SCIENTIFIC AMERICAN

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BRIDGE BUILDING ON THE PENNSYLVANIA RAILWAY WITHOUT INTERRUPTING TRAFFIC.

The freight cars of the Pennsylvania Railroad start at the eastern terminus of the road from a point on the shore of Jersey City some distance to the north of the passenger depot. The freight cars run upon a separate route until the heights back of the city are reached. There the freight and passenger lines converge, and thence both classes of trains pursue the same route to the West. The freight line, at its starting point, is half a mile or more distant from the passenger line. It is not a surface road until the high ground is reached. Through the city it is carried on wooden trestle work, with iron bridges across the streets. This feature keeps the cars out of the way, makes their working entirely independent of street traffic, and in every way is a benefit to the company as well as to the city.

It became evident that the woodwork must be replaced by a more permanent structure, and in this issue we illustrate the operations now in progress with a view to accomplishing this result. The company was in possession of a number of iron trusses eminently suitable for this work. They were used as bridges over various streams and rivers, the Juniata among others. They had served for some years as such when it was determined to devote them to this work, replacing them by other structures on the main line. Over the Juniata stone arches have been built in their place.

Owing to the swampy condition of the route, the first operation was driving piles for the pier foundations. There was insufficient head room to do this under the trestles, so the plan was adopted of cutting out a section of one track with its underpinning and setting up the pile driver in the gap and there driving piles for one-half of the pier base. This, of course, confined the traffic to a single track. After this was done the gap was bridged by a temporary structure, and the same operation was repeated on the other side of the roadway, and all was ready for the stone work. During the second period of pile driving the cars ran upon a new track built in the line of the section first occupied by the pile driver, as shown in our illustration.

Upon the base thus provided the piers of stone were erected. In building them, due regard was had to the depth of the trusses. In one instance a variation of 18 inches had to be provided for, necessitating a rabbet or step upon the top of one pier and a new level for the next. The trusses were to rest upon these, and the roadway was laid upon their upper chords.

The trusses were fastened together with fastenings of the pin or bolt type. This excellent method of constructing trusses, much more prevalent in America than in England, where riveting is the favorite type of connection, had its good features well illustrated here. By removing the pins, the whole structure of a truss was taken to pieces without any destruction of parts. The pieces were taken to the scene of work. The first step was to put them together, truss by truss, keeping them on skids and lying on their sides upon the ground. This was necessary to get all parts together, and each piece in the right place. On each side of the track false work was built for the length of one truss, or equal to the distance between the piers. Its height corresponded with that of the piers. On this the trusses were set up, two on each side. The bottom chord was first put in place, and then, by aid of further false work, the top and intermediate studs and tension rods were set up. This brought two bridges on each side of the regular roadway. The false work was taken away, and the iron work left extending from the line of one stone pier to that of the next, and supported at each end on wooden piers.

The ends of the trusses did not rest directly upon the wood. A couple of rails intervened and bore their weight directly. The object of this is to avoid friction, and so to render the lateral transfer possible. Upon the top of the iron work the full set of sleepers, each numbered, were placed. Two crab windlasses were bolted down to the lower chord level of one of the bridges or pairs of trusses. One windlass was placed at each end. A heavy tackle or blocks and falls were fastened between the bridges, running at right angles to their length and in the line of the windlasses. The end of the fall was taken to the windlass.

The next work is the demolishing of the tracks and woodwork of the trestles which are between the spans. When this is removed, all is clear for the moving. The rails are thoroughly greased well up to the trusses. No grease is placed directly between them and the rails.

They now have to be drawn in laterally and evenly toward each other until over the piers. The first strain, owing to the absence of grease on the rails, is very heavy. For about eighteen inches hydraulic jacks are used to force them from their seats. As soon as the greased portion of the rails is reached, they become amenable to the tackle. By blocking one span is locked fast, and eight men begin turning the windlasses. The blocked truss serves as an abutment. As the strain comes upon the tackle, it draws one of the bridges toward its fellow. The blocked one cannot move, so the other is gradually drawn up to its place. As soon as it reaches its position, it is jacked up. To provide steps for the jacks, heavy timbering

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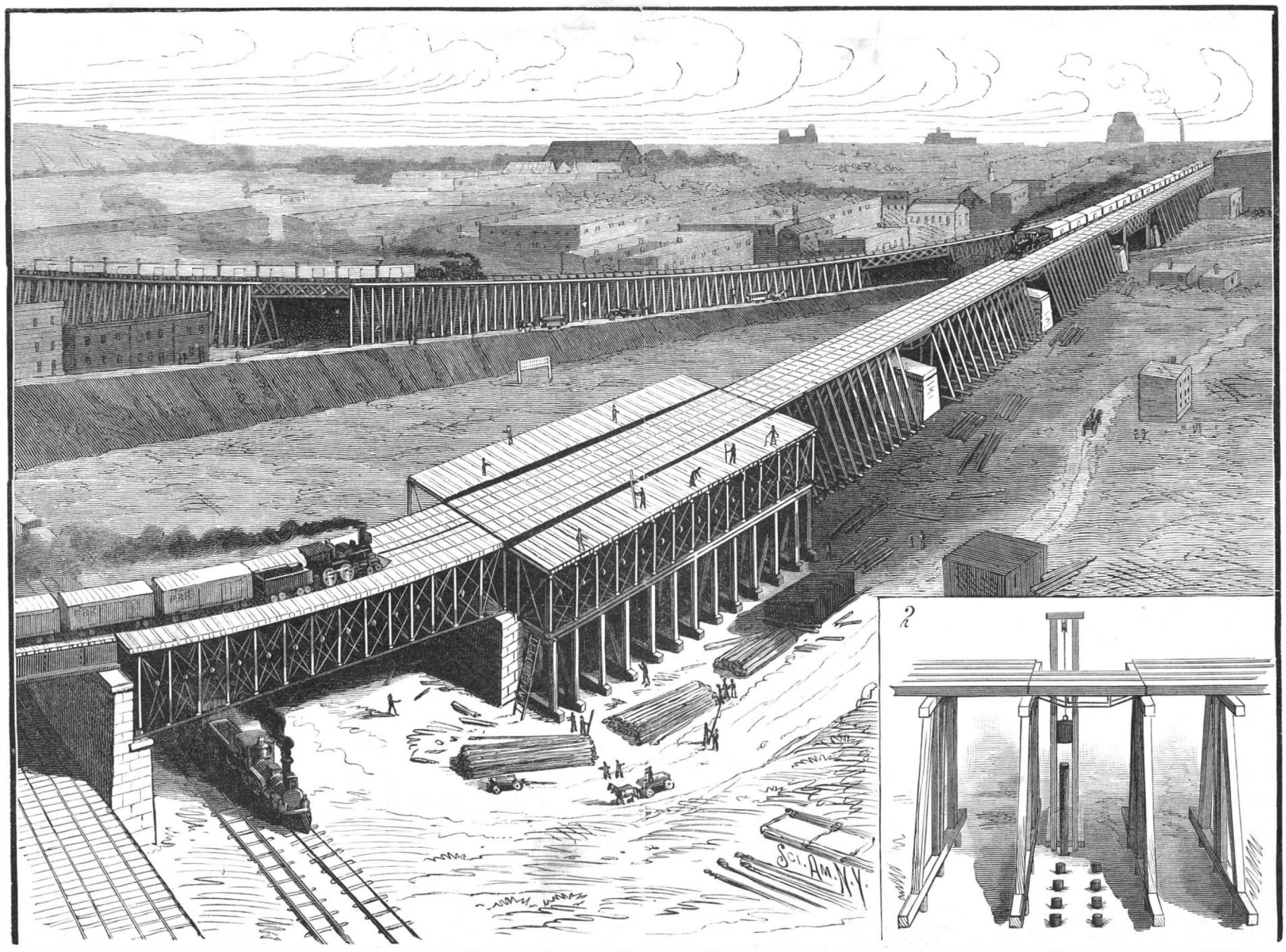

Fig. 1.—BRIDGE BUILDING ON THE PENNSYLVANIA RAILROAD IN JERSEY CITY.

Fig. 2.—DRIVING PILES FOR PIER FOUNDATIONS.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 629.

For the Week Ending January 21, 1888.

Price 10 cents. For sale by all newsdealers.

THE INDIANA PATENT BILL.

Hon. Mr. Holman, of Indiana, has introduced the following bill in the House of Representatives, No. 1344:

"A BILL TO SECURE TO THE PUBLIC THE USE OF PATENTED INVENTIONS.

"Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That all persons or corporations, whether owners or licensees of patents granted by the United States, are prohibited from withdrawing any machine or process from public use because of any regulation of the tariff of charges by the legislature of any State or Territory wherein such machine or process is being used, without the consent of such legislature."

The same bill was introduced at the last session of Congress by the same member, but failed to pass, and we earnestly hope this renewed attempt will share the same fate.

If this bill should pass, it would be within the power of any State or Territorial legislature to subject citizens to the most serious losses. Among the first to suffer would be widows and orphans. All who hold investments in patented properties would be liable to be robbed of their incomes, the same as already has happened in Indiana with the telephone owners.

The Supreme Court of the United States decided long ago that all State laws for regulating the sale or disposition of patented inventions were unconstitutional and void, for the reason that the exclusive authority in such matters is by the Constitution exclusively vested in the Congress.

For some unexplained reason, the authorities of the State of Indiana have for years treated the Supreme Court decisions with contempt, and there are to-day among the Indiana statutes several laws relating to patents that are at variance with the paramount authority of the United States. The most recent Indianian effort in this line is the State law that regulates the price at which patented telephones may be sold. The law specifies that no telephone company shall charge more than $3 a month for use of same; thus taking entirely away from the patentee all voice in or control of his invention. The validity of this law has been sustained by the highest tribunal of the State of Indiana, and is now in force there. The result is that the Bell telephone companies in several of the cities of the State were obliged to withdraw their instruments from use, as the amount allowed by the local law was not sufficient to pay them any profit.

Indiana has profited vastly, in common with all of the States, from the many new industries and manufactures which inventive genius has created and given the country. The industrial prosperity of the State is largely based upon tne wealth which has been brought in to her by the use of new improvements and inventions. If they are to be withdrawn or discouraged, property values must necessarily decline, and manufacturing industries must be removed to more congenial places.

ELECTRIC ENERGY FROM CARBON WITHOUT HEAT.

In SUPPLEMENT, No. 629, issued this week, we print a paper with the above title by the well known electrician, Mr. Willard E. Case. It gives the details of an investigation of a platinum-carbon battery. Carbon in various forms was experimented with as a positive plate of a voltaic couple, while platinum was used as the negative element. An oxidizing solution, formed by mixing chlorate of potash and sulphuric acid, was used as exciter and solvent for the carbon, and a current was obtained. The active agent in the solution was ascertained to be ClO_2, or peroxide of chlorine.

Various changes in the carbon electrode and in the solution gave different electromotive forces, a range from ·08 to 1·25 volt being obtained. These results were obtained without any heat, and in them the investigator sees a possibility of evading the second law of thermodynamics. As the carbon is burned without heat, and the energy set free is converted directly into mechanical energy, he hopes to obtain a far higher return for carbon consumed than is possible with the steam or heat engine and dynamo, where, at most, but fifteen per cent of the heat of the carbon can be converted into mechanical energy, and where a further loss is encountered in the conversion of this into electric energy.

So far the investigation has not assumed a practical form, but it will be a triumph of theory if we are able to effect this direct conversion of the heat energy of carbon combining with oxygen into electricity. Many points are not touched upon by the author. He does not say whether his platinum was completely protected by the carbon, or whether bubbles of carbonic acid gas escaped from the dissolving carbon. The investigation indicates a most interesting line of experiment and one which we can but hope will be carried out to some result that will have a bearing on practice. The solutions used are too expensive to give the present experiments more than a scientific interest. But at least they open a door for future work that may yet produce a carbon-consuming battery that will supplant the present type.

Incidentally another point is strongly brought out. It is that the expense of working a battery is not only due to the consumption of the positive element, which is generally zinc, but that the cost of the solution may have just as much to do with it. It shows that there is room for vast improvements on primary batteries. Electricians may yet find themselves wrong in so generally considering the subject of the economical use of primary batteries in competition with dynamos a wild and impracticable theme for work and study.

SUCCESS OF THE MILLION-DOLLAR TELESCOPE.

The great refracting telescope of the Lick Observatory, Mount Hamilton, Cal., is now in place, and had its first "official" trial on the evening of the 7th inst. The sky was clear and the weather cool. The big telescope was at first pointed at the nebula in the constellation Orion, which appeared to Messrs. Clark, Swazy, Keeler, and Floyd more magnificent than ever before. About 12 o'clock Saturn was also observed, with satisfaction. Only medium power was used, and the observation closed about midnight.

The size of the object glass is 36 inches. It is the most powerful telescope in the world. A magnifying power of 2,000 diameters, it is expected, can be employed on suitable objects. Applied to the moon, it is believed the new telescope will show almost anything that has a bulk of say 300 feet square. If there are any such buildings on the moon as the capitol of the United States, or such works as the Brooklyn bridge, rivers or oceans with large vessels upon them, the great telescope will reveal the fact. But unless all previous observations are greatly at fault, no water, no atmosphere, no people, exist on the moon like those of our globe. Much new and interesting knowledge may, however, be hoped for in respect to the moon and the heavenly bodies when the new instrument is fully worked.

A dispatch to the *N. Y. Herald* says that on the night of the 10th inst. at the Lick Observatory the cold was so intense as to freeze the dome of the observatory and prevent easy observation. However, several short trials were made. The most important was by Captain Floyd and Professor Keeler, who saw the eight rings of Saturn clearly divided. Professor Keeler had an unexcelled view of a division of the outer ring of Saturn on the night of the 7th.

A few nights ago Captain Floyd and others were looking at the constellation Orion, when he detected a little star in the trapezium which is in the sword of Orion. Mr. Clark, on looking, also said he saw the star. No star has ever before been seen in the trapezium.

Saturn and Neptune are the only planets that have been so far viewed, the other principal planets having not yet been in good position at a comfortable hour.

Apprentices of Past and Present Days.

The *Carriage Monthly* thus contrasts the apprentice of former times to those of the present:

Apprentices of the present generation are ignorant of the hardships and misfortunes of the boys in by-gone days. The latter were members of the master's family, boarding and sleeping with them. Part of his business was to mind the children, if there was any, run all the errands for the household and shop from 5 o'clock in the morning until 7 o'clock in the evening, and sometimes even later than that. Many of the boys of the present day do not believe this, but it is nevertheless true. The boy had to stay as long as the agreement made called for, and if he ran away he was considered an outcast. If the parents of the boy could raise a certain sum, the term of the apprenticeship was shortened according to the amount of money paid. In time these boys became good mechanics, obtaining a thorough knowledge of their trade.

The apprentice of to-day is considered equal in standing with the mechanic. He commences work at 7 o'clock in the morning and quits at 6 in the evening, in some cases earlier, and is never kept over his regular time. The employer treats him the same as he does his workmen, sometimes better, and he is paid either by agreement or what he is worth. There are many who still would like to see the old apprenticeship system of fifty years ago in force again.

Curious Geological Phenomena.

The Cordillera of the Andes has for some time been exhibiting a curious phenomenon. It results from observations made upon the altitudes of the most important points, that their height is gradually diminishing.

Quito, which in 1745 was 9,596 feet above the level of the sea, was only 9,570 feet in 1803, 9,567 in 1831, and scarcely 9,520 in 1867. The altitude of Quito has therefore diminished by 76 feet in the space of 122 years. Another peak, the Pichincha, has diminished by 218 feet during the same period, and its crater has descended 425 feet in the last 25 years. That of Antisana has sunk 165 feet in 64 years.—*La Gazette Geographique.*

Trade Marks in the English Patent Office.

In England they have a Comptroller-General of Patents, Designs, and Trade Marks, an official who corresponds to our Commissioner of Patents. He and his staff of civil service officials appear disposed to deal as erratically with the subject of trade marks as does our less be-titled official and his subordinates. We have received from a correspondent in London a most amusing tale of the persistent but unsuccessful attempt of one of the leading patent attorneys in England to have the word "Yum-Yum" registered as a trade mark for whisky, etc. As a preliminary illustration of the inconsistency of its rulings as to non-descriptive words ("fancy words" is the characterization of the British Trade Mark Act), our correspondent cites the following instances: "Cook's Best Friend" has been refused, and "Housekeeper's Friend," "Housewife's Friend," and "Carver's Friend," have been accepted. "Sunlight Soaps" has, he understands, been registered for one firm, and "Suaviter," also for soap, has been rejected for another. To return to "Yum-Yum." This seems a "fancy word." Yet the "Tite Barnacles," as our correspondent terms the patent office people, after Dickens, paused and asked for information concerning the word before passing or refusing it. The meaning of the word was asked for. The applicant's attorneys answered in a facetious yet carefully worded letter, expressing doubt as to any fixed meaning attaching to "Yum-Yum," except that it meant substantially, "how nice," and was credited to savages as expressive of their satisfaction coupled with a desire for more. A reference to the opera "Mikado," with appropriate quotations, etc., was included in the letter. In response, the solemn official letter came, asking whether "Yum-Yum" was a Japanese *word* or name, stating that in the prosecution of a previous application it had been found that "Ko-Ko," the name of a well known character of the same opera, had been shown to be a Japanese name. This letter was answered, the agents saying that they knew no instance of a Japanese bearing such name, and intimating that they did not see what Japan had to do with the matter. The last official letter, closing the correspondence, was a definite rejection. It was based on the admission by the attorneys that the word was an exclamation of delight. Hence it was declared not a subject for registry. The point taken by the office seems to have been that it was not a "word," or if it is, it conveys, according to the attorneys' letter, a descriptive meaning. In an oral hearing, the same decision was rendered. We regret that we are unable to give the full correspondence. It shows much humor on the agents' part, that is in excellent contrast with the solemnity of the official letters. The whole affair shows that we are not the only nation suffering by inconsistent rulings in the patent office.

