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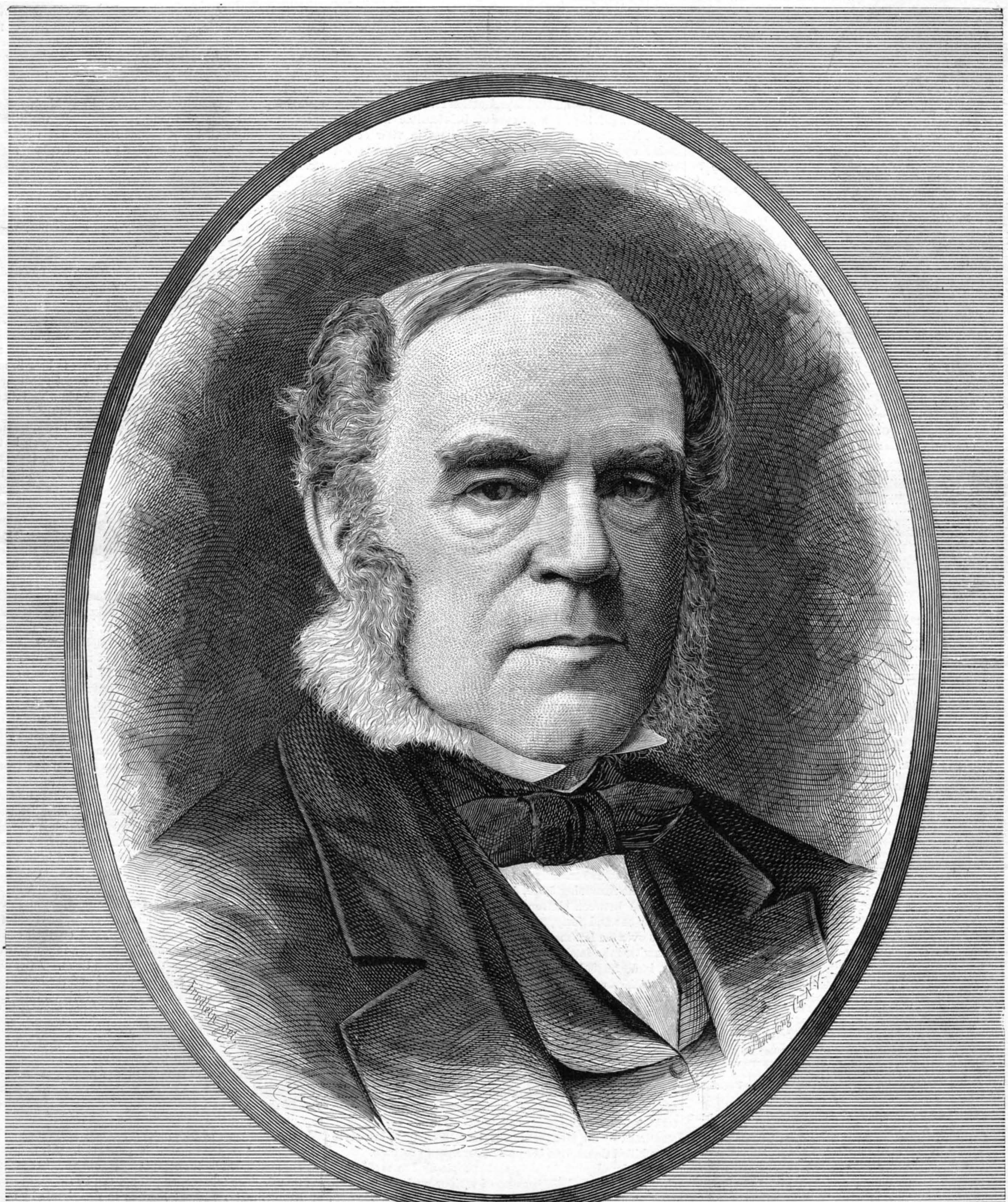

Jno W. Draper

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NEW YORK, SATURDAY, DECEMBER 15, 1877.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 102.

For the Week ending December 15, 1877.

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AMENDING (!) THE PATENT LAWS.

Senator Wadleigh's bill providing for amendments in the United States Patent Laws has been read twice and is now under the consideration of the Senate Committee on Patents. An abstract of the provisions is given elsewhere in this issue, and the bill in its entirety is published in the current number (No. 102) of the SCIENTIFIC AMERICAN SUPPLEMENT, in order that our readers may be enabled to give it thorough and critical examination. Its effect is upon future patentees, and not upon those already in possession of patents.

Our objections to this measure are founded, first, upon certain broad general principles which courts have held to be, and which plainly are, the true basis of our patent system; and second, upon certain specific reasons noted hereafter. The object of our patent laws is to benefit the community. They induce people to invent, so that the inventions produced may, by ultimately becoming public property, add to the knowledge, welfare, and comfort of the nation. The inducement offered is the securing to the inventor of an exclusive privilege in and to his production for seventeen years. While this privilege is a species of indefensible monopoly *per se*, it is nevertheless just and expedient in view of the ends accomplished, and this more especially as the period over which the inventor enjoys it is wholly inconsiderable in view of the advantages which it confers upon the public forever afterward. Now, if this privilege is to be reduced in value, through becoming hampered with unwise restrictions as to how the inventor shall enjoy it, then, the stimulus to invention being lessened, it follows that new and useful ideas will be more rarely produced, and thus the community will be the loser.

Our more specific objections to the bill are that is framed in the interest of a combination of railroad companies. About a hundred and thirty of these corporations some time ago organized an association for mutual protection and combined action in patent matters, and this is now devoting its energies to pushing through Congress the Wadleigh bill. As it is at present, the railway companies are ready enough to use good patented inventions, but about the only good reason which they recognize for paying an inventor royalty or damages is a certificate from their counsel to the effect that they cannot avoid doing so. It is almost needless to add that in the maintenance of protracted suits, etc., wealthy associations already have great advantages over the individual inventor; and if the latter is still further to be hampered, it may soon come to be said that his right is a deception and resides not in him, but virtually in any powerful combination which chooses to pirate it; and this is precisely the state of affairs which the railway companies are seeking to bring about.

The bill being before the Committee on Patents in the Senate, that body is hearing argument concerning it. Inventors should oppose it with all their influence, and we counsel them to go, or send representatives, or even lay protests or letters before the Committee, setting forth the disadvantages. Nor should the active opposition be restricted only to inventors. We have shown how the measure is likely to affect the whole country. It is therefore to the interest of every one who has the progress of the nation, in invention, discovery and science, at heart to lend his aid to prevent its becoming law.

CURIOSITIES OF SUICIDE.

The latest report of the Criminal Administration of France contains a very curious series of statistics relative to the suicides committed in that country in the year 1874. It appears that during that period 5,617 persons killed themselves, and that this total is greater than had ever before been reported. Of these unfortunates 79 per cent were men and 21 per cent women. Of 105 suicides the ages could not be determined, but of the remaining 5,512, 29 were under sixteen years of age, 193 between sixteen and twenty-one, 1,477 between twenty-one and forty, 2,214 between forty and sixty, and 1,590 over the last mentioned age. Leaving out those who committed the fatal act while laboring under mental disorders, in all 1,622, it is interesting to compare the condition of the suicides with the cause which impelled them to make away with themselves. How prolific a source of suicide unhappiness in the marriage relation is, is indicated by the fact that 48 per cent of the total were married people, and that out of 5,136 suicides, regarding which authentic particulars were obtained, 701 killed themselves because of family troubles. It will also be noted that the greater number of suicides were people past the prime of life, indicating that dissatisfaction with a wasted or unsuccessful existence determined their putting an end to it. This is further substantiated by the fact that out of the 5,136, 652 are known to have killed themselves because of reverses in fortune.

Seven hundred and ninety-eight people died to avoid physical suffering, and 489 because of various unclassified troubles. The fact that out of the 815 who were brought to self-destruction by dissipation, 572 owed their misery to drunkenness, is in itself a powerful temperance lecture. It is not easy to understand why spring and summer were the seasons in which most suicides occurred. The percentages are 23 for winter, 19 for autumn, 31 for spring, and 27 for summer. This would seem to negative the statement which has been made that most cases of self-murder occur during gloomy weather, which aids in depressing the spirits, for certainly there are more dark days in winter than in summer and fall. Again, it might be supposed that the privations incident to winter would lend an especial impulse toward the crime. As to the mode of death chosen, more than seven tenths perferred either strangulation (2,472) or drowning (1,514), showing that, while the suicides were willing to throw away their lives, they probably shrank from any mode of so doing which involved mutilation of their bodies.

A COMMON AILMENT.—MALARIAL POISONING.

We give in our this week's SUPPLEMENT—number 102—a full report of a very interesting clinical lecture, lately delivered by Professor Alfred L. Loomis, M.D., before the class of the University Medical College, this city, on Malarial Poisoning. According to Professor Loomis the effects of malarial poison are manifested in a surprising variety of forms and symptoms; so numerous and various, in fact, that they cannot be tabulated. They embrace enlargement of the spleen, neuralgias of different forms, that may or may not be periodical; dyspeptic troubles which cannot be relieved by dyspeptic remedies; headaches that are often treated as cerebral diseases; confusions of mind; staggering gaits; loss of power in portions of the body: impairment of mental faculties; inability to do work of any kind; not sick enough to go to bed, but too ill and habitually too tired to perform anything that requires the least exertion; shortness of breath; rapid, weak, irregular pulse; sleepless nights, etc. The first step toward cure is removal from the malarial locality; then only may the proper medicines be expected to prove beneficial. The infection appears to be far more widely spread than is commonly supposed; and all who have ailments that fall within the category here mentioned, will do well to read the excellent lecture.

NOTES OF PATENT DECISIONS OF THE COURTS.

Eppinger brought suit against Richey *et al.*, to restrain the infringement of his letters patent of June 17, 1873, for bunch or plug tobacco. The defendants answered, admitting the infringement but denying novelty and patentability of the claimed invention. In order that our readers may understand the case, it is necessary for them to bear in mind that licorice or some other moist and sweet substance is used in the manufacture of plug or bunch chewing tobacco, in order to impart moisture and sweetness to the manufactured article. The preservation of these two qualities is greatly desired by the consumer. When tobacco is thus prepared there is danger that the moist tobacco, if exposed to the air, will ferment, or will mould and "dry-rot." It is, therefore, important to make the plug or bunch as compact as possible, in order to preserve moisture and prevent mould. Before the date of Eppinger's invention, this kind of chewing tobacco was made by enclosing strands of sweetened "filler" tobacco in a binder. The wrapped tobacco was then spun upon a wheel, or twirled or rolled by hand into a roll, and, after being incased in a wrapper, was coiled and packed for market; or was subjected to extreme heat, and afterwards to pressure, before being put up in packages. Moisture was removed by this "hot-house" process, and thus danger of fermentation was obviated, but the quality of the tobacco was made inferior. Another method of manufacture was by incasing the sweetened filler strands in an unsweetened binder, and also in a wrapper. The rope was then bent and braided, and the two ends of the braid were fastened by a cap of wrapper tobacco. The braids were subjected to sidewise pressure, but could not be subjected to pressure endwise, in consequence of their shape, and therefore were not compressed sufficiently to exclude the air, and the tobacco was liable to become mouldy. Each braid soon became quite dry in the pocket of the consumer, and lost its flavor.

Eppinger's method is to envelope the "filler" tobacco, treated in the usual way, in a "binder," which is a brighter and larger leaf, and around the binder he wraps what is called a "bright wrapper leaf," which is used in its natural condition without treatment. The rope thus formed is, in fact, a long flexible cigar, with a sweetened filler. This rope or strand is then coiled into a bunch around a central core, one end of the rope, either single or doubled, serving for the core. Several of these bunches are placed on their ends in a strong receptacle, of suitable shape, and a follower is then forced down with great pressure upon them. After about twenty minutes the follower is removed and the bunches are taken out and replaced in the same receptacle on their sides, and side by side, and pressed again in like manner. The claim of Eppinger's patent is for: "Plug or bunch tobacco made as herein described, the same consisting of a rope or strand composed of a sweetened or prepared filler inclosed in a binder, in turn enveloped in a wrapper, the said rope being coiled around a central core, forming a continuous part of the rope, and the bunch thus made being subjected to a pressure, as and for the purposes set forth."

The advantages of Eppinger's method are very marked. The moisture of the tobacco is preserved. Air and dampness are excluded by the compactness into which the tobacco is pressed. The tobacco, so put up, can be shipped to warm or damp climates without liability to deteriorate by mould, and a single coil can be carried in the pocket of the consumer without becoming dry or friable.

The utility of the patented article was clearly proved. The evidence showed that it had had a very large sale, and had commanded a much higher price than the same quality of tobacco when put up in any other form.

The novelty of the invention was also clearly proved. The patented article manifestly differed from the ordinary spun or rolled plug tobacco, in this, that in such tobacco the filler and binder were rolled together, while in the patented article the binder simply encircled the filler. "Twist" or "braid" tobacco was made in the same manner as the patented article was made—by encircling the sweetened filler with two separate wrappings of unsweetened tobacco—but the twist tobacco was simply braided and subjected to lateral pressure. Each plug was a flat braid, into the interstices of which air freely entered; and having a comparatively thin and flat surface, the plug could not be made compact by endwise pressure.

The important question in the case was as to the patentability of the invention. A rope of strands of sweetened filler, inclosed in a binder, which, in turn, was enveloped in a wrapper, antedated the patent. Plug tobacco had always been coiled and braided in various forms, and had been subjected to pressure. The peculiarity of the invention was, therefore, in the form and shape of the coil.

The argument on behalf of the defendants was that the combination filler, binder, and wrapper was old, which was true; that coiling or twisting a moist rope of tobacco had always been practised, which was true; and that subjecting a coiled rope of sweet tobacco to pressure was old, which was also true; and that the particular form of the coil was a matter of fancy, and that the form of the coil could not involve the exercise of the inventive faculty. This was the precise question at issue. Could any particular method of coiling be the subject of a valid patent?

The court, in sustaining Eppinger's patent, answers this question in the affirmative. It holds that the article of plug tobacco had been long in use, and in constant demand; that, as it had been prepared for market previous to Eppinger's invention, it had been liable to spoil in warm and damp weather, and to grow mouldy in any temperature; that no remedy was found for these evils until Eppinger's invention was made; and that it was manifest from the length of time during which the tobacco had been manufactured, from the constant demand for it, and from the well known evils to overcome, that the inventive faculty must have been brought into exercise, or else that mechanical skill would long since have avoided any danger of fermentation or mould; that, however simple Eppinger's change in the method of manufacture apparently may have been, yet it was a change which required invention for its accomplishment; and that the improvement resulting from the changed method of manufacture had been so great that the article which was produced was, in the meaning of the patent acts, a new and useful article of manufacture.

THE PROPOSED AMENDMENTS TO THE PATENT LAWS.

We give below an abstract of the new patent bill which has been introduced into the Senate by Mr. Wadleigh.

The first section enacts that from and after the passage of the act no profits or damages in any suit for infringement of a patent shall be recovered which shall have accrued more than four years next preceding the commencement of such suit, and that all rights of action at present existing must be sued for within four years thereafter. Under this section, if there are a hundred infringers of a patent, a hundred suits must be brought at once to fully protect it; or if an eastern man has a patent, and some one in the extreme west wishes to manufacture the patented article, he may do so for many years before his operations are discovered, and the owner of the infringed patent has no right to recover any damages accruing to him from the infringement that occurred more than four years before suit is brought.

Under the second section a license fee is to be the measure of damages which a patentee may recover from infringers, provided any such license fee has been established; but if not, where from the nature of the invention it *can be made to appear* to be for the interest of the patentee that other persons should use the same, the court or jury shall determine the damages from the evidence, and in such case no account of profit or savings is to be allowed. Where profits are to be taken into consideration, the defendant is not to be charged with any saving he may have made by infringing a patent, unless it can be shown that he has made money by his business. Where he acknowledges that profits have accrued from his infringement, the court is to determine what proportion of the profit is due to the said invention and what to the other elements from which such profit was derived, and the proportion due to the invention is to be the measure of profit recovered; but if said profits shall be found to be in *excess of the injury* done by the infringement, the court is to diminish the amount to such an extent as may be just and reasonable. This last clause appears to be open to the interpretation that, if the defendant can prove that from want of means or otherwise the patentee was in such a position as to be unable to use his invention, and was not therefore actually *injured* by the infringement, notwithstanding the infringer may have made an immense profit from the use of it, unless it can be shown that the inventor actually suffered great injury, he is to be cut down in the profits to the amount of injury he has suffered.

Section 6 has a clause to the effect that no machine or other article made prior to the surrender and reissue of a patent which did not infringe such surrendered patent, shall be held to be an infringement of the new claims of the reissued patent.

Section 9 allows infringers, where a patentee does not bring suit immediately he has knowledge of infringement, to bring a bill in equity to declare such infringed patent void for any of the causes which by law may render the same invalid. So that in case a patentee is too poor to immediately bring a suit against a wealthy infringer of his patent, said infringer may bring suit to declare it invalid; and in nine cases out of ten where the owners are too poor to employ good counsel to protect their rights, perfectly valid patents would be declared void under such circumstances.

Section 10 is to compel patentees to bring suits to enforce their rights, if an infringer demands that a suit be brought no matter whether the patentees have means to bring such suits or not, under the penalty of being enjoined from ever prosecuting such infringer at any time thereafter.

Section 11 is an imitation of the English law in the matter of fees, as it requires that a patentee shall pay fifty dollars on or before the first day of January after the expiration of four years from the date of the patent, and one hundred dollars on or before the first day of January next after the expiration of the ninth year of the patent. In default of either of these payments, the patent is to expire on the 1st day of April next thereafter, and during that month the Commissioner of Patents is to publish a list of the patents that have expired for the non-payment of these extortionate fees. In view of the fact that there is now in the Treasury of the United States over a million of dollars wrung from poor inventors in the shape of unnecessarily high patent fees, we think comment on this section entirely needless.

HOW TO TRUE UP A CRANK PIN.

A correspondent asks: "How can I true up my crank pin? I do not think it is true, because it appears to pound at two opposite parts of the stroke, and if I tighten up the brasses enough to take the pound out they get hot. I cannot find anything on the subject in the books."

One of the most prevalent faults of construction in stationary engines is a slight want of truth in the crank pin, and the result is just such as our correspondent has described. The cause may lie in either of three things, first, the two holes in the crank not being true, one with the other; second, leaving too much for the shrinkage of the large hole of the crank upon the shaft; and third, not properly fitting the key to its seating. If in boring the holes the same back of the crank, whether planed true or not, and although set as true as practicable the holes will be out of true, one with the other, to twice the amount that the chuck plate of the lathe may be out of true and twice the amount that the casting may alter in form from having its surface skin removed, the crank pin hole should be bored with the face which was turned up when the large hole was bored clamped to the face plate.

We may next consider the amount of shrinkage. If it is excessive, the metal must give way in the cooling process, and will yield the most where the metal is the weakest, throwing the crank pin end out of true. The proper amount to allow upon a crank of any size less than about 7 inches is just such as can plainly be perceived by setting the inside callipers, or a wire gauge, to touch very lightly the bore of the hole. The outside callipers or gauge having a barely perceptible contact, daylight should be just plainly visible between the gauge and the wire or inside callipers. Rules are given in books for the proper amount of allowance, but it is expressed in decimal parts of an inch, running to three places of decimals, and the machinist has neither inside nor outside callipers which will measure determinately such large sizes to such minute fractions. For steel tyres upon locomotives and other wheels, in which the amount allowed for contraction is very important, the heavy duty causing the tyres to break from the strain due to too much contractive tension, the following device has been employed: A piece of steel, say 8 inches long and an inch wide, is filed as thin at one end as the least amount of contraction and a little thicker at the other end than the greatest amount of contraction required upon such sizes of work as the gauge or wedge is intended to be used for. Upon the face of the wedge is marked a series of lines running across it at places where the thickness of the wedge represents the proper amount of contraction for the diameter which is marked upon each line. All, then, that the operator has to do is to find upon the gauge the line which is marked with the diameter of the wheel and to then set his wire gauge to fit the male gage or callipers with the wedge interposed at one end, the wedge having just contact with the two when inserted up to the line. This is a very accurate method, and is to be commended for the ease with which it can be applied. We now come to shrinking the crank on to the shaft. For this purpose care should be taken to heat the crank slightly more on the thick than on the thin side, and to make it to a very low red heat indeed—in fact, a just perceptible red heat is best. The crank should lie, while cooling, with the crank pin end vertically beneath the shaft, so that its weight may not tend to warp the crank in cooling, as it would do if lying horizontally.

In fitting the key it should not be driven in tight, because it is apt to spring and show unnatural bearing marks. Towards the finishing process it should be drawfiled, to ease the bearing marks, lengthwise, as that will make it drive easier and smoother. If the key is not fitted to bear exactly even all over the driving, it may spring the crank out of true.

