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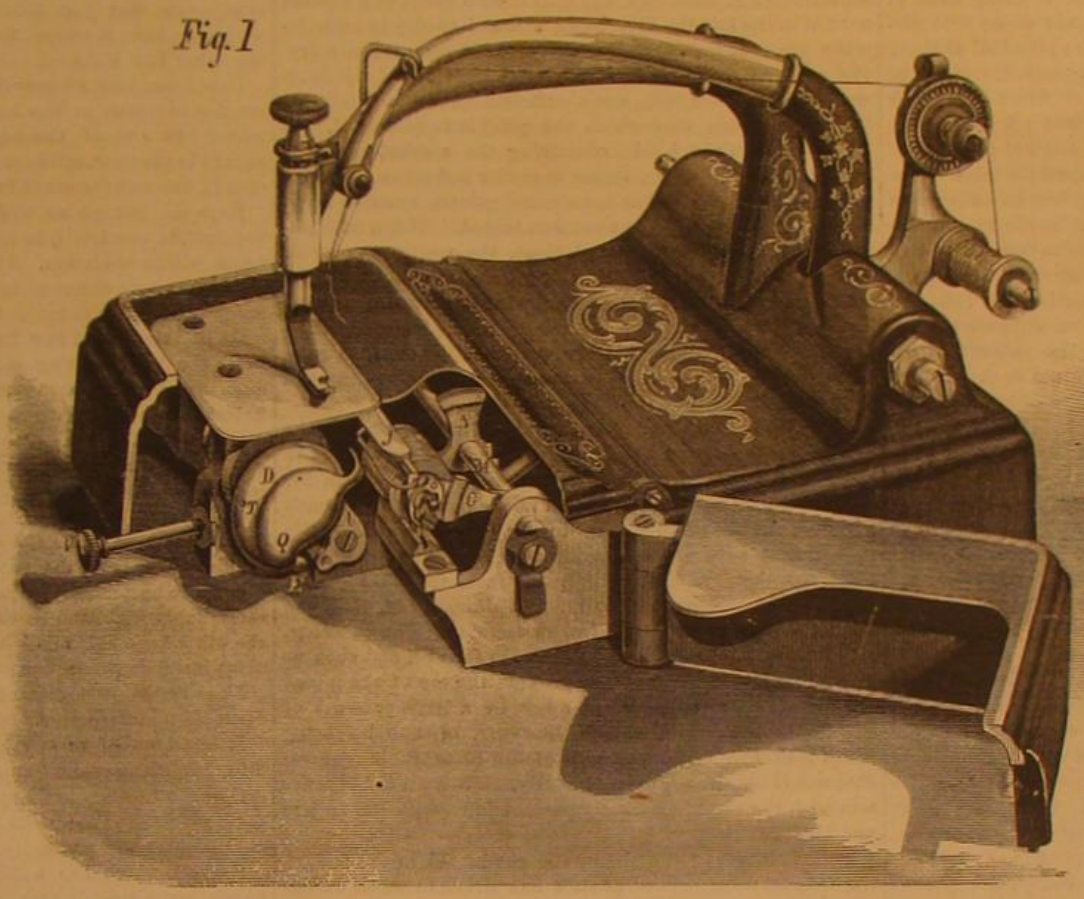
IMPROVED SEWING MACHINE.

We lay before our readers a new form of a well known household convenience which, for the novel movements it comprises, is worthy of a careful examination from all interested, in the development of the sewing machine in particular and in ingenious pieces of mechanism in general. The special point of advantage which distinguishes this device is that it obviates the necessity of bobbin and shuttle and the consequent tedious rewinding of the thread from the spool, thus allowing the latter to be placed immediately in the machine. Either a single thread, forming a chain stitch, or two threads, making a lock or a combined lock and chain stitch, may be employed. Such are the general capabilities of the invention; how its work is done, and with the aid of what effective though simple appliances, we now proceed to explain.

Fig. 1



The large engraving, Fig. 1, represents the machine in perspective, and also shows how the covering is hinged to the main portion so as to be thrown back and to one side, in order to admit of inspection or oiling of the working parts. Figs. 2, 3, and 4 are views of the principal portions in detail, to which we shall refer as we advance. The needle is mounted on the vibrating arm, as shown, the latter communicating with a rocker which is worked by a short crank shaft, which in turn, by suitable arrangements, is moved by the main pulley. The looper, A (Fig. 2) is a long curved finger pivoted to the frame of the machine nearly under the needle. At its upper end, C, it has a large curve, the outer face of which is grooved. The right hand extremity of this portion is a sharp hook which, as shown in Fig. 2, first engages the thread passing between the same and the eye of the needle as the latter descends. The thread falls into the groove of the curved portion, C, and is carried away to the right of the needle D is a rotating plate, to which is attached the revolving looper, E, Figs 2 and 3, the front end of which is notched. This looper, E, comes down upon the thread after it has been engaged by the looper, A, catches it and draws

Fig. 2.

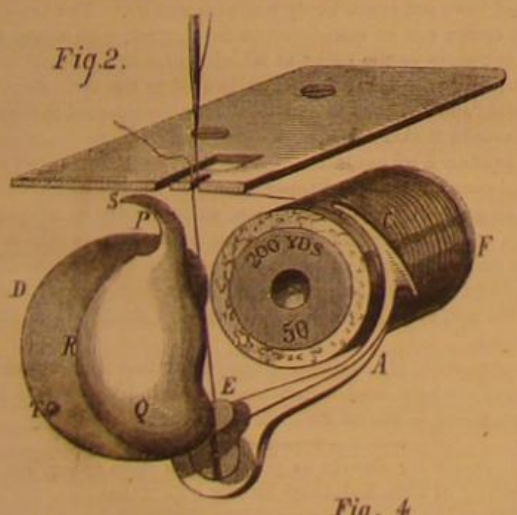
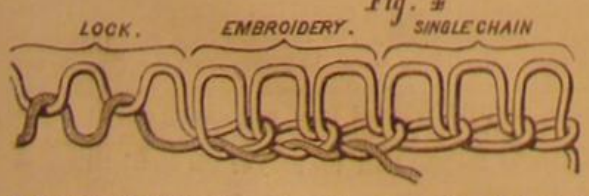


Fig. 4



it downward nearly in a direct line from the point of the needle. The position of the thread, looper, E, and looper, A, is shown in Fig. 2. The looper, A, is here represented at the end of its path, having been actuated by an ingenious combination attached to the horizontal shaft to which the plate, D, is affixed, as in Fig. 2 It will be seen that the thread (Fig. 2) is opened out in the form of a triangle. Another portion of the device now comes into action. This is the spool carrier, which transports the under spool bodily through the triangle of thread, thus leading through the thread that locks the stitch. In Fig. 4, showing the parts from above, F is the spool, placed on a spindle in the spool carrier, G, of which a perspective view is represented in Fig. 1. A thumbscrew, H, in the carrier holds the spindle in place in the two end pieces, and also serves to regulate the tension of the locking thread. The lower side piece of the carrier is fitted to work in the guide ways, I, and the upper side piece, J, traverses similar guide ways (Fig 3). The looper, A, carrying the upper thread, passes through a notch in the upper guide ways and through an opening between the lower ones. The bar, K, is perforated with a small hole, which acts as a guide for the under thread.

In order to move the carrier, G, with its spool through the triangle of thread without its coming in contact with the same, a driver, L, is employed, connecting with the ends of the carrier. This driver has both a reciprocating and an oscillating motion, the former to transport it back and forward in its path, the latter to turn it on its axis to make the necessary connections and disconnections. The first movement is obtained through simple mechanical arrangements acting on an arm attached to the driver and worked by the motive power of the machine. The second is gained in connection with the above by causing the driver to traverse the fixed spiral way, M, so that it is necessarily rotated a certain distance of arc. To the driver are attached the arms, N and O, Fig. 3. These arms are adjusted at nearly right angles to each other, and on their outer curved edges are grooves which engage in the end pieces of, and thus impart motion to, the carrier. As they are at right angles, it is evident that but one arm can be in action at a time. In Fig. 3, the arm, N, is shown disengaged; consequently the carrier can pass along to the left over the looper, A, clearing the thread on the latter by means of the opening between the carrier and the arm, N. But the driver begins to oscillate, and by the time the arm, O, shown connected in Fig. 3, reaches the triangle of thread it becomes disengaged, while meanwhile the arm, N, again comes into action, and continues to impart motion to the carrier. The consequence of the disconnection of the arm, O, is an opening between it and the carrier through which the thread passes. During these movements, the lower spool, unwinding, leaves its locking thread lying through the triangle.

Next, the looper, A, swings back its thread to the notch, P. The looper, E, meanwhile continues to hold the thread. The return movement of the looper, A, necessarily causes a slackening which is liable to kink or become entangled. Therefore the plate, Q, is employed so as to engage what was the lower side of the triangle of thread in a guide groove at R (Fig. 2), and to hold the slack until the notch, P, comes, in its upward course, nearly to the needle. The groove, R, then vanishes in the face of the plate, and the loop escapes from it, over the bulged portion of the plate, D, and slides up to the horn, S, whence it finally passes to the fabric. The looper, A, arrives back to the left, ready to take another thread at the time the notch, P, engages the thread, and is going out with the new loop, while the old loop is being cast out of the guide groove, R. As the looper is taking the new loop, the spool carrier travels back to its former position.

