

lamp. The latter is not fastened to the carriage, and can be removed by a couple of men and carried to any culminating point in the vicinity, while the vehicle remains where it is.

The engraving given herewith represents the type adopted for the French army, which at present possesses light apparatus of the kind. One of the apparatus was shown at the recent exhibition of electricity by the Minister of War, and another by the house of Sautter & Lemonnier.

The projector, which was devised by Colonel Mangin of the French army, is 40 centimeters in diameter. The Gramme machine gives a light equal to 600 Carcel burners. The apparatus thus arranged permits of the exploration of the country to a distance of 2,400 meters, and even of three kilometers if the weather is sufficiently clear.

There was also exhibited at the Palais de l'Industrie another type designed for forts of the first category, but on the same system. This was experimented with for a long time at Mont-Valerien, and it was found that an observer standing alongside of the apparatus could see objects located at a distance of more than six kilometers, and distinguish details of construction at five kilometers. With so great a power as this, it is naturally necessary to employ less portable machines than those above mentioned, and the projecting apparatus and the generator of electricity have to be carried on separate carriages.

We shall now briefly point out the peculiarities of these two essential parts.

What constitutes the originality of the Mangin projectors is the form of the mirror. It is well known that in order to reflect the rays diverging from a lamp into a fascicle of parallel rays, it is only necessary to place the lamp in the focus of a parabolic mirror. Now the construction of parabolic curves is difficult and expensive, so Col. Mangin conceived the idea of employing glass cut with two spherical surfaces, thus facilitating the labor. These two spheres must not be concentric, and calculation permits of finding the degree of eccentricity with which the ray, emanating from one of the centers, is sufficiently parallel in practice (though not geometrically so) with the diameter which joins the two centers to give the fascicle all the power desirable. It is easy to verify the fact that the convex surface has a greater radius than the internal cavity; or, in other terms, that the thickness of the metal in the center is less than at the edges.

A biconvex lens, interposed between the luminous focus and the reflector, diminishes the focal distance, and, consequently, permits of reducing the dimensions of the projector.

Col. Mangin likewise employs a dispenser, the object of which is to spread out horizontally the fascicle obtained—height being of slight importance. It appears that this arrangement has been somewhat criticised, as it diminishes the intensity of the light produced. "The projectors being movable," say the adversaries of this system, "their field may be extended, without any loss of illuminating power, by a simple displacement."

Let us now pass on to the source of electricity. The Gramme machine, adopted in France, Russia, and Norway, is actuated by a three-cylinder engine on the Brotherhood system. The electro-magnets are flat and very wide, and the bobbin has two current collectors. The elements may be coupled for tension or quantity by means of a commutator mounted on the machine, and the changes may be effected instantaneously.

When the electro-magnetic parts of the machine are coupled for quantity, it revolves at the rate of 600 revolutions per minute, with an expenditure of a power of four horses, the light produced varying from 1,000 to 1,200 Carcel burners. When coupled for tension, the machine revolves with a velocity of 1,200 revolutions per minute, with an expenditure of eight horse power, and gives a light equal to 2,000 to 2,500 burners. With such a power, and by the use of projectors 90 centimeters in diameter, ordinary writing may be read at a mile distant, as has been shown by experiments made at Berlin in 1875. By placing in front of the regulator a mirror inclined toward the horizon it has been found possible to project on the clouds a luminous band which, from a distance, looked like the tail of a comet, and on which (as on the screen exposed before a lantern) exhibited themselves such signals as were made in front of the mirror.

There is thus realized, then, a system of optical telegraphy in which the Morse alphabet is employed as a means of correspondence.—Revue Industrielle.

Verdict of the Coroner's Jury, Jewells' Mills Explosion, Brooklyn, N. Y.

"We find that Levi J. Stevens came to his death on the 16th day of February, 1882, by the explosion of two boilers belonging to the Jewell Milling Company. We believe and find that the sole responsibility for said explosion rests upon the Hartford Boiler Insurance Company; and we hold said company responsible for the death of Levi J. Stevens, in giving permission to the Milling Company to carry an amount of steam which the age of the said boilers did not warrant, and which, in the jury's estimation, said boilers were unable to carry. We are of the opinion, and recommend, that boilers be tested in the future by both the hammer and hydrostatic test."

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NEW YORK, SATURDAY, MARCH 25, 1882.

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For the Week ending March 25, 1882. Price 10 cents. For sale by all newsdealers.