If these instructions are carefully followed the job will be a true one, and there will be no possibility of the crank pin causing a pound in the engine. To remedy a pound in an engine we may proceed as follows: To test the truth of the crank pin we attach the crank pin end of the connecting rod in its place with the brasses and key properly adjusted. The other end of the connecting rod should have the brasses and key in place but should not be attached to the wrist pin, or gudgeon, as it is more properly termed. We now place the crank pin at one end of its throw and lower the connecting rod at the other end into the wrist pin bearing and note if the faces of the brasses fall, without the rod being sprung sideways, exactly true into the wrist pin flanges. We perform this testing operation with the crank pin at the four quarters of its revolution, moving the crosshead to the necessary position in each case. And it is obvious that if the crank pin is true the other end of the connecting rod will fall exactly true into the wrist pin bearing; but suppose that when the crank pin is on one dead center the connecting rod brass flanges fall outside, and when it is on the other dead center it falls inside of the wrist pin bearing, it proves that the crank pin does not stand true. If when the crank pin is on the dead center nearest to the cylinder the brass flange falls inside the wrist pin, the outer end of the crank pin inclines towards the cylinder, and *vice versa*, if the brass flange falls outside the wrist pin bearing, the outer end of the crank pin must incline away from the cylinder. Here it may be noted that if the main shaft is not at a right angle to the center line of the bore of the cylinder, the connecting rod applied as above will not fall into the wrist pin bearing; but in this case the deviation of the wrist pin brasses from the wrist pin journal will be all inside or outside of the wrist pin journal, hence the operation of testing the truth of the crank pin will at the same time test the lining of the main shaft.

To proceed, then, having gone through the above operation and thus discovered in what direction the crank pin is out of true, we note how much it was out of true, which may be ascertained as follows: When it is found that the flange of the connecting rod brass does not fall into the wrist pin bearing, we mark even with face of that flange a mark upon the crosshead, and moving the crank to the opposite point in its revolution we mark another similar line, and the sum of the two distances is the amount of the want of truth at that end of the rod. To find how much that is in the length of the crank pin, we divide the length of the crank pin journal into the length of the connecting rod, measured from center to center of the bore of the brasses; the sum thus obtained we divide into the amount first obtained, and the result will be the amount the crank pin is out of line. Now, suppose the amount thus obtained is the $\frac{1}{64}$ of an inch, and that the crank pin when on the dead center nearest to the cylinder stands so that the center line of its length points toward the center of the main shaft at the flywheel end. We take a pair of callipers, set them to a diameter $\frac{1}{64}$ inch less than that of the crank pin, and file upon the crank pin journal, at its outer end, a flat place of sufficient depth as to make the callipers just gauge correctly. This flat place must get shallower as it approaches the other end of the journal, until at the extreme of the other end it runs out, leaving the surface intact. We next file a similar flat place upon the inside end of the length of the crank pin journal, but on the opposite side of the diameter of the crank pin, that is at the end of the crank pin journal nearest to the crank and on that part of the perimeter nearest to the crank shaft center; this second flat place must be filed at that end enough to allow the callipers to gauge correctly at that end, and must disappear at the other end of the journal. Thus we have obtained two diametrically opposite flat places that are true with the center line of the length of the main shaft, and we may now file two more flat places on the crank pin journal, the faces of the four forming a square. The last two, however, must be filed to an equal amount from end to end of the journal, and equally deep on each side, until the callipers will gauge them correctly. This being done, we file up the protruding parts of the journal until one of the brasses rubbed upon the journal will mark evenly all round, and the flat places are just brought to a bearing, and the job will be complete. It is necessary to connect the rod again and go through the testing process the same as at first, to be sure that all is right.

J. R.

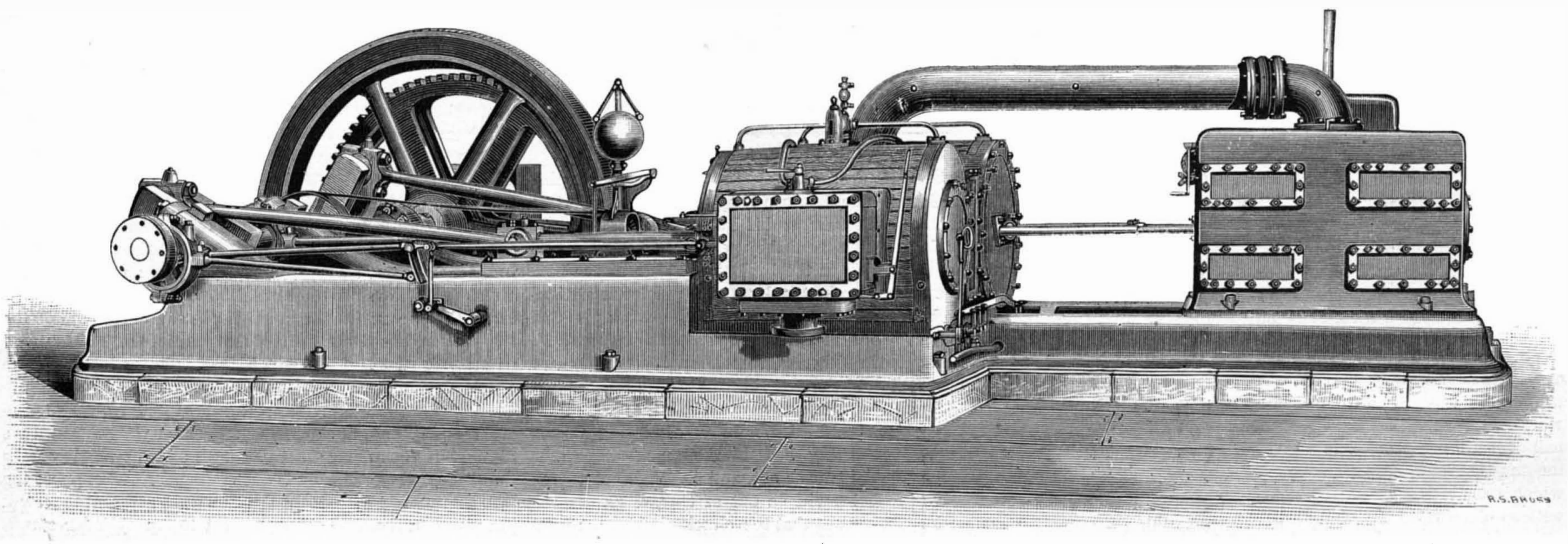
MORE NEWS FROM THE SUN.

We noted recently the fact of Dr. Janssen having obtained some exceedingly large and fine photographs of the sun, and that it was probable that by means of the facility which these afforded for observing the solar surface, new deductions concerning the nature of the latter would probably be reached. Dr. Janssen's photographs are some 15 inches in diameter, and show details of the mottling or willow leaf on the sun of less than 1 second of arc. By examining these points, Dr. Janssen has recently found that the surface of the photosphere has not a constitution uniform in all its parts, but that it is divided into a series of figures more or less distant from each other and presenting a peculiar constitution. They have contours more or less rounded, often very rectilinear, and resembling polygons. Their dimensions are variable, and they sometimes attain a minute or more in diameter. In describing the figures in *Nature*, Mr. J. Norman Lockyer says, that "while in the intervals between them the grains are clear, though of variable size, in the interior the grains are as if half effaced; for the most part indeed, they have disappeared to make way for trains of matter which have replaced the granulation. Everything indicates that in these spaces, as in the penumbræ of spots, the photospheric matter is submitted to violent movements, which have confused the granular elements.

Mr. Lockyer considers the discovery as confirmatory of his opinion that sun spots are an index and not a measure of solar activity; and that their absence indicates a reduction, not a cessation, of the sun's energy. Dr. Janssen also points out that this fact throws light upon the forms of solar activity, and shows that that activity, in the photosphere, is always very great, although no spot appears on its surface.

HORIZONTAL COMPOUND ENGINE.

We take from *The Engineer* the annexed engravings of a horizontal compound engine of excellent design, manufactured by the Avonside Engine Company, Bristol. The engine was one of the objects which secured the interested notice of many of those who visited the company's works during the recent meeting of the Institution of Mechanical Engineers in Bristol. It is provided with automatic expansion gear in the form of a link, operated by the governors, which are of Widmark's split ball type, and which are very sensitive in action. The crank shaft ends at a short distance from each bearing with a face coupling disk, the short piece carrying the fly wheel being fixed to a similar coupling disk to that seen in the upper view. It will be particularly noticed that the wall box supporting the fly wheel and main spur wheel bearing is of such form as to be capable of also embracing the pinion bearing. The two wheels are thus maintained with the proper distance between their centers, and the connection of the two bearings, thus in one wall box, makes a sound job not easily otherwise obtainable.



HORIZONTAL COMPOUND ENGINE.

The principal dimensions of the engine are as follows: Diameter of high pressure cylinder, 18 inches; diameter of low pressure cylinder, 34 inches; stroke of pistons, 3 feet; diameter of air pump, 9½ inches; stroke of air pump, 3 feet; diameter cold water pump, 6 inches; stroke cold water pump, 3 feet; double acting; working pressure intended, 60 lbs.; number of revolutions, 50 per minute.

Phosphate of Potash a Cure for Scurvy.

It is well known that an exclusive diet of salt provisions endangers scurvy, and that at sea or on expeditions where only such provisions can be carried over long periods of time, their injurious effects are prevented by drinking lime juice. Professor Robert Galloway has recently advanced the suggestion that phosphate of potash is a much better preventative of the malady, and at the same time that salt increases the nutritiveness of salted meat, so that he proposes in all cases where such meat is consumed that the phosphate be used as a condiment, the same as chloride of sodium is now employed. Professor Galloway points out that of the different substances which enter into the formation and constitution of the meat some are removed by the immersion of the same in brine, and the principal material thus extracted is phosphate of potash. It is evident, therefore, that if this salt was indispensable to the formation of fresh meat its absence in salt meat must be prejudicial.

The use of phosphate of potash as table salt is strictly analogous to the present employment of chloride of sodium, the latter being consumed and the taste requiring its consumption in order that it may be supplied as needed for the normal formation of the blood. Now, as salt meat lacks potash salts, and as the latter are useful in the formation of the fluids in the meat, it is as logical to use this substance as it is to use common salt. Furthermore, MM. Pasteur and Mayer have demonstrated the importance of phosphate of potash in nutrition, and have shown it to be indispensable to the development of the beer yeast cellule. Professor Galloway also considers that the beneficial effect of lime juice as a preventative of scurvy is due to the presence of potash and phosphates in it. If his views are correct, the discovery is of considerable importance, as phosphate of potash in the small amount needed can be transported with much greater facility and obtained more inexpensively than lime juice, while at the same time it increases the nutritive value of the cheap salt provisions now largely consumed by the poor.

Poisoning by Burning Gas.

The *Lancet* urges the inconvenience, and even danger, of the ordinary burning gas. It says:

"To have our rooms pleasantly illuminated with gas is to undergo a process of poisoning, the more disastrous because, instead of directly producing the characteristic symptoms of defective blood oxygenation, the gas-polluted atmosphere insiduously lowers the tone of vitality, and establishes a condition favorable to disease. It would be difficult to overrate the importance of this household peril. Pictures are spoiled by gas, gilt mouldings are tarnished, the colors of decorated walls and ceilings fade, and men and women of delicate organization are enfeebled and injured by the foul air in which gas is discharged and supposed to burn innocuously. The extent to which this evil works in the midst of domesticated families during the long evenings is not adequately appreciated After the first few unpleasant experiences are over, the physical insensibility becomes inured to the immediate results of breathing an atmosphere charged, more or less heavily, with the products of combustion and unconsumed coal gas. It is not creditable to the ingenuity of practical men that no method has yet been devised by which the advantages of gas as an illuminating agent may be secured without the drawback of slow poisoning, with the host of maladies a depressed vitality is sure to bring in its train."

Steel for Shipbuilding.

The British Admiralty tests at present for steel are as follows:

TENSILE AND EXTENSION TESTS.

1. Strips cut lengthwise or crosswise of the plate to have an ultimate tensile strength of not less than 26, and not exceeding 30 tons per square inch of section, with an elongation of 20 per cent in a length of 8 inches.

TEMPERING TEST.

2. Strips cut lengthwise of the plate 1½ inches wide, heated uniformly to a low cherry red, and cooled in water of 82° Fah., must stand bending in a press to a curve of which the inner radius is one and a half times the thickness of the plates tested.

3. The strips are to be cut in a planing machine, and are to have the sharp edges taken off.

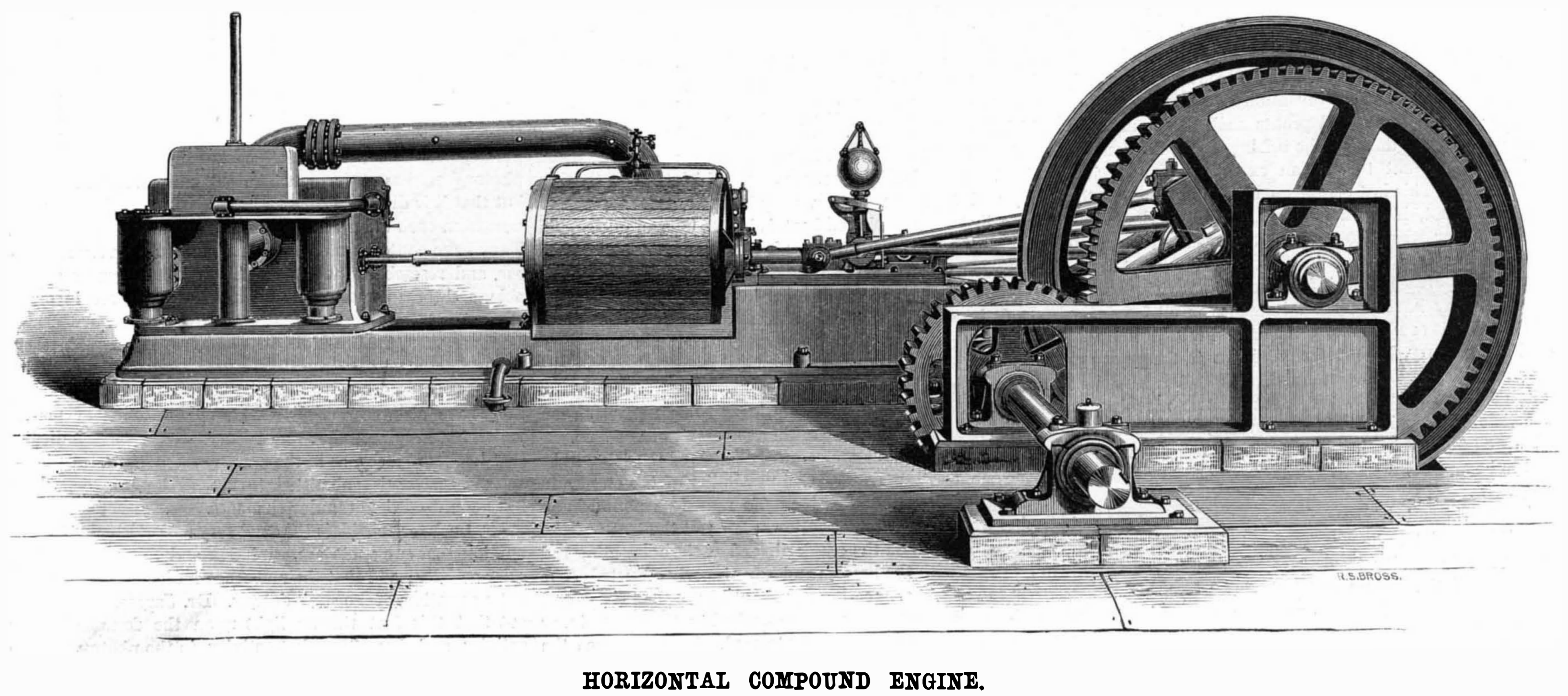
4. The ductility of every plate is to be ascertained by the application of one or both of these tests to the shearing, or by bending them cold by the hammer on the contractor's premises, and at his expense.

5. All plates to be free from lamination and injurious surface defects.

6. One plate to be taken for testing by tensile, extension, and tempering tests from every invoice, provided the number of plates does not exceed fifty. If above that number, one for every addition of fifty, or portion of fifty. Plates may be received or rejected without a trial of every thickness of the invoice.

7. The pieces of plate cut out for testings are to be of parallel width from end to end, or for at least 8 inches of length.

When the plates are ordered by thickness, their weight is to be estimated at the rate of 40 lbs. per square foot for plates of 1 inch thick, and in proportion for plates of all other



HORIZONTAL COMPOUND ENGINE.

thicknesses; the weight so produced is not to be exceeded, but a latitude of 5 per cent below this will be allowed for rolling in plates of half an inch in thickness and upwards, and 10 per cent in thinner plates.

These weights may be ascertained by weighing as much as 10 tons at a time.

TESTS FOR ANGLE, BULB, OR BAR STEEL.

The whole of the steel to stand a tensile strain of 26 tons to the square inch, and not to exceed 30 tons to the square inch. Also to stand the extension and tempering tests described for plate.

All the cross ends to be cut off. One bar is to be taken for testings from every invoice, providing the number of bars does not exceed fifty; if above that number, one for every additional fifty, or portion of fifty.

IMPROVED PROTECTED NON-RECOIL GUN.

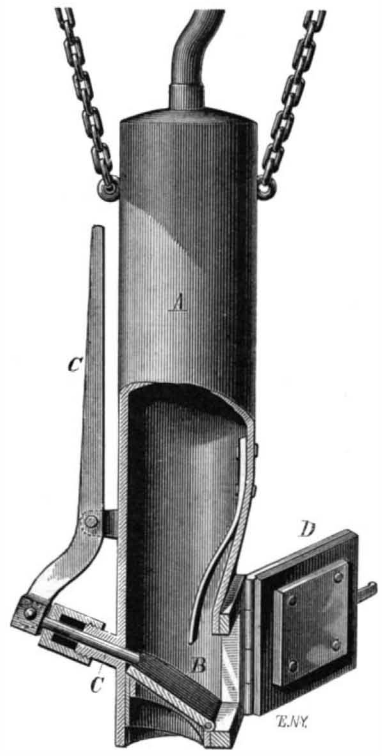
We are indebted to the *Engineer* for the annexed engraving and accompanying description of this invention. The object of the system is the complete protection of the gun detachment and of the gun itself, except at the muzzle. It is also supposed to insure accuracy of aim for a continuous series of rounds. The general idea is that the gun shall pivot at the muzzle in a ball and socket joint, fixed into the armour of a casemate, entirely closing the port and preventing recoil. Krupp claims that when once the gun is laid true on the object, it can be fired any number of times without recoiling, jumping, or otherwise changing its position or direction in the least; so that all error in shooting due to inaccuracy of laying is prevented when once the right direction is secured.

The drawing, Fig. 1, shows a section of a casemate for a 6 inch gun. The muzzle is enlarged to form a ball, A, which plays in a socket consisting of a steel port plug, B, into which is screwed a wrought iron cylinder, C, holding the ball of the muzzle firmly in the socket. On each side of the gun, trunnion, D, travels up and down a carrier, E, in which a slot is cut for the purpose. This carrier is fitted with a hollow soled truck, F, which permits the carrier to pivot on the racer, G, and so to accommodate the arc traveled through by the trunnion, when elevation is given, to the straight slot in the carrier. The truck also moves along the racer, G, when the gun is traversed. The casemate is composed of a thick wrought iron plate, H, in front, supported by strong box girders, K, and roofed with thin wrought iron plate, I. The lower portion is made of cast iron, J. It is protected from the enemy's fire by a glacis of concrete, L, in which is embedded a wrought iron glacis plate, M. A wrought iron shield, N, covers the muzzle of the gun when not firing. It rests on a trigger, O, so that when the gun is ready to be fired, the rope draws back the trigger and the shield falls. As soon as the gun is fired the shield is raised by the winch, P, acting in aid of the balance weight, Q, and the trigger is forced back to its place as a support by the spring, R. The sides of the casemate are built as of brick covered with wrought iron plates. They are all sloped as shown in Fig. 2 to cause shot to glance off.

IMPROVED PNEUMATIC DREDGING TUBE.

Our engraving represents a new pneumatic tube for dredging, mining, and wrecking purposes, which is worked by creating a vacuum and drawing the sand, earth, or other matter into the same. A represents the tube which is connected by a rubber pipe at the top, with an air pump on the vessel or float.

The lower end of the tube, A, is provided with a hinged inclined valve, B, that is fitted by rubber packing, hermetically, to a seat, and locked rigidly, when the tube has been lowered to the bottom, by a sliding bolt or key, C, which is guided in a stuffing box and operated by a lever.



A discharge door, D, is hinged to the side of tube near the bottom valve. A spring, at the inside of the tube, above the side door, serves to cushion the bottom valve when the same is opened for drawing in the sand or earth.

After the tube has been lowered and placed into position on the bottom of the river, the bottom valve being closed, and the air pumped out by the air pump until a vacuum is created, the key is withdrawn by the lever, and the sand or earth drawn into the tube until the same is nearly filled. The tube is then raised, and the contents discharged by opening the side door, the inclination of the bottom valve facilitating the discharge.

THE German government contemplate introducing the telephone into the telegraphic service, and are about to begin experiments upon it.

Progress of the New York Elevated Railroads.