These operations form the lock stitch. To make a chain stitch, the pin, T, is employed, which is thrust through the plate, D, to engage the thread after it drops into the notch, P, and to carry it forward to the right of the needle; so that the latter will come down through the loop thus formed, and deliver the thread to the looper, A, in a manner that, when the old loop is cast off, it will be over the new loop. The chain stitch requires only the single upper thread; but if it be desired to make a combined lock and chain stitch, the pin, T, can still be used and does not interfere with the motions before described. The pin, T, is provided with suitable arrangements by which it can be shifted in or out of working position.

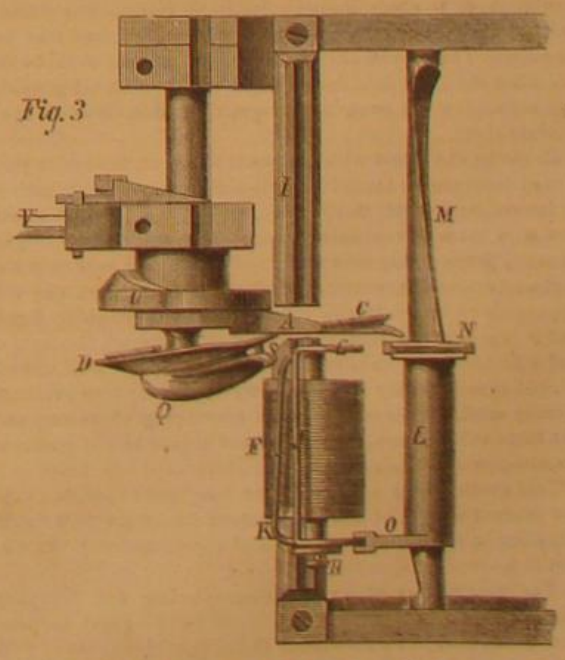
The feed motion is actuated by a spiral spring attached to the frame and by a cam on the disk, U. In connection with it is a wedge-shaped appliance governed by the thumbscrew, V, Fig. 1, by which the length of the stitch is regulated. The remaining portions of the invention, including tensions, foot, etc., are clearly shown in the engraving, and require no special description.

It is claimed that this mechanism prevents any entangling, twisting, or abrasion of the thread, and gives a greater elasticity to the seam than any other method. The works of this machine being all inclosed, oiling or soiling of either fabric or thread is prevented.

LATHROP'S SEWING MACHINE.

The various patents obtained by Mr. Lathrop have been combined with that of Mr. W. W. Abbot, which was perfected in 1865, and issued in 1867. This patent covers the method of changing the stitches at will of the operator. By

Fig. 3



this combination of patents, now owned by the Lathrop Combination Sewing Machine Company, of New York, they claim to be able to produce three machines in one with less machinery than in any other, and perform a larger range of work. The factory is at Frankford Station, Philadelphia, Pa.; the sales' room is on Broadway, New York.

E PAGE PATENT.—THE ATTEMPTS TO ENFORCE IT TO BE RESISTED.

The readers of the *Telegrapher* are not ignorant of the position of the independent telegraphic journal of the country upon this matter, vital to the telegraph interests,—the patent granted to Professor Charles Grafton Page, under a special act of Congress. When the act under which this patent is issued was pending, it was represented, by the gentlemen who had it in charge in both Houses of Congress—Representative Myers in the House, and Senator Patterson in the Senate,—to be a recognition of the claims of an American scientist to an honor which had unjustly been accorded to another person by a foreign government, for certain discoveries and inventions in magneto-electricity and apparatus, and which it was authoritatively stated would infringe upon the prior rights of nobody. Under these representations, the act was passed. When the patent was issued, however, the claims were so framed as to cover certain important particulars in ordinary telegraphic machinery.

Soon after the patent was issued, and before any attempt had been made to enforce it, if such had been contemplated, Professor Page died. Up to this time no intimation had been given of a design to enforce the patent against the telegraphic interests of the country. The legal representatives of Professor Page, however, became impressed with the idea that he had left a very valuable property in this patent, and it was offered to various parties for sale, it being held at $500,000. Two or three licenses were issued under it to parties who were not inclined to contest it, the principal of these being to the American Fire Alarm Telegraph Company of Messrs. Gamewell & Co., and the Gold and Stock Telegraph Company. Among others, the patent was offered to the Western Union Telegraph Company the original price asked for it being $500,000. This was subsequently reduced to $50 000. The Western Union Company had an exhaustive examination of the validity of the patent made by eminent patent lawyers and experts, and declined to purchase it at any price. After the *clique* which now controls that company organized the plan which has been so persistently followed out during the last four years, looking to an ultimate monopolizing of the telegraphs of the country, this patent was believed to offer an important and valuable aid in the realization of their schemes. Negotiations were accordingly reopened with the heirs of Professor Page, and one half of the patent was purchased for the company for the sum of $25,000, the moiety of interest being left for the time nominally in the possession of the heirs of Professor Page, in order that in its enforcement the widow and orphan dodge might be played for effect on judges and juries. Under the new proprietorship of the patent it was reissued, and the claims amended so as to cover all the vital points of the telegraphic instruments of every description in common use, and the principles upon which such instruments could be constructed.

The plans were now about ready to be carried out, and nearly all the leading patent lawyers received retaining fees, in order to secure the services of such as were desired in enforcing the patent and to prevent others from being available for the defence. In due time actions were commenced—the first being against the city of New York, for infringement of the patent in the instruments used in the police telegraph, another against the Deseret Telegraph Company of Utah, and one or two others up to the present time. The object is to obtain two judgments, either by default or collusion, so that, under the patent law, injunctions may be obtained. Up to this point all had been plain sailing, the *Telegrapher* alone having called attention to the monstrous character of the patent, and its destructive effect upon all telegraphic interests antagonistic to or competitive with the Western Union Company.

At length, however, the interests attacked have taken the alarm, and a vigorous resistance is to be made to the enforcement of the patent. An organization of opposing interests has been effected; able counsel have been employed, and are now engaged in preparing an effective defence. The validity of the patent can be successfully impugned, and will be. The counsel employed are in no respect inferior to those on the other side, and in intimate acquaintance with telegraphic and patent law are even better qualified than those arrayed against them.

In the legal contest which is about to ensue, the entire subject of telegraphic invention will necessarily be exhaustively investigated, and many facts, which are familiar to the few who have given this matter an examination, will be brought prominently into notice. The truth in regard to the real and original invention of electric telegraphy, and the apparatus by which it was effected, will be brought to light, and it is safe to say that the result will astonish the public, and will deprive certain parties of honors popularly accorded, but to which they are not justly entitled. The evidence already attainable is of the most convincing character, and the facts will be brought out without regard to any previous standing or reputation.

This contest will necessarily be long and expensive. As the present owners of the Page patent announce their determination to enforce their presumed rights under it, the contest is unavoidable, and must be met.

The proprietors of every telegraph line and company which does not desire to be destroyed by the great corporation which seeks to overwhelm them, the managers of railroad telegraphs, the manufacturers of telegraphic and electrical instruments and apparatus, inventors and owners of telegraphic patterns and franchises, are all vitally interested in defeating this attempt to monopolize and exact tribute from the business in this country. These will all be called upon to unite in this opposition, and a regard for their own interests will suggest the only course that they can reasonably pursue. Divided among so large an interest, the burden of the defence will not be onerous to the different parties. We have no doubt that the response will be general, prompt, and favorable. The public are not less interested in the matter, as a consideration of the result of establishing such a patent will show; and, if it could be done, every person who uses telegraphic facilities would be taxed to put millions of dollars in the coffers of the ring who seek, by means of this patent, to enrich themselves at the expense of the people of the country.

We have made this statement in order that it may be known that so monstrous an outrage is not to be quietly submitted to, and that those who are called upon to unite in averting such a calamity may be informed of the danger which threatens the telegraphic interest, and prepared to respond promptly.—*Telegrapher.*

Enameling of Photographic Pictures.

One part of gelatin is dissolved in thirteen parts of boiling water, and the solution is then clarified by being passed through a piece of clean flannel. A mixture of three parts of alcohol, four parts water, and one part of this gelatin solution is then prepared, and the same passed through the flannel as before. Both liquids are stored up in corked bottles until required for use.

Take well polished and perfectly smooth glass, free from all scratches or markings, and coat it with good, well filtered normal collodion, the film being allowed to dry in some locality where it is protected from dust. When perfectly dry, the gelatin solution, which has set in the form of a jelly, is warmed in a water bath, and a sufficient quantity of it is put into a warm dish into which the print is to be dipped. At the same time, the bottle containing the alcohol-gelatin is also put into hot water, either to render it fluid or to clarify it, for in very hot weather the alcohol-gelatin remains fluid, although it becomes to some extent turbid. When both solutions are perfectly fluid and clear, the operations may be commenced by coating one of the collodion plates with the alcohol-gelatin mixture, the superfluous liquid being poured back carefully into the stock bottle, and the plate put on end to dry. A second coating is afterwards applied, but with the other gelatin; and after the plate has drained, it is laid upon the table.