Value of Eggs for Food.

Many of our best farmers have arrived at the conclusion that poultry raising is the most profitable thing they can engage in. Of the egg alone the London *Standard*, after stating of what it is composed, mentions the various purposes for which it is used.

Every element, the writer says, that is necessary to the support of man is contained within the limits of an egg shell, in the best proportions and in the most palatable form. Plain boiled, they are wholesome. The masters of French cookery, however, affirm that it is easy to dress them in more than 500 different ways, each method not only economical, but salutary in the highest degree. No honest appetite ever yet rejected an egg in some guise. It is nutriment in the most portable form and in the most concentrated shape. Whole nations of mankind rarely touch any other animal food. Kings eat them plain as readily as do the humble tradesmen. After the victory of Muhldorf, when the Kaiser Ludwig sat at a meal with his burggrafs and great captains, he determined on a piece of luxury —"one egg to every man, and two to the excellently valiant Schwepperman." Far more than fish—for it is watery diet—eggs are the scholar's fare. They contain phosphorus, which is brain food, and sulphur, which performs a variety of functions in the economy. And they are the best of nutriment for children, for, in a compact form, they contain everything that is necessary for the growth of the youthful frame. Eggs are, however, not only food—they are medicine also. The white is the most efficacious of remedies for burns, and the oil extractable from the yelk is regarded by the Russians as an almost miraculous salve for cuts, bruises, and scratches.

A raw egg, if swallowed in time, will effectually detach a fish bone fastened in the throat, and the white of two eggs will render the deadly corrosive sublimate as harmless as a dose of calomel. They strengthen the consumptive, invigorate the feeble, and render the most susceptible all but proof against jaundice in its more malignant phase. They can also be drunk in the shape of that "egg flip" which sustains the oratorical efforts of modern statesmen. The merits of eggs do not even end here. In France alone the wine clarifiers use more than 80,000,000 a year, and the Alsatians consume fully 38,000,000 in calico printing and for dressing the leather used in making the finest of French kid gloves. Finally, not to mention various other employments for eggs in the arts, they may, of course, almost without trouble on the farmer's part, be converted into fowls, which, in any shape, are profitable to the seller and welcome to the buyer. Even egg shells are valuable, for allopath and homeopath alike agree in regarding them as the purest of carbonate of lime.

New Process of Paper Making.

The object of this invention is so to arrange the various machines or apparatus for treating esparto, straw, etc., that a continuous process can be carried on direct from the fiber boilers to the paper making machine without the materials being handled by the workmen as hitherto.

In the first place the boilers are emptied and their contents placed upon an arrangement of endless traveling lattices, which carry it to the breaking and washing engines. It is then conveyed into the chests to supply the half-stuff or cleaning machine, after which it is run into a store chest to supply the bleaching engines. After bleaching it passes into a chest to supply the beaters, from whence it is finally conveyed to the paper making machine.

The advantage of this process is that the fiber is maintained in a wet condition throughout the entire process of manufacture, and therefore contributes largely to the saving of both material and time in moving from one process to another. This can readily be done automatically in buildings where the various machinery is subdivided and arranged upon different floors, but in any case where this advantage does not exist, pumps and small stock chests are so arranged that no difficulty presents itself. This system will dispense with the making of the stuff into a solid at the *presse pate* machine.—*Paper Making.*

Liquid Amalgam.

An interesting account of a series of experiments upon the so-called alloy between the metals sodium and potassium is given by M. Joannis in the current number of the *Annales de Chimie et Physique.* For some years it has been known that, although in many respects so similar, these two metals possess a certain affinity for each other, and unite under suitable circumstances to form a liquid amalgam-like substance. M. Joannis has at length shown that a definite compound, NaK_2, is formed with considerable evolution of heat when the fused metals are brought together in the right proportion. In order to prove this fact, thermo-chemical methods were resorted to, liquid mixtures of the composition Na_2K, NaK, NaK_2, and NaK_3 being successively introduced into the calorimeter.

The hydrogen liberated by decomposition of the water in the calorimeter was caused to pass first through a perforated platinum plate, and afterward through a long thin-walled glass spiral, eventually escaping in minute bubbles through the water itself, after becoming reduced to the temperature of the calorimeter. The liquid mixture of metals was gradually introduced by means of an ingenious apparatus consisting of a drawn-out delivery tube containing the alloy between two layers of protecting naphtha, and which, by means of a valve, could be placed in communication with a reservoir of compressed air, so that, by regulating the valve, a gentle stream of the liquid could be forced out as required. When the calorimetrical experiments were concluded, the amount of alkali was determined in an aliquot part of the water in the calorimeter, and thus the amount of metal used could be arrived at.

From the data afforded by these experiments, M. Joannis appears to have conclusively shown that the only stable compound is NaK_2, all others being mixtures of this with excess of one or other of the two metals. It is very satisfactory that a reliable method has at last been found of distinguishing between true compounds and physical mixtures of metals, and rather remarkable that one of the earlier analyses of the most stable combination of sodium and potassium gave as the percentage of potassium 76·5, a number which closely approximates to that required for NaK_2.—*Nature.*

Balfour Stewart.

We regret to announce the somewhat sudden death of Professor Balfour Stewart, M.A., LL.D., F.R.S. Mr. Balfour Stewart, who had only just completed his 59th year, was educated at the Universities of St. Andrews and Edinburgh. In 1859 he was appointed to thedirectorship of the Kew Observatory, and in 1867 to the secretaryship of the Meteorological Committee, which last appointment he resigned on his promotion to the professor's chair of natural philosophy in Owen's College, Manchester, in the year 1870, a post which he held until his death.

Two years before this distinction was conferred upon him he had been awarded the Rumford medal by the Royal Society for his discovery of the law of equality between the absorptive and radiative powers of bodies. Together with Messrs. De la Rue and Loewy he wrote "Researches on Solar Physics," and he and Professor Tait published their researches on "Heating Produced by Rotation in Vacuo." Besides these, he wrote a number of treatises especially on the subjects of meteorology and magnetism. The article in the "Encyclopædia Britannica" on "Terrestrial Magnetism" is from Professor Balfour Stewart's pen. Among the many works of which he was sole or joint author may be mentioned the "Elementary Treatise on Heat," "Lessons in Elementary Physics" (1871), "Physics" (1872), "The Conservation of Energy" (1874), and "Practical Physics" (1885). Most of these are text books on the subjects of which they treat. He and Professor Tait also produced the "Unseen Universe," a work of which twelve editions have been published. At the time of his death he was president of the Physical Society, and was a member of the committee appointed to advise the government on solar physics. Professor Balfour Stewart died on Monday, Dec. 19, at Ballymagarvey, Balrath, in the county of Meath.—*Electrical Review.*

Steel Armor-Piercing Projectiles.

Passing events in connection with the development of our artillery are constantly reminding us that the battle of the guns and plates is not yet ended. At the present time, however, it is not so much the guns as the projectiles that are pitted against the plates and are making their mark—and a pretty deep one, too! We are reminded of this by some successful trials that have recently taken place at Shoeburyness with steel projectiles made by the Hadfield Steel Company, of Sheffield. The first trial was that of a 6 inch projectile against a Cammell compound plate 9 inches thick by 4 feet square, 3 inches of the plate, that is, the front part, being of very hard steel. This plate, which had 12 feet of oak backing, was a new one, and had never been weakened by any previous rounds. The Hadfield projectile successfully penetrated the plate and passed 5 feet into the wood backing. It was found broken into only three pieces, which could be fitted together, showing how well the projectile had stood this severe test. To show its severity, it may be mentioned that the present service Palliser chilled projectile fired at a similar plate would only have made an indent 3 or 4 inches deep, or barely through the steel face. In fact, this 6 inch breech loading gun, comparatively a very small one, fired with a Hadfield steel projectile of the high quality just described, would penetrate armor on all but our heaviest armored ships, which also speaks well for the improvement in the power of our guns. A Hadfield projectile 9·2 inches diameter (say 9¼ inches) has, at Shoeburyness, gone through a 16 inch wrought iron plate, 6 feet of wood, and 8½ inches into a second plate behind. This gives a total penetration of over 2 feet, and yet the projectile was but little injured. The trial of the Hadfield 12 inch projectile, weighing nearly half a ton, was conducted against a 16 inch Brown compound plate. The velocity was about 1,900 feet per second at 100 yards range. The projectile passed through this plate and some distance into the wood backing behind. It was there found, and although fractured, it had arched the plate in addition to penetrating it. These results are still more noticeable as being the first English projectiles to successfully pierce compound plates. If encouraged in the way foreign governments encourage their projectile manufacturers, the Hadfield Steel Company would, doubtless, still further improve their projectiles; and it must be borne in mind that while some special foreign projectiles have penetrated compound plates without breaking up, this is not the rule.—*Iron.*

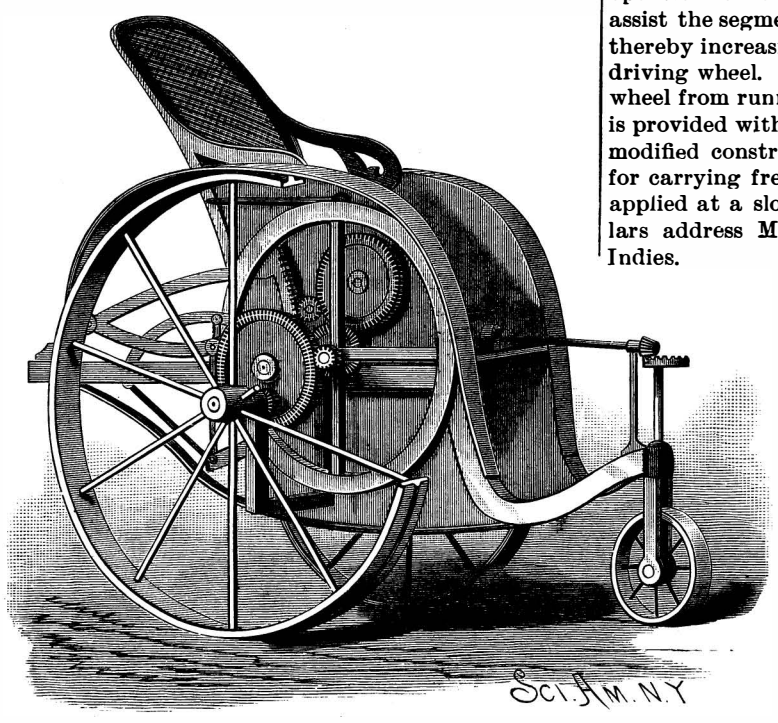
Concealment of Torpedo Boats.

One well known drawback in torpedo boats is the visibility of the flame and smoke when within a distance of 2,500 to 3,000 yards of the object to be attacked. Experiments at the Rochefort Arsenal and on the Seine with an apparatus invented by an engineer of the name of Oriollo, of Nantes, as is reported, have demonstrated that his arrangement is capable at night of quite obscuring the torpedo boat. The flame and sparks disappear, the smoke, which is reduced in temperature from 100 degrees to 30 or 40 degrees, spreads itself out in a horizontal layer over the surface of the water, becomes inhalable, and envelops the boat in an impenetrable vapor, which defies the electric search light to discover the boat. A notable point in the application of the arrangement is that it in no way whatever interferes with the proper working of the engines or the boat. The steam pressure and the speed remain undiminished. The improvement is confined exclusively to the funnel, and the extra weight which it adds to the boat is insignificant. France is engaged in applying this improvement, and Spain and Italy will, probably, shortly introduce it to their navies.

COL. AUCHMUTY, founder of the New York Trade Schools, which were illustrated and described in these columns some time ago, says: "There are 150 young men in the evening plumbing class, and in the day plumbing class there are 35. They come from various parts of the United States."

AN IMPROVED TRICYCLE.

A tricycle which is designed to be easily and conveniently propelled at a high rate of speed, without much exertion on the part of the operator, is shown in the accompanying illustration, and has been patented

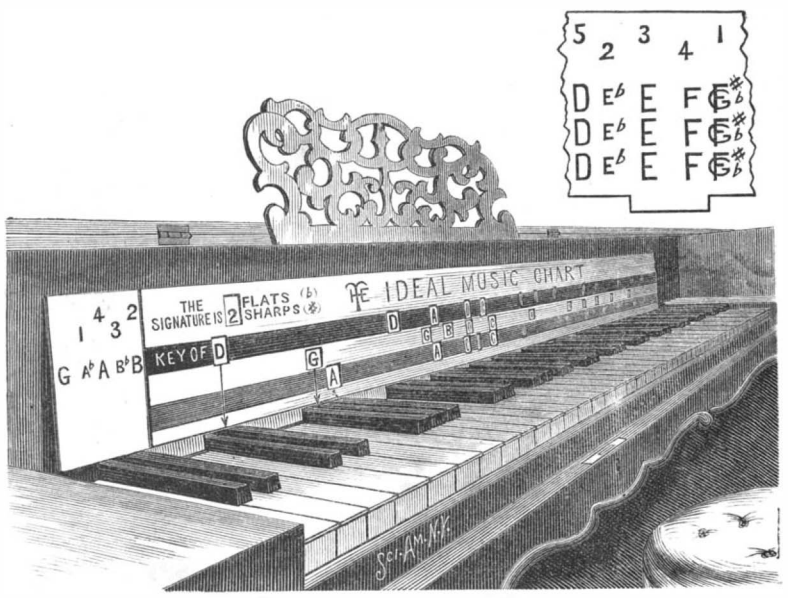


FRIE'S TRICYCLE.

by Mr. Hermanus T. Frie. It consists of a rocking chair located on a suitable frame and operating at its free end on a segmental gear wheel, connected by a train of gear wheels with the axle of a driving wheel. Of the two main driving wheels, one is loosely mounted on a spindle from the frame, and the other is secured on a shaft rotating in bearings on the frame, the inner end of this shaft carrying a gear wheel which meshes into the internal gear of a wheel that is externally geared to mesh into a pinion loosely mounted on the shaft of a fly wheel. This loosely mounted pinion is connected with a clutch held on the end of an arm pivotally connected with one of the spokes of the fly wheel. A segmental gear wheel fulcrumed on the main frame has on its upper end an offset, on which rests a pin projecting from the upper arm of the rocking chair, the runners of which have in their bottom edges each a V-shaped groove, to fit on the V-shaped top edge of a longitudinal bar secured to the main frame. To prevent the runners of the rocking chair from jumping the longitudinal bars, rollers are provided connected with each other on each side by rods, the rollers traveling on the lowest or contact points of the runners of the rocking chair. The lower end of the segmental gear wheel is pivotally connected by a link with the rear end of a foot lever, carrying at its front end a foot piece operated on by the foot of the operator seated in the rocking chair. The train of gear wheels and connected parts are preferably covered by a hood, and the steering wheel in front is operated by a shaft leading to a small foot-wheel within convenient reach of the operator. The downward motion of rocking, through the segmental gear wheel and connected parts, operates the fly wheel, which motion is thence transmitted through the internal gear wheel to the main driving wheel. With the upward motion, the segmental gear wheel is carried to its former position by a coil spring, that had been compressed by the downward movement, but this upward motion of the segmental gear wheel does not affect the motion of the fly wheel, as the pawl and ratchet connection is such as to transmit motion only in one direction. If the operator desires, he can, by pressing on the foot piece, assist the segmental gear in its downward movement, thereby increasing the power transmitted to the main driving wheel. A pawl is arranged to prevent the fly wheel from running in a wrong direction, and a brake is provided with a handle within convenient reach. A modified construction is provided for in a velocipede for carrying freight, in order to give increased power applied at a slow rate of speed. For further particulars address Mr. P. A. Frie, Curacao, Dutch West Indies.

AN IMPROVED MUSIC CHART.

A simple and efficient device for use in connection with pianos and organs, for transposing music from one key to another, is illustrated herewith, and has been patented by Mr. Charles S. Mason, of Earlham, Los Angeles County, Cal. A card, which forms the body of the chart, is provided with three rows of letters, representing in three series the notes of the scale, as shown in section in the small figure. The letters represent the notes of the natural scale and sharps larger than the flats, while the flats are printed in red, so that when they are superposed upon black they may be readily distinguished. The card has projections upon its bottom edge adapted to fit into the wider spaces between the black keys of the keyboard to locate the chart with reference to the scale of the instrument, and is provided with appropriate indices and numerals representing the signatures. An apertured card, with three stripes of different colors, is arranged to slide over the other one, the apertures being in the order required for showing the letters of the different chords of the various keys, with an aperture also for exposing to view the figures on the rear card representing the signatures, the top line or color stripe representing the tonic or first chord, the second line the sub-dominant chord, and the third line the dominant chord. The chart cannot be wrongly placed upon the instrument, and the rapidity and simplicity with which changes can be made from one key to another are obvious at a glance.



MASON'S MUSIC CHART.