When the elevated railroad on the west side of New York city is completed the termini will be South Ferry and Eighty-first Street. The total distance will be then six miles. Foundations for supporting columns are now being put down between Sixty-first and Eighty-first Streets, and the foundations necessary for making the track double between South Ferry and Sixty-first Street will be completed in a few days. Two fifths of the road are finished for a double track. The gauge is the standard one, 4 feet 8½ inches, and the rails are Bessemer steel, 50 pounds to the yard. Rolling plant consists, at present, of 21 dummies and 39 passenger cars. The average number of passengers daily is 11,000. In 21 days of last month (November) there were 207,926 passengers against 139,768 in the same time of the corresponding month in last year, an increase of 68,157.

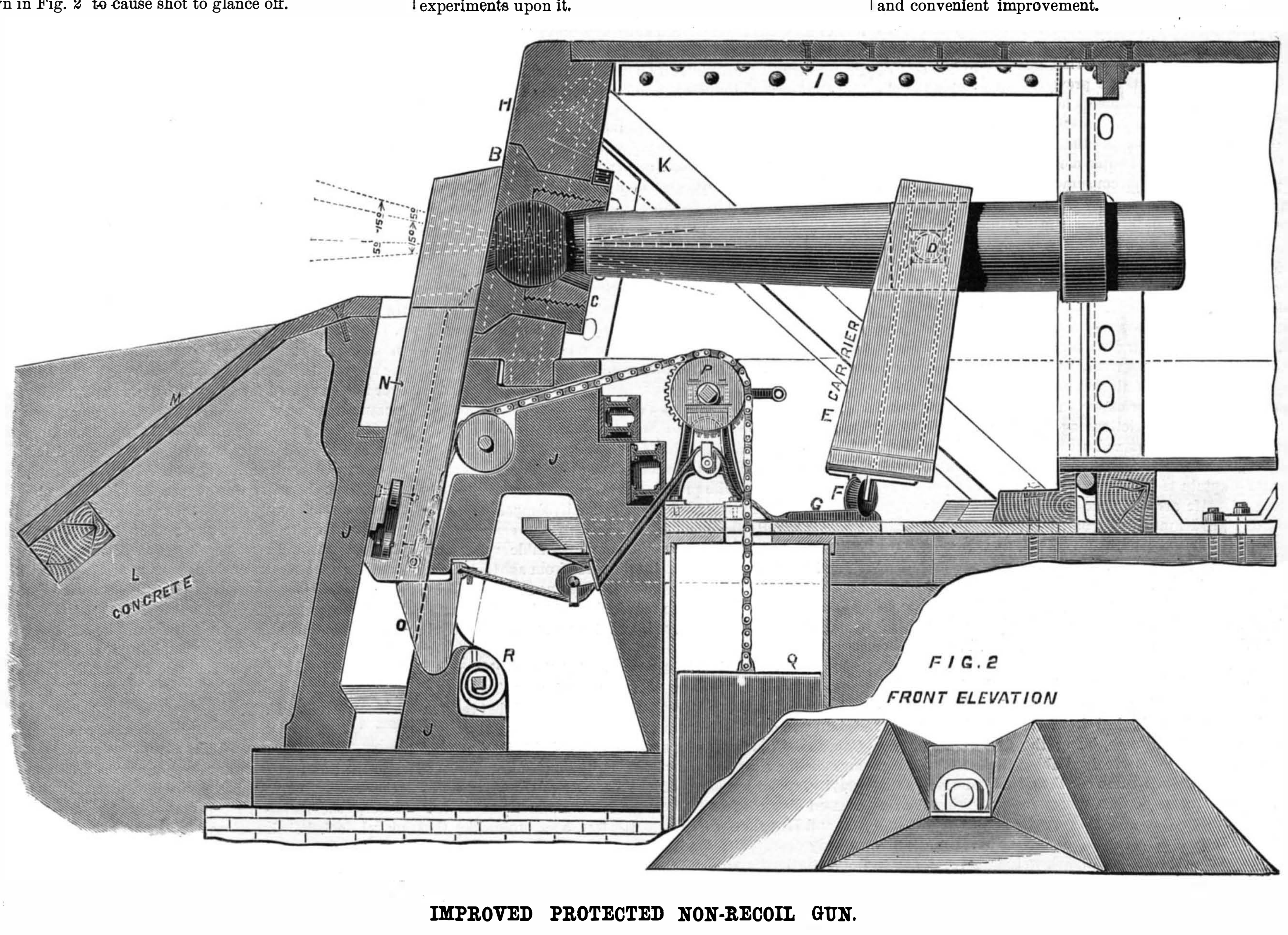
On the east side there will be a railroad from South Ferry to Sixty-first Street, having a double track all the distance. There will be branch roads: one to Fulton Ferry, another from Chatham Square to the City Hall and the end of the Brooklyn bridge, one to Thirty-fourth Street, and still another to the Grand Central Depot. The work on both sides of the city is progressing rapidly. An estimate of the cost by the chief engineer, for the double track on the east side of the city, from South Ferry to the Central Park at Sixty-first Street, 5 miles, with equipments, stations, and all the appointments necessary to its full operation, is $1,625,000, or $425,000 per mile. In this estimate is included sixty passenger cars, twenty-five dummies, eight stations to the mile, and engineering. The estimated numbers of passengers per annum is 14,700,000, and receipts, $1,250,000.

New Agricultural Inventions.

Ladore V. Sikes, of East Otto, N. Y., has invented an ingenious cider-mill. It has two curbs, which move on rails. While the ground fruit is being pressed in one curb, a grinding mill is filling the other. The cake in the first is then taken out and the full curb moved under the press. The curbs are thus alternately changed from the grinding mill to the press, and thereby the grinding and pressing of the fruit and the making of cider is accomplished quickly.

Joseph R. Palermo, of Gonzalez, Texas, has invented an improvement on Cotton Seed Planters by which the seed is more readily supplied to the endless belt of the hopper. By an ingenious device motion is communicated from the rear roller of a band to a crank to a rock post, and cross bar which works a curved wire inside the hopper thus keeping the seed well stirred up.

E. M. Wilcox, of Whitewater, Wis., has invented a check-row attachment for corn planters by which a field can be planted in accurate rows. At the end of a shaft which revolves in bearings attached to the hopper is fitted a chain wheel, the teeth of which mesh into the links of a chain extended across the field. By an ingenious combination of a cylinder, cam groove, shoe and bars, the wheel revolves and the chain marks out the check row. This is a very useful and convenient improvement.



IMPROVED PROTECTED NON-RECOIL GUN.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

In reply to a request from the Committee on Patents as to what legislation was necessary to preserve the models saved from the fire, the Commissioner of Patents has sent a letter to that body, stating that he estimated that about one third of the 90,000 patented models that were in the fire were of metal, and that probably one third of these metal models were so little damaged that by cleaning, polishing, etc., they could still be made available for exhibition and for a fuller understanding of the invention when the drawings and specifications fail, as they often do, to throw sufficient light on the inventions they are supposed to describe. The amount requisite to clean, identify, and re-arrange these damaged models, including the cases to contain them, the Commissioner estimates at $40,000. In addition to this he states that, besides the damage done by the fire, many thousand complicated models in the classes of sewing, spinning, and weaving, were drenched by water, and are rapidly corroding. Many of these will require taking to pieces, cleaning, and polishing, which the Commissioner thinks will cost about $5,000 more, and therefore asks for an appropriation of $45,000 for this purpose.

A bill has been introduced by Senator Windom to establish a Department of Commerce, essentially the same as that favored by the National Board of Trade, providing for the erection of a new department with secretary and assistant secretary, to be appointed and confirmed in the same manner as the other members of the cabinet, and to be charged with the supervision and care of the agricultural, commercial, manufacturing, and mining interest of the United States, so far as the national government is empowered by the Constitution. The new department is, if the bill becomes a law, to have charge of the execution of all laws relating to foreign and domestic commerce, customs, internal revenue, taxes, to navigation, lighthouses, rivers and harbors, and collect statistics relative to our agricultural, commercial, manufacturing, and mining interests and tabulate them.

Mr. Loring has introduced into the House a bill designed to aid in the establishment of additional telegraphic cables between this country and Europe, which proposes to give a liberal charter to a company said to be already organized, and ready to go to work as soon as they can obtain the charter. The company propose to run a line by way of the Azores, and offer to give the government the perpetual free use of the cable to an amount not exceeding the number of words which has been sent over the existing cables by the government in any one year. The bill provides, also, that in five years after the cables shall have been in working order, the rates shall be reduced to 20 cents per word, at the expiration of eight years to 17 cents, in twelve years to 13 cents, and after fifteen years to 10 cents. In return for these low rates, they ask for an exclusive right to land cables on our Atlantic coast.

A bill has been introduced by Mr. Paddock to authorize the appointment of a Committee on Foresting and Tree Planting, to examine and report upon the condition and management of the cultivated forests in Europe; the cost of growing, cultivating, and protecting the same; also the observed influence, if any, upon the climate and water supply of the country; and to examine and report upon the best varieties of trees to plant for the production of forests.

The manufacture of perfumery for exportation is becoming a large and growing interest, in which thousands of barrels of alcohol are used, but owing to a peculiarity of our revenue laws, nearly, if not quite all, of this is imported, because it can be withdrawn without the payment of duty. American alcohol cannot be used in this business without the payment of tax, and there is no provision of law which would authorize a drawback upon the exportation of such perfumery. There appears to be no good reason for this discrimination against our distillers; and the Commissioner of Internal Revenue, in his recent report, recommends appropriate legislation to allow alcohol to used by manufacturing perfumers in the goods for exportation, without the payment of tax, under proper restrictions against fraud.

Captain Tyson, in command of the Florence of the Arctic expedition, has forwarded a letter by a returning Scotch whaler, to Captain Howgate, under date of September 29, reporting his safe arrival, after a long and tedious voyage of forty days, at Niuntilick harbor, Cumberland Gulf. The crew were all in good health and spirits, and Messrs. Sherman and Kumlein are reported as doing very well in their respective departments. Captain Tyson proposed moving to the head of the gulf in a few days, where he intended to establish winter quarters, and carry out his instruction in reference to the collection of materials for the main expedition of next year.

The Fish Commission are at work upon the head waters of the Potomac, stocking them with California salmon, 30,000 having been just shipped from the hatching house at Druid Hill Park, Baltimore, being the first shipment of a lot of about 200,000 eggs received about the 1st of October from Professor Baird's camp on the McCloud river, California. The prospect of thus successfully stocking the Potomac and other rivers appears very favorable, as the success of their introduction into the Delaware has been demonstrated beyond a doubt, several fish weighing from five to ten pounds having been taken in it, as the result of stocking that stream a year previous to the commencement of the work on the Maryland rivers. About 200,000 more eggs are now on their way from the McCloud river, which will be hatched at Druid Hill Park, and distributed to the various rivers. The operations of the Commission in another direction during the summer have brought to light a fishing bank hitherto unknown, about fifteen miles from the mouth of Boston harbor, which is so rich in fish that upwards of 1,000 lbs. were taken within half an hour by trolling, among which a splendid species of flounder, heretofore supposed to be peculiar to Greenland, was discovered. In the investigations in which this discovery was made, which are under the general direction of Professor Baird, assisted by Messrs. Verrill, Wilson, Goode, and Bean, observations are made as to the natural history and economical value of the marine animals of the coast, and as to the temperature of the water in different depths and localities. In some cases, at the depth of 100 hundred fathoms, the thermometer was found to stand at 30° Fah., or below the freezing point of fresh water, and yet these spots preëminently abounded in animal life, great quantities of fish being taken from them.

The Entomological Commission having, during the past season, accumulated a large mass of information regarding the locust and other similar insects, and the best means of preventing their ravages, will shortly present a report thereon to Congress, which, it is hoped, will be of great value to our western agriculturists.

Messrs. Scudder and Bowditch, who have, under the direction of Dr. Hayden, of the Geographical and Geological Survey, been making a tour through Colorado, Wyoming, and Utah, exploring for fossil insects, report that they have secured large numbers of specimens. Near Florisante, the tertiary basin was fonnd exceedingly rich in insects and plants, and Mr. Scudder estimates that the extent of insect-bearing shales are at least fifty times as great as the rich one in Southern Bavaria. Upwards of 6,000 insects and 3,000 plants have already been received from Florisante, and as many more are expected before the close of the year. Besides these specimens, many more are to be received from Wyoming, as arrangements have been made to receive all the specimens found in a newly discovered rich deposit of fossils in the tertiary strata of that territory; and it is believed that, within the next few months, the amount of material at hand for the study of this subject will be greater than ever before possessed by any single naturalist. Professor Leidy, who has also been operating under the direction of Dr. Hayden in the neighborhood of Fort Bridger Uintah Mountains, and the Salt Lake basin, has made a large collection, comprising the lowest and simplest forms of animal life, many of which require high microscopic power to distinguish their structure.

The House of Representatives having called upon the heads of departments to report what objections, if any, there were to making obligatory, in all government transactions, the use of the metric system of weights and measures, the Secretary of the Navy and the Postmaster General have sent replies, the first of which states that he sees no objection, except that in the matter of the soundings on the charts. "If it were applied to these, it would probably involve the total loss of all charts and chart plates now in use, and would be prejudicial to the exchange of charts with England." The Postmaster General states two objections, one of which is that the lack of knowledge and experience of the postmasters at the small offices and the public at large would render the system unsatisfactory in its workings, and the other is the expense attending the change, which would involve the purchase of 43,867 metric balances, which would probably cost $124,788. This alleged necessity of changing the balances has called out the suggestion that, as 15 grammes have been made the lawful equivalent of the $\frac{1}{2}$ ounce for postal purposes, all that is necessary is to increase the movable weight on the present balance to the amount of $5\frac{8}{10}$ per cent, and to add a smaller proportionate weight to the pan, which would render the present balances capable of weighing letters on the metric system: the notches which now indicate one, two, or more half ounce rates, would then indicate corresponding 15 gramme rates.

Washington, D. C. OCCASIONAL.

The Standard of Metric Measurement.

To the Editor of the Scientific American:

Permit me through the columns of your valuable paper to correct an error quite prevalent in regard to the base of the "French Metric System." It is generally supposed that the meter is exactly the one ten millionth of the earth's quadrant, and consequently an absolute invariable unit, something in Nature which remains the same from age to age, and which if lost could be regained with exactness and certainty.

Can such a unit as above required be obtained for a reference by the means employed, and then re-obtained, should occasion require?

It was supposed in Newton's time that the earth was not a perfect sphere. Richer, who was sent by the Academy of Sciences, of Paris, to Cayenne in 1672, observed that the pendulum which vibrated seconds in Paris lost about 2½ daily at Cayenne. This fact, as Newton explained in his "Principia," must be the consequence of the reduction of the force of gravity, either by effect of the centrifugal force or an increased distance from the center. The deductions of Newton and Huyghens that the earth was a spheroid, like that already observed of Jupiter, flattened at the poles, conflicting with the opposite conclusions of the first Cassini, induced the Academy of Sciences to cause exact measurements of meridional arcs to be made both near the equator and the polar circle. The celebrated commission of the Academy of Sciences left Paris in 1735: Bouguer, La Condamine, and Godin to join in Peru the officers appointed by Spain, Antonio d' Ulloa and Jorge Juan; and Maupertuis, with four others, to proceed to the Gulf of Bothnia, where they were joined by the Swedish astronomer, Celsius. Ten years were spent by the party in Peru in the measurement of an arc of over three degrees in length, extending from latitude 2′ 3″ north to 3° 4′ 32″ south; and the length of a degree at the equator, reduced to the level of the sea, was calculated by Bouguer at 362,912 feet.

The northern party found a place for their operations between Tornea, in Lapland, and the mountain of Kittis. The difference of latitude being determined, they measured a base line upon the frozen rivers. The arc being then calculated, it was found to give about 367,500 feet as the length of one degree. The greater length of the degrees as they approached the poles was thus established, and consequently the greater equatorial than polar diameter of the earth.

In 1791 very extensive operations were commenced in France with the object of obtaining the exact length of the quadrant of the meridian, in order to make use of a definite part of this natural and permanent quantity as a standard unit. The measurements were carried out on the meridian of Paris under the distinguished astronomers, Delambre and Mechain. The line was extended across France from Dunkirk to Barcelona, making an arc of about 9°, and every precaution was taken to insure the greatest accuracy in the measurements. Though this arc thus determined was sufficient for the purpose required, the French astronomers in 1805, after an interval of three years, began to carry the measurement still further south, Biot and Arago directing the work after the death of Mechain. It was continued until Formentary was reached, distant about 12° 22′ south from Dunkirk.

A similar anomaly was noticed upon some portions of this arc, and the same was observed in the English surveys, that where these portions were considered separately, the length of the degree appears to increase toward the equator. The effect is to produce an uncertainty in the exactness of the result obtained, showing that there must have been some error in the measurements of the meridian, as the true curvature of the earth has been established beyond a doubt, that it is an oblate spheroid, and that the length of a degree increases as we approach the poles.

In the deliberations of the members of the Academy of Arts and Sciences, at Paris, the length of the pendulum at first appeared proper for a basis for a system of weights and measures, being easy to determine, and consequently to verify, if it should be necessary, by any accidents happening to the standards; but it was thought that to take, as was proposed, for the unit of measure the length of the simple pendulum vibrating seconds, was to employ, in order to determine a measure of length, not only a heterogeneous element, namely, time, but also an arbitrary division of time, namely, the second. A measure of length was, therefore, preferred that did not depend on any other quantity; but it will be seen that observations of the pendulum can, nevertheless, be employed as a means of verifying, and even of finding, that unit of measure, although they have not served as the basis of its determination.

In short, as it has been found that the one ten-millionth of the earth's quadrant (or the meter) differed only from the length of the pendulum beating seconds at Paris about six millimeters, both units would have led to results almost exactly similar. But after years of troublesome experiment and trial of the metrical system, the only advantage that has been gained is that of establishing one common standard, the meter, and that has just now been shown is not correctly what it is intended to represent. If uniformity was the object sought it might just as well have been obtained by making their ancient toise (so universally known) the standard.

The chief reccommendation of the metrical system, or of the meter, as stated in their decree, as well as the authors of the system, Brillat, Brisson, and Tarbe, is that should it be ever lost or altered it may be easily restored, not by a second measurement of the meridian, but by comparison with the pendulum. Thus they allowed the pendulum to be the regulator of linear measure as well as of time, and in short, the ultimate criterion, and of course the principal standard.

If before the meter was adopted as the standard, other meridians on different parts of the earth had been measured, as one in the United States, and a mean taken of the several, the results would have been more satisfactory.

In the astronomical calculations of the length of an arc of the meridian, base lines are used which must be measured by arbitrary means, whereas the length of the pendulum beating seconds at a given latitude of the sea level is a unit of itself, and the labor of re-obtaining it when lost, with certainty and exactness, is reduced comparatively to a minimum. C. F. LEWIS.

Knowlesville, N. Y.

Iron and Its Companions.

In the ordinary metallurgic products of iron a number of other metals may almost always be detected by analysis. Among the metals that accompany iron are manganese, nickel, cobalt, chromium—which metals are all likewise found in meteoric iron—also copper, vanadium, titanium, and tungsten. It is a curious fact that the spectrum of the sun indicates the presence of iron, together with all of the metals above named except tungsten and vanadium.

THE CURIOUS LIFE-HISTORY OF OUR BLISTER BEETLES.

Number II.

BY PROFESSOR C. V. RILEY.

It is generally stated by writers on the hive bee, that the oil beetle (*Meloe*) is one of its parasites. The possibility that our more common blister beetles were similarly parasitic on bees, taken in connection with the frequent complaints from apiarians of the wholesale death of bees from causes little understood, led me, some years since, to pay attention to the biological characteristics of the blister beetles, in the hope of ascertaining whether or not they really bear any connection with bee mortality. From these investigations, I am satisfied that *meloe* is only parasitic on the perfect hive bee, as it is on so many other winged insects that frequent flowers, and that it cannot well, in the nature of the case, breed in the cells of any social bee whose young are fed by nurses in open cells. The triungulins of our blister beetles refuse to climb on to plants furnished to them, or to fasten to bees or other hairy insects. Nor will they nourish upon honey, bee bread, or bee larvæ.

They show a proclivity for burrowing in the ground, and act quite differently from those of *meloe* or *sitaris*, which not only attach to bees in confinement, but which, in the case of *meloe*, I have known to so crowd upon mature hive bees as to worry them to death and cause extended loss in the apiary.

While analogy and the law of unity of habit in species of the same family pointed, therefore, to a parasitic life, I began to conclude, from the facts just stated, that the parasitism was of another kind, having satisfied myself by various experiments that the triungulins did not feed on roots.

Few discoveries are stumbled upon. We find, as a rule, that only which we anticipate or look for. Late last Fall, in digging up the eggs of the Rocky Mountain locust (*caloptenus spretus*) at Manhattan, Kansas, blister beetle pseudo-pupæ were not unfrequently met with. The suspicion thus raised that these insects preyed, in the preparatory states, upon locust eggs, was confirmed last Spring by finding the larvæ of different ages within the egg pods, and devouring the eggs of the locust just mentioned. From such larvæ preying on the eggs of *spretus* I have reared the unicolorous form of *epicauta cinerea*, Forster, or the marginal blister beetle; the *epicauta Pennsylvanica*, De Geer, or the black blister beetle; the *macrobasis unicolor*, Kirby, or ash-gray blister beetle; and the form of it described as *murina*, by Le Conte, or the black rat blister beetle.