Table listing contents of the supplement, categorized into I. ENGINEERING AND MECHANICS, II. TECHNOLOGY AND CHEMISTRY, III. NATURAL HISTORY, ETC., and IV. MISCELLANEOUS.

PROPOSED AMENDMENTS OF THE PATENT LAWS.

Elsewhere will be found the text of a bill (H. R. 4,949), introduced in the House of Representatives, March 6, by Mr. Morgan R. Wise. Most of its features are highly commendable.

The first clause aims to prevent fraud upon "innocent purchasers of patent rights" by making it the duty of intending purchasers of such rights to take reasonable precautions against being cheated; such precautions as any intelligent business man would be sure to take, or would regard himself foolishly careless if he did not take.

This clause strikes at the root of much of the complaints against the patent system. Men who stupidly or with criminal intent purchase alleged patent rights without investigation should blame themselves and not the Patent Office when their ventures prove unprofitable. They have no right to pose as innocent victims of the law, or to besiege Congress for relief from their folly at the cost of honest inventors and patentees.

The latter part of the section provides a fine not exceeding \$1,000, or imprisonment not exceeding three months, or both, for fraud in the selling of patent rights by the use of forged or altered patent specifications, claims, or drawings.

The second section of the bill provides corresponding penalties for fraudulent patent sales, wherein the seller pretends to convey rights or privileges which have previously been disposed of, wholly or in part, to others.

Section 3 is designed to facilitate the work of the Patent Office, and enable it to comply with the terms of the law without antedating or reallowing patents the final fees for which are paid at the end of the six months' limit.

Section 4 makes it possible for the owner of a properly assigned patent to obtain a reissue without the signature of the inventor, who has ceased to be a party in interest.

Section 5 makes the life of an American patent absolute, and not as now contingent upon the life of any foreign patent upon the same matter which the inventor or another may have taken out. This is a proper and very desirable provision.

Section 6 contains two provisions, both commendable. The first is that a reissued patent shall not cover any machine or article the production of which was begun during the existence of the original patent, but not subject to it. When an inventor omits to claim what he might properly have claimed in a patent, it is fair that he be allowed to correct the oversight within a reasonable period; but it is not fair to allow him to make the correction the means of dispossessing or restraining another in an industry lawfully begun. The latter part of the section provides that the surrender of a patent for reissue shall not cause any forfeiture of rights which had accrued under the patent previous to its surrender.

Of the forepart of section 7 we cannot speak so favorably. It fixes a price for the Patent Office Gazette to American subscribers very much lower than its actual cost, and provides a higher rate for foreign subscribers. The office would receive no benefit from this discrimination, for the simple reason that the foreigner would buy through an American agent. The purpose of the diminished price is to diffuse mechanical knowledge and encourage invention. The diffusion of knowledge is no part of the function of the Patent Office; the encouragement of invention is; but the method prescribed by the Constitution for the carrying on of this desirable work does not include the publication at a loss of Official Gazettes or any other literature, however valuable or useful.

The proposed reduction in the price of copies of patent specifications, claims, drawings, and related matter seems to be entirely reasonable. If incorporated into the patent laws the first section of the bill would create a largely increased demand for such papers, and the prices named would appear to be ample to cover cost.

The sections of the revised statutes which section 8 would repeal relate chiefly to the extension of patents granted prior to March 2, 1861—sections which expire by natural limitation this year.

The provisions of this bill, with the single exception noted, are so well calculated to "amend" the patent laws in the best sense of the word, that its early passage is much to be desired.

In place of the objectionable portion of section 7, we should be glad to see a clause making it the duty of the Commissioner of Patents to provide in the Patent Office better facilities for an examination of its records. The records are intended to be, and to a great extent are, open to public inspection; but in the absence of special provision for such work it is practically impossible for an inventor, an intending purchaser of patent rights, a manufacturer, a student of any department of invention, or other citizen, to make an examination of the records of the office that he can be sure is complete and thorough.

What is needed is a room or rooms set apart for the purpose indicated—a place where the searcher could have brought to him for examination copies of every record relating to the subject he is investigating; a room provided with complete indexes of all the records of the office, in charge of attendants able to aid and advise the searcher, as a competent librarian aids the searcher for special information in a great library.

Something of this nature would be of great public utility, and the need of it must increase with time and the rapidly accumulating records of the office. The patents in many departments are now so numerous that even at the low price

fixed for them in the bill in hand, few inventors could afford to buy them all, and if they could it would in many cases be much more advantageous to search the records on the spot.