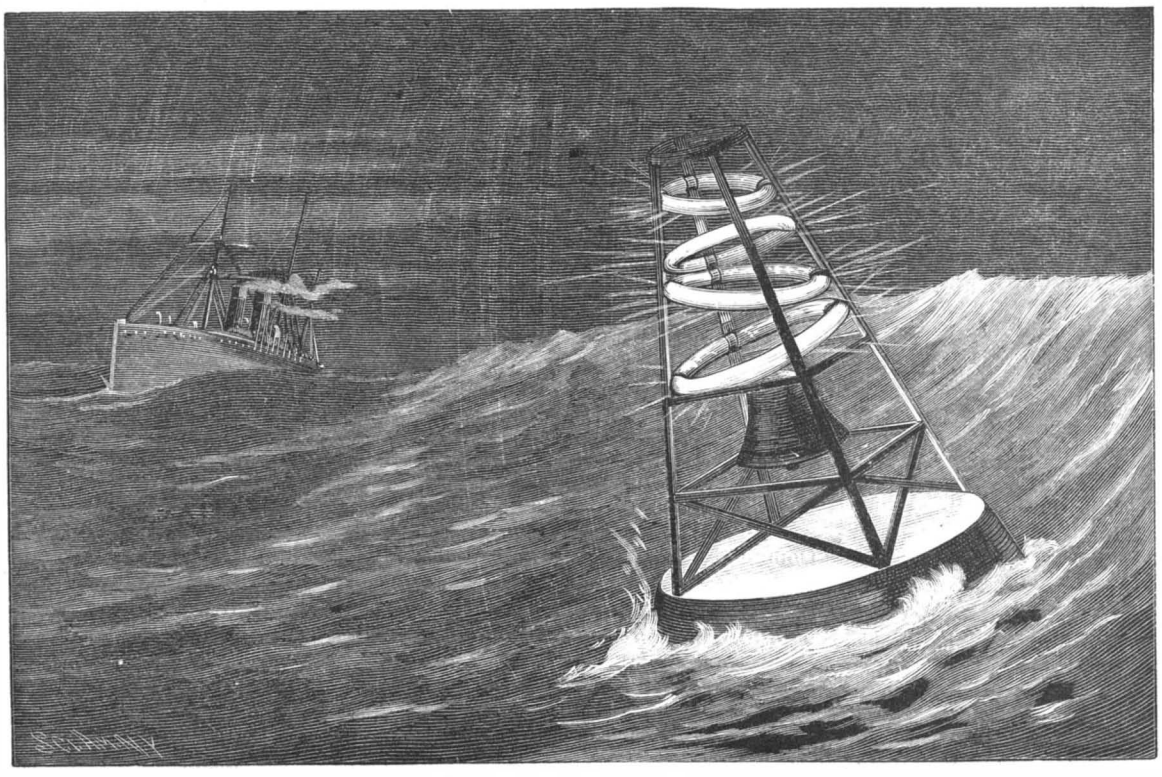
SELF-LUMINOUS BUOY.

BY GEO. M. HOPKINS.

Among the tried devices for rendering buoys luminous are lamps arranged to burn for a long time, phosphorescent mixtures, electric illuminators supplied with the current from the shore by means of a cable, and the more recent luminous paint, which absorbs light by day and gives it out at night. Compressed gas has been employed with great success, some of the buoys having been designed to carry six months' supply of gas and to serve as light ships.

The engraving illustrates illuminating apparatus designed as an auxiliary to bell buoys and whistling buoys. It is based upon the generation of electricity by the agitation of mercury in a high vacuum or in gas of high tension. The self-exciting Geissler tube involves the same principle. The buoy represented in the cut is adapted to ring a bell by the rolling motion imparted to it by the waves. Advantage is taken of this motion to agitate mercury in the annular tubes placed in the upper portion of the frame of the buoy. The tubes are made very heavy and strong, and each contains barriers for causing friction of the mercury against the sides of the tubes.

To insure the action of one or more of the tubes at all times, they are inclined at different angles. A slight motion of the buoy causes the mercury to travel circularly in the tubes and generate sufficient electricity to render the tubes luminous.



SELF-LUMINOUS BUOY.

How to Concentrate the Power of Small Streams.

At the Niagara mill of Bainton Bros., at Buchanan, Michigan, the stream does not furnish water at all times for their 35 horse power wheel, but the Firmus rope transmission enables them to utilize the water again by a second dam 1,100 feet down stream from the first, where a 25 H. P. wheel has been placed. A pulley is placed on the shaft of the last named wheel, and from this the rope travels first to a pair of mule pulleys on the first tower, set on rising ground just above the bank of the pond. From these mules the rope passes in a straight line to the main transmission pulley on a countershaft at the mill, and intermediately supported on six sets of bearers. This countershaft is belted to the main line shaft and is provided with a clutch, so that the transmission may be connected or disconnected at will.

This example shows that it is easy to use the water over and over, and that the lay of the ground is of small importance. It is advantageous, of course, to carry the transmission rope in a direct line, or at least all in one vertical plane, but deviations of direction are not of large importance. In the case illustrated, the rope was carried away laterally to the mules, in order to avoid setting one or more of the bearer towers in the lower pond, where they might be difficult of access in winter. The resistance encountered is that due to the weight of the rope on the bearer journals and the aerial friction on the rope. These are quantities so small that a man can, with one hand, move this transmission from a state of rest, when disconnected from the line shaft. A change of direction increases the journal pressure of the mules, but the rope may go over hills or down into valleys without other effect than increasing its length. Practically, however, as shown in the illustration, inequality of the ground may generally be neutralized by putting the several bearers on the same level or nearly so.

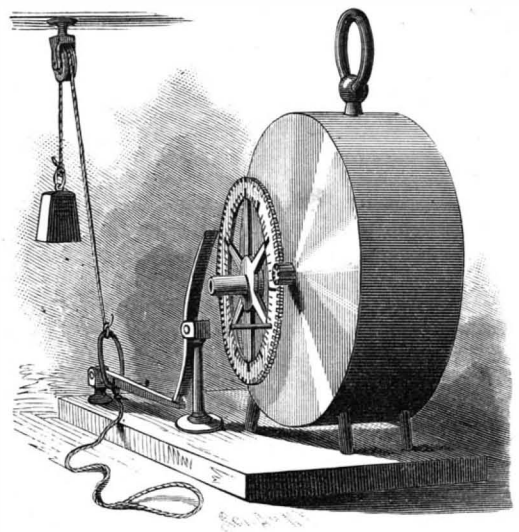
The figures of this transmission are as follows:

Power to be transmitted 25 H. P., distance 1,100 feet, velocity of rope 3,125, transmitting 25 H. P. would show the tension to be $\frac{33000 \times 25}{3125} = 264 \times 60$ lb. (one half the tension weight), equals 324 lb. total strain on rope, but there being two wraps, hence the strain will be divided by two, thus: $\frac{324}{2} = 142$ lb., which is about 5 per cent of the breaking strain of a half inch Firmus rope. The breaking strain of Firmus rope is about 25 per cent greater than Manila.—*Power and Transmission.*

THE British Admiralty is about to build two war ships like the Spanish armorclad cruiser Reina Regente, which has attained such remarkable speed—22 knots per hour. With such examples of enterprise and improvement before it, what a spectacle of stupidity is presented by our navy department in contracting for new ships capable only of 19 knots!

AN ALARM ATTACHMENT FOR CLOCKS.

An attachment for clocks, by which a person may be aroused without disturbing others, and which is designed not to interfere with the clock movement, is illustrated herewith, and has been patented by Messrs. James H. McGlynn and William P. Howells. A pinion on the hour spindle, which may be on the exterior of the back of the clock, engages with a spur gear that may be twelve times its size, a stud or pin on the face of the spur gear wheel, as it comes round in a given



McGLYNN AND HOWELLS' CLOCK ALARM.

space of time, striking an approximately upright lever, liberating another lever, whereby a cord carrying a weight is released. Connection is to be made between the person to be aroused and the weight-carrying cord in such way that the fall of the weight will exert sufficient pull to effect the desired object. The spur gear and pinion are so arranged relatively to each other as to transmit the regular motion of the hour hand of the timepiece, and the spur gear is so attached that it can be readily turned back or forward to set or change the alarm.

For further particulars with reference to this invention, address Mr. James H. McGlynn, No. 366 Market Street, Wilkesbarre, Pa.

Cement to Mend Iron Pots and Pans.

Take two parts of sulphur and one part, by weight, of fine black lead; put the sulphur in an old iron pan, holding it over the fire until it begins to melt, then add the lead; stir well until all is mixed and melted; then pour out on an iron plate or smooth stone. When cool, break into small pieces. A sufficient quantity of this compound being placed upon the crack of the iron pot to be mended, can be soldered by a hot iron in the same way a tinsmith solders his sheets. If there is a small hole in the pot, drive a copper rivet in it, and then solder over it with this cement.

AN IMPROVED WEATHER STRIP.

A weather strip which will be closed and in contact with the threshold only when the door is closed, thereby avoiding the friction of the weather strip upon the floor or carpet, is illustrated herewith, and has been patented by Mr. Samuel A. Rankin, of Mulberry, Bates County, Mo. An offset strip attached to the door has a semi-cylindrical recess, and hinged to the lower edge of the offset strip is a weather strip, with a counterweight upon its inner edge, adapted to be received in the recess of the outset strip as the door is closed. A slotted bar hinged to one end of the weather strip is arranged to slide on a T-shaped projection on the offset strip, a pin being inserted in the door jamb to which the door is latched, the engagement of the slotted bar with which, as the door is closed, brings the weather strip into nearly perpendicular position and into contact with the outer edge of the threshold. When the door is opened, the slotted bar is released from the pin and the weather strip is caused by its counterweight to take a horizontal position, thereby being prevented from rubbing upon the floor or carpet.

RANKIN'S WEATHER STRIP.

Hydrophane.

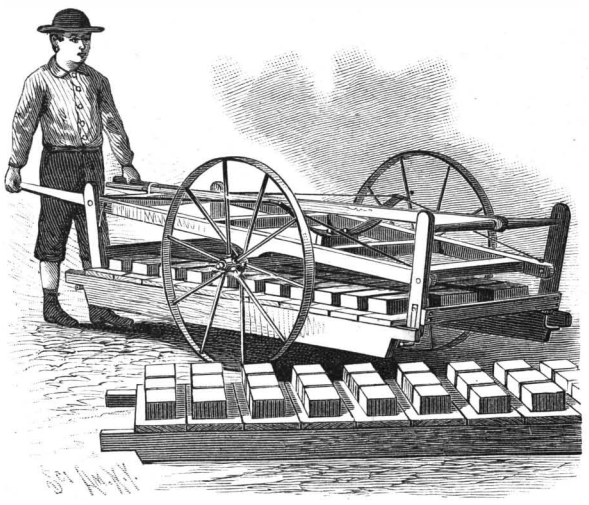
Mr. G. F. Kunz, in the *American Journal*, describes a white opaque variety of hydrophane, in rounded lumps, from 5 mm. to 25 mm. in diameter, with a white, chalky, or glazed coating somewhat resembling the cacholong from Washington County, Georgia, that has recently been brought from some Colorado locality. For its power of absorbing liquid it is quite remarkable. When water is allowed to slowly drop on it, it first becomes very white and chalky, and then gradually, perfectly transparent. This property is developed so strikingly that the finder has proposed the name "magic stone" for it, and has suggested its use in rings, lockets, charms, etc., to conceal photographs, hair or other objects which the wearer wishes to reveal only when his caprice dictates. The specific gravity of several specimens was taken, with the following results: Nos. 1–3 were slabs 2 mm. thick, No. 4 was a natural lump with glazed coating.

	Dry. Grms.	Wet. Grms.	Water abs.	Weight (in water).	Spec. grav.
1.	0·880	1·342	0·588	0·463	2·110
2.	0·644	0·934	0·416	0·3385	2·091
3.	0·730	1·109	0·379	0·382	2·097
4.	1·8745		1·0595	0·864	2·191

The weight was taken both dry and wet, and it will readily be seen that this hydrophane absorbs more than an equal volume of water.

IMPROVED APPARATUS FOR HANDLING BRICK.

An apparatus whereby the number of brick handled by a single workman may be greatly increased without increase of work is illustrated herewith, and has been patented by Mr. Edgar Aber, of Troup, Texas. The main frame is made up of side strips connected by proper cross braces, and mounted upon an axle with two wheels, which are preferably about thirty inches in diameter. Between the forward ends of the strips is pivotally mounted a frame, to the upper cross bar of which is connected a manipulating rod, formed with notches at its other end adapted to engage the cross



ABER'S APPARATUS FOR HANDLING BRICK.

bar nearest the handles. A second swinging frame is pivotally connected to the side strips near the handles. After a pallet has been filled from the moulds, the dally, or mounted frame, is wheeled over the pallet, the handles slightly raised, and, by the manipulating bar, projections from the forward swinging frame are brought under the forward handles of the pallet. Then the handled end of the dally is depressed, and projections from the swinging frame at this end are brought under the rear handles of the pallet, when, by bringing the main frame of the dally to about a horizontal plane, the pallet will be raised, and may be conveniently transported as desired.

Completion of Another Railway Line to the City of Mexico.

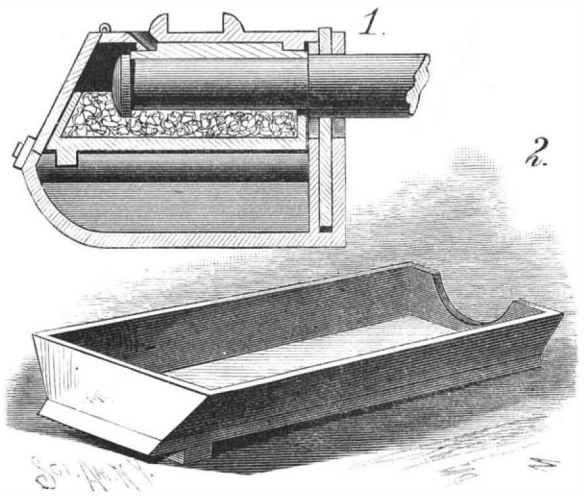
The Mexican International Railway was completed on January 7, 1888, to Lerdo, on the Mexican Central line, thus closing the gap between Lerdo and Eagle Pass, the American terminus of the International road. This completes the second all-rail route to the city of Mexico, and shortens the distance from the Texas border over 200 miles, as against the El Paso route, while the total shortening of the distance from the interior of Mexico to New York and the East is about 700 miles. The International line is part of the Southern Pacific system, and gives San Antonio direct connection with the city of Mexico. The distance is 1,190 miles.

The New Thirty-six Pounder Guns.

In some accounts which have recently appeared in the press of the new 36 pounder guns and mountings manufactured by the Armstrong firm at Elswick, the rate of fire reached has been stated as ten rounds in one minute and 35 seconds. This was, however, when the guns were being fired at an object at a considerable distance, where careful and deliberate aiming was necessary. A truer idea of the real capabilities of the guns in regard to rapidity of fire may be gathered from the practice made at an object at a comparatively short distance, where the man aiming could keep the gun trained on the object without altering the elevation. In these circumstances, at various trials, eight rounds were fired in 32 seconds, 10 rounds in 47½ seconds, 15 rounds in one minute, and 20 rounds in 1 minute and 32 seconds. The fastest rate actually obtained in the experimental firing before the Admiralty officials was 10 rounds in 40 seconds.—*Newcastle Jour.*

AN IMPROVED CAR-AXLE BOX.

A journal box which is designed to effect a constant application of the lubricant under all conditions, and



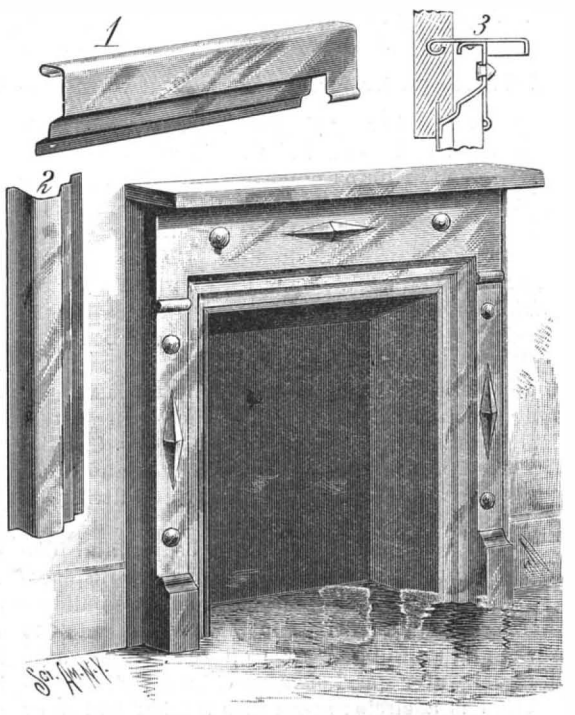
STINARD'S CAR-AXLE BOX.

at the same time save packing, has been patented by Mr. Stephen R. Stinard, of Pompton Junction, N. J., and is illustrated herewith, Fig. 1 being a central longitudinal sectional elevation, and Fig. 2 showing the oil waste tray. A tray having inclined or sloping side walls is fitted into the axle-box below the axle-journal, so that, while the setting oiled waste will be forced or crowded against the axle-journal, the lubricant will be retained in the tray. The tray bottom has a transverse rib which enters notches made in flanges on opposite sides of the axle-box chamber. The bottom of the cup being nearest the axle, the settling of the packing by the shake and jar of the box during the movement of the car tends to keep the lubricant constantly in most effectual application.

AN IMPROVED SHEET METAL MANTEL.

A mantel that is struck up or formed of sheet metal, and built in sections, has been patented by Mr. William J. Turl, and is illustrated herewith, Fig. 1 representing a portion of the frieze, Fig. 3 a vertical section at the top of the mantel, and Fig. 2 a portion of one of the pilasters. The frieze is in one piece, stamped up to shape in dies, to form end wall plates, an upper inner rolled-over flange or support for the mantel shelf, and opposite end portions arranged to stand out in line with the pilasters, the latter being each made in one piece, and having side facings and wall plates, and being arranged to fit under and be overlapped by the end portions of the frieze, to which they are united by rivets or solder. The shelf is a separate piece, rolled over on its inner longitudinal margin where it enters and engages with the wall, its remaining margins being bent down to give finish and strength. Ornaments of glass, porcelain, or other suitable material may be readily inserted and easily made fast in either the frieze or pilasters, in perforations made therefor.