Since then I have had no difficulty in tracing the larval habits and development of the two more common species around St. Louis, namely, the striped blister beetle (*epicauta vittata*, Fabr.), and the marginal blister beetle just alluded to. Careful examination of locust eggs, in the vicinity of potato fields frequented by the parents, show a varying proportion of the egg pods affected, and in some locations nearly every pod of the differential locust (*caloptenus differentialis*) will contain the *epicauta* larva. The eggs of the locust are laid in large masses of 75 to 100. The pod is but slightly bent, rather compact outside, while the eggs are

Fig. 1.—Caloptenus differentialis.

irregularly arranged and capped with but a shallow covering of mucous matter. It is the egg pod of this species which the larvæ of the two blister beetles in question prefer. The larval habits of the genus, as well as of *macrobasis* and *henous*, which I have studied, may be illustrated by reciting those of either of these species.

From July to the middle of October the eggs are being laid in the ground in loose, irregular masses of about 130 on an average. The female lays at several different intervals, producing in the aggregate probably from four to five hundred ova. She prefers for purposes of oviposition the very same warm, sunny locations chosen by the locusts, and doubtless instinctively places her eggs near those of these last, as I have on several occasions found them in close proximity.

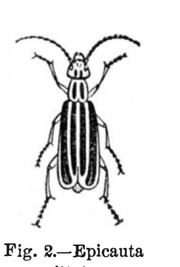


Fig. 2.—Epicauta vittata.

In the course of about ten days—more or less, according to the temperature of the ground—the first larva or triungulin hatches. These little triungulins (Fig. 4, *c*), at first feeble and per-

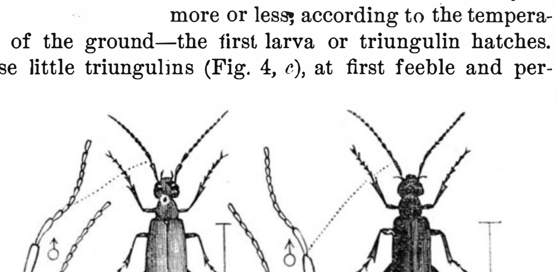


Fig. 3.—MACROBASIS UNICOLOR.—*a*, normal gray form; *b*, black (*murina*) form; *c*, *d*, male and female antennæ.

fectly white, soon assume their natural light brown color and commence to move about. At night, or during cold or wet weather, all those of a batch huddle together with little motion, but when warmed by the sun they become very active, running with their long legs over the ground, and prying with their large heads and strong jaws into every crease and crevice in the soil, into which, in due time, they burrow and hide. Under the microscope they are seen to fairly bristle with spines and spinous hairs, which all aid in burrowing. As becomes a creature of prey that must be indus-

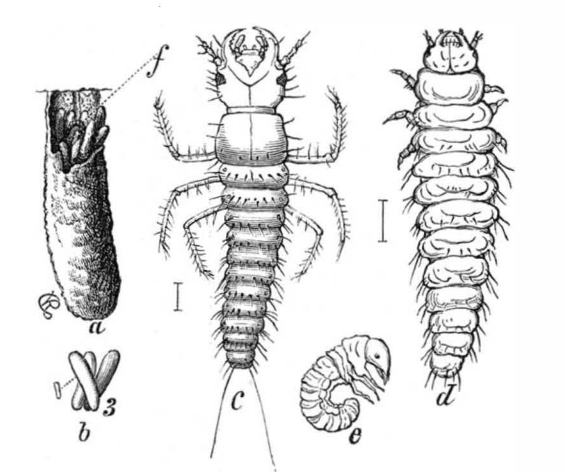


Fig. 4.—EPICAUTA.—*a*, locust egg pod, with triungulin just entering (*f*); *b*, eggs; *c*, triungulin; *d*, second larva; *e*, natural position of same.

triously sought, they display great power of endurance, and will survive for a fortnight without food in a moderate temperature. Yet in the search for locust eggs many are, without doubt, doomed to perish, and only the more fortunate succeed in finding appropriate diet. Reaching a locust egg pod, our triungulin, by chance or instinct, or both combined, commences to burrow through the mucous neck, and makes its first repast thereon. If it has been long in search, and its jaws are well hardened, it makes quick work through this porous and cellular matter, and at once gnaws away at an egg, first devouring a portion of the shell and then sucking up the contents. Should two or more triungulins enter the same egg pod a deadly conflict sooner or later ensues, until one alone remains the victorious possessor. A second egg is attacked, and more or less complete ly exhausted of its contents, when a period of rest ensues, the triungulin skin splits along the back,

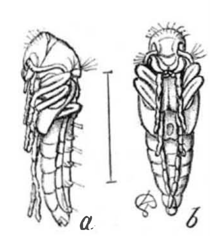


Fig. 5.—EPICAUTA.—*a*, pupa, side view; *b*, same, ventral view.

and there emanates the second larva (Fig. 4, *d*), white, soft, with reduced legs, and quite different in general appearance from the first. This molt is is experienced about the eighth day from the first taking of nourishment. The animal now naturally lies in a curved position. After feeding for about another week a second molt takes place, the skin, as before, splitting along the back and the new larva hunching out of it until the extremities are brought together and released almots simultaneously.

This kind of molting is exceptional among insects, the skin being ordinarily worked backward from the head. The modification at this molt is slight. A third molt ensues with but little change in the form and character of the animal. In this, the ultimate stage of the second larva (Fig. 5, *a*), the creature grows apace, its head being constantly bathed in the rich juices of the locust eggs, which it now

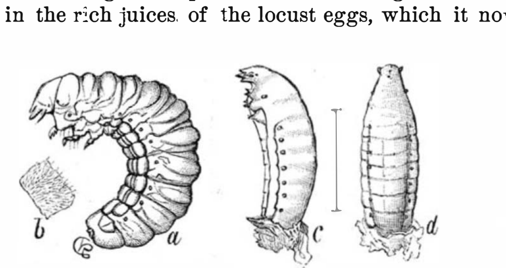


Fig. 6.—EPICAUTA.—*a*, full grown larva; *b*, setaceous points that cover the back; *c*, coarctate larva, side view; *d* same, back view.

rapidly sucks, or more or less completely devours. The color is somewhat more yellowish than it was before. In another week it forsakes the remnants of the pabular mass and burrows a short distance in the clear soil, where it forms a smooth cavity within which it lies, stretched on one side. In three days the skin splits again, but is only partially shed. The mouth parts and legs are now quite rudimentary and tuberculous, the soft skin rapidly becomes rigid and of a deeper yellow color, and we have what has been called the pseudo-pupa or coarctate larva (Fig. 5, *c*, *d*). The insect has the power of remaining in this coarctate larval condition for a long period, and generally thus hibernates.

In spring the coarctate larval skin is in its turn rent on the top of the head and thorax, and there crawls out of it the third larva, which differs in no respect from the ultimate stage of the second larva already mentioned, except in the somewhat reduced size and greater whiteness. This third larva is rather active, and burrows about in the ground; but while there seems to be no reason why it should not feed, nourishment is not at all essential, and all my specimens have, in the course of a few days, transformed to the true pupa (Fig. 6) without feeding. The pupa state lasts but five or six days.

Our blister-beetle larvæ are, therefore, partial parasites. An animal that feeds on eggs is not necessarily parasite, but the term is justly applied to such as feed within, and are confined to, the egg pod, in contradistinction to predaceous species which move from one egg pod to another. Like all parasitic insects that nourish on a limited amount of food, and possess no power to secure more, the blister beetles vary greatly in individual size in the same species, and the larvæ have the power of accommodating their life to circumstances, and of assuming the coarctate larval form earlier or later according to the size of the egg mass which they infest. In an average sized egg pod of the differential locust, however, there are more than enough eggs to nourish the largest specimens of *E. vittata*, and a few are usually left untouched. The period of growth from the first feeding to the coarctate larva averages about a month.

That the eggs may exceptionally hibernate is possible, but from their delicate nature improbable. That the triungulins frequently do so there can be no doubt, especially in specimens like the black blister beetle, which is found on the flowers of solidago, eupatorium, etc., till the end of October and continues laying till frost.

CONCLUSION.

From the foregoing history of our common blister beetles it is clear that, while they pass through the curious hypermetamorphoses so characteristic of the family, and have many other features in common, yet *epicauta* and *macrobasis* differ in many important respects from *meloe* and *sitaris*, the only genera hitherto known biologically.

To resume what is known of the larval habits of the family, we have: First, the small, smooth, unarmed, tapering triungulin of the prolific *sitaris*, with the thoracic joints subequal, with strong articulating tarsal claws on the stout-thighed but spineless legs, and, in addition, a caudal spinning apparatus. The mandibles scarcely extended beyond the labrum: the creature seeks the light, and is admirably adapted to adhering to bees but not to burrowing in the ground. The second larva is mellivorous, and the transformations from the coarctate larval stage all take place within the unrent larval skin. We have: Second, the more spinous and larger triungulin of the still more prolific *meloe*, with long caudal setæ, but otherwise closely resembling that of *sitaris* in the femoral, tarsal, and trophial characters, in the sub-equal thoracic joints, unarmed tibiæ, and in the instinctive love of light and fondness for fastening to bees. The second larva is also mellivorous, but the later transformations take place in the rent and partly shed skins of the second and coarctate larvæ. We have: Third, the larger and much more spinous triungulin of the less prolific *epicauta macrobasis* and *henous*, with unequal thoracic joints, powerful mandibles and maxillæ, shortened labrum, slender femora, well armed tibiæ, slender, spinous, less perfect tarsal claws, combined with an instinctive love of darkness and tendency to burrow and hide in the ground. The second larva takes the same food as the first, its skin is almost entirely cast from the coarctate larva, while subsequent changes are independent and entirely free of the shell of this last.

Recent Tests of the Telephone.

Some interesting trials of the articulating telephone were lately made in England through Dr. Muirhead's artificial cable. This artificial line, says the *Telegraphic Journal*, offers the closest approximation to the electrical conditions of an actual cable that has been hitherto attained. The experiments were made through a length of artificial cable of the type of the Direct United States Cable, and it was so constructed that artificial line capacity could be added to the circuit or taken away from it at will. When the capacity is taken off, the circuit is of course a mere resistance circuit; but when the capacity is put on, the circuit was equivalent to a length of submarine cable. In speaking by telephone through a hundred miles of this cable the words were comparatively loud and distinct, but the instant the capacity was put on, the voice lost both power and distinctness in a remarkable degree. It appeared only half as loud as before, and dull and smothered in tone. With a hundred and fifty miles of artificial cable, while the voice was apparently as strong as ever through the resistance circuit alone, it was completely silenced by putting on the capacity. Even with a superior telephone, the extreme limit of articulation would thus be less than two hundred miles. Theory points out, and experiment verifies the fact, that if the voice is allowed to dwell on a note for a sufficient time to establish, despite induction, a regular succession of electric waves in the cable, a faint sound will be audible. Thus, singing can be heard through a greater length of cable than talking. In articulation the changes of the voice are so hurried that time is not given the cable to establish the regular series of waves necessary to reproduce sound, so nothing is heard at all.

Novel Method of Preparing Oxygen.

The author finds that oxygen may be very readily obtained even at common temperatures by the mutual reaction of two oxygenated compounds formed of several atoms of oxygen, such as hypochlorate of lime and peroxide of barium. These facts prove, he considers, that the oxygen is produced by the neutralization of the opposite electric polarities of the oxygen in one of the compounds and that in the other.—*Sylvester Zinno, in Les Mondes.*

La Nature says that when the whale in the Westminster Aquarium, London, died, all the living eels, which had been put in the tank as food for the monster, at once attacked the body and attempted to devour it.

The Telephone in Collieries.

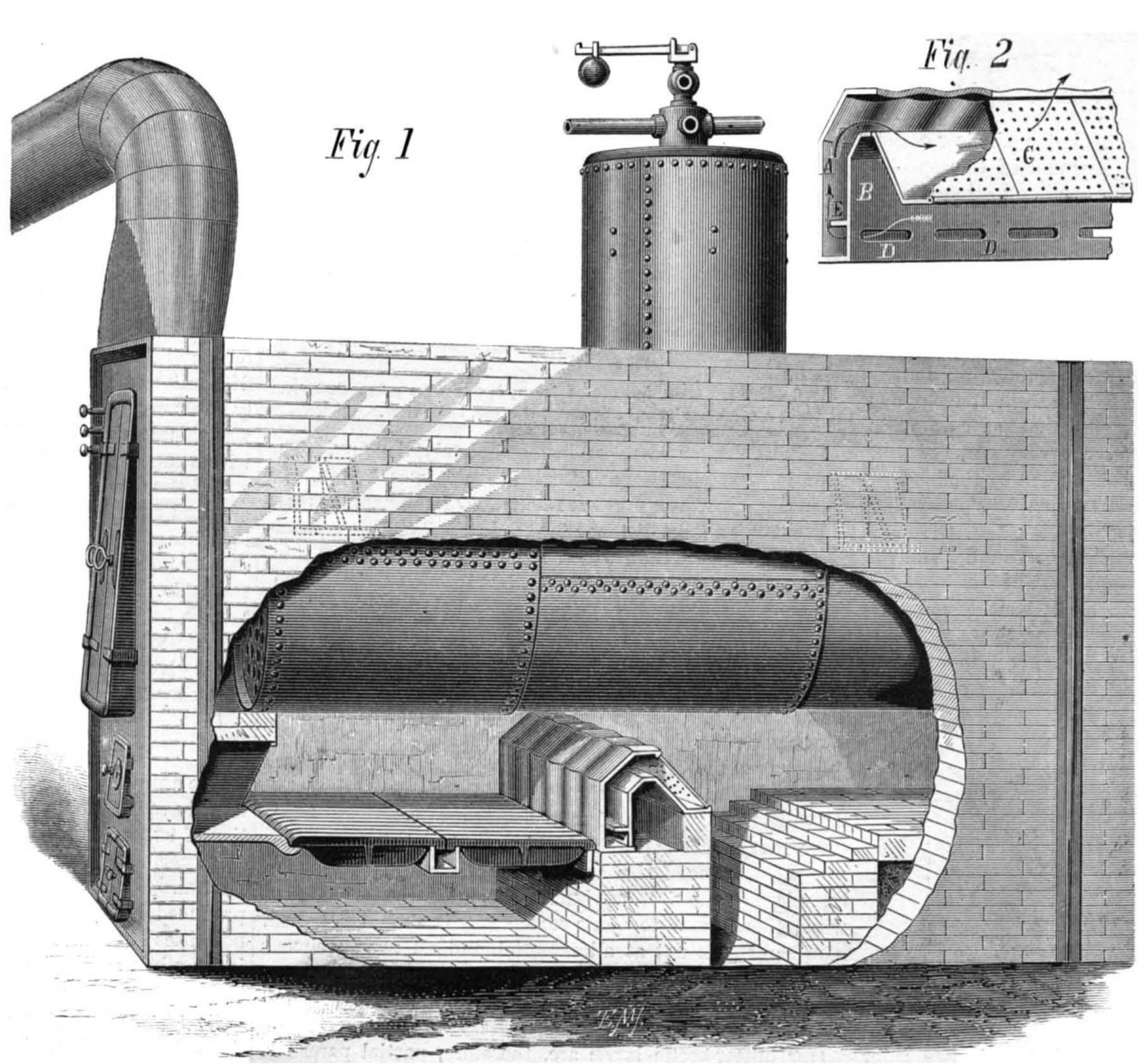
A number of gentlemen connected with the principal collieries in West Lancashire, Eng., lately assembled at Prescot Colliery, belonging to the Wigan and Whiston Coal Company, for the purpose of witnessing experiments with Professor Graham Bell's Telephone, but especially with reference to its use in the working of collieries. By an adaptation of Mr. Hall, Government Inspector of the mines of the district, one of Mr. Biram's anemometers used in collieries for testing the velocity of air passing through the workings had attached to it, instead of the regulator, a telephone, and it was to test whether the state of the ventilation could be ascertained at the surface that the experiments were made. Instead of the ordinary diaphragm, a small thin iron bar was substituted in the telephone attached to the anemometer, every tenth revolution of which caused this bar to vibrate. An anemometer thus provided was connected with the telephone placed in the colliery offices, and then taken down the shaft and fixed in the main intake—an ordinary coated electric wire, some 600 yards long, joining the two instruments. Mr. Hall and a party of underground managers had charge below ground. The vibration of the anemometer was distinctly heard by the instrument in the office, and it was found to give 28 beats to the minute, or 280 revolutions, which, multiplied by area of airway, showed the quantity of air passing. The result was considered eminently satisfactory, and was communicated to Mr. Hall. Experiments in speaking to those in the mine were then made, and Mr. Hall recognized the voices of several friends. At times word was sent from below that they could hear noises going on in the room, conversation between several of the gentlemen taking place, and this interfered with the distinctness of the messages. On the conclusion of the experiments, Sir W. Thomson, using the telephone, addressed a few words to those present, and to Mr. Hall. He expressed himself as both delighted and astonished with the result of the experiments. Never before had he heard the voice more distinct, and the experiments were very satisfactory. He explained the difference between previous telephones and Professor Bell's, and said that although he had often tested the telephone he had never before seen it made of practical use as in the present case.

THE CORRUGATED IRON AIR BRIDGE AND FUEL ECONOMIZER.

Mr. Robert K. McMurray, Chief Inspector of the Hartford Steam Boiler Inspection Company, is the inventor of the new steam boiler attachment herewith illustrated, which, it is claimed, provides an efficient means for economizing fuel, reducing the time and expense usually required for the renewal and repair of bridge walls and preventing smoke by the admission of a proper supply of heated air to the gases evolved by combustion. The principal feature of the device is that last mentioned, the inventor claiming positive advantages through the mingling of heated air instead of cold air with the gases. The bridge is also constructed so as to offer increased resistance against blows shocks, and the effects of expansion and contraction, while it may be easily removed for renewal or repairing.

The arrangement of the bridge in the furnace is shown in Fig. 1, and the device detached with portions broken away to exhibit its interior arrangement in Fig. 2. It consists of a fire plate, A, a back or base plate, B, and a dispersing plate, C. The plate, A, is corrugated in order to give it increased strength and is provided with a light bottom flange which rests upon the bridge wall and thencerises vertically for about two thirds of its height, at which point it is inclined at an angle of 45 degrees. The bottom plate, B, conforms in the relative position of three of its sides, to the plate, A, and terminates below in a horizontal foot. Both plates, A and B, are connected by bolts passing through thimbles, so as to form a hollow case. The perforated diffusing plate, C, is inserted in groves formed in the other plates. A series of air supply openings, D, are formed in the plate, B, near the base. Above them extends a deflecting flange, E. The device is so set that the lower edge of the fire plate, A, is slightly below the level of the grate bars, and its ends are closed by the side walls of the setting or by metal plates fitted therein, the latter arrangement allowing of the bridge being removed as desired by drawing it out longitudinally through the opening in the side wall.

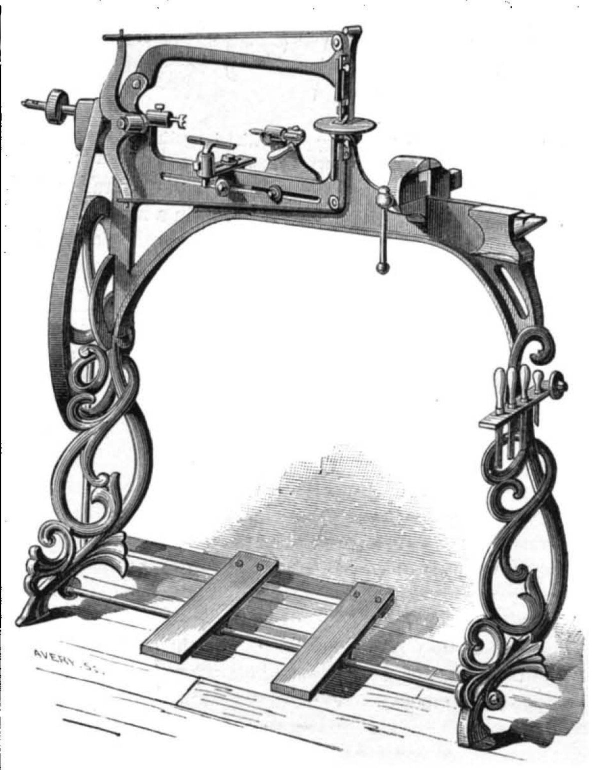
The fresh air enters the space between the back plate and fire plate through the supply openings, D, and is deflected by the flange against the heated surface of the fire plate and thence passes upward as indicated by the arrows, Fig. 2, along the space between the two plates. The air thus becomes introduced in a minutely divided condition into the combustion chamber at a temperature closely approximating that of the gases escaping from the furnace. It mingles with said gases, and is claimed to oxidize the carbonic oxide and to effect complete combustion, with a corresponding economy of fuel and prevention of smoke. The inventor informs us that the device has been well tested with uniformly successful results. Patented September 4, 1877. For further particulars, address Robert K. McMurray & Co., 285 Broadway, New York city.