THE CHINESE CRAZE.

The civilized but sadly unenlightened world is just now grievously afflicted with crazes, due, let us hope, to the culmination of the period of sun spots, and, like the solar disturbances, likely soon to wane and leave the world sane again.

One, perhaps the worst, symptom of the malady shows itself in malignant attacks by the noble Caucasian upon so-called inferior races, because of their unwarranted successes in the struggle for wealth and position. In Europe the terrible Shemite is the victim. The Jew is essentially bad, and a peril to Christian civilization, because he is industrious, thrifty, prudent in business, and determined to get on in the world. He wickedly amasses wealth, crowds himself into high places in the professions, in art, in literature, and threatens to make himself the political as well as the financial master of Europe. So the noble Caucasian cries "down with him!" and, where circumstances favor, proceeds to put him down by mobbing him, destroying his property, and outraging his wife and children.

On this side the Atlantic the anti-Shemitic mania afflicts but few; but the anti-Mongolian mania threatens to be general. Already it has raged in Congress to a degree calculated to humiliate all sane Americans now and for years to come. The picture which Congressmen draw of the certain submergence of Christian civilization in this country by swarming hordes of heathen Chinese is so appalling that Congress threatens to pass a law to prevent it by stopping immigration from that side of the world; thereby adopting toward the Chinese the same policy of exclusion which the Chinese so long exercised against the "outside barbarians." Having compelled China to open her ports and allow Americans to go thither to trade and to upset by missionary operations the social and religious order of the empire, the superior race now finds itself in the position of the fisherman in the Arabian Nights after he had forced the cork of the magically sealed bottle and would fain have the genie shut himself up again. The case would be pitiful if it did not originate in craze and lead to national dishonor.

The reasons for abusing and excluding the Chinese are curiously like those given in Europe for similarly treating the Jews. At first it was said that they were poor, and filthy, and ignorant; that they were religiously perverse; that they were incapable of becoming good citizens; that they did not, or would not, or could not "blend" socially and vitally with the superior Caucasian. Now their great fault is that they will not keep down; that they actually aspire to dominate; and that when suffered to compete with their superiors, they show a capacity to come to the front that is positively alarming. The following from the San Francisco *Alta* illustrates this phase of the subject with curious felicity. Changing "Chinaman" to "Hebrew," it might be mistaken for a literal translation of recent French, German, or Russian utterances arising from the peculiar though kindred race mania prevailing in Europe. The *Alta* says:

"Wherever a Chinaman gains a foothold there he stays. If, for instance, our lumbermen were to adopt that class of labor, they would exclude other competition, and finally find themselves dependent upon the heathen Chinese. What that dependence means, all who have experienced it know. It means the supremacy of Chinese over Americans. When the Chinaman runs out an American, it is only a question of time when the Chinese capitalist shall run out the American capitalist. His money is cheaper, as the labor of his countrymen is cheaper. In every employment they have entered the Chinese have mastered their work. They are the best imitators in the world. The man who belittles or minimizes a Chinaman is a fool. The Chinese are dangerous because they are adepts. In all the arts and sciences we find them rapidly catching up with modern progress. They are reaching out everywhere. It was but recently that the advent of a Chinese ship created commotion on the Thames. It will create more commotion before they are done with it. The Chinese go to stay. A few rebuffs do not dishearten them. Knowing their capacity to underlive and undersell their competitors, they are tenacious in the extreme. They don't know any such word as fail.

"If the Chinese were intellectually inferior to Caucasians the danger would be less. But they are not. In commerce especially they are the keenest, wisest, and most forehanded people in the world. Besides, they live cheaper and can afford to undersell us. Merchants of San Francisco, take this point into your consideration and digest it. You cannot, if you would, evade it. It is a foregone conclusion that every trade the Chinese are admitted into they will finally control. And when Chinese laborers or operatives have displaced Americans, it is simply a little while until Chinese capitalists give their American compeers 'the grand bounce.' They get money cheaper; they live cheaper; how can you compete with them? It can't be done. Our only resource lies in exclusion. We do not sow our fields with thistles, neither should we permit noxious weeds to overspread our commercial garden.

"Merchants of San Francisco, you have a great and pressing duty to perform. Your self-preservation demands Chinese exclusion. See to it that you exclude them in time. Else, you shall ultimately find your investments unprofitable, your business withering, and your occupation gone. With a full knowledge of the probable effects, we sound this note

of warning to American capitalists. They cannot compete with the cheaper capital of China."