For further information relative to this invention address Messrs. John Turl & Sons, No. 534 West Twenty-eighth Street, New York City.



TURL'S SHEET METAL MANTEL.

BRIDGE BUILDING ON THE PENNSYLVANIA RAILWAY WITHOUT INTERRUPTING TRAFFIC.

(*Continued from first page.*)

is arranged at each end. The rails are removed and the trusses are lowered into their place.

The blocking is now taken away from the other span and the windlasses are again turned. The trusses which first moved are now the abutment for the strain, and the other span is drawn in to its place over the pier and close beside the first. It is jacked up, the rails removed, and it is lowered to its seat.

The ends of the four trusses rest upon wall plates. One set of plates are arranged with rollers to admit of motion under changes of temperature.

When the spans are in place and resting upon the wall plates, the rails are spiked down on the ties. The latter are very heavy and placed very close together, but a few inches of space intervening between them. They act not only as sleepers, but as a sort of floor, in case of derailment of cars.

Sunday is selected for the moving. All traffic must be stopped during the operations, which makes the selection of this day a necessity. About four hours are required to execute the work, and some twenty men do it all. Each span weighs about one hundred and fifty tons. The operation is now in progress, and span by span the old trestle is being replaced by the more elegant iron and stone structure, which for many years to come will carry the Pennsylvania's freight through Jersey City far above the heads of its citizens.

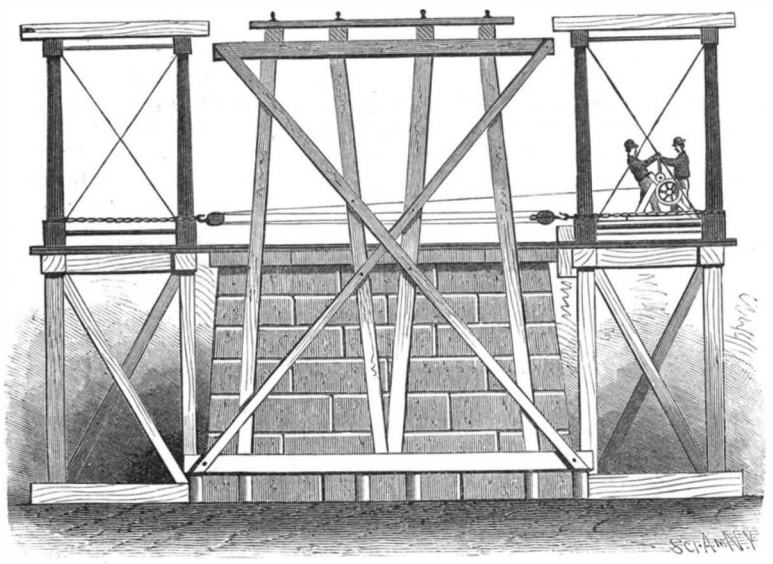


Fig. 3.—MOVING BRIDGE SPANS ON PENN. R.R. IN JERSEY CITY.

The Nordenfelt Submarine Torpedo Boat.

This peculiar vessel was lately tried officially at Southampton, England, with some success. The *Engineer* says:

The Nordenfelt was built by the Barrow Shipbuilding Company. The main engines are double compound, with two high and two low pressure cylinders, and four cranks equally spaced 90 deg. from each other. Steam is supplied by two boilers, and very special precautions had to be taken to prevent not only the entrance of water down the funnel when the vessel is submerged, but the leakage of smoke out of the furnaces, which would quickly stifle her crew. All this has been effected in a most ingenious way. The boat, if left to herself, would always float with a considerable portion out of the water. Direct force is required to sink her, and that is provided by two screws with vertical shafts, one in a recess at the bows, the other at the stern, by which she is forcibly screwed down into the depths of the sea. The moment these screws stop revolving she comes to the surface. Steam is supplied when she is under water on the system suggested many years ago by Dr. Lamm, and used in America for propelling street cars. If the pressure in a boiler is lowered the temperature falls, and part of the sensible heat of the water becomes converted into latent heat by evaporation. The two boilers contain about 27 tons of water. The pressure of the steam is, let us say, 160 lb. above the atmosphere, or 175 lb. absolute. The corresponding temperature is 371 deg. Fah. Now, the engines will work well with steam having a pressure of 50 lb. above the atmosphere, or 65 lb. absolute, the temperature of which is 298 deg. In falling from one of these temperatures to the other, each pound of water gives out 371 deg.−298 deg.=73 units. There are 60,480 lb. of water, and $60,480 \times 73 = 4,415,040$ units. Each pound of steam at 65 lb. pressure will represent 904 units, and $\frac{4,415,040}{904} = 4883$, nearly, pounds of steam of 50 lb. pressure, which can be supplied after the ship has been submerged. Assuming that her engines use 20 lb. of steam per horse per hour—a very high estimate—we have $\frac{4883}{20} = 244$ horse power for one hour. But when submerged the speed is very slow and she requires little power to work her, so that she readily stores energy enough to remain for as much as three hours under water. The air contained in the hull is ample for breathing purposes for that time. There is of course no reason why the pressure should not be as much as 200 lb., or even more. We have said enough to show that with a pressure not greater than that carried in most modern steamships, power enough can be stored up for all practical purposes.

The Nordenfelt arrived in Southampton last July. The time which has elapsed since has not been wasted. She has had a deck fitted to her by Messrs. Oswald, Mordaunt & Co., and various modifications and additions have been made to her machinery and fittings as deduced from accumulating experience.

She is 125 feet long by 12 feet beam, and displaces when entirely submerged 230 tons, her displacement when light being 160 tons. Her engines indicate 1,000 horse power, and drive the boat at a speed of 15 knots when light, and of course on the surface. She has an under-water speed of about 5 knots. The midship section is a circle; any other section will show two arcs of a circle, and the vertical line passing through the center of such section will be the chord of the arcs. In order to maintain the strength of the hull in unison with the midship section, which is round, a deck has been placed on a spreader where the arcs become small at each end. The spaces under these decks are divided by bulkheads into tanks, which, being filled with water or emptied, affect the balancing and displacement of the vessel. The coal bunkers are in the center of the boat, and therefore interfere little with the fore and aft position of the center of gravity. The center of gravity of the boat in its most unstable condition is 6 in. below the center of the boat, and the metacenter in its most unfavorable position is 2 in. below the center of the boat. This means that the vessel will not capsize unless forcibly deflected more than 180 deg. from its upright position. Properly handled as regards coal and water ballast, the boat is more than sufficiently stable. She carries about 35 tons of cold water in her tanks, and, as we have said, 27 tons of hot water in her boilers. This 27 tons of water is expected to give off, as we have just explained, sufficient steam to drive the boat a distance of 20 knots. The 35 tons of cold water, when pumped out, make her sufficiently buoyant to be seaworthy on the surface. The fact that the 27 tons of hot water can be blown out in five minutes does much to promote the safety of the crew. The cold water is pumped out by three pumps, each of which has a 3 in. diameter discharge pipe, and, for security, these pumps have separate engines. The coal bunkers hold 8 tons of coal, and one ton will drive the boat 100 miles at a speed of ten miles per hour. At a speed of 8 to 9 knots per hour, the 8 tons of coal will drive the boat 1,000 miles. Should a great distance be intended to be traveled, twenty additional tons of coal can be carried in the cold water tank. The boat could steam from England to Constantinople by coaling at Gibraltar. In fact, she could steam to India or any other distance.

The sinking propellers are operated by separate engines, which are entirely under the control of the captain, and he can by them force the boat under water or allow her to rise to the surface; or by giving different speeds to the bow or stern propeller, depress the bow or stern as required, and thus cause the boat to maintain the horizontal position. An automatic arrangement exists whereby, should the captain not stop these engines at the right time, they will cease to act at a depth to be arranged.

The boat is steered by steam, the engine for which is also controlled from the forward conning tower, which is in communication with the stokehole and engine room by speaking tubes. In the conning tower are instruments to show the depth, the level, and the course. The boat is lighted by candles. The crew consists of captain, mate, two seamen, engineer, assistant, and two firemen, also a cook. Each man has a separate bed. In addition to the fittings of a submarine boat, the Nordenfelt carries masts, side lights, compasses, anchors, etc., as an ordinary surface vessel. She is registered under the Board of Trade and passed and classed at Lloyd's. There are two torpedo tubes placed in the bow, and there is a place provided for two spare torpedoes. It is proposed to arm the boat with two 2 lb. Nordenfelt quick-firing guns. The conning towers are round, 2 ft. 6 in. diameter, and of 1 in. steel.

A SOLITARY female vulture had dwelt for twenty-five years on the Blotschorn, in the upper Valais, Switzerland, and escaped countless attempts at capture. Recently during severe weather, a poisoned fox left below the cliff proved a successful bait, and the bird was found dead. The body was stuffed and placed in the museum at Lausanne. It measured across the wings, 88½ inches. It is possible that one or two solitary specimens still remain, but it is quite certain there is no nest, and the species is believed to have disappeared from Swiss territory.

Japanese Laborers.

Consul Jernigan, of Osaka, reports as follows to the Department of State:

It may be said, emphatically, that there is great poverty among the lower classes in Japan, the inheritance of long centuries of superstition and despotism. With a population of 37,000,000, living on an area of 150,000 square miles, two-thirds of which are mountains and hills, unsuited for agricultural purposes, labor will continue, for a long time, to be cheap and abundant. A good laborer can be hired for 15 to 25 cents per day, and he will work from 6 A.M. to 9 P.M. and board himself. The laborer don't wear many clothes, and often appears in a suit that would excite the envy of the stanchest dude.

In Japan's progress, other and newer fields will present themselves for the employment of Japanese laborers, a subject of primary consideration for those in authority, for unless some outlet is found, native or foreign, labor will be without employment, which has ever been a disturbing element to the peace and prosperity of nations.

A laborer's house is mostly one story and contains not more than two or three rooms, in addition to a small room each for cooking and bathing purposes. The floor of the rooms is about one foot from the ground and covered with soft, thick straw mats, which are kept very clean, for the Japanese always take off their sandals or clogs when entering the house. Furniture is not used at all in a real Japanese house, except a small table about a foot high and fifteen inches square, which is only called into requisition at meal time, the family sitting on the mats like tailors on their benches. The bedding consists of soft, thick cotton quilts spread on the mats. A laborer's house, including everything connected with it, will not cost more than $100 in gold. In such houses ventilation and warmth seem never to be considered, for the paper partitions and slides are only protected in cold and stormy weather by strong wooden shutters, fitting badly, and through which the wind and rain find little difficulty in entering. And there are neither stoves nor grates in such houses, for the materials employed in building are so inflammable that it would be dangerous to use them. In the place of stoves and grates there are braziers filled with heated charcoal, and at night the brazier, when the weather is cold, is covered with a kind of earthenware and placed under the quilt, the latter being protected from the fire and heat by a wooden grating. Though labor is cheap in Japan, and its reward discouraging, though the laborer is unfamiliar with the comforts which surround the home of the workingman in my own country, I believe that the Japanese laborer is the happiest and best contented being I ever saw. If his pan and cup are filled with rice and tea, he appears the very embodiment of happiness, and over all the ills of life "victorious."

The agricultural implements, as well as machinery of almost every description in use by the Japanese, are of the most primitive origin, but attention is now beginning to be directed to the advantages of modern inventions, though labor is still so cheap and abundant in Japan that such inventions have not yet been received with remuneration in the markets, and there is not any sufficient demand to stimulate shipments of machinery and agricultural implements to this country, except to fill special contracts. The outlook, however, is more encouraging than in former years, and a nation that is fast becoming an important factor in the commerce and diplomacy of the world must soon afford a market for the appliances of modern civilization.

The Flood in China.

A large area of country in China has been overflowed, and the reports of the loss of life and the suffering consequent on the disaster are appalling. Originally a beautiful and populous district of 10,000 square miles, the afflicted area is now covered with a sea of waters. The reports state that at least 3,000,000 of people are homeless and deprived of everything. The loss of life is estimated at three-quarters of a million souls. The Chinese business centers and government circles are greatly disturbed, and are endeavoring to do something to mitigate the evils consequent on the disaster. The reports as regards figures are hitherto little more than conjectural, and the extent of harm may be either over or under estimated.

WE see it stated that the Chicago, Milwaukee & St. Paul has under consideration a plan for working some forty pneumatic gates at crossings in Minneapolis by an air compressor in the shops. A pipe line will tap a storage and equalizing reservoir in each cabin, and connect with the compressor, and cooling and drying tank in the shops. It is not proposed to lay the pipe below frost.

Correspondence.

Preservation of Live Fishes.

To the Editor of the Scientific American:

In your issue, December 10, 1887, you mention "A Newly Patented Mode of Preserving Live Fish," saying: "It was discovered by Mr. Walter G. Murphy, of New York, the patentee, that fish could be kept alive for some considerable time," etc.

Now, it has long been the practice of fishermen in this section to keep their minnow bait alive in stone jugs corked tight. I have forgotten how long I have known of it, but if anybody wants to know how long, at least two of our sportsmen have known and practiced it. I refer them to Col. J. B. Rudolph, Pleasant Hill, Dallas County, Ala., and Mr. Virgil G. Weaver, Selma, Ala.

If the Hon. U. S. Fish Commissioners want to use the *mode*, Mr. Murphy's patent will not be in the way.

W. E. BOYD.

Selma, Ala., January 1, 1888.

Ivy Poisoning and its Cure.

To the Editor of the Scientific American:

The article signed S. E. R., of January 7, was of special interest to me, as this portion of the country, *i. e.*, Steuben County, N. Y., is infested with the various members of the genus *Rhus*, and the inhabitants are frequent sufferers from its peculiar action.

From the frequent calls for relief from this poison, I found it necessary to make an especial effort to obtain some certain means of relief. This has been by no means an easy thing to do, and I had about decided to try the experiment of the internal use of the plant itself, when a case came to me which knocked that idea higher than Gilderoy's kite.

It was that of a man forty-seven years old, who had inadvertently picked up a piece of the ivy root and eaten some of the bark. He was as handsome as an Ashantee warrior; his tongue swollen until it protruded from his mouth, his lips of enormous size and rolling out for about two inches, his cheeks were puffed to double their natural size, and the peculiar blisters with the soapy discharge over it all.

As a specimen of ivy poisoning it was a beautiful case, but as a member of the human family he looked a failure. I shall watch the gentleman, and if he succeeds in handling the vine with impunity hereafter, then S. E. R. can try it as a good cure, provided he does not care for the few drawbacks above mentioned. I shall, however, continue to use the following remedy:

R. F. ex. Grindelia robusta,
Aqua..... aa.
Mix and apply locally every two hours.

The amount of water may be diminished if necessary, or the drug may be used clear. I have yet to see it fail to relieve the itching and burning, reduce the swelling, and hasten the return of health. G. S. GOFF, M.D.

Cameron Mills, N. Y.

The Driven Well Case and Amendments to the Patent Laws.

To the Editor of the Scientific American:

In your journal of December 24, you note the fact that Senator George has introduced into the Senate of the United States a bill to protect innocent purchasers of patented articles from suits for infringement. After stating the nature of the bill and the remarks of Senator George, you say that you think it will bother the Senator to find any great number of persons who have been sued by owners of patents for infringement of their patents, for using articles bought in the open market.

Your experience cannot be that of men who have been observing trade in the country very much. Take the driven well patents as an example. Judge Benedict, in the Cormon case, said that there were about 120 patents issued for appliances used in making and for making driven wells. And in the trial of the Hovey case it was stated that up to October, 1886, there had been nearly 200 patents issued upon driven wells and for appliances on all the phases of the same. If any one has been through Iowa, Nebraska, Kansas, Colorado, and some of the other States, he will find at least 500,000 driven wells, and that they have been put down by a great many different persons, each claiming to have a patent for his particular process. Thus it will be found that the farmers who have these wells had them put down by men who claimed to be protected by a patent issued by the proper department of the government.

It was stated by myself, in the argument of the Hovey case before the Supreme Court, that there were at least one thousand suits then pending in the various circuit courts that would in practice be determined by the decision of the Supreme Court in that case. The attorneys for the plaintiffs said there were at least two thousand such cases. Each of these suits were against men who had purchased their well of men who claimed to have the right to sell the same, and were selling the same in the open market.

You could take the case of the barbed wire fence patents.

Thousands of men are using this article who bought the wire of merchants who expose it for sale, and claim that their wire is protected by a patent.

Now, if the Supreme Court had held the driven well patent valid in the Hovey case, or if they hold the barbed wire patents valid, as held by Judges Drummond and Blodget in the Washburn & Moen *vs.* Haisk case, decided in Chicago a few years ago, then suits will be brought against each of these farmers, and they will have one of two alternatives—to pay the royalties demanded or go from one to three hundred miles to defend a suit. This is the fact, as it is shown in Illinois, Iowa, Missouri, Minnesota, Nebraska, Kansas, and Colorado, and I do not know how many other States are affected in like manner.

In the same issue you copy from the *New Jersey Law Journal* comments upon the uncertainty of the law, and cite the decision of the Supreme Court in the driven well case as a sample.

In those comments, as stated, the writer has fallen into some grave errors.