While the film is hardening after the first coating, and the alcohol is evaporating, the photograph is immersed bodily in the gelatin solution, which has been poured into a dish for the purpose, care being taken that no air bubbles are formed upon the surface of the paper during the operation. After that, as soon as the second coating of gelatin has been applied, the photograph is withdrawn from the fluid gelatin and allowed to sink gradually, face downwards, upon the gelatinized glass until the two surfaces touch one another. In this way but very few bubbles are formed, and such as are present are mostly forced towards the top of the plate, whence they are easily chased away by a little pressure of the finger nail. In the case, however, of bubbles being formed in the middle or side of the plate, their removal does not incur the slightest difficulty. When all bubbles are removed, the picture is finally pressed down with the fingers and placed to dry.

The mounting of the pictures is conducted in the following manner:—After the picture has dried to some extent upon the collodion plate, which happens after the lapse of three quarters of an hour (or, perhaps, double that time) I coat the back of the print with good fresh paste, and lay thereon a piece of cardboard of suitable size coated with paste in the same manner; the card is allowed to soak in water for half an hour, and immediately before use is well dried by envelopment in a towel. The card is placed carefully upon the back of the print, and pressed gently down with the fingers; a plate of glass is put over it, and some heavy weight employed to press the card down well. After an interval of twelve to eighteen hours, the mount will be perfectly dry.

Although the method may appear somewhat circumstantial to describe, it is very easy to practice, and is, indeed, more simple than any other proceeding yet known.—*F. Haugk, in the Photographische Correspondenz.—Photographic News.*

Spontaneous Combustion.

A paper by Mr. J. Galletly, on the spontaneous ignition of cotton saturated with fatty oils, read at the British Association meeting, detailed some experiments made with the view of giving greater precision to our knowledge of the kindling of cotton or other open combustible materials which happen to have imbibed animal or vegetable fatty oils. Graham mentions that "instances could be given of olive oils igniting upon sawdust, and of greasy rags from butter, heaped together, taking fire within a period of twenty four hours." The danger of fire from this cause is familiar to those manufacturers who coat any textile fabric with varnishes containing drying oils, and also to Turkey red dyers, from the olive oil employed in their process. Generally, it is stated in Watt's Dictionary, this combustion "may take place in intervals varying from a few hours to several weeks, when considerable masses of lampblack, tow, linen, paper, cotton, calico, woolen stuffs, ships' cables, wood ashes, ocher, etc., are slightly soaked in oil and packed in such a manner that the air has moderate access to them." (Watt's Dic. II. p. 880.) Nevertheless, there is great vagueness about the exact conditions in which actual ignition of the mass would take place, what size of a heap might be necessary, and the various powers of different oils to produce this result. Graham states in the report already quoted that the ignition of heaps of the materials under discussion "has been often observed to be greatly favored by a slight warmth, such as the heat of the sun." This is a very important observation. "I shall only, however, mention," said the author, "in the mean time, that the first of my experiments was made at a temperature of about 170° Fahr., but I have made some at a heat a little over 130°, or about the temperature a body acquires by lying perpendicular to the sun's rays; the former temperature might represent the heat attained in the neighborhood of a steam pipe, or in front of an open fire.

Boiled linseed oil with chamber kept about 170° Fahr.—A handful of cotton waste, after being soaked in boiled linseed oil and removing the excess of this by wringing, was placed among dry waste in a box 17 in. long by 7 in. square in the ends. Through a hole in the cover of this box, a thermometer was passed with its bulb resting amongst the oily cotton. Shortly after reaching the temperature of the warm chamber the mercury began to rise rapidly, namely, from 5° to 10° every few minutes, and in 75 minutes from the time the box was placed in the chamber the heat indicated was 350° Fahr. At this point smoke issuing from the box revealed that the cotton was now in a state of active combustion, and on removing it to the free access of air it burst into flame. In another similar experiment, temperature rose more slowly but reached 280° Fahr. in 105 minutes, when, from the appearance of smoke, it was plain that the cotton was burning, and the whole mass was soon in a flame on being placed in a current of air. On a smaller scale, I tried a quantity of the oiled cotton that just filled a common lucifer match box; within an hour it was on fire, the temperature of the chamber being 166° Fahr.

Raw linseed oil, as generally supposed, does not so readily set fire to cotton as the boiled oil; but in two experiments, where the size of the box employed was 6½ in. by 4½ in. square in the ends, active combustion was going on, in the one case in five and the other in four hours.

Rape oil, put up as in first experiment on boiled linseed, resulted, in two trials, in the box and cotton being found in ashes within ten hours. The box being put up at night, the result was only observed in the morning. In one trial I did not get the cotton to ignite in six hours; the chamber, in the cases of this oil and raw linseed, was kept about 170° Fahr. With the five following oils, at a little over 132° Fahr., the quantity of waste used was loosely packed in a paper box holding about the sixteenth of a cubic foot.

Gallipoli olive oil.—The two trials made with this oil gave closely similar results; in one case rapid combustion was going on in a little more than five, and in the other within six, hours.

Castor oil.—I found the oxidation of this oil to proceed so slowly that only on the second day I found the interior of the box to be a mass of charred cotton. Its sp. gr (963) is remarkably high, and its chemical nature very distinct from the other vegetable oils I have tried, which, no doubt, has some intimate connection with its slow oxidation.

I have tried three oils of animal origin with effects very distinct and instructive.

Lard oil, an oil of any ordinary specific gravity, namely, ·916, produces rapid combustion in four hours.

Sperm oil, which has a specific gravity of only ·882, and is not a glyceride, showed its unusual chemical character by refusal to char the waste.

Seal oil, which has a strong fish oil odor, not unlike the sperm, but a specific gravity of ·928, produced rapid ignition in one hundred minutes. Comparing raw linseed with lard and seal oils, it would appear that the statement is not altogether correct, that drying oils are more liable to spontaneous combustion than non drying oils. I have also some reason to believe that the rate at which oxidation takes place does not chiefly depend on the presence of small quantities of oxygotised or other easily putrefiable matters, but rather on the particular olein. However, further inquiry on this point is necessary. I have made at least two experiments with each oil, and have got remarkably uniform results. The ignition of the cotton can be calculated on for any oil, with about the same certainty as the point at which sulphur or other combustible material takes fire when heated in the air. So that the term "spontaneous combustion" may be objected to for the same reason that Gerhard objects to "spontaneous decomposition" produced by oxidation. The heavy oils from coal and shale, being chiefly the higher olefines, have a remarkable effect in preventing this oxidation, undoubtedly by giving a certain protection from the air. Mixtures of these oils with 20 per cent rape gave no indication of heat whatever at 170° Fahr.; and even seal oil, with own bulk of mineral oil added to it, did not, at 135°, reach a temperature sufficient to char the cotton."

In conclusion, Mr. Galletly hoped that the experiments he had made would lead to a more elaborate inquiry into the subject, which is one of no little importance.

A thermometer should be placed in an open space, out of the vicinity of high buildings, or any object that impedes the free circulation of air. It should face the north, so as to be always in the shade, should be 12 inches from every neighboring object, should be about 15 inches from the ground, and should be protected against its own radiation to the sky, and against the light reflected from neighboring objects or the ground itself. The thermometer should be read as rapidly as possible, as the heat from the body or the breath influences the instrument.

On the Jewett building, at Seneca Falls, N. Y., there is an illuminated four faced astronomical clock, built by Charles Fasoldt, Albany, N. Y. The person in charge of it states that it has varied only twelve seconds during the year ending last July.

SULPHOZONE, A SUBSTITUTE FOR SULPHUR.*

BY CHARLES ROBERTS, F. R. C. S., ETC.

Sulphur, in the sublimed, precipitated, or powdered form, is extensively employed by medical men, veterinary surgeons, and horticulturists, for destroying the animal and vegetable parasites infesting man, animals, and plants. The substance to which I have given the name of sulphozone (from its strong smell and powerful chemical action) in order to distinguish it from the sulphur of commerce, is a preparation containing free sulphurous acid as its active and essential principle.

For many years past, large quantities of sublimed and powdered sulphur have been used in this country and on the Continent, for the destruction of the mildew and blight attacking vines, hops, roses, fruit and other trees; and it is now, I believe, almost the sole remedy employed for that purpose, as no other has been found so generally effectual or so convenient of application.

From careful and often repeated series of experiments, I have arrived at the conclusion that the beneficial action is to be attributed to the presence of a small but variable quantity of free sulphurous acid (occasionally hyposulphurous acid) which exists as a constant impurity in the sulphur of commerce. Sublimed sulphur contains more acid than powdered crude sulphur, and is more certain in its action, while precipitated sulphur, being almost or altogether free from acid, is quite useless. I find that when substances are carefully purified from all traces of sulphurous acid by repeated washing with spirit and water, they are equally ineffectual in destroying mildew and other vegetable and animal organisms, and that seeds germinate as quickly and as vigorously when sown in pure sulphur as in fine sand, and that molds grow on the surface when a little organic matter, as flour, has been mixed with the sulphur. I find also that cheese mites are not destroyed by pure sulphur, but live and multiply indefinitely in cheese covered with sulphur; though they are immediately destroyed by commercial sublimed sulphur. On the other hand, when pure sulphur is impregnated with sulphurous acid, it destroys mildew and other minute organisms with an energy proportioned to the quantity of acid it contains, and it does not appear that one form of sulphur possesses any advantages over the others, provided the quantity of acid is uniform. Many other substances which contain no sulphur, when impregnated with sulphurous acid in a similar manner and to the same extent, are equally effectual in destroying mildew.

