily strengthened.

Fourth. The defense of our cities cannot be left to the navy alone, however large.

Fifth. A navy that would equal the great navies of Europe is unnecessary, and its cost makes such a navy impracticable.

Sixth. A navy quickly deteriorates and is expensive to maintain.

Seventh. The construction of land defenses should always precede the building of a navy.

The ethical argument can be briefly stated by saying that when we have adequately provided for home defense, our duty in the matter of military and naval preparation is done. Our navy should be of such proportions only as are necessary for successful co-operation with the land defenses. Our naval programme should be laid down with strict regard to a home, as

distinct from a foreign—a Republican, as distinct from an Imperial policy.

Great Britain's navy, by way of example, has been called into existence by the exigencies of the defense of an empire whose widely scattered colonies bring her into hourly danger of conflict with any one of a dozen different governments. The secret of the strength of our great republic lies not merely in the political and geographical union of its many States beneath one flag and within a single boundary line, but also in the fact that it has been both able and willing to concern itself with its own internal development, and has in the past and we hope it will in the future carefully abstain from embarrassing entanglements with the affairs of other peoples and nations.

The building up of a navy of European proportions would be a distinct departure from the national traditions above mentioned, and would involve the entering upon a policy whose execution would be as exhausting to the national treasury as its principles would be opposed to the spirit of our constitution, and subversive of the brightest hopes of its founders.

WEATHER TESTS ON THE NEW YORK UNDERGROUND TROLLEY ROAD.

In our issue of February 22 we gave a fully illustrated description of the underground trolley system now in operation in New York, and stated that it could not be called experimental in the usual sense, as the line was in daily operation and gave the greatest satisfaction. Nevertheless, there are some engineers who have claimed that, though the open conduit might stand the trial of ordinary weather, it would inevitably break down under the attack of a heavy storm of snow and rain. Such a trial was had on Monday, March 16, when a total fall of ten inches of snow was recorded; and the way in which the Lenox Avenue road endured this supreme test proves that the conduit system, as carried out in New York City, is a distinct success, even under the most trying conditions.

It commenced snowing at noon on the previous Sunday, and continued to snow more or less for twenty-four hours; the total fall being ten inches. During Monday afternoon the snow gave place to rain and sleet, and the streets were soon deep in a heavy slush. On Tuesday the rainfall was exceedingly heavy, and this, combined with the rapidly melting snow, put a heavy tax upon the surface drainage system of the city, and incidentally upon the cable and electric conduits of the Metropolitan Company.

The operation of the Lenox Avenue and Lexington roads was carried on throughout the storm without a break. There was no short circuiting, nor any delay that could be attributed to failure of the purely electrical part of the plant. The large amount of surface drainage was carried off without inconvenience; and the water in the conduit was never high enough to threaten the insulation, or in any way interfere with the current.

There are twenty-one cars on the Lenox Avenue line, and they were all in constant operation; nineteen of them running on the regular service and two of them acting as snow sweepers.

The full number of trips was made, and the time that was lost on each trip was due entirely to the slipping of the wheels, and to the increased resistance due to the deep snow. As soon as the electric sweepers had cleared the track the regular schedule time was maintained.

The seven cars on the Lexington Avenue line had a trying experience throughout the whole of Monday. Owing to the scarcity of sweepers, the tracks were not cleared, and the tracks were covered with four or five inches of slush. In spite of this, schedule time was maintained, and there was not a case throughout the whole storm of a "grounded plow."

The Lenox Avenue cars are run under a two and one-half and three minute headway, and the actual running speed is about ten miles an hour. That this service should have been maintained under such trying circumstances for the greater part of forty-eight hours without any breakdown or apparent distress, either in the power house or on the line, is a fact well worthy of record; and the advocates of the open conduit system will write the item down in red ink in their note books.

THE GOVERNMENT TESTS OF THE STRENGTH OF TIMBER.

When the government determined to undertake an exhaustive series of tests of the strength of native American woods, the fact was received by builders and engineers with much satisfaction. It was realized that the publication of the results of these tests would fill a long felt want.