"Bill Nye" was a true prophet; and to be consistent, before the craze passes, Congress ought to pass a resolution to the following effect:

"Resolved: America is the home of the Free and the land of the Brave. We are the Smartest people in the world. Our national doors are opened wide; but all immigrants must come under bond that they will not try to compete with Us."

On the Estimation of Small Traces of Gold.

BY NELSON H. DARTON.

It is of considerable interest to geologists, as well as prospectors, to note the rocks containing mere traces of gold; and as they are very abundant even in this State, we often meet with them. There is a porous gneiss at Inwood, New York City, containing appreciable amounts of gold, sintered down from elevations in the north as placer deposits of very weak intensity, and become fixed in the rock. This origin is clearly shown, as there was a very gentle slope through the State, and the amount of gold, probably limited to commence with, was thus widely disseminated over this incline and there fixed by deposits above it, and came into intimate contact with the rock by infiltrating waters taking it into solution and depositing it through the mass. Fissures and basins occurring in several of the counties in northern Central New York intercepted and concentrated parts in its downward movement of the richer portion of ore, and thus gave in places the rich indications and yields. But to return to the subject.

There have been a number of methods proposed to detect the minute quantities of gold occurring in the rocks mentioned above, and in ore tailings, etc.; and having examined and tested every method I have known to have been suggested, I have come to the conclusion that the one noticed below yields by far the most satisfactory results if the details are well carried out, and is the most practicable in the field or in the laboratory. I know of no compound which would be formed from natural products by the method which would mislead by staining the ash a color at all similar to the distinctive purple of finely divided gold.

Small parts are chipped from all the sides of a mass of rock, amounting in all to about a quarter of an ounce. This is finely powdered in a steel mortar and well mixed. About half of it is placed in a capacious test tube, and then partly filled with a solution made by dissolving twenty grains of iodine and thirty grains of iodide of potassium in about an ounce and a half of water. The mixture thus formed is thoroughly agitated by shaking and warming, and then, after all particles have subsided, dip a piece of pure white filter paper in it, allow it to remain for a moment, then let it drain, and dry it over the spirit lamp. It is then placed upon a piece of platina foil held in a pincers, and this heated to redness over the flame; the paper is speedily consumed; and after heating further to burn off all carbon, it is allowed to cool, and then examined. If at all purple, gold is present in the ore, and the relative amount approximately deduced, as much, fair, little, or none. This method takes but little time and is very trustworthy.

New Method of Purifying Copper.

Successful experiments, described in the December number of the *Comptes Rendus*, have recently been made by M. J. Garnier, at the works of Messrs. Laveissière et Fils, Dèville, near Rouen, with the purpose of removing arsenic and antimony in the commercial copper. From a theoretical standpoint the method now generally employed might be more satisfactory. The refining hearth is covered with silica, supposed to absorb the arsenic and antimony which are oxidized during the process, and to make them go into the slag. In reality this combination is formed very imperfectly, and an amount of two one-thousandths of arsenic is considered sufficient to impair the quality of the copper. M. Garnier's process in some respects resembles the Thomas-Gilchrist process. He employs a sole of chalk and tar, over which, for each separate operation, he places a false sole of limestone and manganese peroxide. With the melting of the copper a generation of carbonic acid and oxygen begins from the upper sole, which oxidizes the charge. As soon as the metal is sufficiently liquid the lime and manganese protoxide rise and dissolve the arsenic acid. By this one operation the amount of arsenic, according to M. Garnier, is reduced to one-fifth. Subsequent fusions with basic fluxes are said almost completely to eliminate the arsenic. An analysis of a cement copper of Rio Tinto is added. Of 0.8 per cent of arsenic only 0.023 could be determined at the end of the third operation, the amount of iron contained being at the same time all but removed. No mention is made in this analysis of antimony. As special advantages of this system M. Garnier claims that the roasting of the black copper becomes unnecessary, and that the loss of copper, arising from parts of the copper combining with the silica of the slag, is avoided.

Improvement in Zincography.