It has been observed that, when a piece of silver leaf is suspended over a roll of sulphur, it is slowly converted into the sulphide of silver, and it has been inferred therefrom that sulphur vaporizes at ordinary temperatures; and the theory has been advanced, by a well known vegetable physiologist, that the oxygen, given off by the leaves of plants to which sulphur has been applied, oxidizes it and produces sulphurous acid, and thus the action of sulphur in destroying vegetable organisms may be accounted for. But this theory is not borne out by my experiments. When silver leaf is suspended over pure sulphur, it does not tarnish more rapidly than when suspended in the air, and its conversion into the sulphide by the roll sulphur may be explained by the fact that that substance contains free sulphurous and hydrosulphurous acids and sulphuretted hydrogen, which are constantly escaping from it. When pure sulphur is applied to the leaves of plants, no evidence of oxidation can be detected by either litmus or starch and iodine paper. If oxidation were to take place under such circumstances, the product, if sulphurous acid in the first instance, would be immediately converted into sulphuric acid by further oxidation, and it could not escape detection. Further: precipitated sulphur, being in a much finer state of division than sublimed sulphur, would be more easily oxidized, and ought to prove the more potent agent; but practically it is found to be the least so.

Sulphur in various forms is used by medical men and veterinary surgeons for the destruction of the itch and other insects, and in the treatment of various diseases (as ringworms), caused or accompanied by fungous growths, infesting the skin and hair of men and animals; but sulphurous acid, in solution, is in many instances substituted for them on account of its more certain action. Many surgeons, indeed, believe that the beneficial action of sulphur ointment in the treatment of itch is to be attributed to the grease of which it is made, rather than to the sulphur it contains; and this is probably true, as the quantity of sulphurous acid is exceedingly small, and I find the action of the ointment is remarkably increased when the sulphur has been strongly impregnated with acid previous to being made into ointment, and this is equally true of its other applications in medicine.

In addition to its destructive action on organized bodies, sulphurous acid possesses a powerful chemical action on the organic and inorganic products of decomposing animal and vegetable substances, and on emanations from persons and animals suffering from infectious diseases; hence it is one of the most potent and valuable disinfectants we possess, and it appears to prevent the spread of small pox, diphtheria, cattle plague, etc. Its qualities as a deodorizer are also very considerable. It attacks and destroys sulphuretted hydrogen, and neutralizes the strong smell of ammonia and other alkaline bases, but without losing its antiseptic properties, or destroying their manurial value. (Crookes.)

From my experiments and observations, and from the well known properties of sulphurous acid, I conclude, therefore, that it is the acid, accidentally present in the sulphur, which is the active agent in the destruction of mildews and blights, and that the sulphur is only the medium for its application. This is a fact, not only of scientific interest, but of great practical and commercial importance; for under the mistaken impression that the sulphur itself is the active agent, great care and expense have been incurred to secure its freedom from acidity, which is by no means necessary.

Sulphur, like charcoal and many other substances, possesses the power of absorbing a large quantity of sulphurous acid; and by a modification in the refining process the acidity may be considerably increased, and the quantity of sulphur correspondingly diminished, and a more certain and uniform agent produced. For horticultural purposes, however, it is necessary to limit the quantity of sulphurous acid, or it will prove destructive to the plant as well as to the parasite. This limit I have established practically by experiments made on rose trees infested with mildew; and as the rose mildew is with difficulty destroyed by common sulphur, except by repeated applications, this preparation (to which I have given the name of sulphozone, for reasons given above) may be considered to be of the maximum strength, and four or five times stronger and more potent than sublimed sulphur. In substituting it, therefore, for sulphur, a great saving will be effected in the cost of sulphur, its carriage, and the time and labor of applying it. There will, moreover, be the additional advantage of not loading the foliage with a large quantity of sulphur powder, which must in some measure impair its health by its mere mechanical presence; and in the case of hops, the brewers will have less ground for objecting to the quality of the produce. Sulphozone, being a fine dry powder like sulphur, may be applied in a similar manner and with the same apparatus, care being taken to use a much smaller quantity (namely, about a quarter of that of sulphur).

For medical, veterinary, and sanitary purposes, a very strong sulphozone has been prepared to take the place of sulphur in the officinal preparation, and for use as a disinfecting powder. This substance is exceedingly destructive to organic life, and is not adapted for horticultural purposes except for dressing the stems and branches of deciduous trees in the winter, and for destroying insects where it can exert no deleterious influence on surrounding vegetation, or for disinfecting and deodorizing manure heaps, etc., for which purpose it is better adapted than any other disinfecting powder, as the sulphurous acid fixes the ammonia—the most valuable constituent of manure—and makes it available for gardening and farming purposes, while chlorine and other disinfectants destroy it, and reduce the value of manure in proportion to the extent of their action in deodorizing it.

*Paper read at the Meeting of the Royal Horticultural Society at Birmingham.

Influence of Marriage upon Health.

M. BERTILLON, lately having had to draw up a paper for the Academy of Medicine of Paris on the influence of marriage on mortality, consulted the registers of the only three countries in Europe which were carefully enough kept to give him a reply to his question, those of France, Belgium, and Holland. He shows that if the male sex be first considered, we find that, from 25 to 30, 1,000 married men furnish 6 deaths; 1,000 unmarried, 10 deaths; and 1,000 widower, 22 deaths. From 30 to 35, of 1,000 married men, 7 die; of 1,000 unmarried men, 11½ die; and of 1,000 widowers, 19 die. From 35 to 40, of 1,000 married men, 7½ die, of 1,000 bachelors, 13 die; and of 1,000 widowers, 47½ die; and so on at all the following ages, the married man continuing to live with greater facility than the bachelor. It has been said that since the most fortunate men can afford to marry, it is not astonishing that these persons should live longer. But this will not, of course, account for the very great mortality of widowers at all ages, which, indeed, surpasses that even of bachelors.

However, it must be noticed that 8,000 young men marry in France yearly, under the age of 20. This is very fatal to such young men, for M. Bertillon finds that, whilst 1,000 young men from 15 to 20 furnish 7 deaths, when unmarried, no less than fifty deaths occur among 1,000 young married men under 20. Women seem to reap less advantage from marriage than men, and there is but little difference in the mortality of unmarried and married women before the age of 25. It is but little marked even between 25 and 30.

Apparatus for the Production of Ozone with Electricity of High Tension.

Experiment has shown that in the production of ozone by electricity, the maximum amount of oxygen is ozonised by the silent or glow discharge. In using the Holtz electro machine, the form of the apparatus usually employed must be varied to give good results.

When the poles of the machine itself are separated to a sufficient distance, the electricity passes between them, either in the form of a diffuse brush, spanning the whole interval, or with a very minute brush upon the negative pole and a glow upon the positive, the intermediate space not being visibly luminous. This is the so-called dark, or silent discharge.

When this occurs, the strong odor shows that a considerable amount of the atmospheric oxygen is converted into ozone.

If this discharge is made to take place in an enclosed space through which air or oxygen can be driven, the ozonising effect of the electricity is hightened and can be utilized. The apparatus which I have employed, and which has afforded very satisfactory results, consists of a straight glass tube about 20 centimeters long and having an internal diameter of 25 centimeters, the two ends being stopped with corks covered on the inner side with a thin coating of cement to protect them from the action of the ozone. Through the axis of each cork is inserted a glass tube of about 5 m.m. caliber and 7 centimeters in length, having a branch tube inserted perpendicularly at the middle, and long enough to permit a rubber tube to be slipped upon it. The outer ends of the tubes themselves are closely stopped with corks, through which are passed straight, thick copper wires carrying suitable terminals at their inner ends, and bent into a ring at the others. They are fitted so as to make tight joints, but to allow of motion in order to vary the distance between their inner ends. One of these wires carries a small ball; the other terminates in a disk with rounded edge, set perpendicularly to the axis of the tube, and so large as to leave an annular space of some two or three millimetres breadth around it. The gas is admitted through one of the branch tubes and escapes through the other, after having passed through the whole length of the tube.

In using the apparatus, the wires must be connected with the poles of the machine in such a manner that the disk becomes the terminal, as this arrangement gives the greatest degree of expansion and diffuseness to the current. On turning the machine and adjusting the ball and disk to a proper distance, a nebulous aigrette surrounds the latter, quite filling the interval between it and the wall of the tube, while the part of the tube between the disk and ball is crowded with innumerable hazy streams converging upon the positive pole, or simply causing the latter to be covered with a faint glow. A current of air or oxygen sent into the tube must pass through this, and ozone is very rapidly produced and in great quantity. The condensers are of course not used with the machine when this apparatus is employed.

Noctilucine.