The United States are rich in all kinds of timber, and especially in those woods which are suitable for structures which have to carry heavy loads. The great pine and fir forests of the extreme Northern and Southern States, with those that clothe the lower slopes of the Cascade and Rocky Mountains, have contributed to our agricultural and commercial development to an extent that is little understood. Without the cheap and abundant timber with which the pio-

near railroads were able to span broad rivers, and throw lofty trestle bridges across the innumerable ravines and canyons of our mountain passes, our great system of transportation could never have been so rapidly developed—that is, its development would have had to wait for the capital and time necessary to the erection of more costly steel and iron structures.

In addition to the extensive use of timber in heavy structural work such as bridges and buildings, a large amount is used annually in the construction of rolling stock in the form of both freight and passenger cars, as well as in the various minor branches of the engineering and building trades.

It is a surprising fact that, until the above mentioned government tests were undertaken, there had been no systematic attempt, on a large scale, to ascertain the exact strength of the various kinds of American timber. The tables contained in the engineering textbooks had been drawn up from tests of a limited range, and of more or less imperfect execution. As a consequence they were—and indeed are to-day—viewed with more or less distrust by engineers and builders. The result of this is that motives of self-protection will lead the designer to select the larger rather than the smaller figures, and his structures will be more bulky than reasonable safety demands.

The government tests were undertaken with a view to providing a table of the strength of timber which should include not only those woods which are used in the heavier structural work to which we have referred, but also the woods which are used in the various arts and manufactures. Timber, again, is so variable in its quality, that it is necessary to test a much larger number of specimens than is customary in the case of iron and steel, in order to get a reliable average of its strength. Writing on this subject to Walter G. Berg, C.E., of the Lehigh Valley Railroad, Dr. Fernow says:

"You will, however, understand that this test work differs from other testing done hitherto, in that it places reliance only on large numbers. Hence, for instance, the 276 tests on Oregon fir would hardly warrant us in drawing any conclusions. They are not better than any other tests, except that their moisture condition is noted, which is, to be sure, one important advantage.

"On the other hand, for the Southern pines we may claim to have such a series of data as to make it unnecessary for anybody else to test these timbers again; they cover such a large number, under all sorts of conditions, that absolute confidence in the reliability of the data for the range of strength in the species should be accorded to them.

"At the same time the confusion existing in engineers' tables with regard to the kind of pine (names or species) should not be permitted any longer, especially since the various species promiscuously referred to as Southern pine, yellow pine, pitch pine, etc., differ up to 20 per cent in average strength values."

How elaborate were these tests, and how great will be the value of the results, may be judged from the fact that over 20,000 separate tests were made on the Southern pines alone.

Altogether about 40,000 tests have been made to date. Of these, only the Southern pine tests have been published; and a large mass of unpublished tests, to the number of 20,000, remain pigeonholed for want of the small appropriation necessary to cover the expense of printing. A bill making special appropriations for the continuance of this work has been introduced into the Senate, but its passage is regarded by Dr. Fernow as exceedingly questionable. If the work should be stopped, it will be a great loss to the industrial world at large. Nothing reliable is known about the strength of our Maine and Michigan timber, nor of that which comes from the great forests of Washington, Oregon, and California. It is quite possible that the lumber interests, especially of these Western States, are suffering because the high average of elasticity and strength of their timber has never been reliably tested, and is, therefore, not known. Proof of this was made recently at Tacoma, when a comparative test of Douglas fir with Eastern oak showed a decided superiority for the Western timber. Nothing short of certified government tests would enable the fir to compete in the markets as a structural material with the renowned Eastern oak.

The cost of completing this good work would not be great. Compared with the value of the results, it would be very small. Engineers, architects, builders, and, indeed, all workers in wood, ought to use their influence to secure the completion of a work that so vitally affects their interests.

The Effect of a Cannonade.