THE CORRUGATED IRON AIR BRIDGE AND FUEL ECONOMIZER.

COMBINATION LATHE, SCROLL SAW, ETC.

The machine illustrated herewith is a combined foot power drill and turning lathe, scroll saw, grinding wheel, vise,



and anvil, in the construction of which many novel features are embodied. The body and legs are cast iron, the treadles wood, the belts leather, the wrench iron, the fixed screws polished iron, the set screws casehardened, the finish black japan with ornamental paintings. The lathe will turn work four inches by nine long. It is suitable to hand turning, has a press lever for drilling, and is furnished with steel spur and pointed centers. The rest has all the adjustments common to large turning lathes. The scroll saw plays vertically through the center of an iron table, which may be tipped on an angle for inlaid work. The saw is held by means of iron clamps and thumbscrews, said clamps being attached, each to the end of a leather band, which bands pass over friction pulleys and are hung to pins on the ends of the vibrating lever, which is driven by an eccentric on the lathe spindle. There are several pin holes in the upper band to adjust the strain to saws of varying lengths. An arm projecting over the table serves as a presser foot to hold the work down while sawing, and adjusts itself to varying thickness in boards. When the saw is disconnected to enter holes, said arm may be raised to admit the board, or it may be swung over to leave all clear above the lathe if desired. This machine swings fifteen inches under the arm, and the motion of the saw is in a straight line.

In carrying out this principle of operating the jig saw on a large machine, the saw is hung in sliding guides as usual, but the bands for reaching any distance on the work and the vibrating lever are the same as here shown.

It is claimed that no perceptible jar is felt in running a sixteen inch saw that will reach the center of work up to ten feet radius. This steadiness is caused by the vibrating lever being very short and well balanced, and by the cushioning effect of the inertia of the bands. The lever need not be over six inches radius to give the saw four inches stroke.

The vise and anvil are permanent attachments to the machine. The emery wheel on the spindle is heavy, and serves as a fly wheel to the lathe and saw. In the outer end of the spindle is a drill for bracket work. When desired, the manufacturer furnishes tools and extra parts with the machine, such as face plates for chucking, a drill plate, a circular saw, and table, turning gouges, chisels, etc.

Patent pending. For further particulars see Business and Personal column, or address W. X. Stevens, East Brookfield, Mass.

The Delicacy of the Telephone Circuit.

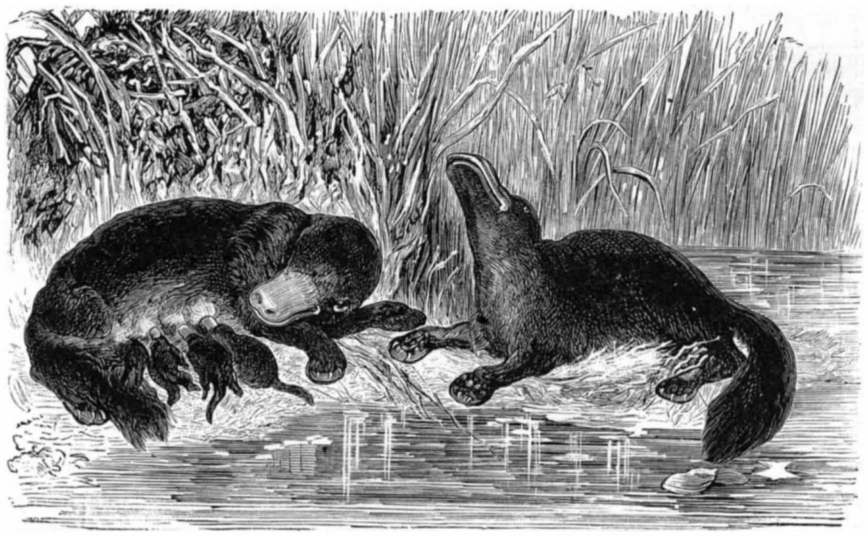
In a recent lecture before the Society of Telegraph Engineers in England, Professor Bell called attention to the remarkably slight earth connection which is needed to establish a circuit for the telephone. In describing an experiment showing this, he stated that while an assistant made connection at his end of the line by standing on a grass plot, he himself stood upon a wooden board. On trying the telephone Professor Bell was very much surprised to hear a continuous musical note uttered by his coadjutor, and on looking for the cause he found that a single blade of grass was bent over the edge of the board and that his feet touched it. The removal of the grass was followed by a cessation of sound from the telephone, but the sound became again audible whenever the Professor touched even the petal of a daisy with his foot.

Ferroux's Rock Drill at the St. Gothard Tunnel.

M. Ferroux's rock drill, which has been in operation since 1873 at the works of the St. Gothard tunnel, has recently been much simplified in the mechanism for the feed and the percussion. The piston of the percussion cylinder is formed conically at each face for the purpose of reversing it at the end of each stroke. When it arrives at the end of the stroke it strikes a small plug, which slides in a cylindrical opening and presses it inwards. This movement is simultaneously communicated by a lever to the small supply piston at the upper end of the cylinder by which the compressed air is shut off, and the exhaust opened. The percussion piston is then promptly returned to the upper end of the cylinder, where it strikes the small supply piston, and opens it for a fresh supply of compressed air, when the percussion piston makes the next down stroke. This rotation of the percussion piston and rod is effected by means of an inclined groove cut in the rod, in which a pawl is engaged. The pawl is one piece with a ratchet wheel, which turns freely with the pawl as it is swayed by the groove in the descending piston rod, but is prevented by a ratchet from returning. The ball being thus held stationary, the piston rod necessarily sways to the pawl in its turn, and makes a portion of a revolution, shifting the position of the jumper for each stroke. The weight of the new Ferroux drill is about 440 lbs. The calculated volume of air expended per stroke of the piston is 85 cubic inches.

THE DUCK-BILLED PLATYPUS.

The *ornithorhynchus* or platypus is a singular animal, which seems to form a connecting link between the mammals and birds, and in some respects having affinities even with reptiles. It is from 18 to 22 inches long, and has a stubby tail 5 inches long. The color is brown above and whitish below. The jaws are inclosed in a a horny sheath, very sensitive, like the bill of a duck, and have two horny teeth on each side; the snout is flat and broad, the lower jaw shorter and narrower, the eyes small and brilliant; ears not apparent externally, with an aperture that can be opened or shut at will; and the fur is soft and thick, like that of the otter. The legs are short, and the feet five toed, and webbed. It secretes milk for the nourishment of its young, which are born blind and naked. It burrows in the banks of streams, where it passes the day in sleep, rolled up like a ball, coming out at dusk and during the night in search of food. It is an excellent swimmer and diver, and feeds upon worms, insects, and small aquatic animals, in the manner of a duck. It walks very well, and climbs trees with facility. It can remain under water for eight minutes at a time; it is cleanly in habit, and fond of warmth and dryness. The young die very soon in confinement.


THE DUCK-BILLED PLATYPUS.

Poisoning by Earrings.

Two young girls in Paris suffered from blepharitis, and one of them also from an inflammation of the lower part of the left auricle. All the usual remedies proved inefficacious, but both patients quickly recovered after their copper earrings were discarded.

PROPOSED BALLOON VOYAGE TO THE NORTH POLE.

We find in the London *Graphic* the annexed engraving of an arrangement of balloons proposed by Mr. Henry Coxwell of England as a means of crossing the Palæocrystic Sea and so reaching the north pole. Our contemporary attributes to Commander Cheyne, R.N., the origination of the idea of using balloons for this purpose. It is believed that the three balloons connected in the manner shown in our engraving would carry six men, besides three tons weight of gear, boat cars, stores, provisions, tents, sledges, dogs, compressed gas, and ballast. The triangular framework connecting the balloons would be fitted with foot ropes, so that the occupants could go from one balloon to another in the same manner as sailors lie out upon the yards of a ship, and the balloons would be equipoised by means of bags of ballast suspended from this framework, and hauled to the required position by ropes. Trail ropes would be attached to the balloons, so as to prevent their ascent above a certain height (about 500 feet), at which elevation they would be balanced in the air, the spare ends of the ropes trailing over the ice. The boat cars would be housed in for warmth, and telegraphic communication kept up with the ships by means of a wire uncoiled from a large wheel (see sketch) as the balloons moved onward. This wire, being marked at every five miles, would also serve to keep a record of the distance traversed. Commander Cheyne proposes that the balloons should start about the end of May, on the curve of a wind circle, of known diameter, ascertained approximately by meteorological observations conducted on board the vessel, and at two observatories some thirty miles distant in opposite di rections. It is estimated that, with a knowledge of the diameter of the wind circle, and the known distance from the Pole, the balloons could be landed within at least twenty miles of the long wished-for goal. There the balloons would be securely moored; and when the necessary observations at the Pole had been carried out, a return wind would be secured for their return, the requisite full inflation having been made by means of the surplus gas taken out in a compressed condition. The returning voyagers would arrest their course to the southward on the parallel of latitude on which they left their ship, and the remainder of their journey, east or west, would be performed by means of the dogs and sledges conveyed in the balloons.

Recent Archæological Discoveries.

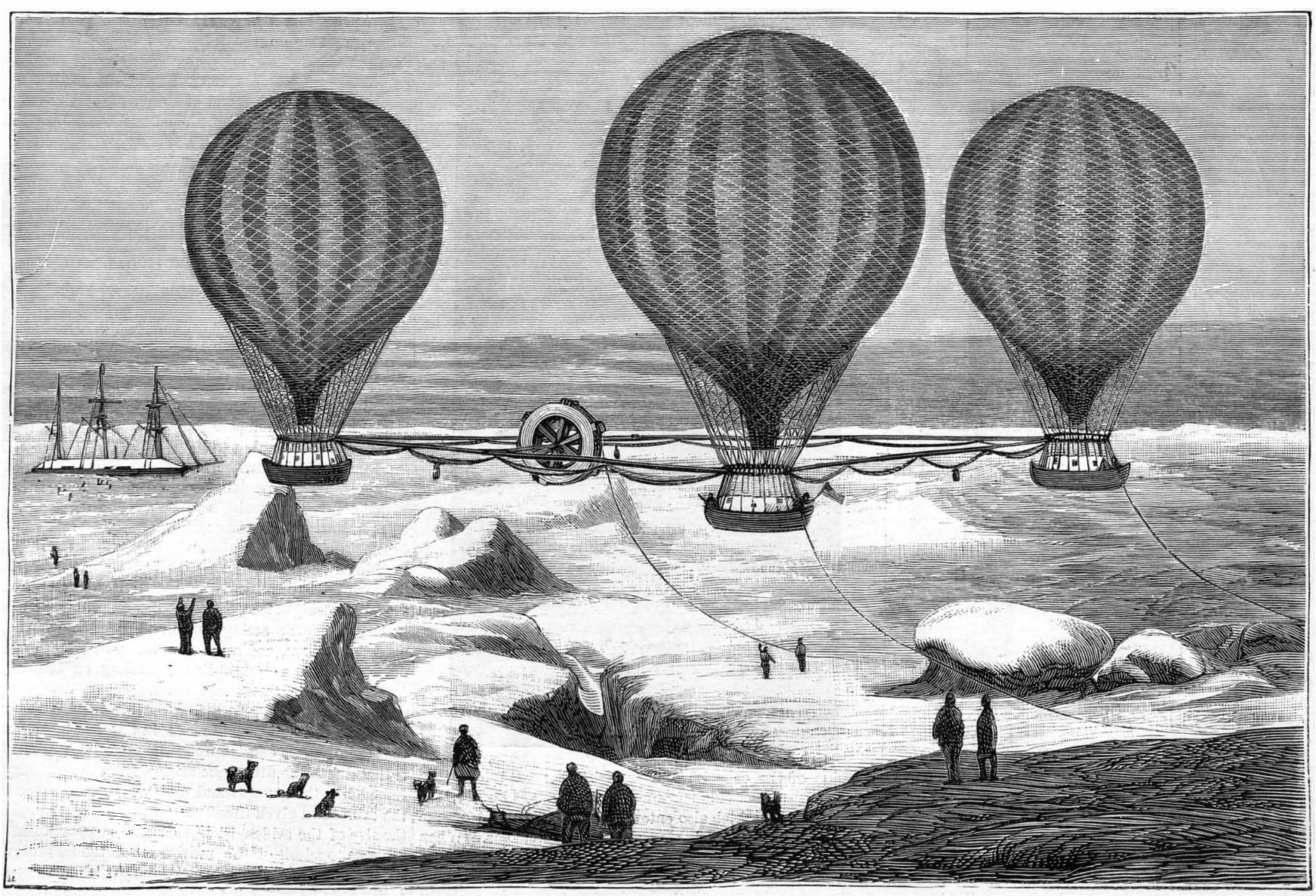
In a volume on "Notes on the Barrows and Bone Caves of Derbyshire," Mr. Rooke Pennington, the author, gives some interesting facts in regard to explorations made near Castleton. The surrounding country is dotted with tumuli, usually rough, round heaps of stone and turf and some of a peculiar oblong shape. The large mounds are about fifty feet in diameter and five feet high in the center. Their contents are all the evidence in existence as to the beliefs, practices and social life of men who tenanted the British Islands in the neolithic or polished stone and bronze periods of culture. In one barrow was found a stone cist made of six rough slabs, four for the sides and two for top and bottom. Fragments of pottery with rude scratches for ornamentation laid scattered around the bones of an old man. Near by and in the very center was found in a shallow grave the skeleton of a young man, buried in a crouching position. Large pieces of limestone were piled around and there were many bones of the short-horned ox, the boar and the horse. It was evident the young man was one of high rank, both from the high mound and the bones of the animals, which were, Mr. Pennington thinks, the remains of a funeral feast. An awl made of stag horn and a jet ornament were the only personal articles found.

In a recent number of the *Athenaion* is a short summary of the discoveries which have been recently made in tombs at Spata in Attica, Greece. To the south of the village a square chamber cut in the rock was found accidentally at a depth of about 17 feet from the surface. On the eastern and northern sides of this chamber were smaller ones. The door leading into the great chamber was walled up with small stones and earth, a small aperture being left at the top; the entrance to the two smaller chambers was free. In clearing out the passage were found many objects in glass or ivory and a few in silver, gold, bronze and terra-cotta; also a few ashes and bones. These objects were found scattered about in the earth, as if the tomb had been anciently sacked and some of its contents dropped by the plunderers in their way out. In the northwest corner a layer of ashes and burnt bones was found intact.

A Patent Law for Switzerland.

Switzerland and Holland are the only two European nations that at the present time refuse to inventors the protection of patents. Holland, it seems, is soon to be left alone in that glory. A bill is now under discussion, prepared by Federal Councillor Droz, which if passed will give to the republic of Switzerland a patent law system very much like that of the United States. The fees for patents are to be small, and the mode of securing inventions simple. We shall give our readers due notice of the passage of the Swiss patent law.

CHARCOAL FOR OFFENSIVE BREATH.—A correspondent of the *Dental Cosmos* says that the best treatment in regard to offensive breath is the use of pulverized charcoal, two or three tablespoonfuls per week, taken in a glass of water before retiring for the night.


PROPOSED BALLOON VOYAGE TO THE NORTH POLE.

MACHINES THAT HEAR AND WRITE.

The propagation of sound in air is excellently illustrated in the ingenious apparatus devised by Professor Tyndall and represented in Fig. 1. A is a stem passing through the upright, B, to which a shock can be sent from a ball, C, through a spring to another ball, thence through another spring to another ball, and so on until at last the shock reaches the last ball, which is projected against the india rubber pad at the end, D, placed there to represent in a rude mechanical way the drum of the ear. When the stem, A, is pressed, the ball, C, only moves to and fro, yet it sends a kind of pulse, *f*, *e*, *e*, *f*, which travels along the line and ultimately causes the last ball to give a smart stroke on the pad, D. That this represents what takes place in air, when sound is propagated through that medium, is shown by the apparatus represented in Fig. 2. A tube 11 feet long and 4 inches wide has its ends closed with thin india rubber. Against the rubber at one end there presses a cork, *a*, with which is connected a hammer, *b*, which is in contact with the bell, *c*. If now a pulse be sent from the other end of the tube, the india rubber will drive away the cork and will cause the hammer to strike the bell. It will thus be evident that, when vibrations are caused in the air of a tube closed by a membrane, that those vibrations will be transmitted to the membrane. In the ear, as we have stated, the auditory nerves take the vibrations from the membrane to

FIG. 1.

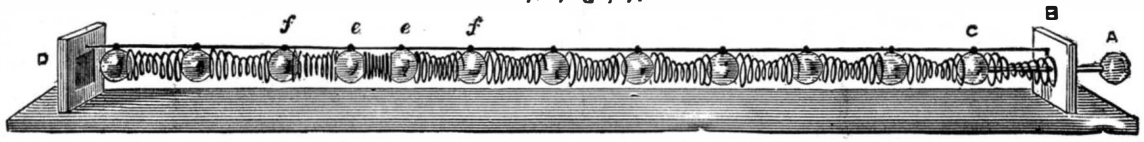
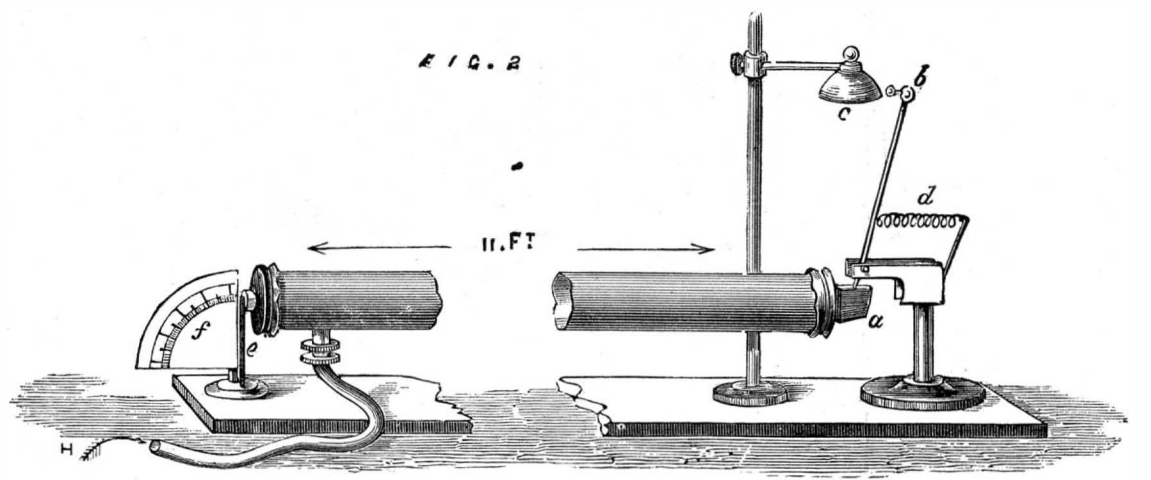


FIG. 2.



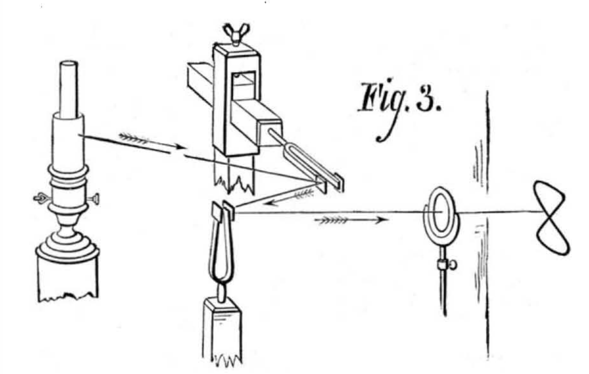


Fig. 3.

the brain, and the latter influences other nerves and muscles which cause us to write down what we hear. The problem to be solved in the phonograph is to find a mechanical substitute for auditory nerves, brain, and muscles, or, in other words, to connect some device with the body thrown into vibration by the sound, which shall register the movements

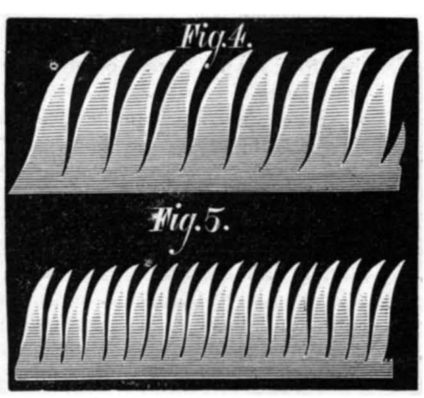
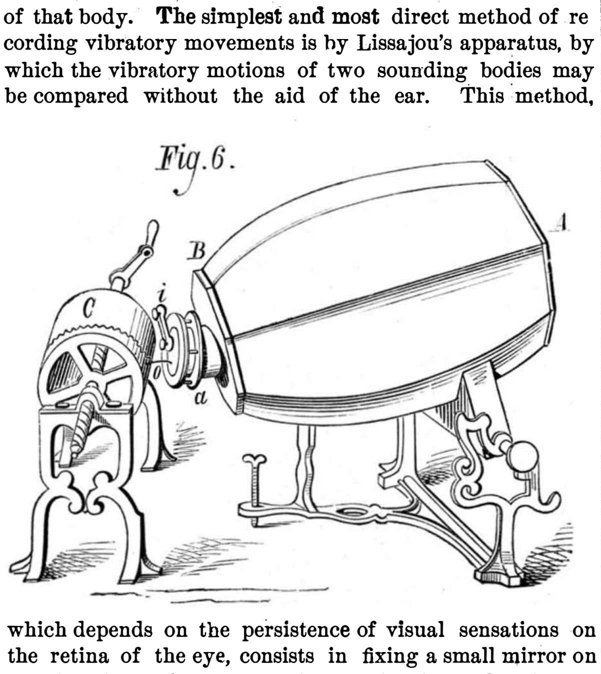


Fig. 4. Fig. 5.

