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SCIENTIFIC AMERICAN SUPPLEMENT

No. 691.

For the Week Ending March 30, 1889.

Price 10 cents. For sale by all newsdealers.

THE NEW COMMISSIONER OF PATENTS.

The President has appointed Mr. Charles E. Mitchell, of Connecticut, to be Commissioner of Patents. Mr. Mitchell is a man of the highest ability, wide influence, exalted character, clear judgment, a successful and experienced patent lawyer, and prompt and vigorous in action. No one could be better qualified for the duties of the Commissionership. Mr. Mitchell is about 53 years of age and a native of Bristol, Conn. He is a graduate of Brown University. He has occupied several important public positions, among them that of State Senator, but for the most part his energies have been devoted to the practice of patent law. His nomination as Commissioner of Patents gives general satisfaction. It is conceded on all sides that under his administration the affairs of the Patent Office will be ably conducted.

WAR MATERIAL OF AMERICAN DESIGNING.

The world moves so fast and improvements follow one another in such rapid succession that the work of original designers is often lost amid a maze of modifications, and the imitator becomes famed above the artist. If we turn to modern war machinery, we shall find apt illustrations of this, and in most of the effective material in the great European armaments behold the cunning fashioning of the Yankee inventor. Admiral Porter has told us that the guns at Hampton Roads—the Monitor and Merrimac fight—resounded through the world and announced to the British that their great steam fleet—the finest in the world at that time—was obsolete. The great iron fleets of to-day have been developed from this Monitor germ. The liquid compass, that makes it possible to navigate iron and steel ships, is the invention of Mr. Ritchie, of Brookline, Mass.

The world talks of the Krupp gun, yet how few are aware of the fact that it was only through the invention of the American Col. Bradwell that Herr Krupp was enabled to make his guns effective? Gen. S. V. Benet, Chief of Ordnance, U. S. A., speaking on this subject, says:

"All modern steel guns are of one or two systems, either the Krupp bolt system or the interrupted screw used in the French service. Our guns are of the latter system, which seems to offer the greatest advantages. Like all good modern inventions, it is an American one. So, for that matter, is the Krupp, or rather what gave Krupp's invention the practical value. The great trouble with the Krupp gun was the escape of gas at the breech. This was overcome by the aid of the 'Bradwell plate,' the invention of Colonel Bradwell,* an American who sold Krupp the invention. It consists of a thin steel plate, with elastic edges, that fits in the breech, and the pressure of the gas wedges it tightly against the sides and prevents the escape of gas."

The machine gun, that terrible weapon now so important a part of the great European armaments both on land and sea, is primarily an invention of the American, Dr. Gatling; the French mitrailleuse is a modification of it, so is the Nordenfelt. In June, 1883, Nordenfelt brought suit against Gardner, inventor of the Gardner machine gun, for infringement. Gardner showed that the principles on which the Nordenfelt gun was constructed had long been developed in the American Gatling machine gun and Winchester rifle, indeed long before 1873, when Nordenfelt got his English patent. It may fairly be said that this principle has found its highest development in the automatic gun of the American, Hiram Maxim, a gun which will fire 600 shots a minute; the recoil being utilized to load and fire and to keep a stream of water moving about the barrels for cooling. The disappearing gun mechanism is also his invention. The screw propeller, an invention that makes it possible to sink the motive power of a war ship, within and without, out of range of flying shot, though first tried in British waters, found no favor till Captain Ericsson came hither. The revolver, now in universal use, is, as everybody knows, the invention of Col. Colt, of Connecticut. We may add to the list the dynamite gun, yet in the infancy of its development, and the dynamite cruiser, intended to make up for its shortcomings in point of range, of which an English authority recently said there was not, probably, a ship afloat that would be safe before it. The torpedo, now holding so important a place among war material, was first made practicable and effective during our last war; its cousin, the automobile torpedo, of comparatively recent designing, is also American, though there are several foreign forms of the same.

WANTED—A FIRST CLASS GUN.