Mr. T. L. Phipson treats of noctilucine as a new and special organic substance, widely spread throughout the world of Nature, and which shines like phosphorus. It is not only the cause of the phosphorescence of the flesh of animals and fish, but it is also secreted by glowworms, fire flies, *scolopendra*, probably by all animate objects that shine in the dark, and produced by certain living plants (agaricus, euphorbia, etc.,) and by the decomposition of vegetable matter under certain special conditions, such as the fermentation of potatoes, etc.

At ordinary temperatures, noctilucine is a nitrogenous, almost liquid substance, capable of dilution with water, but insoluble, and appearing to have a density slightly less than that fluid. It is white, contains (when newly extracted from a luminous animal, living or dead) a small proportion of water, and has a slight odor somewhat resembling caprylic acid. Insoluble in alcohol or ether, it is readily decomposed by mineral acids and alkalies; potash sets ammonia free from it. Fermented in contact with water, it manifests after a time the odor of decayed cheese. While damp, noctilucine absorbs oxygen and gives off carbonic acid gas; but exposed to the air, it dries in thin, translucid, amorphous flakes, very similar to the slime of slugs. When fresh, it is strongly phosphorescent, owing to its oxidation by contact with moist air, and it will even shine under water while there is any air. In oxygen gas it is a little more brilliant; and it is more especially so in air when the wind blows from the S. W., that is, in the presence of ozone. This production of light ceases so soon as the oxygen of the matter is consumed; but if air in the smallest quantity is adherent to it, noctilucine shines for some moments in moist carbonic acid gas.

In phosphorescent animals, noctilucene is secreted by a special organ, and appears to be at once effectively luminous. Under certain conditions of temperature and humidity, it is also generated by dead animal matter, flesh, blood, and sometimes urine.

Whencesoever it originates, its light is invariable and monochromatic, giving a spectrum mainly visible between the lines E and F, and possessing always the same chemical properties.

The *scolopendra electrica* secretes noctilucene in a state of comparative purity, and by making several of these myriapods run about over a large glass capsule, in the month of September, a sufficient quantity may be obtained for examination and analysis to determine its chief properties. It can also be obtained, but is less pure, from glowworms and the phosphorescent surface of dead fish, by scraping the luminous matter on to damp filter paper.

The secretion of noctilucine by the superior luminous creatures, such as insects (*lampyrus, elater*, etc.), is doubtless up to a certain point under the influence of the nervous system, so that they have the faculty of causing their light to cease at will, in which case the secretion is arrested for the time; but glowworms' eggs continue to shine for some time after they have been laid, so that they must also contain a small quantity of noctilucine. In the lower orders of animate beings, such as the little *noctiluca miliaris* of the English Channel, the flexible *polypi*, etc., there is also no doubt of the existence of a special organ for the production of the light; and, where there are scarcely any indications of a nervous system, the secretion of the material appears frequently to be susceptible to the influence of external circumstances.—*Mechanics' Magazine.*

MR. JOHN KEEFE, a fireman on the Northern Central Railroad, did a noble thing on Sept. 23. As the express train going south was approaching Milo Station, Yates county, N. Y., a little child three years old was seen to be on the track, but too near for the train to be stopped before reaching it. This man, John Keefe, thereupon climbed forward on the engine, got down on the cow-catcher, and, as the train thundered along, reached forward and picked up the child from destruction.

THE importance and value of some of the patented stove improvements may be judged of from statistics which were made public at the recent meeting of the stove manufacturers of the United States, held in Cincinnati. It appears that this interest has, in this country, a combined capital of over $30,000,000, that it employs 150,000 men, and that the probable product, during the current year, will not fall short of 2,500,000 stoves.

SELF-FEEDING DRILL.

We lay before our readers, in the accompanying engraving, a neat, convenient, and effective form of bow or fiddle drill, especially designed for use by jewelers, gunsmiths, and others having occasion to do fine work in metals. The disadvantages of the ordinary instrument commonly used, requiring, as it does, the constant attention and both hands of the workman, will, it is believed, be obviated by the use of this invention.

Fig. 1, in the illustration, is a perspective view of the device which, as will be seen, can be immovably attached to any table or work bench by means of the plates and ordinary screws. Fig. 2 shows the drill and chuck, and the mode of attaching the same by a screw thread on the spindle. Any variety of style of chuck may be thus attached, or the chuck being removed the drill may be inserted directly in the spindle.

A is a bar of steel passing through slots cut in the frame and securely held in any position by the thumbscrew on one of the upright arms. The end of the bar, A, is bent upwards, and is provided with a metal casing, B, extending horizontally outward. In this casing is a plunger, surrounded by a strong spiral spring, shown through the part of the casing that is broken away. This spring acts on a flange on the plunger, forcing the latter a certain distance out of the casing and toward the drill, D. At the outer end of the plunger, and square with the drill, is a face plate, against which the work to be bored is placed. The plunger is then pressed back in the casing, and the bar, A, drawn along and secured, so that the action of the spiral spring firmly presses the work against the drill point. The latter is then set in motion by means of the bow acting on the pulley wheel on the spindle. It is evident that, by the action of the drill deepening the hole, the pressure of the spiral spring feeds the work on continuously.

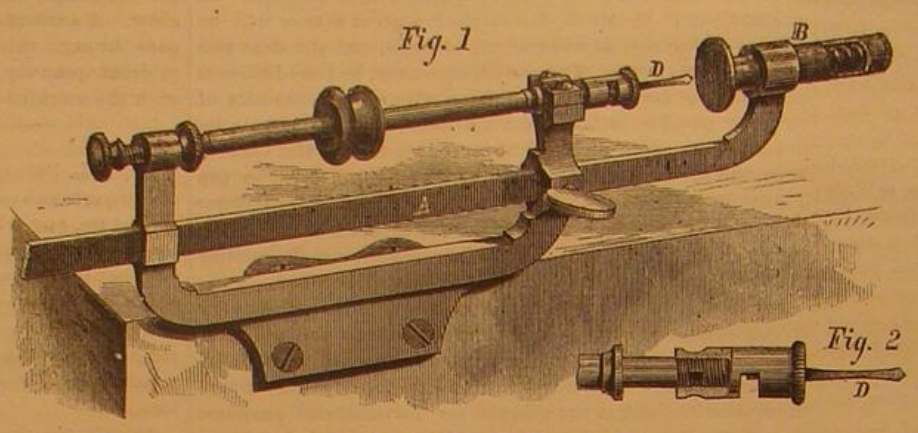


Fig. 1

Fig. 2

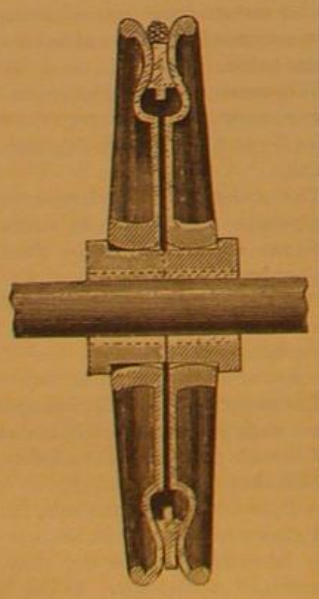
HALES' SELF-FEEDING DRILL.

The instrument may be placed either in a horizontal position, as shown, or it may be arranged vertically on the corner of the bench, so as to bore straight downwards. When thus placed, a hand wheel and gearing may be added, so as to turn the spindle without the aid of the bow. For workers in precious metals, this instrument is especially suited. It is perfectly steady and penetrates with exactness. The space underneath the sliding bar, A, admits of the introduction of a sheet of paper, so that all dust or filings may be saved, while the bar itself may be extended, thus admitting of the drilling of holes of any required depth.

The patentee of this machine is desirous of selling the entire right. For further information address John Hale, Scranton, Pa.

Pulley for Wire Ropes.

The illustration shows an improved pulley for preventing the slipping of the wire rope running over it. The hub of the pulley is keyed on to the shaft and cut into an octagon or other flat sided form, so that the two halves of the pulley are held tightly in the direction in which they revolve, but have a little lateral play on the sides of the octagon shaped hub, by means of the curved surfaces on which they rest as shown. The rims of the disks or halves of the pulley are doubly curved, so that a flat ring, slightly concave on both sides, lies between them, and forms an almost solid periphery to the pulley. The tension of the rope is on the loose ring, and forces the disks apart at the upper side, thus tending to close them together at the opposite side, holding the loose ring tight, and the rope is held clutched between the disks on the upper side.



A Curious Gum Varnish.

It is well known that the ordinary gum arabic so freely used in photography consists chiefly of the calcium salt of a peculiar acid called "gummic acid." The other salts of the acid are but little known, though the acid itself can be isolated by a process which we shall give presently. Our object in referring to this matter now, however, is to draw attention to a body which appears to be an iron salt, and to possess properties likely to render it of some value.