Sir William Thomson has recently been making experiments to discover what the effect of a cannonade of quick-firing guns would be on board the vessel firing and the ship subject to the fire. He finds that after fifteen minutes' firing the survivors of the crews of both vessels would be reduced to a state of mental, if not physical incapacity, owing to the concussion of the projectiles on the sides of the vessel and the noise of the guns.

The Rights of the Machinery Inventor.*

When purchasing an equipment of machinery, the mill owner takes upon himself the risk of being called upon to pay for one or more of each line of machines the second time. The average mill owner may, however, find considerable satisfaction in knowing that in these days a patent gives to the holder only a presumptive right of property. When it is infringed—no matter how wantonly—the trespasser is permitted to protect himself by proving at the trial that the invention was first made by some other person, and not by the plaintiff; though it may have been kept a profound secret, and would never have seen the light, but for the subsequent invention of the patentee; or he may defeat the action by showing that the same contrivance is described in some publication printed in any foreign language, and which publication was never seen or heard of in this country before the date of the trial when this proof is made.

The liability to be set at defiance in this matter continues throughout the entire life of the patent. And no matter how often the validity of the patent may be established in court, it is equally liable to be called in question on any new trial. The evils of the present law are that there is a great deal of uncertainty in the mode of ascertaining what really is a new invention. Hence, when a patent has been granted, if it is of such a nature as to lead to competition, infringements are almost matters of course, and the only mode of discovering and checking the infringement is so tedious, costly and ineffective that inventors generally pass their lives in constant litigation, fighting in detail a succession of imitators who often have nothing to lose by defeat, and therefore entail all the greater burden on the legitimate manufacturer. The disheartening and prostrating influence that this is calculated to exert upon those who devote their lives and energies to the actual improvement of the milling and mechanical arts, and to making those discoveries which have given a character to the present age, can readily be perceived without comment.

In the opinion of many, however, any remedy that can be contrived would be more to be feared than the evil which was sought to be remedied. But is there any good reason for such a conclusion? Why should the holder of a patent, which is presumptive evidence of title, be forever liable to have his right called in question by every mere trespasser? Such a course is not permitted in relation to any other species of property. The wrong doer is not in other cases permitted to protect himself by calling in question the title of him who has prima facie evidence of ownership. Why should he do so in relation to this species of property? It is true, that if a patent should be granted for a machine already in common use, and which is therefore fully the property of the public, any person sued as an infringer should be permitted to protect himself by showing the facts of the case. But why should a person who has trespassed upon what he does not pretend to be public property be allowed to defend himself by showing the property to belong rightfully to some other individual?

The analogies of the law relating to tangible property lead to this same conclusion. If one person make an inclosure upon the lands of another, his right of action against any trespasser is complete and unquestionable. But if he were to inclose a portion of the public highway, no such action would be maintainable, for his inclosure is itself a nuisance, which any one may disregard or remove. Analogy also suggests another provision, still more important and effectual. So great are the evils resulting from uncertainty of title to real estate, that in most of our codes means are provided by which the presumptive owner may file a bill in equity, and bring such uncertainty to an end. Is there anything in the species of property we are considering which renders a similar provision out of place or objectionable? If the holder of a patent were permitted, under proper regulations, to file a bill to quiet his title, either in one of the federal courts already organized or in a special tribunal created expressly for that purpose, would not the result prove as harmless and as beneficial as though the patent were for real estate? The patentee would then be enabled to feel that security which would give double value to his property, and would be free from that continued series of vexatious lawsuits which often render the most valuable inventions the sources of continual annoyance, if not of eventual pecuniary ruin to their authors.

As a short and effectual remedy for all these difficulties, it is the opinion of some who have thought upon this subject that the whole system of granting patents ought at once to be abolished. But is it not one of the cardinal purposes in the establishment of all governments to protect the citizen in undisturbed enjoyment of his property? This species of property is by the Constitution placed under the special guardianship of Congress, and it is difficult to perceive why it is not as much entitled to legislative favor and protection as any other property. If inventions are not to

be made capable of being effectually appropriated, why should lands, or any tangible article of personal property, be so? And yet no one proposes to return to the savage state, so far as these kinds of property are concerned. To do so in regard to inventions would be a retrograde to civilization, as well as a departure from the plainest principles of justice.