Now that we are building a new navy, and Congress, with the people at its back, ready to grant the money, there is more encouragement for inventors of war material than at any time since the civil war. In the matter of ships and guns alone there is a large and rich field for ingenuity. Admiral Porter and other reliable authorities say that among the great modern European fleets, of which we have heard so much, there is not one effective line-of-battle ship—an assertion which recent performances of these unwieldy monsters in sham battle seem to fairly sustain; and there are other authorities, and good ones too, who insist that the big guns of these same fleets are constructed on a false interpretation of the natural laws, and that, when they are put to a severe test, will fail.

"Gun tests in Europe," says a writer—an ordnance officer—"are private affairs. Guns fail without the fact becoming known outside of the small circle of officers assigned to be present at the butts. Who can say how many of these failures there are?"

For long it has been known that there was something amiss at the great gun works at Terre-Noire, and recently the cause has appeared. The French, who long since adopted the American (Rodman) system, began at these works to construct guns on the built-up plan, but there were so many failures—the test being only forty rounds—that the project was given up. And of this Rodman system some of the best authorities say it has no equal, and may be applied to cast steel as well as to iron. By it guns are cast hollow and then cooled down from the interior, so that the interior, being first solidified, is compressed and supported by the contraction of the outer parts when they subsequently cool down. A gun thus made being fired, the compressed inner portions expand under the influence of the powder gas to and beyond their natural diameter, the strain going at once to the outer parts. By this system, it is said, a 200 ton gun may be made just as securely and surely as one of the old 15 in. or 20 in. smooth bore guns.

Mild cast steel is thought by many to offer superior advantages for great-gun making, being stronger and more homogeneous than wrought iron. It is stronger, too, than cast iron, though not more homogeneous. Mr. William Metcalf, for many years connected with the old Fort Pitt foundry, and now engaged in making steel, speaking of the application of this famous system of casting to steel, says:

"If ordnance constructors could only be made to understand that cast steel is only cast iron refined and strengthened; that every rule, every property, every characteristic, of one is common to the other, only differing in degree; if they would realize that Rodman reached the perfection of science in manipulating crystalline metal, American guns of cheap cost and sure value would soon be as far ahead of the composite failures of Europe as the great cast iron Columbiads of our war days were ahead of anything the world had ever seen up to that time. It has cost Europe many millions of dollars to secure a feeling of safety against those old Rodman guns, and yet there is not a really safe, well designed, mechanically constructed great gun in Europe to-day, and it is safe to say there never will be one that is made by hammering or pressing. What America needs is another Rodman to develop his principles again, and so place our armament away in advance of anything that has been done anywhere in the world."

POSITION OF THE PLANETS IN APRIL.

VENUS

is evening star until the 30th, and then morning star. She is in inferior conjunction with the sun on the 30th, at 9 h. P. M., passing between the earth and sun, and reappearing on the sun's western side. Her charming presence in the western sky will be greatly missed, for she has reigned there without a rival for many months, but she will be equally brilliant in the eastern sky as morning star, passing through the same phases in reversed order. Venus sets on the 1st at 9 h. 35 m. P. M. On the 30th she rises at 4 h. 33 m. A. M. Her diameter is 43".2, and she is in the constellation Aries.

JUPITER

is morning star. He is on the meridian on the 1st, at 6 h. 32 m. A. M., and at the close of the month will rise soon after 11 o'clock in the evening. His size and brilliancy are increasing as he approaches the earth, and he is at this stage of his course a beautiful star from midnight till dawn, well worth the trouble of rising early to behold. Jupiter rises on the 1st at 1 h. 11 m. A. M. On the 30th he rises at 11 h. 20 m. P. M. His diameter on the 1st is 37", and he is in the constellation Sagittarius.

SATURN

is evening star. He is on the meridian on the 1st, at 8 h. 23 m. P. M., is retrograding, and slowly increasing his distance from Regulus. On the 13th he is stationary, and on the 17th he changes his course, moving eastward and approaching the bright star. Saturn sets on the 1st at 3 h. 25 m. A. M. On the 30th he sets at 1 h. 32 A. M. His diameter on the 1st is 18".2, and he is in the constellation Cancer.