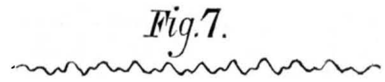
of that body. The simplest and most direct method of re cording vibratory movements is by Lissajou's apparatus, by which the vibratory motions of two sounding bodies may be compared without the aid of the ear. This method,

Fig. 6.

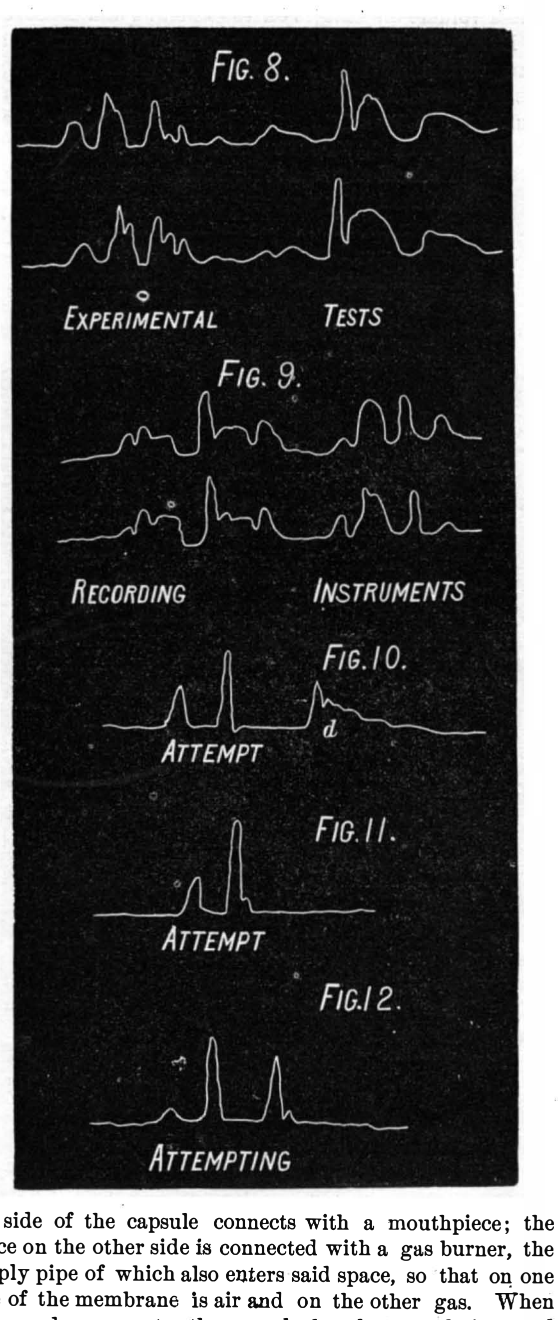


which depends on the persistence of visual sensations on the retina of the eye, consists in fixing a small mirror on the vibrating body, so as to vibrate with it, and to impart to a luminous ray a vibratory motion similar to its own. The bodies used are tuning forks, and in Fig. 3 is represented the optical combination of two rectangular vibratory motions, the figure being projected on a screen. A large number of curves are produced, which are more complex when the ratios or the numbers of vibrations of the bodies are less simple; and as each curve or variation corresponds to a definite condition of the forks (pitch, etc.) it is evident that, while it is a graphic representation of the vibrations which take place in the bodies, it also represents the sound resulting from such vibrations. If the beam of light producing the curves were projected upon a sensitized surface, then the curve would be photographed, and consequently we should have a graphic representation of the sound.

Fig. 7.



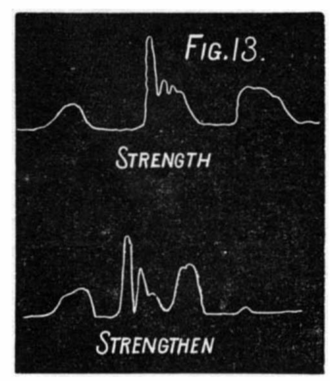
König's manometric flames furnish a very delicate mode of graphically showing the nature of sounds. The apparatus used consists of a metallic capsule divided into two compartments by a thin membrane of rubber. The tube on



one side of the capsule connects with a mouthpiece; the space on the other side is connected with a gas burner, the supply pipe of which also enters said space, so that on one side of the membrane is air and on the other gas. When the sound waves enter the capsule by the mouthpiece and tube, the membrane yielding to the condensation and rarefaction of the air waves, the gas in the compartment on the opposite side of the membrane is alternately contracted and expanded, and hence are produced alternations in the length of the flame, which are, however, scarcely perceptible when the flame is observed directly. But to render them distinct they are received on a mirror with four faces, which is rotated on a vertical axis. As long as the flame burns steadily there appears in the mirror, when turned, a continuous band of light. But if the capsule is connected with a sounding tube for example, yielding the fundamental note, the image of the flame takes the form represented in Fig. 4, and that of Fig. 5 if the sound yields the octave. For different sounds produced before the capsule the flame assumes widely differing appearances. It would not be impossible to photograph the representation of the flame in the mirror, and thus permanent graphic records of sounds might be obtained.

We now come to purely mechanical means of registering sound, to which class belong the Edison and other phonographs. In Fig. 6 is represented Leon Scott's phonautograph, which consists of an ellipsoidal cask, A, of plaster of Paris, and about 1½ feet long. The end, A, is open; that at B is closed by a solid bottom having an orifice, in which is a bent brass tube, *a*, which carries a ring on which is affixed a thin membrane. Near the center of the latter is a very light style; and in order that this style may not be at a node, the membrane stretching ring carries a movable piece, *i*, which is termed a subdivide, and which, being made to touch the membrane first at one point and then at another, enables the experimenter to alter the arrangements of the nodal lines at will. It follows that, when a sound is produced near the apparatus, the air in the ellipsoid, the membrane and the style will vibrate in unison with it, and it only remains to trace on a sensitive surface the vibrations of the style and to fix them. For this purpose a rotating copper cylinder, *c* is covered with lampblacked paper and the style is brought in contact with the latter, so that, when the cylinder is rotating and the style vibrating, a sinuous line is produced, the nature of which depends upon the sound. Thus in Fig. 7 is represented the trace of the sound produced jointly by two pipes, whose notes differ by an octave. This arrangement of rotating cylinder is also employed in connection with tuning forks, a style being arranged on one arm of the fork. On a note being sounded in unison with which the fork is tuned, the fork vibrates and consequently a sinuous line showing the nature and velocity of the vibrations is made upon the paper of the cylinder.

In April, 1873, Mr. W. H. Barlow read before the Royal Society a paper on the "Logograph," an invention of his own for recording sound, which consists of a small speaking trumpet about 4 inches long, having an ordinary mouthpiece connected to one end of a tube of ½ an inch in diameter, whose other end is broadened out so as to form an aperture of 2½ inches diameter, which aperture is stopped by a membrane of goldbeater's skin or thin gutta percha. Against this membrane a spring presses lightly and has connected to it a light arm of aluminum, which carries a marker consisting of a very fine sable hair pencil, projecting from the lower end of a glass tube containing coloring material, the tube and pencil together forming a kind of fountain marker,



as the coloring material gradually oozes out and keeps the pencil continually moist and supplied with color. Under this marker a continuous strip of paper is made to pass, in in the same manner as the strip of paper in the register of the Morse telegraph, and the whole is so arranged that when the membrane occupies its normal position the marker makes a simple, straight line, as the strip of paper passes beneath it, but any force acting on the membrane will cause the marker to move, and a crooked line will be the result, the deviation from a straight line depending on the amount of force exerted on the membrane.

To provide for the escape of the air passing through the trumpet a small orifice is made in the side of the tube, so that the pressure exerted upon the membrane and its spring is that due to the difference arising from the quantity of air forced into the trumpet and that which can escape through the orifice in a given time. The pressure of the spring and the size of the orifice have to be so proportioned to each other as to admit of the movement of the marker with the slightest pressure of the breath, and yet it must not move so easily as to pass over the edge of the paper under the greatest pressure which the breath is capable of producing. By this apparatus, when properly adjusted, the various sounds produced by speaking will act on the membrane, causing it to move the marker correspondingly to the force exerted by the differing tones of the voice, and thus a series of irregular lines will be produced, exhibiting remarkable uniformity when the same phrases are repeated, as is shown by the diagrams in Figs. 8 and 9, made by the instrument when the words under them were pronounced by the same speaker successively.

One of the first peculiarities manifested in using the instrument was the action produced by the silent discharge of air from the mouth after a word was pronounced. This silent discharge appeared to depend on the force required in the last syllable, and was most developed in those syllables terminating with the consonants termed "explodents," whether with or without the silent vowel E after them. This effect is shown in Fig. 10, in which the part marked *d* is the silent discharge, and its appearance in the diagram is under the control of the will, for by holding the breath immediately after pronouncing the word, this part of the diagram can be altered as shown in Fig. 11. If, instead of terminating with an explodent, another syllable be added to the word, making it terminate with a consonant of softer sound, the air which would have been silently discharged is used to form the syllable added, and the subsequent silent discharge is very much diminished, as at Fig. 12.

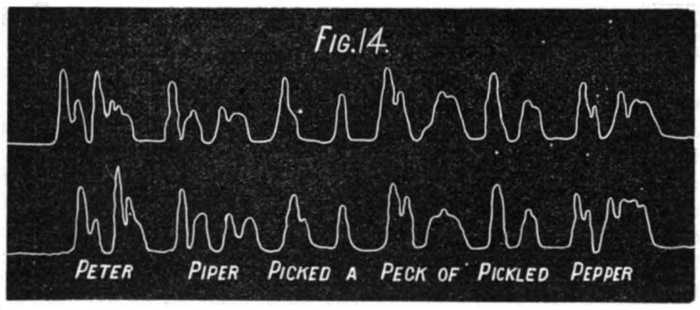
Some words appeared shorter when a syllable was added, as, for instance, the word "strength" and "strengthen," the mark made by sounding the latter being considerably shorter than when the former was spoken, as may be seen by comparing the diagram of the two words in Fig. 13.

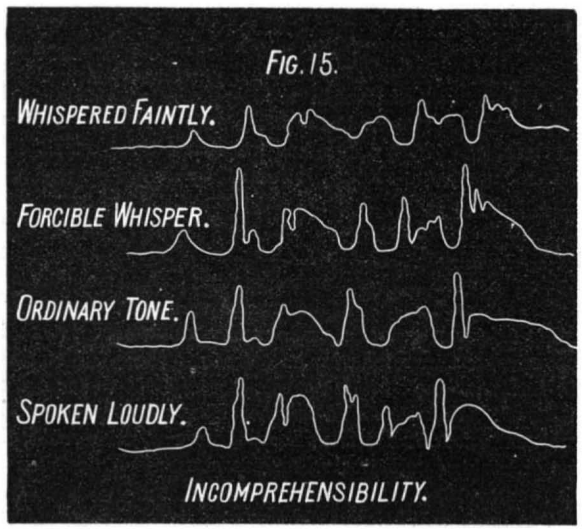
To test the rapidity of the action of the instrument, the old nursery line "Peter Piper picked a peck of pickled pepper" was repeated at the rate of six syllables per second, and the diagram shown in Fig. 14 was the result.

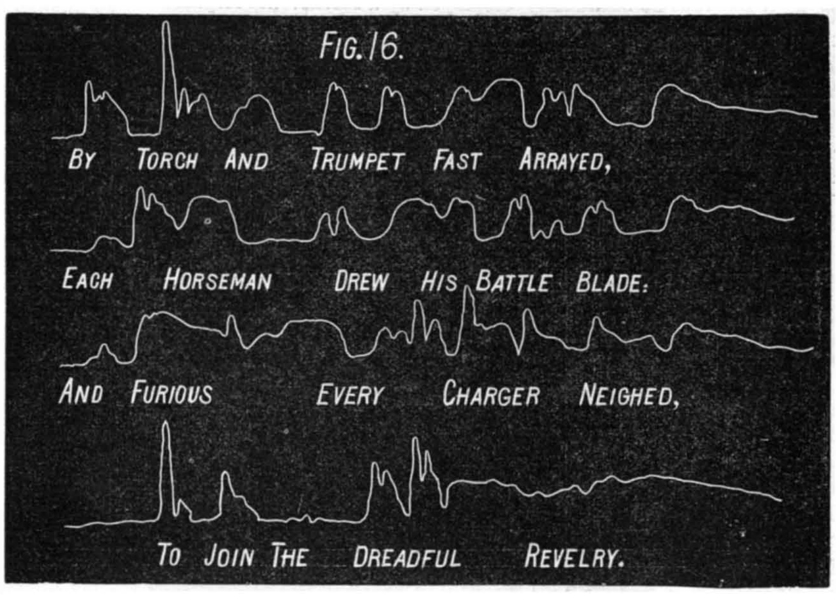
In Fig. 15 may be seen the diagrams made when the word "Incomprehensibility" was spoken in different tones, showing that, although a certain amount of variation due to the energy occurs, yet each sound preserves the same specific character.

Fig. 16 shows the diagrams made by repeating the well known stanza from "Hohenlinden."

From the above it would appear that sooner or later we may expect to see the desks of our popular preachers provided with reporting instruments something on the same principle as Mr. Barlow's logograph, only much more delicate, so that each discourse may be taken verbatim, as it would seem that it would be comparatively easy to learn to translate the logographic diagrams (or logograms, if we may be allowed to coin a word) into plain English writing. It may be more difficult, however, to report the speakers at a public meeting in this manner, as, so far, we know of no means of separating from the discourse the various noises that indicate the applause or dissatisfaction of the audience, and which would, when operating in conjunction with it, produce a strange jumble of marks that would puzzle not only a Philadelphia lawyer, but a dozen of them, to decipher. If to the various noises produced by the vocal organs of the audience is added the occasional peculiar "swish" of a mal-odorous egg, deftly thrown by one used to the business, we are inclined to think that the deciphering of the extraordinary logogams thus made would require something more than human judgment, and it may therefore sometimes be necessary to press into the service as a translator the spirit of some defunct reporter or compositor, who, when in the flesh, made his living by rendering the late Horace Greeley's hieroglyphics into decent Roman type.







Washing with Silver.

Copper articles can be covered with an almost imponderable layer of silver. Some idea of the thinness of this layer can be imagined when we think that, inclusive of material, labor, capital, etc., the cost of silvering 1 lb. of corset eyelets is only 6¼ cents, while 1 lb. of buttons, suspender buckles, pins, etc., cost from 2 to 3 cents, while a grain of pure silver is worth 5 cents.

The method of washing these articles with pure silver is thus described by Roseleur in the *Metallarbeiter*, p. 316: Any desired amount of granulated silver is dissolved in twice its weight of nitric acid. The solution of nitrate of silver is then diluted with distilled water, and precipitated by a solution of table salt or hydrochloric acid, when a white cheesy precipitate is produced, which soon settles (especially if stirred). It is easy to ascertain whether all the nitrate of silver has been decomposed, which is the case when a drop of the salt solution or acid does not produce turbidity in the clear, supernatant liquid over the precipitate. The liquid is poured off and the precipitate washed by decantation repeatedly with distilled water to remove all free acid. If it is necessary to preserve the chloride of silver some time before using, it must be carefully protected from the light, because under the influence of light it changes rapidly and acquires a bluish color.

The chloride of silver is then intimately mixed with a little water and at least 80 per cent of tartar (bitartrate of potash), and the whole preserved in a stone pot. The composition of the mass is found to be extremely varied, for to the tartar is added a quantity of other substances like sulphate of soda, common salt, quicklime, magnesia, corrosive sublimate, etc., most of which, if not exactly injurious, are at least perfectly useless. We give here a formula somewhat cheaper than when tartar alone is used, which gives very good results: Chloride of silver from 30 grammes silver; pulverized tartar, 2½ kilos.; table salt, 2½ kilos. Some persons employ the salt alone without any tartar, but the silvering is then rather bluish.

When the paste is ready, some water is heated to boiling in a vessel of red copper, and one or two spoonsful of the paste thrown in it, which dissolves more or less. In a bath prepared in this way, the articles to be silvered must either be suspended from hooks or contained in a colander; usually a second vessel, less deep than the first and full of holes, is set against it, resting upon edge of the first, so that the articles in it are covered to a certain depth with the bath. When the silvering is ended it can be removed without wasting any of the solution. The articles are stirred around with a wooden spatula.

In each operation a quantity of paste, proportional to the surface of the articles to be washed, is added.

This silver bath improves by use, and finally acquires a dark green color from the dissolved copper, which takes the place in solution of the precipitated silver.

The silvering is not so perfect as the gilding in gold washes. They generally make use of the useless acids as in coppering. They are polished by means of sawdust, scarcely ever by means of a brush.

The smallest quantity of iron, zinc or tin, in the bath, spoils it, for all brass and copper articles then turn red.

The iron is first removed by means of a magnet. Little splinters of zinc are removed by treating the article with very dilute hydrochloric or sulphuric acids, which do not attack copper when cold. Tin or lead, which, however, are seldom present, must be removed by hand.

If, for any reason, the silvering did not succeed, the articles are subsequently dipped for a few seconds in boiling solution of nitrate of silver, 100 parts; cyanide of potassium, 600 parts: water, 1,000 parts.

This bath, which does not keep long, increases the lustre and the whiteness of the article considerably.

Another mixed process, which stands intermediate between dry and wet silvering, is the "paste process," and is also called thumb silvering, stuffed, or pencil silvering (*Daumen, stopfen*, and *Pinsel*, in German). These methods, whose results possess no considerable permanence, but still are much better than the washing process, frequently serve to repair the small breaks in better silvering, and also to produce on thinly gilded articles a mixture of gold and silver, or gold with so-called oxidized silver. The portions which are to be left unsilvered are simply varnished.

The paste for this process is made by grinding in a mortar, or with a muller upon a plate, excluding the light as far as possible, an intimate mixture of the following substances: Fused nitrate of silver, or, better, chloride of silver, 100 parts; binoxalate of potash, 300 parts; tartar, 300 parts; table salt, 420 parts; sal-ammoniac, 80 parts; water, 100 to 150 parts: or, take chloride of silver, 60 parts; tartar, 200 parts; table salt, 300 parts.

The mixture is ground as fine as possible in the mortar, then ground with a muller upon a thick piece of ground plate glass, until no grains are felt when pressing it between the fingers. This paste is kept in a black bottle, or a jar of opaque material, to protect it from the light, which rapidly decomposes it.

When about to use it, a small quantity is triturated with some water in a glass or porcelain dish, and the mass applied with brush or pencil to an article completely covered with gold, either by dipping or electro-plating, where the gold is so thin that the paste can be decomposed through it by the copper. It is then allowed to dry, and warmed. The dry paste exhibits a pink or perfectly green color, according to the thickness of the gold plate and the consequent strength of the chemical reaction. The latter color indicates that a considerable quantity of the copper is dissolved, and in consequence a corresponding amount of silver has been reduced.

The salt that sticks to the article is removed by washing with cold water. The silvering is then pretty but dull, and its lustre and whiteness is increased by dipping for a few seconds in very dilute sulphuric acid, or. better, a solution of cyanide of potassium.

This silvering will bear brushing and polishing, and can also be oxidized, hence it is easy to see that it is preferable to the washing or boiling with silver first described.

In case the first deposit has not been thick enough to make it sufficiently durable, it can be repeated, after polishing. a second or third time.

By the use of this mixture upon non-gilded copper, the silvering is less white and not so durable as upon the gilded articles.

The different powders and liquids which are met with in commerce under the names of silver water, plate conservator, California liquid, etc., and which are used in restaurants and cafés to repair their worn-off silver plate, are nothing more than some of this paste suspended in pure water or salt water.

In America, silvering solutions are usually some poisonous mercurial compound which forms with the brass or copper a brighter and silver-like amalgam, which lasts just long enough for the guilty pedler to effect a safe retreat before its brightness disappears.

These liquids must not be confounded with others sold under the pompous names of "aurophile" and "argentophile," which latter are intended to freshen up old gilded and silvered articles by dissolving the layer of oxide formed on the surface. These fluids are simply solutions of cyanide of potassium, which was formerly recommended for this purpose. They are most violent poisons, and ought under no circumstances to be tolerated in the kitchen.

American Railway Builders in Brazil.