No title can be more unquestionable than that resulting from discovery, unless it be that which is derived from actual creation. The recognition of either, if not instinctively in the brute, is certainly found in the lowest and most uncultivated orders of human intelligences. The bird seems to have a sense of property in its nest, the beast in his lair, the savage certainly in the cave he has discovered or the weapon he has made. Even the first occupant of a tract of land, which he has neither discovered nor created, has a title which, in the absence of a better, is protected by the governments of all civilized countries. To none of these is the title of the inventor at all inferior. He has created or discovered all that he claims the right to possess. The property for which he asks protection might never have existed but for him, who has created it out of nothing. At least, he has called it into active being, and made it the servant of mankind, subject to the limited right of ownership, which he claims for himself. Were the law to afford no protection to the inventor, his only means of reaping any particular benefit from his invention would be by hiding it from the knowledge of the world, as in Turkey the peasant secretes his wealth lest it should become the prey of that rapacity against which the laws afford no sufficient protection.

Taking it altogether, reforms in the operation of the United States Patent Office will be difficult to accomplish. The Patent Office, silent and unobtrusive in its course, connecting itself with none of the agitations of the day, and demanding nothing from the public treasury, can only ask the assent of the national legislature to such an arrangement of its instrumentalities as shall secure efficiency to its action.

From New York to Paris by Land.

Mr. Harry de Windt is an Englishman, but was born near Paris, in 1856. His father was English and his mother French. He has already distinguished himself by the expeditions which he has made under difficult conditions. He has been to Siberia three times: in 1887, in 1890, and in 1894—his mission this last time being to visit the Russian prisons—and finally he crossed Asia and Europe, going by land from Peking to Calais.

Upon his return from his last journey, he conceived the idea of a new expedition, says the *Tour du Monde*, which he has now undertaken. He took passage on an American vessel, the captain of which—an experienced sealer—told him that he had crossed Behring Strait on the ice seven times. Mr. De Windt decided immediately that he would try to go from New York to London by Alaska, Behring Strait, and Siberia, and he has just started for America, where he will begin his journey, giving a series of lectures in the cities through which he passes. At San Francisco he will find his servant, George Harding, who was his faithful companion in his former expeditions, and whom he has charged with the preparation of all baggage necessary for the expedition. At Vancouver he will meet Captain Adair, the sealer whose stories gave him the idea of crossing Behring Strait, and who will accompany him. Mr. De Windt expects to leave Vancouver by the end of March with a party of Indians or half-breeds.

The crossing of an unknown part of Alaska will be attended with considerable difficulty, and, in fact, danger. Nulata will be the last inhabited point of American land passed by the expedition, which will, from there, ascend Cape Prince of Wales, so as to cross the strait at the narrowest point. Mr. De Windt expects to cross on sledges drawn by dogs and to strike land in Asia at East Cape, from which he will direct his course to Iakoutsk. He has set eight months as the probable length of time required by the journey, a most difficult one because of the cold incident to four months of polar night. The crossing of Behring Strait will take about twelve days, on account of the numerous accidents that will be liable to occur to the sledges.

Mr. De Windt expects to return to London in the autumn of 1897, and he calculates that his long journey will cost him over \$25,000.

THE deepening of the Hudson to 12 feet, as far as the State Dam, seven miles above Albany, will probably be completed within the next two years. The improvement projected and being carried out by the federal government calls for a channel 12 feet deep and 400 feet wide to the foot of Broadway, in Troy, and a channel 300 feet wide, but of the same depth, to the State Dam, at the head of navigation. The contracts for this work, let in 1893, cover the removal of 4,620,000 cubic yards of earth and 190,000 tons of rock, and the building of 8 miles of dikes. The estimated cost is \$2,500,000.

*By Charles Mason, in *Milling* of February, 1896.