URANUS

is morning star until the 9th, when he becomes evening star. He is in opposition with the sun on the 9th, when he is at his nearest point to the earth, as far from the sun as possible, rising at sunset and setting at sunrise. He may be readily found on account of his vicinity to Spica, the brilliant star that rises about sunset in the southeast at the time of his opposition. Careful observers will find Uranus about 2° north of Spica, shining as a star of the sixth magnitude. A small telescope will transform the tiny star into a small sphere of a

* According to the patent, this should be Broadwell.

delicate green tint. Uranus rises on the 1st at 6 h. 54 m. P. M. On the 30th he sets at 4 h. 5 m. A M. His diameter on the 1st is 3".8, and he is in the constellation Virgo.

MERCURY

is morning star until the 25th, and after that time evening star. He is in superior conjunction with the sun on the 25th, passing beyond the sun, and reappearing on his eastern side to pursue his short course as evening star. Mercury rises on the 1st at 5 h 6 m. A. M. On the 30th he sets at 7 h. 24 m. P. M. His diameter on the 1st is 5".6, and he is in the constellation Aquarius.

MARS

is evening star. He approaches the sun with laggard steps, and ceases for the present to be of any account for terrestrial observers. Mars sets on the 1st at 8 h. P. M. On the 30th he sets at 7 h. 54 m. P. M. His diameter on the 1st is 4".2, and he is in the constellation Aries.

NEPTUNE

is evening star. He sets on the 1st at 10 h. 16 m. P. M. On the 30th he sets at 8 h. 27 m. P. M. His diameter on the 1st is 2".5, and he is in the constellation Taurus.

Mercury, Mars, Neptune, Saturn, and Uranus are evening stars at the close of the month. Venus and Jupiter are morning stars.

The Cause of Earthquakes.

At a recent meeting of the Manchester Geological Society, Mr. Thomas Oldham read a paper on "The Cause of Earthquakes, of Dislocation and Overlapping of Strata, and of Similar Phenomena." The author said this was a subject which had caused much perplexity and doubt in the minds of many eminent geologists, in endeavoring to account for the cause of some of the greatest phenomena in nature continually taking place. These were the cause of earthquakes, the dislocation and overlapping of strata, and the submerging and upheaval of continents, etc.

The hypothesis he intended to submit was based upon purely physical laws, and he had often felt surprised that such views had not previously been promulgated. He must premise by stating it had been ascertained that this globe is about nine miles smaller in diameter at the poles than at the equator; in the next place, it was known that the globe rotates on its axis at about 26,000 miles every twenty-four hours, which is nearly equal to the speed of a cannon ball.

Another thing that had been ascertained was that the axis of the globe is gradually altering by becoming more oblique, and that it requires about 39,000 years before this alteration arrives at its maximum. When they took into consideration the great velocity at which the globe rotates, it was evident that a large amount of centrifugal force must be exerted, and as Nature never did anything without a motive, it would be seen that this force is the cause of the globe being nine miles different at the equator and the poles. As the axis got gradually more oblique, so the direction of the equator would alter.

It is supposed that the crust of the earth is only about fifteen or sixteen miles in thickness, and below that distance there is a mass of incandescent minerals. This has been proved, in one way by mining, where they find in sinking the first 1,000 feet the temperature rises very considerably, and becomes greater as they get lower. In order to bring these things practically before them, he would suppose a model to be made to represent the globe in exactly the same proportions as they stood toward each other, and for this purpose he would take a mass of some plastic material, say potter's clay, of sufficient consistency to allow of its being formed into a sphere of about 9 feet in diameter; he would then pass an iron rod through it, and connect the whole with a steam engine to obtain the required motion. If they gradually raised one end of the axis, the equator would get more oblique, and more toward the north or south as the case might be. It is known that centrifugal force acts not only at right angles to the earth, but has also a lateral motion.

Astronomers told them that the deviation of the axis arrives at its maximum every 39,000 years, so that consequently the south pole, when the climax occurs, would occupy the place where the north pole is now.

It was supposed that the last great climax was a glacial one, and there are plenty of evidences to prove this. In the river Amazon, which is now exactly on the equator, there are many evidences of glaciers, and in like manner these are also come across in northern latitudes. When they looked upon human life in comparison with geological ages, the life of a man seemed but an atom, and their historical records only went back 2,000 years, anything further being purely legendary. It was supposed that at one time the spaces now occupied by the Atlantic and Pacific Oceans were large continents, and when naturalists go up mountains, they frequently come across beautiful specimens of conchology which could only have got there by the upheaval of oceans. These changes, the author concluded, were the source of much perplexity to geologists, and were of great interest.