The patent to Green was not granted by the Department of the Interior, but was rejected by that department on several grounds, and among those was one for the prior use of the thing he claimed to have patented.

This decision Green was not willing to accept, but appealed to the Supreme Court of the District of Columbia, and the patent was granted on the order of that court.

This patent, it is true, was tried in many courts, but in none of them was the defense set out that by reason of others having used the device more than two years he had forfeited his right to a patent.

That was first plead by myself in the Hovey case and other cases that were to abide the result in the Hovey case. I also plead that Green knew of this use. But had both of those pleas in the answer.

In our proof, we showed that several hundred wells were made by other parties than Green between 1861 and 1866.

We also showed by five witnesses that Green knew of the use of several of these wells.

The writer of that article is mistaken in another fact. The construction that was put upon the law of 1839 as added to the law of 1836, by the Supreme Court, was put upon that law by Judge Blatchford in Egbert *vs.* Lippman, while he was circuit judge.

The Supreme Court in that case, when it reached them, said it was not necessary to construe that section, as it was conceded that Borns, the patentee, knew of the use, that the court held was sufficiently public to invalidate the patent.

Judges Blatchford and Love had agreed upon the construction of the law as adopted by the Supreme Court before this case was appealed.

Congress should amend our patent law so that innocent purchasers are protected, and so that in proving the prior use of a patent, the patent should be taken only as the oath of the patentee that he was the original inventor of the article, and believed himself to be the first. He swears to that fact to get his patent, and the grant of the patent by the government should not be held as proving anything more than the testimony of the patentee to the facts stated to get the patent.

As it is, the circuit courts have construed the granting of the patent to require the defendant who pleads a prior use of the thing patented to prove that use beyond a reasonable doubt, and some judges have held that the defendant must prove the use beyond all doubts.

This is unjust and unfair to the defendants. Not only should Senator George's bill, or a bill like that, be passed, but one enabling the defendant to show prior use by a preponderance of evidence only, and not require him to prove it as fully as the State is required to prove the commission of a crime before it can convict one of a criminal offense. The people should have their rights protected as well as inventors.

One other thing might be done. Congress might provide that no patent should be issued for improvements or some little change in a machine or its operation.

No patent should be allowed to issue for what might be termed mechanical ingenuity in changing a perfected machine. The Patent Office should be restricted by law in the patents it is allowed to issue.

Take this driven well patent business. If there are 150 patents, many of them must cover the same matters, and I know that there are several covering the same thing as covered by Green's patent. Others are slight variations from that, and then there are many others, that in fact cover but some slight change that could not be detected by one not a mechanic. The same thing applies to the great number of patents that have been issued in the barbed wire cases.

Yet, if you read the specifications and claims, you would think that the whole matter was covered by the patent unless you were used to examining patents. In this respect, the public ought to be protected by some act of Congress restraining the issuing of so many patents.

It is to be hoped that Congress will amend the patent laws in some of these respects. J. M. LAKE.

Independence, Iowa, January, 1888.

[Our correspondent does not quote us nor Senator George correctly. The Senator said, as reported in the SCIENTIFIC AMERICAN of Dec. 24: "As far as I can learn, there has been more wrong and injury done under the patent laws, by suits against men who go into open market, into the stores and warehouses of the country, and buy in good faith articles which they suppose the seller has a right to sell, *and then are afterward brought up before a court fifty or a hundred or two hundred miles from their homes to account for it.*" The evident aim and intention of this statement is to convey to the public the idea that when a man innocently buys a patented article he is liable to be sued, then arrested, and dragged perhaps two hundred miles away from his home and family and brought before a court.

No such law or practice has a basis under the patent statutes; and in our reply of Dec. 24, we said we thought Senator George would find it difficult to produce any considerable number of examples of persons who had suffered in the manner asserted.

When a man infringes a patented article, he is liable to suit, and if he chooses he may defend. But he is not subject to arrest, and is not brought away or compelled to leave his home. This the Senator knows full well, and so does our correspondent.

Our correspondent, in his statement before the Supreme Court, to the effect that there were at least 1,000 cases concerning driven wells then pending in the various circuit courts, all of which would in practice be determined by the one Supreme Court decision, meets his own arguments excellently well. Several thousand cases had been brought in the circuit courts, and had not been made weapons of blackmail, but had quietly been held in abeyance until the highest tribunal decided as to the validity of the patent. Nothing could be more equitable than this. Any one can bring a suit for any thing. If his basis of action is unjust or imaginary, he loses his case and has for penalty the statutory costs it may be, or perhaps only his lawyer's bill.

In most cases the law affords only a very insufficient retribution to the party unjustly sued, if it affords him any. This is a valid complaint against all human justice. To do away with unjust patent suits by substantially abolishing patents would be equivalent to curtailing personal rights in order to prevent unjust prosecution for their violation.

The barbed wire cases are also cited. The writer thinks that a hardship would be incurred by farmers paying royalties after purchasing wire fencing from parties whom they presumed were authorized to sell it. The hardship would be the same as that borne by an innocent purchaser of stolen goods who was obliged to restore them to their owner. If the innocent purchasers of patented articles should be protected, then protection for the innocent accessories of thieves should also be provided.

As for the balancing of proofs of prior use, that suggestion if carried out would lead to endless trouble. Nothing could be more inequitable than to declare a probability of prior use enough to invalidate a patent. The people's rights should certainly be protected. But when an inventor contributes to the sum of the world's possessions a new invention unknown before, his consideration, a seventeen years' franchise, should be rigorously guarded. The invention never existed before the inventor's conception; he has added to the world's wealth. As the producer of a new thing, his rights should precede those of the public whom he has benefited. The public would never have known of the invention but for him.

Congress should avoid tampering with the patent laws. It is utterly futile to attempt to make the Patent Office in any sense a final arbiter of what constitutes invention. A patent merely gives standing in the courts to the patentee, and limits sharply what he can claim there. Hence patents should be granted to all except those utterly unable to show the presence of the statutory requirements.]

A New Remedy for Tapeworm.

Dr. Harris, of Simla, calls attention in the *Lancet* to the value of the fruit of the *Embelia ribes* for tapeworm. He states that the drug has for the last five years been used extensively, not only by the natives, but also by the Europeans, with great success.

The dose of the pulverized fruit is from 1 to 4 drachms, which should be given in the morning with milk.

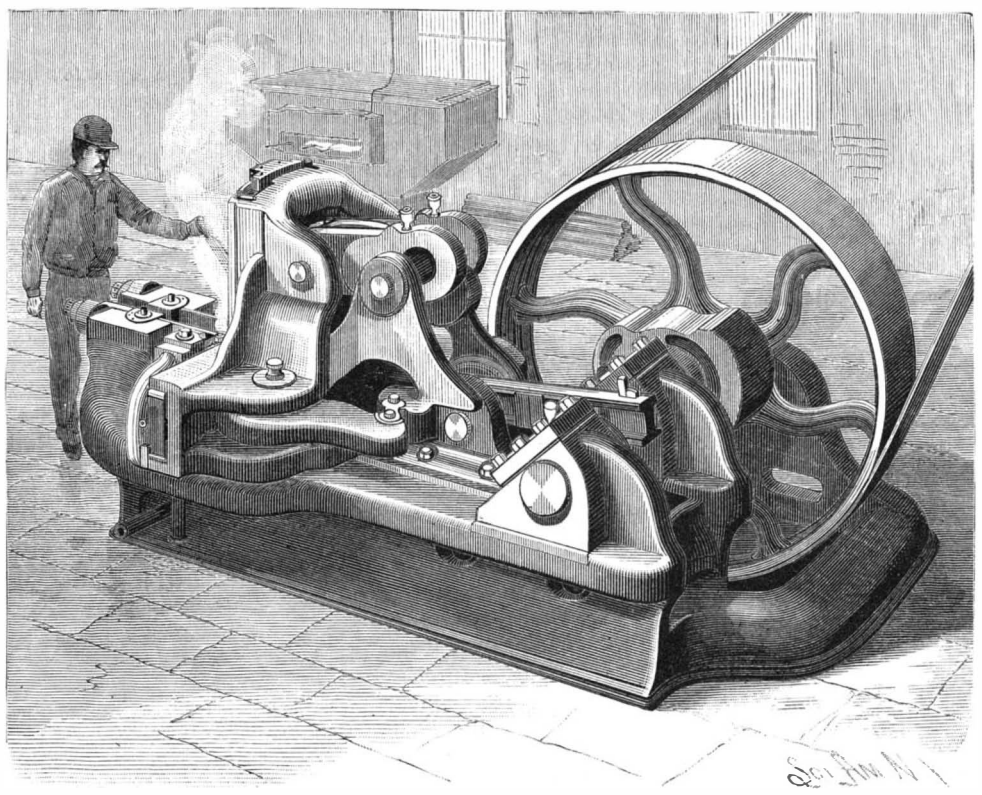
The fruit has an aromatic taste, and is about the size of a pepper seed. According to Dr. Dymock, they have recently been exported in large quantities to Germany, where they are said to be used as the chief ingredient of several patent tapeworm "specifics." The drug is said to heighten the color of the urine.

POLISH bright iron work with rotten-stone and oil, if it is running machinery.

THE ABBE FORGING MACHINES.

Since the introduction and adaptation of machinery in forging metal into regular and irregular forms, the inventors and manufacturers in the United States have expended much thought and money to produce special machines for special work to meet the requirements of the users, their aim having been to bring together as few pieces as possible in such machines, and do the work in as small a space as could be used conveniently to get at the parts for adjusting and removing for repairs. That our readers may judge how well this has been done, we place before them an admirable illustration of a mammoth bolt forging and rod upsetting machine, designed and patented by John R. Abbe, and manufactured by the S. C. Forsaith Machine Company, of Manchester, N. H.

This company has manufactured two smaller sizes of these machines for many years, they being known to the trade as the No. 1 Abbe header, working iron 1¼ in. diameter or under, and the No. 2 Abbe header, working ¾ in. iron and smaller sizes, and so well have these machines been received, both in this and foreign countries, that many inquiries have been received for one of greater capacity, to cover a wider range, such as bridge rods and for similar service.



THE ABBE FORGING MACHINE.

In operation this machine is identically the same as the smaller patterns, the machine being held on separate base casting, without legs, bolting to the main bed of the machine, this giving a more extended bearing on the foundation, while on the left hand side, at the back end, two arms project each side of driving wheel, and on the end of these are bolted a pedestal for the outer bearing for the crankshaft, relieving the shaft from the strain caused by the extra heavy weight of the pulley and the strain of the belt. The floor space over all occupied by the machine is in length from front to back 12 ft. 7 in., the width 7 ft., and the height 5½ ft., the distance from bottom of base to center of shaft being 34 in., and the shaft is of forged iron, 6 ft. 3 in. long, 5½ in. in diameter, with three bearings, two on the main frame 12 in. long, and outer bearing on the pedestal 12½ in. long, the distance from center to center of wrist pin being 3½ in., giving the crosshead which carries the upset a horizontal movement of 7 in. The driving pulley is of heavy balance wheel pattern, weighing upward of two tons, 6 ft. in diameter, 17 in. in width of face, with bearing of hub on the shaft 16 in. in length, the hub being bushed with composition so as to be removed and replaced when wear may occur. All sliding parts are gibbed as in the smaller machines, so any perceptible wear can be taken up at will, with gib and key connections, and the major portion of the small parts of the machine are of steel, the complete machine weighing 16 tons. The dies are wider than the bolt heads, leaving no fins upon the corners, while the holding dies leave the bolt exactly the size of the rod, while its working surfaces, all slides, and, in fact, every bearing upon the machine, are above the water, scale, and cinders that fall from the work—a notable feature possessed by no other machine, no gears, cams, or springs entering into the construction of the machine to cause repairs or noise when in use.

Its adaptability for other classes of work than bolts and rods is extensive, the great strength of the machine allowing a wide range in work performed thereon For instance, one of these machines is in use in the shops of the Philadelphia, Wilmington & Baltimore R. R. Co., doing special locomotive, car, and bridge forgings, one class of forging being the punching of a slot 5 in. in length, ⅞ in. in width, through a bar of 2 in. square iron, 8 in. long, the slot or keyway being made with one revolution of the crankshaft of the machine. In fact, the machine forges a wide range of special work, such as crank pins, lever handles, connecting pins, and, in fact, anything for which dies can be produced.

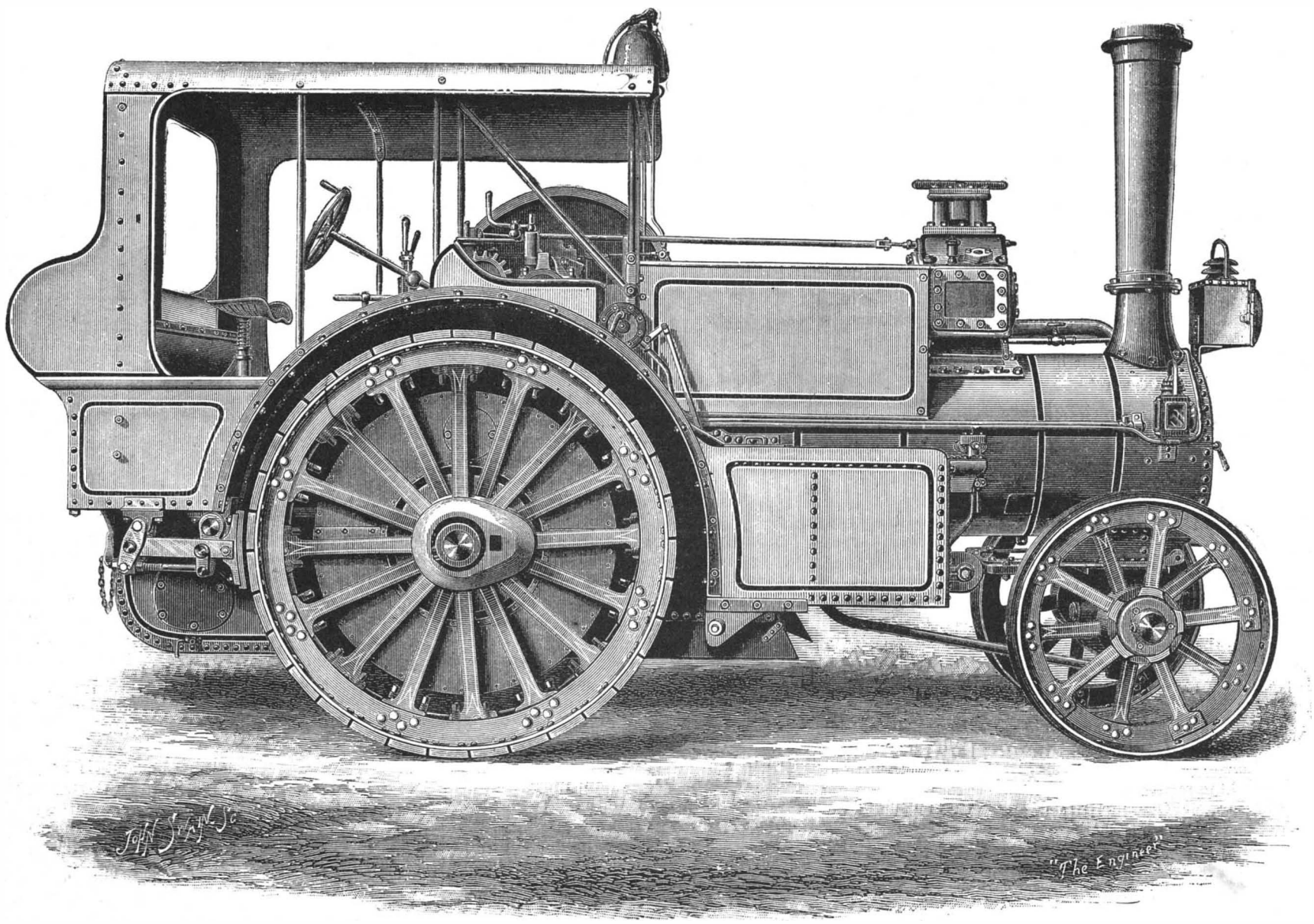
The superiority of these forging machines was well attested at the great exhibition in Philadelphia in 1876, when they were selected by the United States commission to illustrate the high order of bolt heading machinery used in this country.

The machine from which the photograph was taken to make the cut has just been placed in the shops of the Roanoke Iron Works, Roanoke, Va., through the Niles Tool Works, of Philadelphia, Pa., and Hamilton, O.

ROAD LOCOMOTIVE FOR POSTAL SERVICE.

The engine we illustrate is one of several constructed by J. & H. McLaren for the *Fourgon poste* service in the south of France. This service is in the hands of different contractors, and altogether apart from the postal service of the state. It consists of the collection and delivery of parcels and light merchandise in districts remote from railways or indifferently served by them. Strange as it may appear, many of the largest railway centers are also the chief centers of the *Fourgon poste* services, which collect their parcels in one town, and convey them by horse conveyance, and deliver them in another town many miles away, although there may be a direct line of railway between the two places. The excessive charges of the railways for goods carried *grand vitesse*, and the excessive time occupied in the conveyance and delivery of goods carried at *petite vitesse* rates, enables these contractors or carting agents to do a large business, many of them requiring several hundreds of horses for their work.