If we take a solution of gum, and add to it an acid solution of perchloride of iron, no change takes place when the mixture is not exposed to strong light; but if instead of strongly acid solution, we take one which contains as little free acid as possible, and add this to our mucilage of gum, the latter becomes a complete jelly, stiff and strong, immediately on mixture of the two liquids. This jelly has a reddish brown color, and dries up to an even horny layer, very different from gum in appearance. We have coated paper with this substance as follows:—A solution of the liquor of perchlorides of iron of the British Pharmacopœia was taken, and to it ammonia cautiously added with agitation until a permanent precipitate made its appearance. The liquid was then filtered, paper saturated with the solution, and allowed to dry in the dark. The coated sheets were then floated on some thick mucilage of gum arabic. The surface of the paper was thus covered with an even layer of the "gummate of iron."

When the paper carrying the iron is first coated with the mucilage, the color does not at once change, but presently a strong, yellowish brown tint is produced, and the gum "sets," and then the layer dries up, leaving the paper very flexible for a long time and highly glazed. When paper so treated is allowed to stand in cold water, a certain amount of the gum dissolves, but a considerable quantity is retained by the iron. The portion but little affected by cold water is, however, easily removed by the hot solvent, some iron at the same time passing into solution. When the gummate of iron paper is exposed to light for some time, the gum is less easily dissolved by hot water, and less affected by cold water, than that which has not been so treated. The paper is distinctly sensitive to light, as most other iron prepared papers are. If washed in water containing a small quantity of ammonia, the brown tint of the paper is increased, and the gum is somewhat less easily dissolved out by water, though, by treatment with a little very dilute acid, the gum and much of the iron can be dissolved out.

The gummic acid above referred to can be prepared by precipitating a solution of gum arabic with acetate of lead, washing the precipitate, and then suspending it in water through which a current of sulphuretted hydrogen is passed Sulphide of lead is formed and gummic acid set free. The latter can then be obtained on evaporating the solution.—*British Journal of Photography.*

Iron as made and used by the Romans in Great Britain.

Mr. W. J. Grover, C. E. states that the Romans, although they had mineral coal at nearly all their stations, and it was not unfrequently met with in their villas in Britain, yet only used charcoal in smelting. In the Roman villa in Britain, vast quantities of iron were used; much more than in an English modern house of similar dimensions. The number and variety of iron keys were truly surprising, and gave an insight into the elaborate domestic economy and housekeeping arts of our early conquerors here. Articles of furniture, though long perished, were indicated by their locks and keys, and must have been a goodly array. There were also found door keys and locks, bolts and hinges, and what was more curious, lifting latch keys, such as are now used in London houses. Then there were padlocks and cylindrical locks, and keys attached to rings to wear on the finger, though these were generally of bronze. Fire dogs of handsome make in iron had been found, showing that fire places had been partially in use in some of the apartments. In addition to the articles already named were found numerous hunting weapons, knives, scissors, and nails of all variety of sizes, not only for building purposes, but for the soles of sandals.

At Chidworth Villa, two large masses or blooms of iron were found, evidently brought to the villa to be worked up, and this was perhaps the explanation of the quantity of iron work generally found. A resident smith was always employed, and when the repairs of locks, keys and farming implements did not keep him going, he no doubt employed his time in working out some of the little ingenious iron devices in rings and keys. The chief locations of the iron industry in Roman Britain were in Sussex in the vast forests, (Anderida, as the locality was then called,) and in the Forest of Dean. Pits from which the ore had been extracted were found in Sussex, together with great heaps of cinders, accompanied with Roman pottery and coins, but it was on the banks of the Wye that the most workings existed. Indeed, that district must have been the primeval "Black Country,"—the dark rich center of smoke, noise and industry. For many miles together the ground was formed of a continuous bed of iron cinder; about Monmouth and Ross must have been the Dudley and Birmingham of Roman Britain. The cinders contained—some of them—from 30 to 40 per cent of metal, and throughout the last 300 years numerous blast furnaces in the Forest of Dean had been supplied solely with Roman scoriæ.

KEEPING FISH FRESH WITH SUGAR.—A method adopted in Portugal for preserving fish consists in removing the viscera and sprinkling sugar over the interior, keeping the fish in a horizontal position, so that the sugar may penetrate as much as possible. It is said that fish prepared in this way can be kept completely fresh for a long time, the flavor being as perfect as if recently caught. One tablespoonful of sugar is sufficient for a five pound fish.

Facts about Friction.

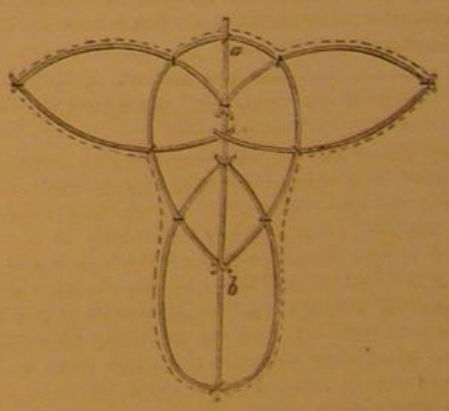
In a new edition of his "Principles of Mechanism," Professor Willis says: The friction of materials in contact with unguents interposed is given as one twelfth of the pressure, and the limiting angle of resistance, 5 degrees; of metals on metals, one sixth of the pressure, with an angle of 10 degrees; of wood on wood, one third of the pressure, with an angle of 18 degrees; and of bricks and stones, two thirds of the pressure, with an angle of 33 degrees.

The magnitude of the friction between a pair of plane surfaces, the one fixed and the other movable, is governed by three principal laws, which have been confirmed by innumerable experiments. The first law is that the magnitude of the frictional resistance between a given pair of surfaces of any materials is proportional to the pressure that keeps them in contact. The second law is that the frictional resistance is unaffected by the area of contact, which may be shown by placing the upper block first flatwise, and then on edge, when the friction will be found to be the same in both positions. The third law is that the frictional resistance of solids is wholly unaffected by the relative velocity of the rubbing surfaces. It is worthy of remark here that the laws of friction of solids and fluids are essentially different with regard to velocity, for while the friction of solids is independent of it, that of fluids increases as the square of the velocity.

It is curious to observe that, taking the mean value of friction at one third of the pressure which generates it, if we take a cylinder of any diameter, as the barrel of a common windlass, and fix it, and throw a rope over it, any weight tied to one end will support a weight about three times as great at the other end. If the rope be taken once round the barrel, and the two ends hang freely down, the small weight will support one twenty-seven times as great at the other end. Thus, with half a coil, as in the first case supposed, the rope will support at one end three times as much as at the other; with one complete coil, nine times as much; with a coil and a half, twenty-seven times; with two coils, eighty one; with two and a half coils, 243; with three coils, 729; with three and a half coils, 2,187; and with four coils, 6,561 times the weight suspended at the other end. In drawing water from a well where the depth is not great, or winding up earth from sewer excavations, this property of coil friction is sometimes employed by taking three or four coils of the rope round the windlass barrel. The empty bucket or skip takes the place of the small weight, and the full one that of the greater weight, the coils grasping the cylindrical surface so firmly as to sustain the load. But although the friction of these coils is sufficient to sustain the load, there is a practical difficulty in the method, from want of clearance room, where the buckets or skips pass each other up and down.

The Japanese Bird Kite

The frame is made of thin bamboo, as in the sketch, and is covered with colored paper. The wings, which are somewhat concave, and fall back a little, are dark maroon, and



the body and tail represent a Japanese lady. Small white twine is used. By various devices, the hovering and soaring of a hawk can be admirably imitated. Length of middle cane 20 inches, spread of wings 26 inches; *a b*, points where the "belly band" must be attached. Dotted lines show the paper.

Orris Root.

The following is an abstract of a paper read before the British Pharmaceutical Conference, at Brighton, by Henry Groves, of Florence:

A small district round the city of Florence seems to be at present the chief, if not the only, source of orris root. The plants yielding it are *Iris florentina, I germanica, I pallida*, and the scraped rhizome is the portion of the plant which occurs in the market as orris root. Large quantities of these roots are used by perfumers, for the purpose of blending with other essences, and it is also largely used for tooth powders, and for the composition of what is commonly known as violet powder. A discussion arose as to whether orris root contains any essential oil. Mr. Haselden stated that he had frequently endeavored to obtain this oil by distillation, but had failed to do so. Mr. Umney, London, stated that he had distilled many tuns of the root, and had obtained the essential oil in the form of a fatty substance, similar to cacao butter. This substance was yielded in very small quantity, and was even more costly than otto of roses; it possesses all the fine aroma of the original root.

RECIPES AND EXPERIMENTS.

The following recipes and experiments have not been practically tested by the editor of the SCIENTIFIC AMERICAN, but are published for the benefit of readers who may desire to try them. The editor would be glad to be informed of the results of such trials.

WASHING COMPOUND.—The use of soda for washing linen is very injurious to the tissue, and imparts to it a yellow color. In Germany and Belgium, the following mixture is now extensively and beneficially used: 2 lbs. of soap are dissolved in about 5 gallons water as hot as the hand can bear it; then next is added to this fluid, three large sized tablespoonfuls of liquid ammonia and one spoonful of best oil of turpentine. These fluids are incorporated rapidly by means of beating them together with a small birch broom. The linen is then soaked in this liquid for three hours, care being taken to cover the washing tub by a closely fitting wooden cover. By this means the linen is thoroughly cleaned, saving much rubbing, time and fuel. Ammonia does affect the linen or woolen goods, and is largely used as a washing liquor in the North of England.