Northern Pacific Railway—Canadian Extensions.

There is a new factor in Canadian railway enterprise in the introduction of a series of lines promoted by the Northern Pacific. This company, whose transcontinental line from Tacoma on Puget Sound to Duluth on Lake Superior is the main competitor of the Canadian Pacific, proposes to construct a series of railways in Canada which will afford a new outlet from the great Canadian Northwest wheatfields to the Atlantic, and will seriously interfere with the existing arrangements of the Canadian railways, and completely destroy the monopoly held by the Canadian Pacific over certain districts in the Northwest.

The question of the level crossings of the Northern Pacific extensions in Manitoba, bitterly fought through all the courts of law, and settled adversely to the Canadian Pacific, has stirred up an amount of irritation against the latter company which is not shared alone by the Northern Pacific, and this year that railway is promoting a series of acts in the different legislatures that point to a very important increase in the mileage and importance of these Canadian extensions.

The Northern Pacific lines actually built or building comprise at present three lines in Manitoba, the first from Winnipeg city to the boundary line due south about 65 miles, where it connects with a branch of their railway, forming an independent line between Winnipeg and St. Paul. This line is finished and working. By an arrangement with the Hudson's Bay Company the railway secured an excellent block of land in the heart of the city of 30 acres with a water frontage on the Assiniboine River, on which elevators and warehouses have been built, and extending across to Main street, on which the company propose this season to build a capacious central hotel with a first-class railway station and running shed behind it for their trains, forming for both purposes decidedly the best location in the city.

Branching from this line immediately south of the Assiniboine River, which is the southern limit of the city, the second line turns off, and running due west again crosses the Assiniboine in 60 miles, and in five miles more reaches Portage la Prairie, where it crosses the main line of the Canadian Pacific to a junction with the Manitoba and Northwestern Railway, which commences at Portage, and is now open about 250 miles in a northwest direction toward the comparatively well settled farming district of Prince Albert on the Saskatchewan River. This line, 65 miles long, is graded, and the rails will be laid early this spring. A third line, on which at present but little work has been done excepting the acquisition of the right of way, commences at Morris on the first line about 20 miles north of the International Boundary, and runs northwest about 130 miles to Brandon, where a second crossing of the Canadian Pacific enables it to form a junction with the Northwest Central Railway now making to Battleford. All these lines are building or built under the authority of acts passed by the Manitoba Legislature, but as the Canadian Pacific have raised the question of the validity of these charters (although the only two branches they have constructed themselves in Manitoba have been under the same authority), the Northern Pacific have an act before the Houses at Ottawa giving them the fullest powers, which doubtless will become law, and overrule these objections.

Besides this, they are obtaining power in the local legislature to extend a branch from the Morris and Brandon Railway to the Souris coal field in the southwest of the province; and in the Quebec Legislature they have three bills, which, if presented and completed, will give the Northern Pacific and the Grand Trunk—for it is an open secret that they are working together in these extensions—a new line from Ottawa direct to a port on the Gulf of St. Lawrence, 500 miles nearer to Europe than Quebec or any other Canadian port excepting Halifax, and open for a much longer season than any part of the St. Lawrence. For the interest of Canada this extension to the peninsula of Gaspe is very desirable, and it places the whole Atlantic connection between Canada and Europe on a much better footing than it now is, bringing the nearest port to a point only 2,000 miles distant from Ireland, and opening up to commerce the excellent harbor of Gaspe, one of the finest and most capacious ports in existence, but at present useless for general commerce.

The Northern Pacific during the last twelve months have very much improved and consolidated their system, and though the total mileage is not much increased, only 77 miles during the year, many of the short lines built are of great importance to the whole system. The short line from Pasco to Kennewick substitutes an all-rail route for their through traffic for an objectionable ferry over the Columbia River, the bridge over which consists of nine steel spans of 250 feet each and one drawbridge of 235 feet opening.