Some two years ago, Messrs. McLaren made one of their compound road locomotives, and tried it on one of

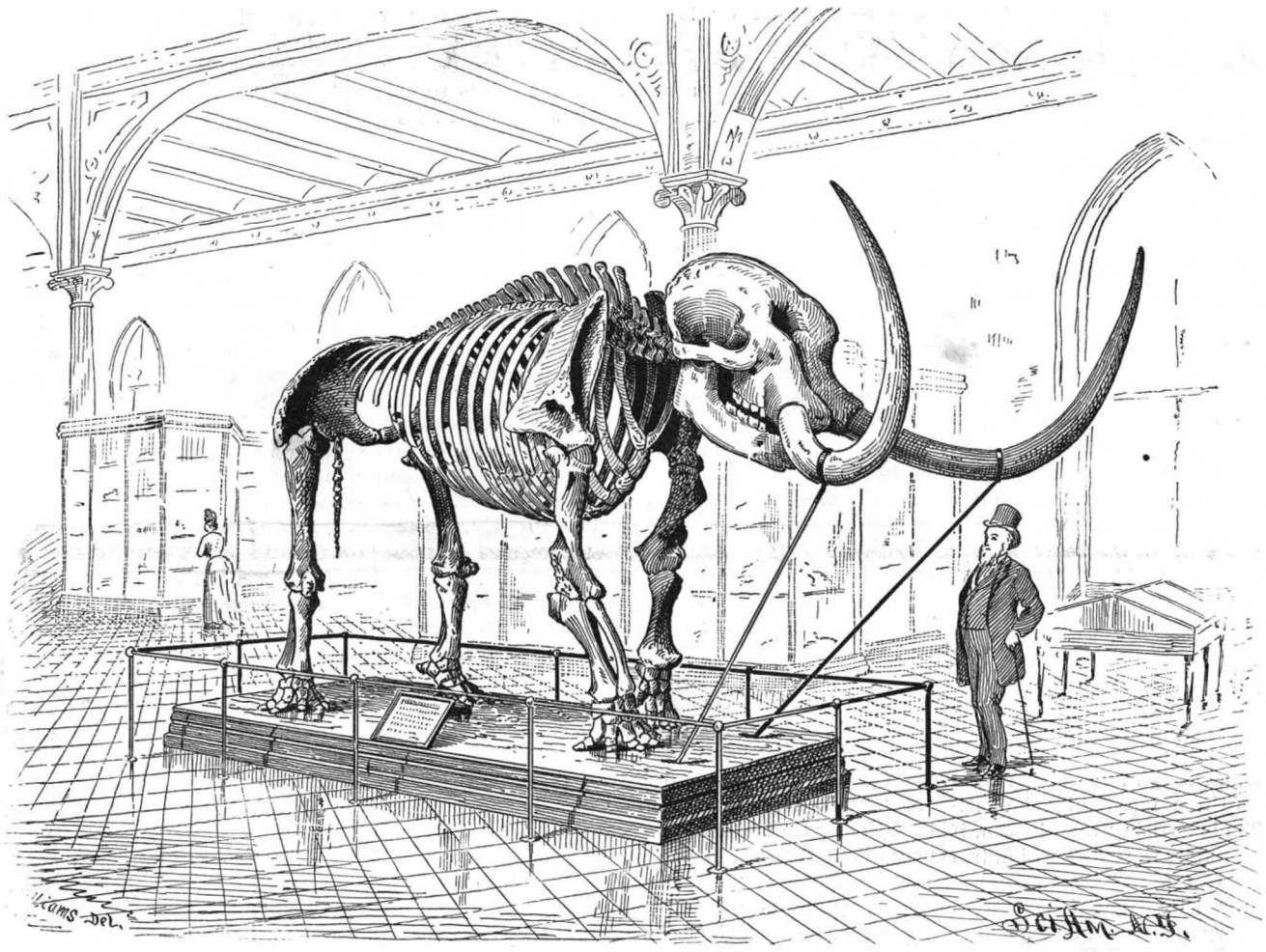


IMPROVED HIGH SPEED ROAD LOCOMOTIVE, FOR POSTAL SERVICE.

the principal *Fourgon poste* lines, with so much success that in a short time a number more was ordered, similar to that engraved. The engines are on the compound system, 12 horse power, working with an average pressure of 175 lb. on the square inch. They are mounted on two laminated locomotive springs under each axle. They are running regularly between two large towns in the south of France, 70 miles apart. The goods are collected and packed in the wagon—which will carry about six tons—during the day and dispatched every evening. Consequently, the whole of the running is done in the night. Twelve hours are allowed for the journey of 70 miles, but out of this about three hours must be deducted for stoppages at various places *en route* to take up and put down merchandise. The average running speed is, therefore, about 8 miles per hour. The road for about 30 miles of its entire length is fairly straight and through a comparatively level country. For the remaining 40 miles it is very hilly, the gradients varying up to as much as 1 in 11, while some are as much as 3 to 4 miles long. For miles the road winds along a shelving side of the mountains, without any protection whatever on the low side, while at another part it descends a zigzag course down to the bottom of a very steep valley.

In consequence of the dangerous nature of the road, it is of the greatest consequence that the engines should be fitted with ample brake power and an efficient system of lighting. They are therefore fitted with a steam brake—worked by McLaren's patent steam reducing valve—as well as the ordinary hand brake. The former can be applied instantly with such force as to pull the engine up with full steam on, and at the same time, by means of a chain, the brake is also applied to the wheels of the wagon. In the experimental engine it was found impossible to make lamps which could be relied upon, so the new engines have all been fitted with an arrangement for burning ordinary gas. This is compressed into a receiver up to 175 pounds pressure, and reduced down to burning pressure by means of a patent regulator or diminishing valve, which Messrs. McLaren specially designed for this purpose. One charging of gas is sufficient to give a brilliant headlight and supply the signal lights for the round trip of 140 miles. The water tank capacity is sufficient for twenty-five miles, so that, with a fill-up before starting, it is only necessary to take up water twice *en route*.

When the roads are in fair condition, 10 cwt. of fuel suffices for the round journey; a little more is required in bad weather. The weight of the engine empty is 13½ tons; loaded up with coal and water, 15 tons. The wagon weighs 2½ tons, and the load from 5 tons to 7 tons, so that the average total weight of the train is about 23 tons. The service is a daily one from each end, so that one engine leaves each terminus each evening with its load and goes straight through with it. A reserve of engine power is always available, so that ample opportunities exist for washing out, cleaning, and repairs. The average mileage of each engine is about 15,000 miles per annum. The engines in question have been running for over six months without a hitch or breakdown, and the system is admitted by all to be a complete success.—*The Engineer.*



MASTODON GIGANTEUS—FOUND NEAR NEWBURG, N. Y.

THE MASTODON GIGANTEUS (*Cuvier*).

BY DR. J. B. HOLDER, AMERICAN MUSEUM, CENTRAL PARK.

The mastodon, that great fossil mammal, allied somewhat nearly to the elephant, has become, perhaps, more familar to the public than any other of the numerous great creatures which once lived in our extended country. This familiarity came about through the frequent discovery of well preserved skeletons of the mastodon.

In nearly every State west of New England portions of this creature have been disinterred. And every year there are several found, more or less in a state of complete preservation. The circumstance of several examples having about them evidences of man's work is extremely interesting. On one account it brings the date, though greatly indefinite, to man's existence. We are, therefore, able to say, man and mastodon are contemporaneous. But the date is obscure. We have not determined what sort of man made those stone arrowheads which struck the life out from the great carcasses and lie among their remains. We have not a knowledge of what sort of man made the charcoal which was found lying among the partly burnt bones of a mastodon near the Mississippi River. But we do know that some man made the arrowheads. And we know also that no other than man is capable of making charcoal, or even to make fire by which it is formed. We are then able to say that the mastodon, like the fossil elephant of America, lived in the period allotted to man, while the marvelous great skeletons of extinct mammals, which have also been found in the Western "Bad Lands," are of more ancient date, being of the Miocene and other ancient deposits.

The most perfect, and also the most remarkable, as to size and interesting developments, is the skeleton of a mastodon now mounted in the Geological Hall of the American Museum of Natural History, in Central Park. This example, of which our engraving is a correct picture, was found embedded in a peaty material in the town of Salisbury Mills, near Newburg, N. Y. At the time of the discovery of these bones, in 1877, the locality was cultivated as a potato field. It was, fifty years since, a pond hole of considerable size. In digging a ditch about 20 inches deep, in order to drain the pond, at the depth of 14 inches the workman came upon a hard substance, which proved to be one of the long bones of the mastodon.

Prof. Whitfield, of the geological department of the American Museum, in company with Major Brooks, of Newburg, visited the place of discovery. He found the situation to be "a swamp, bordered on the side nearest the position of the skeleton by a low hill of 'bowlder clay,' a hard, blue clay, mixed with gravel, which slopes down and passes under the peat or muck of the swamp, and forms the original bottom of the pond. Every evidence, as has usually been noticed in other examples, was in proof of the animal's extinction by miring."

This skeleton is regarded as the most perfect of mounted ones known. This is a gratifying circumstance, as the greater number which have been removed from their burial places have proved to be greatly decayed. Often the upper side of the great creature is much decayed, owing to the nearness of the bones to the surface.

The only skeleton now in museums which compares to the present one in perfection is that famous one—the Dr. Warren example—which was found in 1845, near Newburg, N. Y.

In the present specimen the tusks were so injured that two others were substituted. The latter belong to the skeleton the only other portion of which is a lower jaw. This jaw is on exhibition with the skeleton, and exhibits the two remarkable under tusks which are known to exist at early age. These lower jaw tusks are obsolescent, being only about six inches in length. In most mandibles of the mastodon which are extant there is more or less of remaining alveolar development, which shows that at some period the creature had the mandible tusks fully grown.

The great tusks which are used in the skeleton to replace the decayed ones which were found with it are from an example found in Hoopstown, Illinois.

The dimensions of this skeleton are as follows:

Extreme length	18 feet.
Exclusive of tusks	14 "
Width of pelvis	5 "

It is the purpose of the American Museum trustees to mount alongside this mastodon the skeleton of the great elephant which Mr. Barnum lost by the late fire. This will afford an opportunity to compare the bones of the largest of Asiatic elephants with a large mastodon. It is well known that the African elephant has some near affinities to the latter, and in the near future a good example of that species will be added to the group.

The elephant as contrasted with the mastodon shows at once a greater height and shorter body. This is very considerable. Perhaps the next important comparison is in the aspect of the fore limbs. In the elephant the fore limbs are columnar, as are the hind limbs. In the mastodon there is a decided aspect more or less of prehensile capacity (as it were), that is, the latter have the fore feet approaching the plantigrade in aspect, and the limbs correspondingly adapted for pronation and the opposite. Of course this is slight, but shows the difference in probable habits. The fore limbs of the mastodon, with such development, we should expect, would be able to be thrown over low foliage or brushwood, and a crushing effected by the somewhat expanded manus. No such movement could be effected by *Elephas*. As much as we naturally compare the two great creatures, and especially as both have similar nasal developments, a near view of both together shows many differences in form.

The teeth are usually spoken of as constituting strong characters. The molars of the mammoth, with projecting, strong tubercular ridges, resemble the teats of a cow. The Greek *mastos*, a breast, being the root, hence mastodon, *mastos* and *odontos*, breast-toothed, or nipple-toothed.

The latter named kind of teeth are manifestly for crushing the coarse vegetable matter; and this corresponds to the probable uses of the fore limbs in crushing down shrubbry. The elephant, we see, grinds his food as the horse does. Both creatures, however, have the proboscis, and probably use that member similarly.

The first notice of the finding of the remains of a mastodon is found in the Transactions of the Royal Society of London, in the year 1714. Here is a short article in which is stated that a letter from Cotton Mather, of Boston, New England, to Dr. John Woodward, gives a description of some large bones which were found in 1705 at Claverack, in New York State, near Albany. Nothing further appeared until 1740, when De Longueil, a French traveler, discovered some bones at the Salt Lick, in Ohio.

To Cuvier we are indebted for the first intelligent accounts. Until 1801, little was known of the perfect skeleton. At that time Mr. Peale, of Philadelphia, obtained and set up in his museum an example which was found in Orange County, N. Y. In 1840, Mr. Koch found one on the banks of the Missouri River. It is now in the British Museum. Some specimens, single bones, have been taken up in Connecticut, along the Farmington River. The great river which separates New England from New York seems to have been a partial barrier to the passage east of the great beasts.

It is gratifying that, though New York City has not had the privilege of exhibiting a good skeleton of the

mastodon since the days of Peale's museum, it has now the best example yet known. The great frame of bones, as it stands in the Geological Hall, is truly an imposing and impressive example of mammal osteology, and well repays a visit.

Wages and Living Forty Years Ago.

The Springfield *Republican* publishes a portion of the address of James Bartlett, an old citizen of Detroit, at the semi-centennial of Michigan. Mr. Bartlett is an intelligent workingman and no rhapsodist. He had long been a machinist in Massachusetts when young, and spoke of things within his own knowledge. His own recollection went back forty-five years, for he first began in 1842, in a machine shop employing about fifty men on cotton machinery for Lowell. He said:

"The wages of a machinist in this shop were $1 to $1.25 a day; one nabob of a pattern maker received the sum of $1.50. They went to work at 5 o'clock in the morning and worked until 7:30 at night, with an hour for breakfast and three-quarters for dinner. It was several years before we obtained eleven hours a day. It has now been ten hours a day for twenty-five years or more, and we grumble at that, though we may get more than twice the wages we did forty years ago; and we are hoping to get the same or higher pay for working eight hours. I know the condition of the machinist is better then when I first joined the guild. He has better pay, better houses, better education, better living; and I hope he will keep on improving for the next fifty years. Large machine shops were started before 1836. One in Lowell employed over 1,000 men on cotton machinery. Now the country is dotted with them. For my part, I don't want any more of the good old times. The present time is the best we have ever had, though I hope not the best we shall ever see. In fifty years we have reduced our hours of labor from fourteen to eight hours a day, our wages are doubled, and the necessaries of life are much cheaper (a barrel of salt, which cost $3.50 years ago, has been sold in Michigan for 75 cents). The great curse of drunkenness is very much diminished. We live in better houses, better warmed and lighted, and we are better clothed; a high school education is in the reach of every child; books are free to all; the poorest laborer who meets with an accident in our streets will receive surgical aid that no king could purchase fifty years ago. Our great railroads distribute the fruits of labor so that famines are impossible. Beef killed on the prairie is sent all over the country, and supplies the markets of Europe. Fish from the salt seas and from our great lakes are eaten fresh all over the continent, and tropical fruits are peddled round all our streets."

Electrical Litigation.

The year 1887 closes with a considerable amount of litigation going on in connection with electrical patents, although few, if any, cases of importance have been concluded during the year. At the time of writing, the Supreme Court has not delivered its decision in the Bell telephone cases, although it has been anxiously expected for the last three months by the various parties in interest. The long delay would seem, if anything, to be an indication that the court will affirm the validity of the patents. If a sufficient defense were found among the many urged by the various defendants, it would not be necessary to consider other points at length; whereas, in preparing an opinion sustaining the patents, the court might consider every point carefully and at length, a proceeding which, in view of the enormous volume of evidence, would necessarily occupy much time.

The suit of the Western Union against the Baltimore and Ohio Telegraph Company for infringement of the Stearns condenser patent is likely to be terminated by a decree by consent of defendants—a result which, in view of the recent union of the two companies, can hardly be said to be unexpected. It is reported that Mr. Van Hoevenbergh, late electrician of the Baltimore and Ohio, who was made a defendant to the suit, has not yet consented to the decree—a circumstance which may have the effect of prolonging the litigation.

The numerous suits brought by the Edison Electric Light Company against the United States, Westinghouse, Consolidated, and other companies engaged in incandescent electric lighting, have apparently made but little progress during the year. In most of these cases the defendants have filed pleas, alleging that the Edison patents have expired, and that the present Edison company, which, it will be remembered, was formed by the consolidation of the original company with some of its sub-companies, has no legal standing in the present litigation.

The suit of the Thomson-Houston against the American Electric Manufacturing Company, alleging infringement of Professor Thomson's patent for automatic regulator for arc light dynamos, is in progress, a considerable amount of testimony having been taken.

The suit brought by the Brush company against certain users of apparatus of the Fort Wayne Jenney Company for infringement of the Brush arc lamp patents has been vigorously contested. The testimony has been completed, and the case having been argued early in December, is now awaiting decision.

The suits brought by the United States Electric Lighting Company against the Edison company, alleging infringement upon Farmer's patent for regulating apparatus for multiple arc circuits, are making slow progress, the testimony for the defense being yet unfinished.

Two suits have been instituted by the Westinghouse Electric Company on the Gaulard & Gibbs patent for induction lighting by alternate currents, one against the Sun Electric Company, of Woburn, Mass., in which the evidence has been completed and the case prepared for argument, and the other against the United States Illuminating Company, of New York, in which no evidence has yet been taken.

Another action for infringement, which has been commenced, but in which no evidence has been taken, is that of the Consolidated Electric Light Company against the McKeesport, Pennsylvania, Light Company. This is a very important case, as it is designed to determine the validity of the Sawyer-Man patent claiming the exclusive right to the incandescent filament of carbonized fiber, which is employed by the Edison company as well as by most other manufacturers of incandescent lamps.

An action has also been commenced by the Brush company against the Faraday Carbon Company, of Pittsburg, alleging infringement of Brush's patent for copper plated carbons. A suit on the same subject was commenced by it some years ago against the United States Company, but was dropped and never brought to an issue. A movement is said to be on foot among the manufacturers of carbon points to make common cause with the Faraday company in its defense.

Quite a number of other suits of minor importance are now pending in the courts in which electrical devices are involved, but the above list comprises the most important ones. It is probable that the present year will be marked by the decision of a number of important patent cases, which will have a marked influence upon the future direction of electrical development.—*Electrical Engineer.*

Natural Gas.