GOLD POWDER.—Gold powder for gilding may be prepared by putting into an earthen mortar some gold leaf, with a little honey or thick gum water, and grinding the mixture till the gold is reduced to extremely minute particles. When this is done, a little warm water will wash out the honey or gum, leaving the gold behind in a pulverulent state. Another way is to dissolve pure gold, or the leaf, in nitro-muriatic acid, and then to precipitate it by a piece of copper, or by a solution of sulphate of iron. The precipitate (if by copper) must be digested in distilled vinegar, and then washed (by pouring water over it repeatedly) and dried. This precipitate will be in the form of a very fine powder. It works better and is more easily burnished than gold leaf ground in honey as above.

CEMENT FOR MARBLE AND ALABASTER.—According to Ransome, the following mixture affords an admirable cement for marble and alabaster: Stir up to a thick paste, by means of a solution of silicate of soda (water glass), 12 parts Portland cement, 6 parts prepared chalk, 6 parts fine sand, 1 part of infusorial earth. An irregular piece of coarse grained marble was broken off by means of a hammer, and the surface coated by a brush with the above paste, and the fragment inserted in its place. After 24 hours it was found to be firmly set, and it was difficult to recognize the place of fracture. It is not necessary to apply heat.

FRENCH PUTTY.—Seven pounds linseed oil and four pounds brown umber are boiled for two hours, and 63 grammes wax stirred in. After removal from the fire, 5½ lbs fine chalk and 11 lbs. white lead are added and thoroughly incorporated. This putty is said to be very hard and permanent.

INK FOR ZINC LABELS.—A correspondent of the *Country Gentleman* recommends the following as an ink for zinc only, that will endure for years, cuts slightly into the metal, has a black color, and is as legible after a dozen years as when newly written: "Take one part verd gris, one part sal ammoniac, half part lampblack, and ten parts of water; mix well, and keep in a bottle with glass stopper; shake the ink before using it. It will keep any length of time. Write it on the label with a steel pen not too fine-pointed. It dries in the course of a minute or two."

DEATH OF MR. W. H. SEWARD.

William Henry Seward, whose public and political career has extended over the last fifty years, and who has served his country in many capacities, having been a Senator for many years and twice appointed Secretary of State, is no more. His high character gained him the respect of all classes of politicians; and the vigorous courage which distinguished him through life remained with him to the last. So recently as 1871, when in his 70th year, he made a tour round the world, although he had hardly, when he started, recovered from the attempt on his life by the assassin Payne, in 1865. Mr. Seward died at his home in Auburn, N. Y., in the 73d year of his age, on Oct. 10th.

INK PLANT.—Botanists are endeavoring to introduce and acclimate in Europe a plant of New Granada, which will be a valuable acquisition to manufactories of ink. The juice or sap which it yields, and to which is given the name of *chanhi*, is at first of a reddish tint, but in a few hours becomes intensely black. It may be used without any preparation. The *chanhi* corrodes steel pens less than ordinary ink, and better resists the action of time and chemical agents. It is said that, during the Spanish domination, all public documents were required to be written with this ink; written otherwise, they were liable to damage by sea water.

ADVANCE IN THE PRICE OF WINDOW GLASS.—The principal makers of the above material in the midland districts (England) have issued circulars stating that it is necessary, in consequence of the increase in the cost of fuel and other materials, to advance the price of window glass. They state that for the present the net price for "fourths" crown will be 42s. per crate; and the quotation for "thirds" 15 ounce sheet, glazing quality, is 4½d. per foot, less 35 per cent discount.

BRANDY FROM MOSSES AND LICHENS.—In Russia, alcohol and brandy is now largely manufactured from mosses; the quality is said to be exceedingly good, and many distilleries are making profits of 100 per cent by this novel industry.

Correspondence

The Editors are not responsible for the opinions expressed by their Correspondents.

The Dangers of Car Coupling.

To the Editor of the Scientific American:

Your issues of Sept. 21st and Oct. 5th contain articles on the above very important subject. I have myself been one of that class of railroad employees, so much worked and so little paid, having filled the positions of switchman, brakeman on both freight and passenger trains, fireman, and conductor during a period of eight years or longer. I affirm that every thinking man who knows anything at all of railroading practically will agree with me in saying that the man who fills the position of switchman or car coupler, freight brakeman or conductor carries his life in his hand. To talk of "getting on the platform to couple" is like describing an object as about the size of a piece of chalk; one conveys as much information on the subject as the other, being equally indefinite. Everybody knows that not one freight car in ten thousand has a platform, and there is so little coupling and switching of passenger cars as to render an automatic or self coupler almost unnecessary. There are perhaps ninety-nine couplings to be made with freight cars where there is one with coaches. And the danger of coupling is, in the estimate of many, not as great as the danger of uncoupling, especially when making a "running switch", as it is often necessary for a man to climb down between cars with no ladders on either end. Take a situation like this, for instance: The brakes are on opposite ends of the cars, and there are no ladders on the end of either car; so a man, while pulling the pin, is obliged to stand on the dead wood without anything to hold to, and after pulling the pin, has hard work to get back to the deck of the car. Suppose, as has been the case, the engineer pulls out, or the motion of the train causes the cars to separate prematurely; what is to keep the man from falling on the track and being run over? Or say that a coupling is to be made between a box and a flat car, the flat one having lumber or railroad iron projecting; it is then necessary to stoop the head, or, as has been the case many times, have it crushed. If a man gets on the inside of a sharp curve with ladders of both cars on the ends and same side on which he stands, and there be a number of cars both next to the engine and in rear of him, so it becomes a difficult matter for the engineer to hold the cars, should the springs on the drawheads be a little weak, ten to one that he will get a squeeze, or worse. Now these are no imaginary situations, but a few of a great many in which your correspondent has himself been placed, so that he can sympathize with those who are compelled to daily risk their lives or, in the language of a great many officers who control the situations, "quit". There have been automatic couplings invented which would fill the bill as to cheapness and utility, and that would not necessitate the removal of all the draw heads on a road at the same time; and besides they have been practically tested by daily use on the road. Such a one I have seen, and know that the only reason why it has not been put into general use can be found in the sentiment, which many railroad presidents, superintendents and directors entertain, that poor men at $40 per month are cheaper than patent couplings. This will no doubt be their opinion on this subject until legislation shall compel the adoption of life-saving apparatus for the coupling of all railway cars.

Cincinnati, Ohio. D. M. S.

A Curious Ice Picture.

To the Editor of the Scientific American:

Inclosed please find photograph of a cake of ice delivered in the ordinary course of trade to one of our citizens. It was cut, with other ice, in the Wabash and Erie Canal in this place. You will notice that there is a well delineated outline of a cake basket, which resembles frosted silver; some

inkered it to a fountain sending up a shower of diamonds. The photograph gives but little idea of the beauty of the real thing, only an outline of the form. No foreign body was present in the ice, and the query is, what produced this particular figure? You or some of your contributors will probably be able to enlighten us through your paper.

C. A. MCCLURE.

Delphi, Ind

AMONG the industries of Waterloo, N. Y., now rising into importance, is that of manufacturing yeast cakes, 80,000,000 of which were made last year.

August Meteoric Showers—Do They Come from the Sun?

To the Editor of the Scientific American:

A considerable number of meteors were seen here on the evenings of the 11th, 12th, and 13th of last August, but unfortunately the evening of the 14th was so cloudy that we saw none, though most probably many fell. Several friends and I made a point of watching them from the evening of the 8th to that of the 15th. We saw none on the evening of the 15th.

Four years ago (August, 1868), I saw them also fall during several nights in succession. Then they seemed to move in every direction; but this year all we saw moved northwardly, or nearly so.

Some scientists have supposed that the earth passes through what they call a "meteoric belt" on the 14th of August, and others have imagined that it passes through the wake of some comet; but how those men can account for the velocity of the sun and the regularity of the August meteors is rather puzzling to me. I believe the August meteors come from the sun. Let me explain my notion:

Suppose the sun to throw out meteors to a distance from him of say 100,000,000 miles; the earth, in the return half of her orbit, will, as it were, meet the sun and pass through the meteorites when about half way. Thus, the earth will be crossing the sun's wake about the 14th of November; she will be up to, and, as it were, on the right side of the sun about the 12th of February, and she will be direct before the sun before the middle of May; and on the left side of the sun about the 12th or 14th of August.

The August meteors are as regular as are the November ones, and to no other source can we consistently ascribe their origin but the sun. Admit that, and we can account for all the meteors which fall throughout the year, regular as well as irregular, in all lands, and at all seasons. Contend that they fall from a meteoric belt, or from the wake of a comet, and we have either to suppose the sun standing still in space, or that the meteoric belt, or the comet's wake, is moving along with him at the same exact rate, which does not seem possible.

The above theory is at least plausible, and the probability is that it is nearer the truth than either of the others.

Gloucester, N. J. JOHN HEPBURN.

The August Meteors.

To the Editor of the Scientific American:

I was at Knoxville, Tenn., on August 10, and between ten and eleven o'clock, P. M., I think there were more meteors fell than I have seen in the previous 35 years; I think many persons will corroborate this, and I have heard a number speak of seeing a few more on the 11th, and also some on the 12th.