The rapidly increasing ocean traffic from the Pacific has necessitated some extensive alterations at Tacoma, the western terminus, where nearly three miles of additional sidings with other conveniences and extensions have been made during the year. The increasing development of the mining industry of the eastern slope of the Rocky Mountains has required a complete rebuilding and remodeling of the station and yards at Helena, which is now the principal intermediate station on the transcontinental line, and where six miles of additional siding accommodation has been made. An important line, the Central Washington, is under construction through what will shortly be a new State, and a line from Cheney to Devonport, 40 miles long, is nearly complete. Altogether, the past year has been a prosperous and important epoch in the development of the Northern Pacific.—*Engineering.*

Prizes for New Inventions.

A grand exhibition of safety apparatus is to be held at Berlin next summer, and the magnitude and importance of the undertaking is beginning to be appreciated. Until recently its character and scope were misunderstood. It is not to be a mere collection of apparatus and devices for the protection of the persons of workpeople, brought together to promote the interests of a small number of manufacturers. It will be rather a great industrial exhibition, superior to any yet held in Germany. A number of industrial operations will be carried on within the spacious building now in course of erection. Among these will be spinning, paper making, corn grinding, brewing, chocolate making, shaft sinking by the Pœtsch freezing process, and other mine engineering work. This exhibition may be justly regarded as international.

Prizes have been offered for the following inventions: A prize of $2,500 for a satisfactory means for preventing the inhalation of dust in mills for grinding basic slag, a prize of $1,000 for a similar means applicable to the mercury vapor in mirror factories, and several smaller prizes for a more efficient brake for the wheels of brewers' drays.

Analyzing Steel and Iron for Structural Purposes.

The extreme accuracy required in the chemical analysis of steel and iron for structural purposes has become so great that chemists find that the errors of weighing, also those which are personal to the operator, and those due to the process employed, are sufficient to cause considerable confusion in a comparison of the results of analyses. To remedy the evil, the *Railway Review* states that Prof. J. W. Langley has proposed that a system of international standards of iron and steel be obtained, and his plans have met with approval. The method of procedure is to have a number of ingots of steel cast in lots whose composition shall be as near as possible 1·3, 0·8, 0·4, and 0·15 per cent of carbon respectively. These lots are kept separate. The skin of each ingot is to be removed and the metal then cut into fine shavings, which shall be crushed, sieved, and intimately mixed. These shavings shall then be hermetically sealed and an equal portion sent to each of the five countries which have entered into the plan, namely, Sweden, Germany, England, France, and the United States. The committee in each country shall then carefully analyze their samples, and averages of all the analyses of each lot be taken as the correct ones. The remainder of the metal in the hands of the committee shall then be held for distribution in the countries in which they are located. A chemist, by an analysis of a sample thus obtained, can find a factor by which he must multiply his results to make them agree with the international standard.

The Decimal or Metric System.

The metric system is about 100 years old, it having been first proposed in 1790. Since its introduction it has been adopted by the following countries: France, French Colonies, Holland, Dutch Colonies, Belgium, Spain, Spanish Colonies, Portugal, Italy, Germany, Greece, Roumania, Mexico, New Granada, Ecuador, Peru, Brazil, Uruguay, Argentine Confederation, Chili and other South American States, Austria, Norway, Sweden, Switzerland, Venezuela, Hayti, Mauritius, Congo Free State.

Its use is permissive in Great Britain, India, Canada, and the United States.

There are no tables connected with this system; none are necessary; one unit is tenfold another unit. The whole system can be stated in a single sentence: Measure of lengths, in meters; measure of capacities in liters; measure of weights in grammes; using decimal fractions for divisions. The measure for land is the square of the measure for length, the square of a chain of ten meters giving 100 square meters as a unit for land measure; and the square of 100 meters is the agrarian unit, equal to about two and a half acres.

THE hygroscopic quality of table salt, and its tendency to pack together in cruets and containers, may be entirely overcome by thoroughly drying the salt and intimately mingling with it a small percentage of dry corn starch or arrowroot. From 8 to 10 per cent is amply sufficient for the most humid atmosphere (as on the sea coast), while a much less percentage of the starch is sufficient for inland points.—*St. L. Med. and Surg. Jr.*