The gas field of Murrysville is one of the wonders of the world. One hundred and twenty-five wells within a radius of one mile are pouring forth a volume of gas that is marvelous. Frank L. Stewart, the best posted man on the subject in the United States, says that there is no perceptible diminution of the flow from the wells—that each well, on an average, produces daily from 50,000,000′ to 75,000,000′. Taking 60,000,000′ as an average, and multiplying that by 125, and the daily product of gas is 7,500,000,000′. There are now fifteen gas pipe lines down, conveying the element to as many different points. From the fact that the flow is so immense, and the pressure is so evenly maintained, the conclusion is reached that there must be a constant generation of gas going on beneath the earth's crust. The report has been once and again set afloat that this or that well was giving out, but the gentleman above referred to says that in every instance it has been found that the decreased pressure was caused by some obstruction in the tubing, and that, having withdrawn the casing and put down the bit, the flow has been restored to its original pressure. With such a gas field in our midst, the material development of Western Pennsylvania must be unprecedented.—*Saltsburg Press.*

Millerstown, Pa., December 23, 1887.—This town had a narrow escape from a wholesale holocaust at about 10:30 o'clock, Wednesday night, the 28th. The cause was natural gas. At the hour named the citizens who had not yet retired were startled by their lights and fires suddenly springing up a distance of a foot or so. This was immediately followed by an additional rush, and the lights leaped to the ceiling in an instant. The stoves roared liked furnaces, and the wildest excitement ensued. People rushed through the streets warning their neighbors, and but for the prompt action taken, the town would certainly have been destroyed, and no doubt several lives would have been sacrificed. The surplus gas was caused by the ball on the safety valve of the gasometer being either taken off or falling off, thereby throwing the entire pressure of the well on the service lines. This pressure was no less than ninety pounds, and perhaps more. This terrible pressure was thrown on at every house, and as almost every one had left the gas burning, it is a miracle that there was no one burned out. This is only attributed to the time it occurred, for had it been two hours later, nothing could have saved the town. There was a high wind blowing, and the cold was severe. Men ran through the various streets to the public school building, churches, and other places, and in most cases were compelled to break in the doors. After the excitement was over the people returned to their homes, but many of them were so frightened that they slept in the cold rather than to relight the gas.

An enthusiastic correspondent writes from Kokomo, Ind.:

The Schrader is the second in power of any gas well yet discovered. It has a pressure of 340 pounds to the square inch, discharging 10,000,000′ of gas each twenty-four hours. An iron tube 3″ in diameter resting on braces about 6′ high is first seen by the visitor. It looks as harmless and quiet as the dead iron. No one would dream that sleeping dormant within this little space is a power that awes the stoutest heart and blanches the rosiest cheek when the screw is turned and the match is applied, notwithstanding the observer has been warned "not to get frightened when the full force is turned on." In a flash the blaze shoots 70′ high, with a width of fully 15′; the roar is heard for miles around, and the very air and the earth tremble as if in the giant grasp of a visible divinity. There is no language to exactly describe the noise made by this newly discovered agent of nature that enriches all and makes no one the poorer. I have stood at the foot of old Vesuvius and witnessed her eternal fires, but the grandeur of the volcano pales into insignificance before the power, majesty, and beauty of the Schrader well. It is worth a trip across the continent to witness the lighting of this at night. It is a Niagara of fire. Notwithstanding the city is largely heated and lighted by this well, and immense factories furnished with motive power, it does not seem to decrease the volume one iota. The gas-heated house has solved the domestic problem as to who shall build the morning fire, for the laziest married man on earth is equal to scratching a match, no matter how low the thermometer may be, and this is all that is required in the city of Kokomo.

The New Gold Fields of South Australia.

In his report to the Department of State, United States Consular Agent J. W. Smith writes from Port Adelaide as follows:

The most important and noteworthy circumstance which has occurred in South Australia during the past year is the discovery of a rich alluvial deposit of gold about 230 miles north of Adelaide, and within 20 miles of the railway line, now nearly completed, to the rich silver district across the New South Wales border, and known as Silverton. The existence of gold in the neighborhood of the recent discovery has long been known, and a reef of ironstone and quartz, yielding gold in payable quantities, from 17 pennyweights to 1¼ ounces per ton of stone, has for many years been worked 15 miles to the west of the newly found alluvial. The place is called the Teetulpa gold fields, from the name of the sheep run on which it is situated.

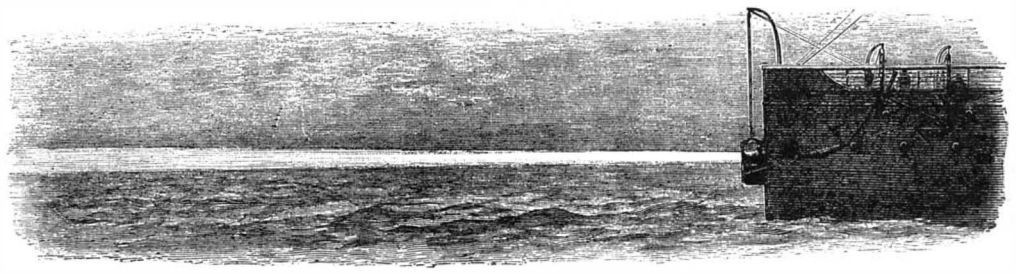
The account here given of it has been furnished by Mr. I. B. Austin, a recognized authority on mining matters in the colony, and who has for ten or twelve years been acquainted with this part of the country as an auriferous district. Shortly after the alluvial discovery was made public he visited the locality, so that much of the information is given from his personal observation. Notwithstanding the fact that gold reefs had been worked for years within a few miles of the place, and some prospecting done with the view of finding alluvial gold, the discovery was made quite accidentally. Two men, who had been searching for gold and were camping at a "dam" or water reservoir with some others, went in search of their horse, which had strayed, and while looking for it a thunder storm came on. The rain washed away some of the soil in a small creek, exposing to view two or three nuggets of gold. The party fossicked them out with three or four more, and after waiting, with the digger's usual caution, until the other men had gone away, they proceeded to open up the ground, which they found so rich that they at once applied to the warden of the gold fields for a prospector's claim and the reward of £1,000 offered by government for the discovery of a new and payable gold field. A rush speedily took place, and a number of nuggets were found in the little dry creek, some only two or three inches from the surface and some in the crevices of slate rock.

In about a fortnight from the announcement of the discovery it was estimated that 2,000 men were on the field. No washing was attempted for the first fortnight, all the gold being picked out of the dry and friable loamy soil and gravelly wash dirt. Two boys got out 3 ounces in two days; four men got 16 ounces of rough, nuggety gold in one week; one man got 18 ounces in eight days; four men got 30 ounces in one week. The pieces varied in weight from half a pennyweight up to several ounces (3, 5, and 6 ounces), and one of 8 ounces 14 pennyweights was also found. Since then several nuggets have been found, weighing, stated roughly, without being exact to pennyweights and grains, 10 ounces, 10½ ounces, 11½ ounces, 12, 13, 16, 18, and 29¾ ounces, all fully authenticated, and more than one from 7 ounces to 12 ounces. Besides these there is a report of one weighing over 61 ounces, which, not so undoubtedly confirmed as the others, is nevertheless stated on excellent authority to be genuine.

QUEEN VICTORIA is to receive the first bar of gold taken from the newly discovered Gwynfynydd Mine at Dolgelly, Wales.

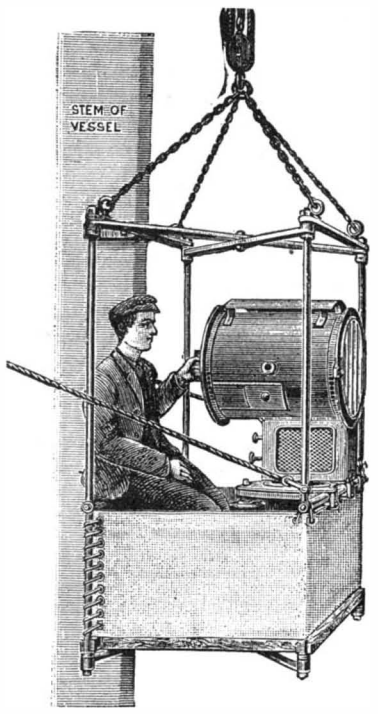
ELECTRIC LIGHTING OF THE STEAMSHIPS VICTORIA AND BRITANNIA.

The magnificent fleet of the Peninsular and Oriental Steamship Company has, during the past few years, been gradually fitted with the electric light, one vessel following another, and each having the benefit of the experience gained in those which preceded it. From the ample opportunities thus placed at his command, Mr. Hall, the head of the engineering and marine department of the company's business, has decided that success is best obtained by the use of machinery which conforms to the ideas and habits of thought of ship's engineers, and which they can take charge of without special instruction or explanation. In order to act upon this idea, it is evident that the use of all belting, wheels, and other form of multiplying gear must be abandoned, equally with the various high speed engines which run in closed casings and have more or less complicated arrangements of valves. An engine as nearly of the marine type as possible, driving direct on to the spindle of a dynamo, as if it were a screw shaft, is the ideal arrangement of Mr. Hall, and this, by the progress recently made in electrical engineering, he has been able to secure for the two splendid new vessels, the Victoria and the Britannia. As long as the minimum speed of a large dynamo was 400 to 500 revolutions per minute, its direct driving by the ordinary type of engine was subject to too many drawbacks to render it preferable to the use of intermediate gearing; but now that machines are made capable of running at two hundred revolutions, and at the same time of giving a very large output, the case is entirely changed, and there is no longer the need of resorting to driving appliances which are not viewed with favor by the sea-going engineer.

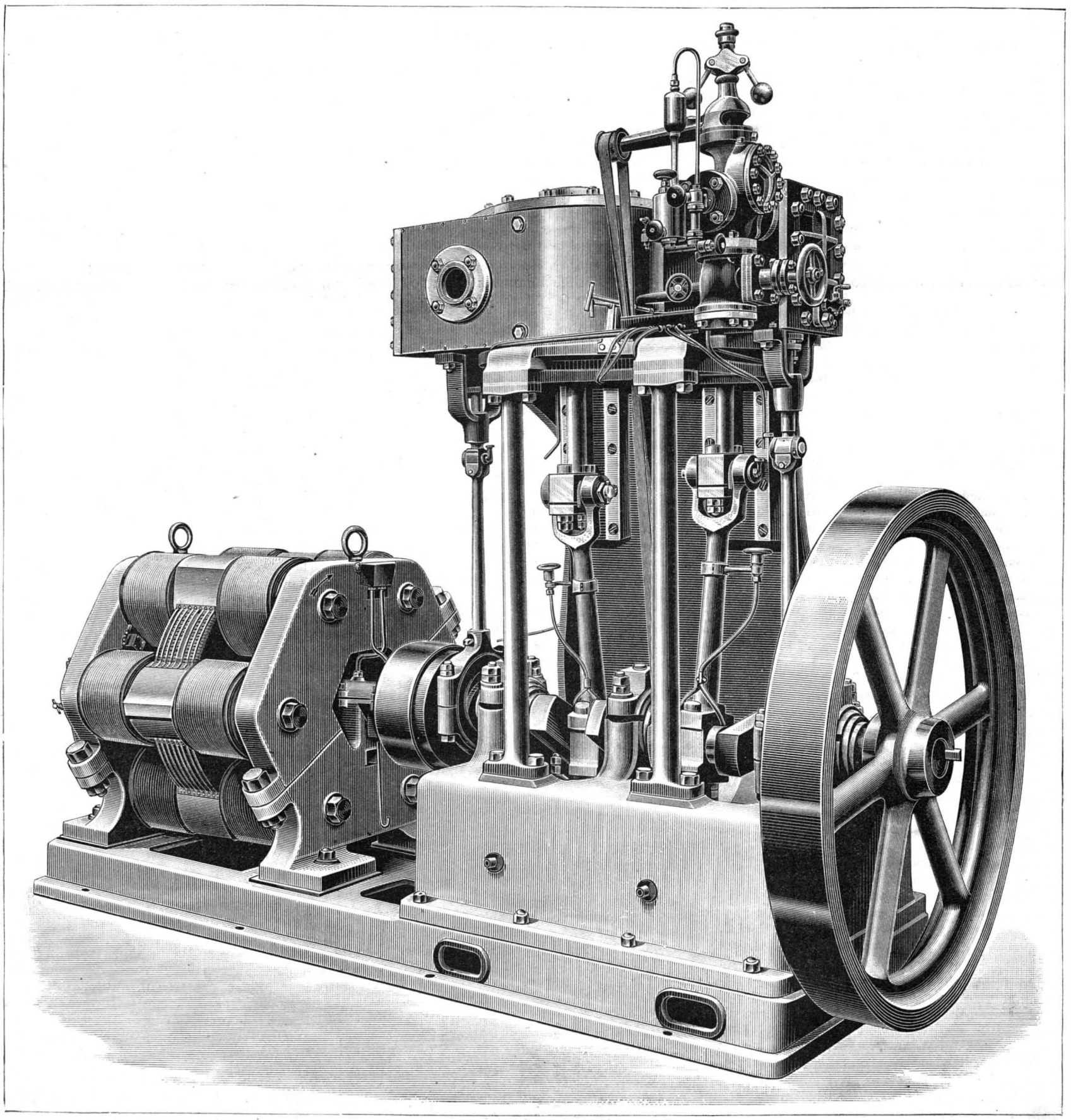


THE ELECTRIC LIGHTING OF THE STEAMSHIP VICTORIA.

The plant erected on the Victoria and Britannia by the Anglo-American Brush Electric Light Company, Limited, of Belvedere Road, London, consists of a Tangye engine having cylinders 8 inches and 16 inches in diameter respectively, by 10 inches stroke, driving directly on to a Victoria Brush dynamo capable of feeding 450 lamps. Between the crankshaft and the armature spindle is an improved form of Oldham coupling, consisting of two plate couplings with an



BOW LIGHT—ELECTRICAL FOR VESSELS.



ENGINE AND DYNAMO FOR THE STEAMSHIP VICTORIA.

intermediate disk. In the face of each plate coupling there are two flattened studs which take into a slot in one face of the intermediate disk, the slots on the opposite sides of the disk being at right angles to each other. A shrouding on one coupling covers the disk and studs. Thus if the two shafts should fail to lie in the same straight line, the coupling permits them both to work freely. The dynamo, which is self-regulating, has six poles, and gives its full output at 200 revolutions per minute.

The plant is entirely in duplicate, each set being capable of maintaining all the lights. The conductors from the dynamos are led to a main switchboard, and are then distributed through the vessel on the single wire system, in which the frames and plating of the ship serve as return conductors to the engine room. The lamps and groups of lamps are turned in and out by the porcelain switches made by Messrs. Dorman & Smith, of Manchester.

The Peninsular and Oriental Company's vessels pass through the Suez Canal, and according to the present regulations they are allowed to steam on at night, instead of being obliged to moor at dusk, if they are provided with search lights. For this purpose the Brush Company provides the apparatus illustrated herewith. This consists of a cage which is suspended over the bows of the vessel and is lowered within 8 feet of the water. In this cage there is mounted an arc lamp taking a current of 70 amperes and 65 volts. The lamp is regulated by hand by an attendant who sits behind it and feeds the carbons together as they are consumed. The beam is reflected by a mirror 22 inches in diameter and 12 inches focus, and then is spread sideways by a dispersion lens which widens it into a sector subtending an angle of 22 degrees. The direct rays of the arc are prevented from leaving the lantern by a carbon shield, but as the crater is turned toward the mirror there is very little loss from this cause. By the use of this apparatus the time of passing through the canal is reduced from an average of 36 hours to 15 or 18 hours. In the case of a vessel fitted with duplicate plant, the spare dynamo is employed to work the arc lamp in passing the canal. Vessels that are not fitted with electric appliances take them on deck on entering the canal and discharge them at the other end, and thus one set will serve a whole fleet of steamers.—*Engineering.*

Government Meddlesomeness.

In the United States, the recent action of the French government, in providing that nothing shall be bought for public use which is not of domestic production, and which the outside world has regarded as a policy unworthy of an enlightened nation, has had its counterpart and precedent in the previous legislation of quite a number of the States; with this exception, that in France the discrimination is made against foreigners only, while in the United States the discrimination is made against their own countrymen living in different political divisions of the country. Nothing, moreover, can probably be found in Europe to parallel the recent legislation of one of the leading States of the Northwest (Minnesota), and a large part of which was the work of a single legislative session (limited to sixty days) in 1885, and which has thus been described by a recent writer: Prominent in importance were statutes providing for the weighing, handling, and inspection of grain; the construction and location of grain warehouses, the providing of cars and side tracks by railroads, and the regulation of rates of transportation. Next was legislation respecting State loans of "seed grain" to farmers whose crops had been ruined by grasshoppers, for the subsidizing of State fairs from the State treasury, for enabling farmers to avoid the payment of a portion of their debts, for protecting butter makers from the competition of artificial products, such as "butterine," for regulating the details of the cattle industry to the extent of registering and giving State protection to brands and other modes of identification, and of stamping out contagious diseases with small courtesy to the rights and wishes of individual owners, and for regulating the lumber business to such an extent that not a log can float down a stream to the saw-mill for which it is destined without official cognizance. One State board regulates the practice of medicine and the admission of new practitioners, a second the examination of druggists and compounding clerks, as precedent to entering into business, while a third regulates the practice of dentistry. Various enactments prescribe the toll to be exacted for grinding wheat, when one man may slay his neighbor's dog with impunity, how railway companies must maintain their waiting rooms at their stopping places for passengers, the hours of labor, and the employment of women and children, the maximum time for which locomotive engineers and firemen may be continuously employed, what books shall be used in the public schools, forbidding "raffles" at church fairs under "frightful penalties," and making it a crime to give away a lottary ticket, and a misdemeanor "to even publish an account of a lottery, no matter when or where it has been conducted." Among bills introduced, and which found considerable support, but were not enacted, was one forbidding persons of different sexes to skate together, or even be present at the same hour on the rink floor, and another to lincense drinkers, which provided that no person should be permitted to use intoxicants or purchase liquors of any kind without having first obtained a public license.—*David A. Wells, in Popular Science Monthly.*

The Modern Military Rifle.