Mr. Gowen, of Philadelphia, has just received a cable telegram from London announcing the execution of the contract there between the Madeira and Mamoré Railroad Company (Limited), the National Bolivian Navigation Company, and Messrs. P. & T. Collins, contractors, of Philadelphia, by which the latter agree to complete the grading, masonry, and superstructure, and furnish the equipment of the railroad of the first named company. This road is projected from the present head of navigation on the Madeira River, a branch of the Amazon, in Brazil, to Bananeria Falls, on the Mamoré River, on the borders of Bolivia, and is about 180 miles long. embracing the falls and rapids, which now render navigation impracticable. It is designed as a narrow gauge road, with iron rails of 45 pounds per yard, and will be used to transport the products of the Atlantic slopes of the Andes to the navigable waters of the Madeira River and thence down the Amazon. The Philadelphia and Reading Coal and Iron Company will supply all the rails and other ironwork and materials that will be required to construct and equip the road. This is a first and most important opening of trade between this port and Brazil. The equipment will include locomotives, cars, rails, spikes, bolts, chairs, turn-tables, etc., and the total cost of the road is said to be

$5,000,000. The payment to the contractors will be about three quarters in cash, for which the money is now in hand, and the remainder in the debentures of the railway company, guaranteed by the Brazilian Government. The Philadelphia and Reading Coal and Iron Company will receive immediate cash payments on shipment of the materials from the port of Philadelphia.—*Engineering News.*

New Inventions.

A novel Horse Detacher has been patented by Mr. John L. Kellum, of Salem (Maxwell Station P. O.), Tenn., the arrangement of which is such that the animal may be quickly let go. should he become frightened or unmanageable. The device also enables the traces to be conveniently fastened to or loosened from the whiffletree when attaching or detaching the horses.

A new Sun Dial, patented by Mr. Axel W. Anderson, of Bedford, Pa., consists of a ring having circumferential slots, surrounded by a perforated adjustable band, and containing an adjustable dial or scale, formed in an epicycloidal curve. A pencil of light falls upon hour marks engraved on the device, through an aperture in the band. This invention is both curious and ingenious, and as the inventor states it may be made small enough to serve as a charm for a watch chain, it doubtless would be a profitable article to manufacture.

Mrs. Julia Wuerfel, of Sheboygan, Wis., has devised a new Dress Pattern Chart, which is quite simple, and which furnishes a guide for any size or style of cutting. Its use is quickly learned.

A new Photographic Camera, invented by Mr. John C. Moss, of New York city, is adapted for drawings photographs, etc. It consists mainly in a device for suspending the instrument so that it will not be affected by the jarring or vibration of the building in which it is placed, and also in novel mechanism for focusing and adjusting the camera.

Mr. Joseph G. Densmore, of West Dresden, Me., has invented a Ferry Boat, which is impelled across rivers, etc., by the action of the current. The boat is adjusted at an angle with respect to the crossing rope, so that the current will strike directors at an angle which may be increased or diminished at will.

A novel Thill Coupling has been devised by Mr. David R. Silver, of Sidney, Ohio, which is so constructed as to have little wear, to allow of wear being taken up, and which admits of the thills being readily and quickly attached, or they may be detached by removing one bolt from each coupling.

A Surgical Apparatus, patented by Frank Green, of Columbia, S. C., for preparing bandages, spreads the plaster of Paris simultaneously with the winding of the bandage, so as to save time and material. It consists of a box with guide, tension, and winding devices, used in connection with a hopper for the plaster of Paris, having slides to regulate wide and thickness of plaster to be spread, and to cut off the supply when the bandage is nearly covered. The box has also a tank to apply soluble glass to a bandage. It is valuable to surgeons.

A new method of Attaching Shanks to Door Knobs, patented by A. E. Young, of Boston, Mass., consists in pouring into the hollow knob a quantity of melted cement, sufficient to partly fill it, inserting the shank or socket, and inverting it to permit the cement to settle around it.

In a Rein Holder patented by Gregory Jennings, of West Cairo, O., a slotted tube is provided with a hook and spiral spring. The rod is fitted with a screw and crosshead, which fits between the arms of the hook. It holds the reins firmly and prevents their falling to the ground.

In a Bicycle, patented by John Smith and E. T. Thurston, of Rockville Center, N. Y., the driving wheel is provided at the axle with end pinions, which are operated by internally geared wheels loosely pivoted on each side and provided with treadles. It has the merit of simplicity.

G. Keilicks, of Chapin, Ill., has invented a Door Securer. At one end of a slotted bar is a chisel-shaped point at right angles, which fits into the jamb of the door. A thumb screw is fitted to the other end, which works through brackets. It is of use to travelers.

An improved Brush has been patented by B. R. Hill, of Pompton, N. J. After boring the usual holes in the wood, a suitable tool is introduced into them, and interior tapering holes are made larger than the outer hole. The brush is driven in with a small wedge, which expands in the large hole within and firmly holds the bristles.

In a Smoke Ventilator, invented by C. K. Edwards, of Boston, Mass., the strips and openings being all constructed by sixes, three openings will receive the wind, leaving three for the smoke and foul air to escape through. By an ingenious device the strips and openings are so arranged that the wind cannot blow into the main pipe, but must pass out through the openings on the opposite side, carrying the smoke with it and increasing the upward draft of the flue.

A Tucker, patented by Eliza Ann Vance, of Gallipolis, O., consists of two movable parts, both of which are clamped to the cloth plate of the sewing machine. The upper part is movably attached to the lower by flanges, to regulate the distance apart of the tucks, and edges of arms are turned over each other. It is a useful addition to the sewing machine.

An Oil Well Torpedo has been patented by C. A. McCoy, of Edenburg, Pa. It consists of a cylindro-conical vessel adapted to contain nitro-glycerin, and which is provided externally with annular elastic cushions to prevent premature explosions. Percussion cap plungers are secured to a weight and suitably guided and arranged to strike upon anvils fixed inside of the vessel. It is an effective instrument.

JOHN WILLIAM DRAPER.

John William Draper was born at St. Helen's, near Liverpool in 1811. From an early age his attention was devoted to chemistry, natural philosophy, and the higher mathematics. After prosecuting his chemical studies for some time at the University of London, he emigrated to the United States and entered the University of Pennsylvania. He took the degree of M.D. there in 1836, with the rare distinction that his thesis was selected for publication by the medical faculty. For a time he was Professor of the Natural Sciences at Hampden, Sidney College, Va., and in 1839 he was called to the chair of chemistry in the University in the City of New York. Among the first studies to which Dr. Draper directed his attention was the chemical action of light. In 1842 he discovered that not only might the Fraunhofer fixed lines in the spectrum be photographed, but that there exists a vast number of others beyond the violet, which up to that time had been unknown. Of these new lines, which more than doubled in number those already known, he published engravings. He also invented the instrument for measuring the chemical force of light, the chlor-hydrogen photometer. His memoir "On the Production of Light by Heat," published in 1847, was an important contribution to spectrum analysis. It gave the means for determining the solid or gaseous condition of the sun, stars, and nebula. He established experimentally that all solid substances, and probably liquids, become incandescent at the same temperature; that the thermometric point at which such substances are red hot is about 977° Fah; and that the spectrum of an incandescent solid is continuous—it contains neither bright nor dark fixed lines.

Dr. Draper was the first person who succeeded in taking portraits of the human face by photography, and was also the first to take photographs of the moon. His memoir on the Distribution of Heat in the Spectrum showed that the predominance of heat in the less refrangible regions is due to the action of the prism, and would not be observed in a normal spectrum, such as is formed by a grating; and that all the rays of light have intrinsically heating power.

He discovered more than forty years ago the facts in regard to capillary attraction, claimed by Mr. Lippman and which lately excited so much attention in Europe.

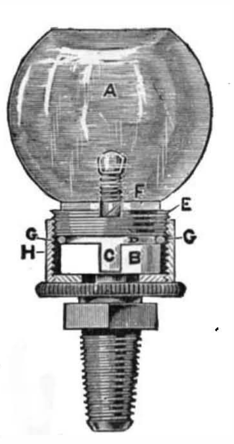
Dr. Draper has published many works on scientific and other subjects, and has made many other important discoveries, too numerous for us to mention here. He stands in the front rank of living scientists. His two sons, Professor J. C. Draper and Professor Henry Draper have also written much and made many important researches, the latter having lately discovered the presence of oxygen in the sun.

The large and elegant likeness we present on our front page was engraved from a recent photograph by the Photo-Engraving Company of 67 Park Place. It shows to what perfection the art of photo-engraving has been brought, and the fineness of the work which it performs. There is no hand work whatever on the block, and yet the lines are deep sharp, and even, and fairly rival the best work of skilled wood engravers. It seems eminently proper that the portrait of one of the first discoverers of photography should thus be beautifully displayed by a further development of his own discovery.

AUTOMATIC SHAFT OILER.

The annexed cut represents a new and simple shaft oiler, by means of which it is claimed that the difficulty experienced in making an air-tight joint between the glass globe and its brass socket, and in regulating the flow of oil, is avoided.

A is a glass globe with grooved neck, B, the end of which is ground smooth to form a tight joint against a cork washer.



A threaded brass ring with a projection, C, to prevent turning, slips over the neck, and is retained by a soft brass ring to the groove above B. The feed is regulated by a hole in slotted screw, D, with air-tight packing, E. The slot in screw is parallel with the hole, and will show the amount of fuel like a cock. A new glass is easily replaced by removing the soft brass ring from the groove, and the feed regulated without removing the cup.

By the use of these cups, waste in oiling machinery is claimed to be avoided, as it is stated that a cupful of oil will keep machinery well lubricated for many months.

For further particulars address F. Lunkenheimer, Cincinnati Brass Works, Cincinnati, Ohio, sole owner and manufacturer.

New Regulation about Boilers.

Supervising and local inspectors of steam vessels are now notified by the Treasury Department Supervising Inspector-General, that some manufacturers of boiler iron are stamping iron of their manufacture at much higher tensile strain than such iron will bear when tested by the Riehle testing machine. In consequence of this practice, injury has resulted to boiler manufacturers, who innocently purchased such iron, and failed to apply the test until after the completion of the boilers, as recently occurred in two cases in the local districts of New York and Philadelphia.

To prevent a practice so unjust and manifestly dangerous, Inspectors are directed to obtain samples from the plates of all boilers about to be constructed in their districts, and subject them to an actual test *before* the boilers are begun, and to represent to boiler manufacturers the importance to themselves of this precaution. Whenever the results of such tests fall below the tensile strength stamped on the iron, Inspectors must report such results to the Supervising Inspector-General.

Inspectors are also directed to carefully ascertain that all samples of boiler plates tested by them have the homogeneousness and toughness required by Revised Statutes, and to be especially careful in that respect where the plates are stamped above 50,000 lbs. tensile strength.

New Mechanical Inventions.

An improved system of Friction Gearing has been patented by Mr. Daniel H. Merritt, of Marquette, Mich., which consists in making a V-shaped groove between the bases of the ribs or teeth, the angle being more acute than that of the latter. As the teeth travel faster at this periphery than at their bases, they are consequently liable to greater wear at the former portion, but by this construction as they are abraded they maintain their original form.

Mr. Greene Chote, of East Saginaw, Mich., has devised a new Pipe Elbow Seaming Machine. The parts of the elbow are passed through collars, so that the seam is closed directly over the edge of a plate. The rear collar is then drawn down, forming one bend of the seam and holding the inner section. The drawing down of the forward collar closes the seam.

A new Breech-Loading Firearm, patented by Mr. Victor Bory, of New York city, is an improvement on the arm patented by same inventor June 5, 1877. The construction is materially simplified, and new devices for hinging the barrel to the breech-piece, working the extractor, etc., are added.

A new Rock Drill has been patented by Mr. Uriah Cummings, of Buffalo, N. Y. The novelty consists in constructing the clutch head with ratchet teeth on its upper end, in combination with a pawl, which is so arranged on the frame of the machine that the drill rod will receive intermittent rotary movement during its ascending strokes.

Mr. Albert S. Todd, of Pultneyville, N. Y., has invented a very ingenious Mechanical Movement, which may be driven either by hand or foot, and by one or more persons, for actuating machines, propelling boats, and carriages. Several correspondents have asked us for a machine of this kind, and their attention is accordingly directed to Mr. Todd's device.

J. R. Vellacott, of Buffalo, N. Y., has patented a Tension Attachment for Scroll Saws. It consists in the combination, with a suitable frame, of two curved levers, connected by a link of flexible material, and drawn upward by spiral springs attached to stirrups, in which are journaled rollers, that travel on the under surface of the curved levers and equalize the strain upon the saw. It is a good device.

A Hinge patented by Benjamin Fahnestock and H. F. Peckham, of Watsonville, Cal., consists in a reversible or right and left butt hinge, which is constructed with a removable solid eye, having secured to it a washer and also pintles, which are designed to enter double barrel eyes formed on one of the leaves. It is a good hinge.

H. Niles Harrington and Mitchel Stoddard, of Stockbridge, N. Y., have invented an improved Washing Machine It consists of a permanent suds box with side uprights or standards. Oscillating upon a cross rod at the top is a slightly convex rub board grooved diagonally on its lower face. A curved lever, suitably attached, serves to press the rubber upon the clothes, which are placed on a series of rollers which are themselves supported on springs, which yield to the varying thickness of material. It will prove a very useful article in the laundry.

George W. Higgins, of Shelbyville, Ind., has invented an improved Saw Frame for Sawing Machines. It is independent of and detachably fastened to the vehicle frame, and can be slid upon the latter, so as to allow the vehicle to turn conveniently among the trees. It can be operated easily by one attendant.

In a Water Meter invented by D. P. Weir, of Salem, Mass., a toggle-jointed spring lever works the valve by the recoil of the spring, which is compressed by the piston of the engine in the forepart of its movement, and escapes after passing the center, and then acts on the valve. It is geared to the valve by a simple and effective device, thus furnishing a reliable meter.

A Cut-off Valve has been patented by Thomas Whittaker, of Passaic, N. J. The top plate of the cylinder has steam ports and induction and eduction channels, and is combined with a balanced side valve with correspondingly tapering cavities, to which longitudinal and transverse motion is imparted for regulating the speed of the engine, so as to secure uniformity of speed. The valve is guided by a transversely reciprocating slide frame connected to the governor. A steam chest is thus dispensed with and a simple slide valve obtained.

An improved Circular Saw patented by C.Y. Wilson, of Macon, Ga., has three teeth in each set, the front one being a base recessed clearer in line with the saw plate, and the other two being cutters vertical on one edge, inclined on the other, and sharpened as well as rounded on the points. It cuts smoothly and quickly.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion.

Notes & Queries

(1) H. S. asks: What is the cause of a perspiration sweating after death? There was a case of that kind in our settlement and it was thought very strange. A. Probably it was caused by the condensation of vapor on the cold surface of the body, similar to the action in the case of a pitcher filled with ice water.

(2) R. C. A. asks why the drive wheels of a locomotive grip the rails when the cranks are down, and slip when up? A. It is due to the action of the counterbalance.

(3) W. W. W. asks for a recipe for cleaning kid gloves? A. Wash them in benzine.

(4) B. T. M. says: I had a large brick house on my hands, although not an old one. The foundation having given out, I determined to take it down and build a smaller one, using the same bricks. The brick work is now done, but the old mortar shows very much on the brick, more especially on the headers. Is there any way of cleaning off the old mortar with acid, and what acid, what proportion, and how done? A. It would be very difficult to clean the old lime off so as to look well. It would be better to clean the house a light cream color. However, if you can touch the red spots with a little red paint of the color of the brick, you could then give the house a coat of linseed oil.

(5) W. G. R. says: In painting on china with oil colors I find that the paint will not stick, or rubs off. Can you give a recipe to prepare the object so as to make the painting adhere without burning? A. You might scratch the glaze with fine emery paper and use thick colors; but there is no way of permanently applying colors to china except by burning them in.

(6) W. R. K. says: I am desirous of becoming a surveyor, can you tell me where I can learn? A. It is a very common plan for one who desires to obtain practice in surveying to join a surveying party in some humble capacity, and work his way up. There are also technical schools in which surveying is taught. The profession, like most others, has some vacant seats in the front row.

(7) I. G. R. says: I have a mill and well which stand 160 yards from the bed of the creek; from the bed of the creek to the top of the well is 30 feet. The well is 38 feet deep, 8 feet below the bed of the creek. Can I draw the water from the creek into the well by a siphon? A. Yes.

(8) S. A. H. can free his pot plants from lice by enclosing them in a tight chamber and fumigating them with tobacco smoke.

(9) E. R., in answer to R. P. N., says that the Indian summer is caused by the heat which is absorbed by the Lakes, which is given off during the fall as the atmosphere grows colder.

In answer to W. A. P., who inquires what angle the under side of the teeth of an upright saw should make with a horizontal line, E. R. suggests to make the angle 2°, and to hang the saw forward for cutting soft wood.

(10) I. J. I. asks: What are the different kinds of trout and do they belong to the same species? What is the difference between the salmon and the salmon trout? A. All trout are but a species of the salmon family, inhabiting principally fresh water. The salmon trout belong to the genus *fario*, having one row of teeth on the vomer, true salmons having a smooth palate. It is very much larger than the true trout, of a different color, and is found in larger lakes and rivers. Its habits resemble those of the salmon. There are several species of salmon trout in the lakes of Maine. The brook trout is the *salmo fontinalis*, and inhabits streams. To the genus salmo also belong the char of the British and Swiss lakes, the gray trout or togue, and the siskiwit of our own great lakes.

(11) T. G. B. asks: Is there such an instrument as an oblong square? A. No.

Does not the wheat crop of California exceed that of Michigan? A. Yes.

Which are the most valuable, the copper mines of Michigan or the gold mines of California? A. The gold mines.

(12) H. W. W. asks how to prepare electroplates from engravings on lead? Have obtained an impression with plaster of Paris, but cannot copper plate it. A. Take your impression in beeswax and dust it lightly over with finely powdered plumbago. There should then be no difficulty in obtaining a copper deposit in a suitable bath.

(13) E. T. H. asks for a recipe for polishing show cases of German silver? A. A good polishing powder consists of rock alum, burned and finely powdered, 5 parts; levigated chalk, 1 part. Mix. Apply with a dry brush.

(14) H. F. B. asks: How to mix paints? A. Buy your paints ready mixed in sealed cans in colors to suit your taste.

What is the best and shortest way of building a continued stairway? A. To learn how to build a stairway with continuous rail, you require a treatise on stairbuilding. If, however, you send the dimensions set apart for your stairs to a stairbuilder in this city, he can furnish the stairs for you, and send a man to put them up. Consult a New York business directory if you do not find what you want in our advertising columns.

(15) R. W. asks for a method of rendering canvas or cotton goods impervious to water, yet pliable? A. Plunge the fabric in a solution containing 20 per cent soap, and afterward into another solution containing the same percentage of sulphate of copper. Wash afterwards.

(16) H. R. H. asks: What is the correct answer to the following example? 714—·714÷(·34—·034×·25 of 6.) The above said example was given at an examination at the Oshkosh State Normal School, and a dispute arose as to how it should be solved. The following are the solutions of the disputants;

First. 714—·714=713·286
·34—·034=·306
·25 of 6=1·5
·306×1·6=·459
713·286÷·459=1554; answer.

Second. ·25 of 6=1·5
·034×1·5=0·51
·34—·051=·289
·714÷·289=2·47058+
714—2·47058+=711·52942+ answer.

Should the signs of multiplication and division have preference to those of addition and subtraction? A. The second solution is the correct one. For the first solution the example should be given thus: (714—0·714)÷[(0·34—0·034)×0·25 of 6.]

(17) H. S. asks how to make a powder or solution whereby he can silverplate without a battery? A. Mix 1 part of chloride of silver with 3 parts of pearlash, 1½ parts common salt, and 1 part whiting. Rub the mixture on the metal, previously well cleaned by means of a piece of soft leather. When properly silvered the metal should be washed in hot water slightly alkaline.

(18) C. S. F. says: The indicator on my steam gauge before using was down to the pin (zero). After a few days' use it rests at 10 with the boiler empty. Can I safely consider it as indicating 10 lbs. too much under all pressures? It is in working order. A. You cannot, in the absence of a test.

(19) A. A. W. asks whether any better results would be obtained in setting the valves of a locomotive for fast passenger trains, by giving the backing eccentric more lead than the go-ahead one? A. Other things being equal, we think not.

(20) A. A. asks: What is the strength of a band of wrought iron 2 inches in width and ⅛ about (or No. 10, I think) in thickness? A. It should be able to bear a strain of from 10,000 to 12,000 lbs., if the ends are properly welded; a little more than ¼ as much if they are secured by rivets.

(21) J. W. P. asks: Does not the compression of exhaust steam in the cylinder retard the motion of the engine, and is it a disadvantage only in taking up the lost motion? I find my engine runs smoother with compression, but I do not know about its economy of fuel. A. It is economical to cushion to a certain extent. Compression beyond the economic point is frequently required, in order to make the engine work well.

(22) I. T. S. asks whether a reciprocating engine can be so balanced at a given speed as to stand steady? A. A horizontal engine can be so balanced that there is no tendency to move in a horizontal direction, and if it is sufficiently heavy, it will also be steady in a vertical direction.