The following is the ingenious method adopted by Captain Biny: A zinc plate, about half a millimeter in thickness (or more, if desired) is coated with bitumen, and exposed to the light under a negative plate. After being sufficiently exposed, it is treated with a solution which removes all the bitumen that has not been rendered insoluble by the action of light. We have thus an image formed of lines in

bitumen on a zinc plate. This plate is next brushed over with gum, and then rolled up with an inked roller, as if an impression in zinc lithography was to be taken from it. No impression, however, is taken; the only object of inking the plate is to better protect the lines, and insulate them more perfectly when the plate is coppered. Before coppering, the plate is dipped in water acidulated with three per cent of nitric acid, and it is then well washed in pure water. Next it is placed in a bath of the double cyanide of copper and potassium, and left there for ten to twenty minutes, when copper will be at once deposited on it. It is then washed again in water, dried, and placed in a vessel containing pure benzine; this substance dissolves the fatty ink and the bitumen which form the image, and the lines of the picture will be seen to appear in zinc on a copper ground. After again washing the plate very copiously, it is then immersed in water acidulated with three per cent of nitric acid, in order to produce a slight etching of the surface. In this bath it is left for about a minute, keeping the liquid agitated, and passing a brush along the lines of the zinc so as to clear them. The acid in the bath being highly diluted, it acts very feebly on the copper, but on the zinc its action is much more energetic, so much so as at the end of a minute to produce very marked depressions. When the etching is completed, the plate is again washed, and dried at a gentle heat. A varnish of six or eight per cent of bitumen dissolved in benzine is then passed over it, and when this is dry, the plate is transferred to a stone or to a sheet of metal which has been coated evenly by means of the roller with a layer of fine lithographic ink. The squeegee is then passed lightly over the back of the zinc plate, and it will be found that all the projections have been blackened by the ink wherever they have come into contact with the stone, while the lines constituting the drawing are free from ink altogether. This black layer which covers the bitumenized surface is intended to form a screen against the action of the light, and when the whole plate is now exposed, only the direct rays act upon the bitumen of the lines which is not protected by the blackened surface. To complete the plate, it is now only necessary to lay it on a level table, with the prepared surface upwards; it is rubbed over with a metal cube, first interposing a piece of blotting paper dipped in spirit of turpentine. In this way the whole surface is cleaned, and the zinc of the ground alone appears, while the lines covered with bitumen have not been touched, and we have a plate for which a large number of impressions may be taken almost equal to copperplate, although produced in a lithographic press. By electro-depositing a layer of copper on a sufficiently thick plate of zinc, and then submitting it to prolonged etching, lines of considerable depth may be obtained; the image may be taken on the copper surface either by means of bitumen, or by means of bichromated gelatine or gum—as in the Gobert process—and we have an engraving in copper, the cost of which has been much reduced owing to the foundation being of zinc.—*Leon Vidal, in Photo News.*

The Eads Interoceanic Ship Railway.

The Senate Committee on Commerce reported favorably, March 4, a bill to incorporate the Interoceanic Ship Railway Company. The bill provides for a guarantee by the United States of a dividend of 6 per cent per annum for fifteen years on \$50,000,000 of the capital stock of this company—the total capital stock being \$75,000,000—and stipulates that, in return for this assistance, the company shall transport gratis for ninety-nine years the mails, war vessels, and all other property of the United States, and shall transport American merchant vessels for one-half the rates charged by the company on all other commerce except that of Mexico. It is further provided that for any advances made by our government under its guarantee the company is to give its bonds, payable in fifteen years, without interest, which bonds, in the event of their non-payment at maturity, are to be receivable for tolls on any American vessel, with ten per cent added to their face value.

The guarantee is to attach to the extent of \$5,000,000, when ten miles of the ship railway, and the terminal works connected therewith, shall have been completed and tested in the presence of government engineers, by the safe transportation of a loaded ship, weighing 2,500 tons, from the harbor to the terminus of the said ten mile section and back again, at an average speed of six miles per hour.

Another \$5,000,000 is to be guaranteed when another ten-mile section, with the necessary terminal works, shall have been completed and tested in the same manner as the other end of the railway. A commission of engineers, appointed by the President of the United States, is then to examine the intermediate portion of the route, and report whether or not the completion of the ship railway over it is entirely practicable at a cost not exceeding \$60,000,000. If the commission reports in the affirmative, the government guarantee is to attach for the remaining \$40,000,000 of the \$50,000,000 of stock to be guaranteed in accordance with the successive completion of the intermediate sections of the line. If the commission, however, reports in the negative, the bill provides that no further guarantee shall attach until a loaded ship, weighing 4,000 tons, shall have been safely transported over the entire line from ocean to ocean.

THE TELEGRAPH IN CHINA.—To induce the people to make themselves familiar with the operation and utility of the telegraph, the Chinese authorities have shrewdly made the use of the new lines free for the space of one month.