When, in the development of the military musket, the necessity for imparting rotary motion to the ball was realized, rifles were adopted, and at once the question of loading assumed new difficulties. The ball had to be so small that it could be forced down the barrel from the muzzle. Naturally, such a bullet did not adequately take the grooves. Then the idea of expanding its base after it was quite or nearly home was conceived. The *carabine a tige* met the issue in a peculiar way. At the bottom of the bore a solid spindle projected in the center of the chamber. The ball, which had a hole formed in its base, was driven down upon the spindle so that it was expanded. Probably the force of the explosion tended still further to drive the lead outward. This seems a very crude contrivance, and inferior to the Minie principle. In the latter the bullet had a cavity in its rear, back of which an iron cup was placed. The explosion drove the iron cup into the lead, forcing the metal into the grooves. Later it was found that the cup was unnecessary; the simple excavation of proper shape was enough. It is said that in a rifle of the original Minie system, the iron cups have been blown through eight bullets in the same number of successive discharges, leaving the remains of the bullets in the barrel.

When breech loaders were adopted, the trouble disappeared. Yet the now universally adopted arm met with much opposition. It is actually recorded that a breech loading rifle, invented by an American, Mr. Morse, of Louisiana, was reported on unfavorably by a committee of the British army for the following reasons: 1. It fired too quickly, twelve rounds a minute. 2. Its cartridges were metallic. 3. They contained the principle of their own ignition.

Eventually, the Prussian military successes of 1864 and 1866 are thought to have turned the scale in favor of breech loaders, as the needle gun, with all its defects, did great execution.

The movement of the day is in the direction of small calibers and high initial velocity. An ordinary lead pencil represents very closely the favorite diameter of bullet. As a type of the old style the Springfield, still in use by the U. S. Army, may be cited. With a 500 grain bullet it develops an initial velocity of only 1,301 feet per second. In a range of 1,000 yards its trajectory reaches the great height of nearly fifty feet. Its caliber is 0·45 inch.

The Lebell rifle in France and the Hebler rifle in Germany are examples of the modern style of military arm. In both of these the caliber is small, 0·315 and 0·296 inch respectively. An extremely long bullet is adopted, and a new material is used in its construction. The Hebler bullet is 4·46 calibers or diameters, and the Lebell bullet is said to be about 9 diameters in length. The Hebler bullet is of lead covered with a soft steel shell. The Lebell bullet is entirely of steel. The latter bullet, if the above figures are reliable, would be over two and one half inches long. The German arm is credited with an initial velocity of 1,968 feet. For one thousand yards range, it rises in its trajectory only twenty-nine feet, a little over half the height attained by the Springfield.

All of the factors show how inferior a weapon is carried by the United States soldier. This follows not alone from a comparison with the Hebler rifle. The Pieri rifle, now the subject of experiment in Italy, and the Lebell rifle of France are said to still further surpass it. England is thoroughly roused. After adopting a new model of 0·402 inch caliber, and constructing 100,000 of the pieces, she has ordered them to be disposed of and is to adopt a new model of but 0·31 inch caliber.

As the bullet is made far longer, the rifling is made very acute. The Hebler rifling makes one turn every four inches, while in old practice over twenty inches were allowed for a revolution. The increased rotation is requisite to secure enough gyroscopic force to steady the long bullet in its flight.

The magazine principle so successfully applied to the Henry, now the Winchester, rifle is also invading the military field. It is among the probabilities that nearly all Europe will be armed with magazine rifles. The force of recoil is utilized in the Maxim and in the Paulson rifles. The former works like the machine gun of the same inventor. A single pull upon the trigger sustained for the proper period causes the automatic discharge in regular succession of all the cartridges in the magazine. In the Paulson system the force of recoil extracts the shell, and if a magazine is used, the same force effects the loading.

The stories told of the use of smokeless powder in the Lebell rifle giving a very slight report read somewhat like a myth. Yet it is known that this is possible. By increasing the length of the barrel, the same character may be imparted to the discharge of a gun loaded with gunpowder and bullet. In some experiments conducted by the U. S. Ordnance Department, it was found that with a barrel 112 inches, or nearly ten feet, in length the bullet was discharged with hardly any noise or smoke. With a five inch barrel there was a great abundance of smoke and a very loud detonation. Thus the account of the French powder may be correct.

Fortunately, America is not dependent on an armed peace. But it would seem well for the nation to do something in the way of improving the armament of her soldiers. The same administration that is creating a new navy might do something toward supplying a more efficient rifle to the army.

The smaller bullets tend to increase the number of wounded men, and decrease the number of killed. This want of fatal execution is considered a good feature. One wounded soldier requires two unwounded ones to take him to the rear. It is humorously said that such assistance is always to be had for the asking.

The Sensitiveness of Tea.

A costly evidence of the sensitiveness of the tea leaf was given to the brokers round about Front Street recently. A new lot of tea was put on sale by the various firms to which it was consigned. Tasting it, the first process through which it is put by the broker, developed the fact that every pinch of tea with its dash of hot water made a sweetened beverage. It was evident at once that it had not been tampered with since the box was opened, and investigations were at once begun. It was thought at first that a mixed cargo had been stowed by some stupidity, and that the tea had come over side by side with raw sugar.

This would have explained the taste, but it was found that the tea was brought over by the tramp ship Mosser, and formed the only cargo, saving a comparatively small lot of Chinese curios. It was, however, proved that the previous cargo had been raw sugar from Manila, and that it had done the detected damage, the protestations of the captain that the hold had been thoroughly cleansed and whitewashed to the contrary notwithstanding.

It has not yet been ascertained, of course, how much of the cargo has been damaged, but at present it looks as if a considerable portion had been tainted and its value correspondingly decreased. If this is proved and no settlement is effected, suits will be instituted and the ship will be libeled. The cargo consisted of 294,595 pounds of Formosa, 175,880 pounds of Japan and 575,000 pounds of Foo-Chow and the curios above mentioned, and, being of various grades, probably amounted in value to about $250,000. It is no small matter, it will easily be seen, and should suit be instituted there will probably be a very lively fight over the matter, as the captain and those concerned are already declaring that such an effect is absolutely impossible to have come without cause.

The last case at all similar to this was about twelve years ago, when tea was packed in the same hold with camphor. The tea was sold for less than half its value and so gotten rid of, but it left a strong impression upon the captains and consignees concerned. Another interesting thing brought out by the discussion of the sensitiveness of the tea leaf is that its only rival is another plant with an odor of its own fully as strong. A leaf of tobacco laid for two hours within six feet of open kerosene will be found to be as rank as possible with the smell and flavor of the oil, and even when dried and pressed into heavy hogsheads will take the odor from other articles in the hold of a ship, even from sugar.

Among those particularly interested in the matter at present are Busk & Jevon, Pordon & Wiggin, and Fearon, Low & Co. They are some of the consignees most heavily involved.—*N. Y. World.*

A Theory as to the Origin of Petroleum.

Professor Mendelejef has recently advanced the theory that petroleum is of purely mineral origin and that the formation of it is going on every day. He has, moreover, succeeded in producing artificial petroleum by a reaction that he describes, and he states that it is impossible to detect any difference between the natural product and the manufactured article. His theory is as follows: Infiltrations of water, reaching a certain depth, come into contact with incandescent masses of carburets of metals, chiefly of iron, and are at once decomposed into oxygen and hydrogen. The oxygen unites with the iron, while the hydrogen seizes on the carbon and rises to an upper level, where the vapors are condensed in part into mineral oil, and the rest remains in a state of natural gas. The petroleum strata are generally met with in the vicinity of mountains, and it may be granted that geological upheavals have dislocated the ground in such a way as to permit of the admission of water to great depths. If the center of the earth contains great masses of metallic carburets, we may, in case this theory is verified, count upon an almost inexhaustible source of fuel for the day when our coal deposits shall fail us.—*Annales Industrielles.*

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. Willian H. Wrigley, of New Orleans, La. An ordinary link is employed in connection with a tilting pin which will be automatically lifted at its lower end to fall into the link, and which may be lifted out of the way of the link by suitable means when the cars are to be uncoupled.

MISCELLANEOUS INVENTIONS.

An improvement in spectacles has been patented by Mr. James P. Tryner, of Denver, Col. The longitudinally apertured arms have large balls at their free bent ends to engage the front rims of the wearer's ears, in connection with other novel features of parts and details.

A neck scarf has been patented by Mr. Max Wald, of New York City. In connection with a reversible knot is a neck band, a band tooth, a detachable fly, with a tab and clasp for connecting the detachable fly to the knot, making a scarf which is readily reversible without ripping it apart and stitching it together again.

A vehicle wheel has been patented by Mr. Walter Knight, of San Andreas, Cal. It has a double series of inclined metal spokes, the wheel being made of a novel combination of wood and metal, whereby great simplicity, durability, and strength are secured, and the wheel may be easily repaired when required.

A pocket lumber gauge has been patented by Mr. John P. Peterson, of Phillips, Wis. It is rectangular in shape, with rounded corners, and has recesses and compound recesses in each of its side edges for gauging tongue and groove lumber, wainscoting and ceiling stuff, and all the usual sizes of marketable lumber.

A ceiling brush has been patented by Mr. James W. Boyle, of Negley, Pa. It has a revolving brush and a reservoir which may be charged with water for washing the ceiling, or with sizing or whitewash for coating the ceiling, the invention covering various novel features of construction and combinations of parts.

A tag adapted to form a suit record for a clothing dealer has been patented by Mr. Edward B. Webster, of Clay Center, Kansas. It consists of an apertured plate or cover, with slips secured to its back, and provided with detachable panels, with other novel features, making a device whereby a salesman may determine at a glance how many suits of a particular size there are in stock.

A velocipede has been patented by Mr. James E. Steffa, of Rockvale, Ill. This invention provides a novel form of motor adapted for traction or stationary purposes, for running light machinery, for transporting light material, and for various other purposes, the invention consisting in the construction and arrangement of the various parts, their details and combinations.

A shackle or handcuff has been patented by Mr. Frank McDonald, of Boise City, Idaho Ter. It consists of a lock case with spring bolts and a pair of shackle arms or bows which slide upon each other and upon the lock case, the thumbs, wrists, or other parts of the body inserted being held between the curved parts of the shackle arms and the sides of the lock case.

A road grader has been patented by Mr. John E. Branch, of Sioux City, Iowa. It has a mould board and landside hinged together at their forward ends, and so that the rear end of the mould board can be set farther from or near to the back end of the landside, with various other novel features, the machine being also adapted for cutting or smoothing ditches and other similar work.

An axle setting machine has been patented by Mr. James F. Hennessy, of Winona, Minn. It has a sill or bed to which is fitted a series of grooved blocks to receive the axle, with a screw or equivalent device for pressing the axle near its arm, with other novel features, whereby axles may be set when cold to give them the proper "pitch" and "gather," at one operation, and without gauges.

A tannery hoist has been patented by Mr. Albert F. Jones, of Salem, Mass. It is especially adapted for lifting hides from limes, soaks, handles, and layaways, and depositing them in other vats, without liability to hook marks, and is made with a strong timber frame with two front wheels and a rear pilot wheel, with simple and efficient hoisting machinery whereby the work can be done with economy of time and labor.

A safe lock has been patented by Mr. Harry Stanynought, of Brooklyn, N. Y. The lock is in the body of the safe, away from the door, but the bolts have direct engagement with the door, although the lock is so located that it cannot be reached even though a hole were bored in the door of the safe large enough to admit the entrance of a hand, the bolts being also so located as to render it difficult to insert powder or other explosive into the safe.

NEW BOOKS AND PUBLICATIONS.

THE ART OF PROJECTING. A Manual of Experimentation, etc., with the Porte Lumiere and Magic Lantern. By Professor A. E. Dolbear, M.E., Ph.D. Boston: Lee & Shepard. 1888. Pp. vi, 178.

In its new edition, this well known book is brought up to date by the introduction of new plates and descriptive matter, especially referring to the electric light. Besides this, some additional work is treated of. Thus vortex rings, experiments in spectroscopy, floating magnets, projection of the electric spark, vibration of films, and other topics are added to the original matter. The introduction of additional full page illustrations is also to be greatly commended, giving instances of the leading heliographs and other apparatus for projection. The book will receive due welcome, we are certain, from the many workers with the heliograph and magic lantern.

PHOTOGRAPHIC MOSAICS: AN ANNUAL RECORD OF PHOTOGRAPHIC PROGRESS. Edited by Edward L. Wilson. Twenty-fourth year. New York: E. L. Wilson. 1888. Pp. 144.

This little work contains a number of eminently practical contributions from workers in photography. A reproduction of the table of contents would be the only practicable way of giving a good idea of its scope. Suffice it to say that it is emphatically one of the books that every photographer should have, as there will be no one, who practices the art intelligently, that will not derive both entertainment and instruction from the monographs here collected by the well known photographic editor. The Moss-type frontispieces and portrait of the author add to the appearance of the book materially.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

TO INVENTORS.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) G. A. D. asks where the greatest pressure is in a steam boiler with working amount of water. A. The greatest pressure is at the bottom of the boiler, where the pressure is greater than that of the steam by the pressure of the water due to its depth.

(2) J. G. asks if there is a way to deaden the noise of steam while blowing off through a wrought iron stand pipe. A. The sound may be much modified by enlarging the end of the pipe like a trumpet or cone; which should be long, 20 or 30 times the diameter of the pipe, opening to 4 or 5 times its initial size.

(3) W. R.—Fusible plugs are put in the crown sheet of locomotive boilers to save the crown sheet from burning in case of low water, when the plug melts and lets the steam and water into the fire chamber to dampen and put out the fire as well as to make an alarm. They may also be employed on other forms of boilers, and are much used in connection with whistles for low water alarms only. Boilers should not be blown out for cleaning with fire under them or while the walls (if set in brick) are hot enough to do damage to the iron shell. Locomotive boilers may be blown out very soon after the fire is entirely removed. All brick-set boilers should be left several hours after the fire is drawn before blowing off for cleaning. Roper's works are all good. If you have not the book on "Instructions and Suggestions to Engineers and Firemen," $2, or "Questions and Answers for Engineers," we recommend you to obtain them, $3.

(4) C. K. S. writes: I have been trying for some time to do some brazing with a blowpipe, but can't succeed in melting the spelter. I use an alcohol lamp and a plain blowpipe curved at one end. A. Probably the work is too large for your blowpipe. A mouth blowpipe is suitable only for small work like jewelry. Do you use a good flux?

(5) C. V. B. asks how to dye sheepskins black, so as to make a sleigh robe. A. Use first a bath of 10 pounds carbonate of soda. For the second bath use pure extract of logwood, 17 pounds; catechu, 10 pounds; blue vitriol, 2 pounds. Place the skins first in the carbonate of soda solution, rinse them, and then place them for two hours in the second bath before the blue vitriol is added. During this operation the temperature of the bath should be kept at 85° F. The skin is then removed, cooled, and replaced in the bath, now heated to 95°, and this operation, after the blue vitriol is added, is repeated, increasing the temperature every time 10° F. up to 120° F. The skin is then thoroughly rinsed.

(6) T. H. D. asks: 1. Has any process been discovered for tempering copper suitable for edge tools? A. Not to our knowledge. 2. Are there any tools containing copper and made by the ancients in existence? A. There are a few specimens in the museums of Europe. They are a hard bronze of copper and tin. 3. Is there any reward offered to the person that succeeds in tempering copper? A. Not that we know of. 4. Would copper tools have any advantage over steel? A. No very obvious advantage.

(7) L. P. M.—Thin shellac varnish that has been allowed to settle for a few days, and the thin upper layer then taken off, makes a clear lacquer for brass work. The great trouble with amateurs is that they try to use lacquer that is too thick. It should be so thin as to be partially transparent, and as clear as good wine. Heat the articles a little hotter than boiling water, and lacquer quickly. If the work looks foggy or streaky, the lacquer is too thick or there was not enough heat. Sometimes it can be made clear by placing the work in a hot stove oven for one or two minutes. For steel color on brass, dip in a solution of chloride of platinum. See Spons' "Workshop Receipts," first series, for dipping, bronzing, and lacquering brass goods, which we can furnish for $2.

(8) C. M. W. asks the latest and best process employed by cutters and others in etching names and designs on steel. A. Take copper sulphate, sulphate of alum, and sodium chloride, of each 2 drachms, and strong acetic acid 1½ ounces, mixed together. Smear the metal with yellow soap and write with a quill pen without a split.

(9) J. M. G. asks: 1. Can tin plate be plated with copper? A. With a strong battery copper can be deposited upon tin. 2. By what process, and can I get a book that will give me information how to do it? A. We can supply either of the following, which will give full information on the subject you desire: "Electrolysis," by Hospitalier, price $3.50; "Electro Deposition," by Watt, $3.50; "Galvanoplastic Manipulation," by Wahl, $7.50.

(10) M. J. S. asks the cause of albinism in animals. A. It is owing to some normal difference in the organization of the individual or animal, that the substances that give color to the skin, eyes and hair are absent, and cannot be explained any more than the fact that some persons have black eyes while in others they are blue. See the articles on "Albinos" in any of the cyclopedias.

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