(23) S. B. asks: 1. Has an artificial rainbow ever been produced? A. Yes; by projecting a beam of white light through water in the form of very fine spray. 2. Can it be produced, and how? A. See the SCIENTIFIC AMERICAN SUPPLEMENT No. 52, and SCIENCE RECORD for 1874 and 1875.

1. How can I construct the simplest machine (to work by water power) to produce the electric light? A. Sixty to one hundred carbon or Grove cells are connected in series—the zinc of the first and the carbon of the next, and so on. A wire from either end of the series to the lamp completes the circuit.

(24) W. M. says: I have got Bessemer steel shoes ready made for my horse, but the blacksmith cannot weld on caulks of common steel of the Bessemer shoes. A. There should be no difficulty in the welding if the parts are cleaned on leaving the fire with a steel wire brush; try borax as a flux.

(25) G. C. says: 1. Please inform me if I will get more pressure of water by having my tank bottom made like a funnel, and have a pipe from bottom to my feed pump, than to have it flat? A. No. 2. Also do I want more space for exhaust to escape from heater with two engines than from one, using same steam on both, as one? A. No. 3. Also if one engine has more stroke than the other, will it work all right, both on same shaft, crank on each end, one 8 x 17 and one 10 x 15? A. It can be made to do so. 4. Can I run two engines with as much economy, providing one would do the work? A. Generally, no. 5. I have two rigged up, one 8 x 17 and one 10 x 15; which should I run if only one? I use two boilers, locomotive built. A. It makes very little difference, if they are equally well designed and built. 6. Please say how fast I should run both, and how fast one if used alone? A. You can run them at a piston speed of between 400 and 500 feet per minute, if they are properly constructed.

(26) T. E. M. says: A friend has a horse-chestnut tree in front of his house, a limb of which points toward the west. In the winter, when the weather gets down to zero, the limb turns about 7 inches toward the south: when it becomes warm again it resumes its former position. Will you please give me some explanation? A. The phenomenon may be due to unequal contraction in the trunk of the tree or ground.

(27) E. F. says: I have a small seed microscope with 2 lenses, 1⁄16 inch in diameter and 2¼ inch focus. Can I make a camera obscura with them? A. No.

How thick is a bound volume of the SCIENTIFIC AMERICAN? A. 1½ inches including covers.

(28) D. F. asks: How is gaseous ammonia made? A. Place a quantity of ammonia water in a retort and apply heat. The gas will immediately begin to come over; it is nearly all expelled from the water by boiling for a few minutes. Ammonia is also obtained by heating ammonium carbonate or chloride (sal ammoniac) with a solution of caustic potash. 2. How can I make gaseous chloride? A. If you mean chlorine, heat an ounce of peroxide of manganese with an equal weight of hydrochloric acid. Chlorine is very poisonous when inhaled. 3. How can I distil chloroform? A. Place the chloroform in a glass retort gently heated. The vapor must be passed through a glass worm surrounded by water, which condenses it.

(29) E. S. asks how to tin cast iron pipe? A. File bright the piece of iron required to be tinned, and mix up the following solution: In a small quantity of spirits of salt, put a piece of zinc the size of a quarter dollar; the spirits of salt will eat it away; wet the places required to be tinned with the solution, then while wet use a copper bit with fine solder, and it will immediately tin.

(30) N. B. asks for a good freezing mixture? A. Pounded ice, salt, and a little sal ammoniac, or ice and hydrochloric acid.

(31) A. J. wishes to polish mother of pearl? A. Go over it with pumicestone finely powdered, and make it very smooth; then apply putty powder and water by a rubber, which will produce a fine gloss and good color.

(32) B. F. asks for a cheap invisible black ink? A. Dissolve 1 fluid oz. of common oil of vitriol in a pint of soft water. Stir well and allow to cool. Write with a clean pen. When dry it will be invisible; held to the fire it turns an indelible black.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

L. H.—It is quartz—of little value.—J. H. M.—A is a sandstone containing scales of mica. B is a limestone with small particles of marcasite. An analysis would be necessary to determine the exact composition of the samples.—C. M. H.—It is an alloy of tin and lead; the amounts of each can only be determined by a chemical analysis.—E. B.—No. 1 is hornblende. No. 2 is hausmanite—an ore of manganese.—J. S. H.—The rock contains much graphite, and can probably be economically worked.—E. J. F.—It is a ferruginous sand. It does not contain precious metals.—H. F. L.—It is partially altered fibrous talc—a hydrous silicate of magnesia. The mineral is extensively used in the manufacture of writing paper and fireproof roofing paper and paints. It is the chief constituent of many anti-friction powders. See p. 309, current volume of the SCIENTIFIC AMERICAN.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure, the receipt of original papers and contributions upon the following subjects:

On a Method of Ventilating Rooms. By H. E. V.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

WANTS AND BUSINESS INQUIRIES.

Almost any desired information, and that of a business nature especially, can be expeditiously obtained by advertising in the column of "Business and Personal," which is set apart for that purpose subject to the charge mentioned at its head.

We have received this week the following inquiries, particulars, etc., regarding which can probably be elicited from the writers by the insertion of a small advertisement in the column specified, by parties able to supply the wants:

Who makes "Colard Slides" for magic lanterns?

Where can Stephen's writing fluid be bought at wholesale?

Who makes small steam propellers?

What is the address of D. S. H., who inquires about gas purifiers in our issue of December 1?

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

November 6, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Adze eye tools, die for forging, D. Maydole 196,917
Album, B. J. Beck 196,776
Ammonia, producing acid, etc., of, J. D. Siebel.. 196,771
Apple quartering and coring machine, S. Cooper. 196,743
Axle box, self-oiling, J. Dawber 196,789
Barrel machine, J. Naylor, Jr. 196,927
Bath, hot air and vapor, G. Gordon 196,890
Beer cooler, H. Voigt 196,956
Belting machine, C. Kohsel 196,911
Boot, E. F. Bickford 196,778
Boot jack, J. H. Aufderheide 196,857
Bottles, etc., stoppering, J. L. Besnard 196,867
Bottles, etc., stoppering, T. Rule 196,936
Brick machine, R. W. Brownhill 196,782
Brick machine, M. Hasslacher 196,752
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Butter worker, R. W. Barnard 196,859
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Can or vessel, metallic, C. P. Maxfield 196,758
Car coupling, W. Harrison 196,896
Car heater, L. T. White 196,961
Car, railway box, S. W. Murray 196,926
Cars, steam plowing attachment, S. T. Shankland 196,836
Carbureter, J. Stratton 196,946
Cartridge, blasting, A. C. Rand 196,767
Chair seat and back, P. Rath 196,824
Chandelier, extension, J. F. Brown 196,872
Cider mill, portable, L. V. Sikes 195,837
Cigar box, H. Meyers 196,920
Clothes wringer, D. G. Beers 196,777
Coffee and peanut roaster, C. L. Hall 196,964
Corkscrew and extractor, combined, N. Oak 196,761
Corset clasp, O. K. Scofield 196,940
Coupling and steering, W. Frick (r) 7,934
Cultivator, H. S. Hoyman 196,903
Cultivator, wheel, W. Mettler 196,818
Curtain fixture, J. Reichert 196,768
Curtain roller and bracket, R. E. Abbott 196,737
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Drawers, men's, H. Borkhim 196,780
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Electric engineering, W. E. Sawyer 196,834
Electroplating, Weston & Quimby 196,846
Feathers for dusters, preparing, G. M. Richmond 196,828
Feed water heater and purifier, N. A. T. Jones ... 196,808
Feed water regulator, Gorriti & Unanue 196,797
Fencepost, E. L. Gillham 196,889
Fence post, iron, McNeill & Lambert 196,816
Fire arm, breech-loading, V. Bovy 196,781
Fire arm, breech-loading, G. H. Fox 196,748
Fire kindlers, composition for, W. McArthur 196,918
Fire places, fender for, H. Adler 196,738
Fire pot and water heater, E. P. Doyen 196,884
Fireman's helmet and dress, J. Bechtold 196,862
Floor, fireproof, E. Gleason 196,750
Flower pot, W. F. Russell 196,937
Fluting iron, J. H. Cleveland 196,878
Furnace grate, T. James 196,905
Furnaces, L. C. Taber 196,839
Furnaces, fuel feeder for, R. Morgan 196,924
Furnaces, feeding air to boiler, H. F. Hayden 196,897
Gas burner, W. G. Pugh 196,931
Gas burners, reflector for, W. E. Prall 196,765
Gate, farm, C. A. Mosher 196,925
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Glass labels, making, P. Arbogast 196,855
Governor for steam engines, etc., E. A. Sutcliffe 196,947
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Grain band, W. A. Sutphin 196,949
Grain binder, W. A. Sutphin 196,950
Grain binder, C. B. Withington 196,775
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Inlaid work, making, E. Jebsen 196,906
Ironing machine, P. O'Thayne (r) 7,936, 7,937
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Knobs, attaching shanks to door, A. E. Young ... 196,852
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Latch for car doors, J. Capron 196,741
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Plant setter and seed planter, J. C. Terrill 196,840
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Planter, corn, S. Rydbeck 196,938
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Surgical bandages, preparing, F. Green 196,892
Tablet, grave, F. C. Bushway 196,740
Telegraph instrument, autographic, W. E. Sawyer 196,832
Telegraphy, autographic, W. E. Sawyer 196,833
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Tire upsetter, J. G. Mole 196,923
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Torpedo for oil wells, C. A. McCoy 196,815
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Toy scroll sawing machine, S. N. Trump (r) 7,938
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Traction wheel, W. H. Trenwith 196,843
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Watch case spring, A. N. Clark 196,786
Water closet, N. Folsom 196,792
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Wire stretcher, C. F. Roth 196,830

DESIGNS PATENTED.

10,290.—FONT OF ORNAMENTAL PRINTING TYPE.—D. W. Bruce, New York city.
10,291.—FONT OF ORNAMENTAL PRINTING TYPE.—Henry Brehmer, Stapleton, S. I., N.Y.
10,292.—FONT OF ORNAMENTAL PRINTING TYPE.—Julius Herriet, New York city.
10,293 to 10,295.—CARPETS, ETC.—John Hamer, Mattewan, Dutchess Co., N.Y.
10,296 and 10,297.—GLASSWARE.—Jenkin Jones, Pittsburg, Pa.
10,298 to 10,304.—OIL CLOTH.—C. T. Meyer *et al.*, Bergen, N. J.
10,305.—SPICE CADDIES.—Edwin Norton, Chicago, Ill.
10,306 and 10,307.—CARPETS.—Thomas J. Stearns, Boston, Mass.
10,308.—HINGES.—E. J. Steele, New Britain, Conn.
10,309.—HAT RACK.—L. H. Fish, Cincinnati, O.

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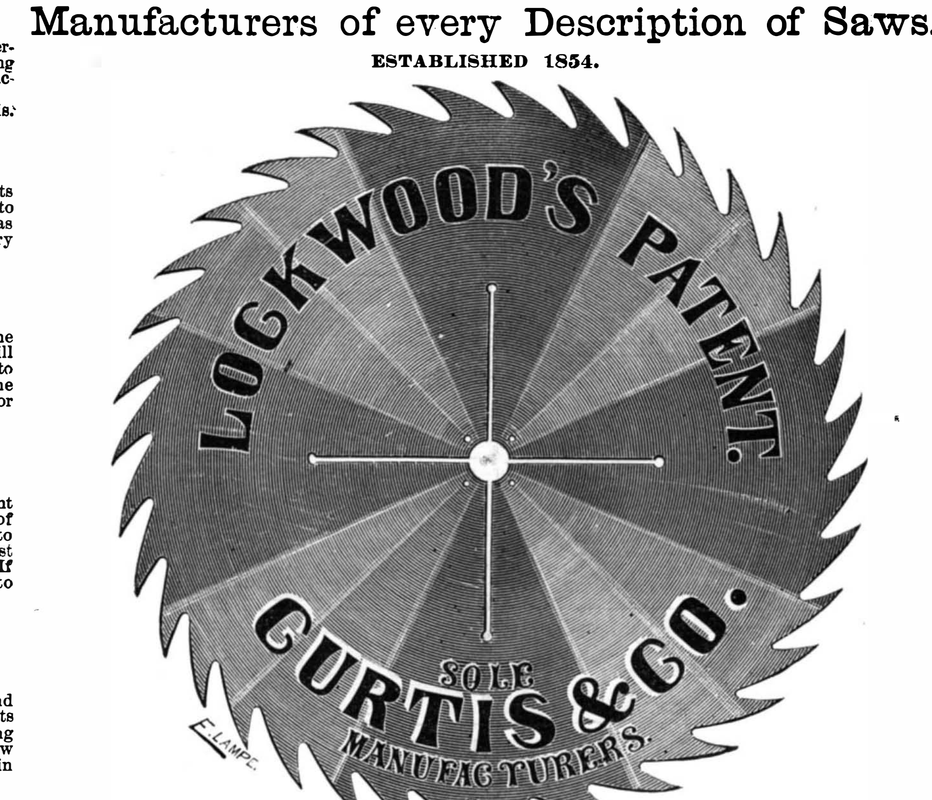

WE desire to call the attention of those interested in using good Saws, to the merits of ***Lockwood's Patent Slotted Circular Saw.*** We do so with confidence, in view of the extraordinary success it has met with during the past five years, in hundreds of mills in almost every State and Territory in the United States. These Saws are made of Jessop's best English steel, ***and fully warranted.***

The principle is, that the slots running from the eye outward, completely neutralize the expansion and contraction of the saw; thus, if a saw be heated at or near the eye, the slots close up as much as the metal expands, thus leaving the edge of the saw entirely unaffected.

It has stood the test, both in the different kinds of pine and hard wood lumber with best possible results, demonstrating that a slotted saw can be run with at least one gauge less set. Will make much truer and smoother lumber, and, being unaffected by heating, retains its stiffness and will never require re-hammering, as the case with solid saws.

It is evident that the saving thus affected renders it ***the most economical saw*** that can be used.

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SAINT LOUIS, MO.

TESTIMONIALS.

PESHTIGO, Wis., Oct. 23, 1876.

Messrs. CURTIS & Co.:

GENTS—You are at liberty to use our name in reference to the Slotted Saw, as we will endorse anything you say about it, as they have given the fullest satisfaction. Very truly yours, THE PESHTIGO CO., Per W. A. Ellis.

VICKSBURG, Miss., Oct. 19, 1876.

Messrs. CURTIS & Co., St. Louis, Mo.:

GENTS—Yours of the 14th inst. received and contents noted. In reply we say you are at perfect liberty to refer to us in any way as regards the Slotted Saw, as we consider it the best saw we have ever seen in every respect. Yours very truly, H. FRENCH & CO.

TOLEDO, A EXANDER Co., Ill., Oct. 25, 1876.

C RTIS & Co., St. Louis, Mo.:

GENTS—As to the Slotted Saw, you may use my name in any way you wish. I have been foreman in a mill for sixteen yea s, and have never found any saw to equal it for running light and straight and with the least set. I do say that it is the best saw now in use for hard or soft timber. Yours truly, B. F. DUNCAN.

NECEDAH, Wis., Nov. 2, 1876.

Messrs. CURTIS & Co., St. Louis, Mo.:

GENTS—After having used four of Lockwood's Patent Slotted Circular Saws purchased from you the whole of the past season, we take pleasure in recommending to all who are interested in getting good saws as the best and most perfect working saws we have ever used. If you can do yourselves any further good by referring to us you may do so at any time.

Yours respectfully, T. WESTON & CO.

MILLVIEW, Fla., Oct. 20, 1876.

Messrs. CURTIS & Co., St. Louis, Mo.:

GENTLEMEN—Your favor of the 14th inst. at hand and contents noted; also your inquiry in regard to the merits of your Patent Slotted Saw. I take pleasure in saying that I regard them as being the very best circular saw made, and shall at any and at all times take pleasure in so recommending them.

Respectfully yours, GEO. W. ROBINSON.

NORFOLK, Va., Nov. 2, 1876.

Messrs. CURTIS & Co., St. Louis, Mo.:

GENTS—In reply to your letter of inquiry regarding the 60-inch, nine gauge, Slotted Saw of the Lockwood Patent, which we purchased of you during the early part of the present year, we are happy to state that it does its work well, giving us entire satisfaction. We are running it 700 revolutions and carrying 2-inch feed, in Virginia green pine, which during the largest part of the year comes to the log-yard with more or less mud and grit. Yours truly, BATCHELDER & COLLINS.

MILL SPRINGS, Mo., March 27, 1876.

Messrs. CURTIS & Co.:

GENTLEMEN—Your favor at hand. In reply, allow me to congratulate you upon the success of your Lockwood Patent Slotted Saw. I have been using the saw for six months, and I can frankly say in my entire sawmill experience of fifteen years I have seen no improvement of any nature in a sawmill that combines so many good qualities—no waver, no heating, etc.; and I am able to run it with such little set that I make no more sawdust than I can conveniently burn, while before I was compelled to employ an extra man to wheel away the surplus dust. I have known my sawyer, Samuel Be field, after hammer swedging the teeth, to run from 6 A. M. to 12 noon, without pointing up.

Yours respectfully, R. CUTLER.

TESTIMONIALS.

LUDINGTON, Mich., March 6, 1876.

Messrs. C. & Co.:

GENTS.—In reply to your inquiry as to the working of the Lockwood Slotted Saw, we are happy to state that it has given us the most perfect satisfaction. We used the saw alternately with a solid saw, and we found from actual test that during every tour of the Slotted Saw (and it run equal time with the solid) we cut from 3 M to 5 M feet more lumber than we did with the solid saw. The lumber was smoother and better, and during the whole season the Slotted required no hammering and never dodged from a perfect line. We filed the Slotted to run into the log and forced the saw with the guide to its true position; but it made as good lumber as before, and no heating affected its work. We can do with a Slotted everything that we can do with a solid saw, and we can make good lumber with a Slotted Saw, when, under like conditions, a solid saw could not make a cut. We have given this saw a thoorugh practical test, and are fully satisfied that it is the most successful working saw ever made. We care to use no other in our mills, and shall take pleasure in showing its work to all who are interested in getting good saws.

Very truly yours, DELOS L. FILER,

Pres't Pere Marquette Lumber Co.

MR. H. B. HOFFMAN:

DEAR SIR—I am very glad to tell you that the 60-inch Lockwood Patent Slotted Saw I ordered from you, manufactured by Curtis & Co., St. Louis, has been put to the severest test, and we are perfectly satisfied that the Slotting is a great improvement over the ordinary saw, and it gives us perfect satisfaction. I have just received a second saw and so far find it to fill the bill perfectly. A. MARTIN.

New Orleans, March 13, 1876.

Messrs. CURTIS & Co., ST. LOUIS, Mo.:

GENTS—Yours of the 14th inst., asking our opinion of the Lockwood Patent Slotted Circular Saw, is received. We hasten to say that we have run it the past season, sawing old, dry, condemned hewn timber into sawn timber, the most severe test we think that could be made, and one which no other saw which we have used has withstood and have not cut a crooked line. We shall want another just as soon as this business starts. No runner for other make of saws stops to bother us after seeing our saw and its work. *It is a complete success.* Yours very truly,

THOMAS F. BURGESS, Manager.

Island Mills, Pensacola, Fla., Oct. 21, 1876.

CURTIS & Co.:

GENTS—Yours of the 14th inst., to hand, and in reply will say I have been in the saw-mill business twenty years and have never run a line with any other but a circular saw, and have run the following brands: Hoe; Diston; Welch & Griffith; Branc., Crookes & Co.; Turner & Son; Spear & Jackson; Curtis & Co.; but I think the Slotted Saw I got from you last spring is the simplest cutting saw of any I ever controlled. I run on a 2¾ inch feed through any common timber, with 80 lbs. steam and a 10 x 20 Blandy Portable.

Yours respectfully, W. J. JACKSON,

of the firm of Manny & Jackson.

Murfreesboro, Tenn., Oct. 19, 1876.

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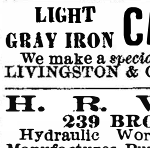

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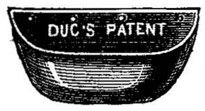

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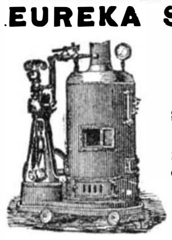

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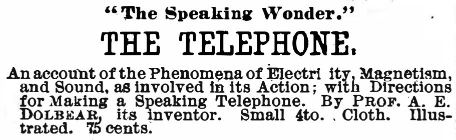

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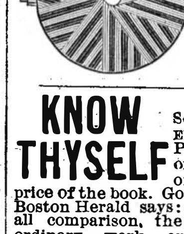

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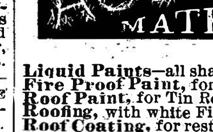

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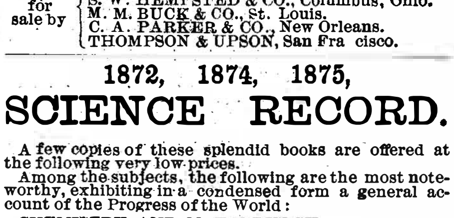

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