About a week previously, there was a fine display of the aurora borealis, visible at Knoxville. It was of a red color. It is unusual to see this phenomenon so far south, and it was pronounced at once to be a sign of coming war and bloodshed. It pained me to see the apprehension which the people in that part of the country felt.

I have lived in this State over 30 years, and I have often seen auroral displays of a red color, but never so fine a one at midsummer as the one at Knoxville.

Detroit, Mich. JAMES E. RANKIN.

Propelling Canal Boats.

To the Editor of the Scientific American:

In your issue of October 5, 1872, an individual, signing himself "Voysgeur," gave an idea in regard to propelling canal boats which proved not, as he supposed, original. The side swells, instead of amounting to very little or nothing as he would have us suppose, are the most difficult obstacle that the inventor has to overcome. We know that a propelling screw would not create waves as large as those produced by the boat plowing or displacing the water in front; and if an inventor can succeed in destroying the latter, the waves from the propelling wheel or screw can be levelled by the same device. It should be borne in mind by every inventor that what is wanted is something to keep the waves from reaching the banks, and not, as a great many suppose, something to propel the boat.

My idea for destroying swells is to have false sides, running from the bow or stem (not curved with it, but straight) to about five feet past the stern and two feet or more from the side of the boat. Let them extend three feet under water, and the same above. At the stern, where they project, have a coarse cloth fastened from one to the other, dragging in the water between them. The false sides would carry the waves from the front and paddle wheels (if they should be used instead of a screw) to the stern, where they would be swept down by the cloth. J. A. D.

Franklin, Pa.

Small Fast Side Wheel Steamers.

To the Editor of the Scientific American:

I am building a miniature side wheel steamboat, calculated to draw 6 inches of water, and to run at the rate of 8 miles per hour across current with engines open. Her length is 35 feet, width 6 feet, with the bottom flat, and she is bilged from water line up; her side wheels are 5 feet in diameter. Her engines have 2 cylinders, each 3½ inches in diameter with 5 inches stroke, linked in locomotive style, and placed at an angle of 20°. The cylinders are near the bottom of the boat, and the crank shaft is geared to the wheel shaft, making 300 revolutions to the wheels' 100. I think that, for small side wheel steamers requiring fast steady running, gearing the engines direct to the wheel shaft, as above stated, is far superior to the beam engine referred to by your correspondent in your number of the 5th instant. J. W. SWARR

Harrisburg, Pa.

[For the Scientific American.]

Death of Mr. E. B. Horn.

Mr. E. B. Horn deserves more than a passing notice. He was one of the most ingenious mechanics and finest workmen we had in this country. Associated with Mr. Daniel Davis, Charles G. Page, and others, in their early experiments in electro magnetism, he has constructed probably a greater variety of electro-magnetic engines than any other man in the world.

For several years he turned his attention to electro-magnetism as a motive power, and so early as 1835–6 was exhibiting an electro-magnetic engine which turned a lathe. He had also an electro-magnetic locomotive, with car attached, which, for a small pecuniary consideration, carried passengers at the various places in which the invention was exhibited. After many years expenditure of time and money, he finally abandoned the idea of ever obtaining power from electro-magnetism.

He was a most remarkable workman, and could do the most difficult work, and that, apparently, without tools. When a young man, he constructed a perfect watch (a fair time keeper), the materials of which consisted solely of sheet tin, solder, and iron wire. His friends used to say "he could make anything, from a watch to a locomotive." During the latter part of his life, he was engaged in the repair of clocks and watches of the most difficult and intricate construction.

He was modest and retiring in manners, being one of the old school mechanics. In his death, we have lost a worthy man, one regretted by all his friends and one whose place will not be easy to refill.

The greater part of his life was spent in Boston, Mass.

T. H.

THE VIENNA EXPOSITION BUILDINGS.

The *Engineer* publishes the following details relative to the magnificent buildings which are now being prepared for the great exposition in Vienna. The chief structural materials to be employed are stone, brick-work, zinc, glass, and wood work. The great central rotunda, in which the choicest objects will be displayed, springs from the ground a circular façade of piers, of no less than 436½ feet in diameter. Above this rises the immense roof, surmounted by a lantern of cast iron and glass, the diameter of which is 105 feet. Above the latter is a second lantern, and then a cupola, the extreme hight of the finial being 300 feet. The vastness of these dimensions may be judged from the fact that the domes of St. Peter's in Rome, or St Paul's in London, or the steeple of Trinity Church in New York, might be easily set down within this enormous concave without nearly touching it anywhere. Access will be provided to the summit, from which an extended view of the city and adjoining country will be gained.

At three sides, the quadrangle round this central hall will consist of continuations of the exhibition galleries, but the fourth or north east side of it will be reserved for offices and administration rooms. There will be six grand entrances, of most imposing architectural design, and twenty-eight smaller entrances through the long sides of the structure. The great central quadrangle of lateral and transverse galleries will be about 755 feet square externally, and the total length of the grand central spine, 2,985 feet. The width of the latter will be 82 feet and its hight 52½ feet. All the galleries in both directions consist of brick walls to about half the hight, stuccoed into a bold sort of paneling exteriorly, between recurrent piers which rise to the hight of a frieze running the entire length. The space between the top level of the brick work and the frieze is glazed, the whole of the light being derived from the sides.

The building set apart for machinery is of brick, and is 2,614 feet long and 155 feet wide. Several boiler houses are annexed, and water and steam are laid throughout the structure. Connecting with two lines of rails within this building and with nine other tracks extending the whole length of the exposition, is the North of Austria railway, so that exhibitors will thus be enabled to bring their goods, without the risk of unloading, right up to the very point of location. There are four grand entrances to the machine hall. Sewerage is provided along its entire length, and, in addition to the supply of water laid along at high pressure, well water may be obtained at any desired spot by sinking to about ten feet below the surface.

The next most important building in point of size will be the picture and sculpture gallery of which the projected dimensions are 575 feet in length by 80 feet in width. It is thoroughly fireproof and is protected by every safeguard against dampness. The great barrack, constructed for no less than sixteen hundred of the Austrian sappers and miners with their engineer officers, is no great distance off, and the most careful watch, day and night, has been arranged against any accident happening to the treasures with which the picture gallery will be filled.

For decorative purposes, a new material has been found and largely applied, which is said to possess great capabilities and beauty as well as remarkable cheapness. It is a coarse cloth woven from jute, upon which the means have been discovered for printing in colors, gilding, etc., so as to relieve the naturally fine straw color of that fiber; and surfaces wholly or partially covered with this material are said to show as much charm in beauty as in novelty.

Anti-Sea-Sick Steamers.

Mr. E. J. Reed, the late Chief Constructor of the Navy, is now engaged on plans for building for the Channel passage two ships of 350 feet in length, propelled by engines of 5,000 indicated horse power and capable of performing a distance of 20 miles per hour, for the purpose of testing the practicability of Mr. Henry Bessemer's new Channel scheme. His plan is to place the engines, etc., in the fore and aft parts of the vessel, and in the center to fix a hanging saloon, oblong in form and of dimensions 20 feet in length, 30 feet in width, and 20 feet in hight. For maintaining the level and to avoid any rolling motion to this saloon, Mr. Bessemer has contrived hydraulic apparatus to which are attached a pair of delicate equilibrium valves, and by watching a spirit level a man can, by a slight movement of a rod resembling the handle of a letter-copying press, control the slightest oscillations of the saloon with the greatest ease. It is expected that passengers can be conveyed across the English Channel in these swinging saloons without experiencing the dreadful qualms of sea sickness. An engraving of a swinging saloon for vessels, the invention of L. D. Newell, of New York, will be found in the SCIENTIFIC AMERICAN of May 21, 1870.

[From the American Journal of Science and Arts.]

The Nature and Duration of the Discharge of a Leyden Jar.

When the primary coil of an inductorium is connected with a voltaic battery, the act of interrupting the connection, as is well known, produces a current of electricity in the secondary coil, which can be accumulated in a Leyden jar, and then discharged by a spark. Now it is possible to adjust either the electrical surface of the jar, or its striking distance, so that, with a given coil, only a single spark will be produced each time that the battery circuit is broken; but in the great majority of cases, it will happen that enough electricity will be generated to charge and discharge the jar a number of times. The circumstance that electricity is continuously furnished by the coil during the fraction of a second, is favorable to the production of these multiple discharges, has been demonstrated by Professor Rood in a number of experiments; from which it also appears probable that an in increase in the striking distance is accompanied by a corresponding increase in the interval between the sparks composing the multiple discharges, though upon the whole it shortens the total duration of the act, by diminishing the actual number of discharges.

Still Later Intelligence from the Moon.

Mr. Birt, at the last meeting of the British Association, dealt with the observation of the spots on the floor of the crater Plato. It appears that changes in the appearance and luminosity of the streaks have been detected, and these changes are of such a character that they cannot be referred to changes of illumination, but depend upon some agency connected with the moon itself, while the color of the floor was found to vary as the sun ascended the lunar heavens, being darkest with the greatest solar altitude. The reports indicate a strong probability that definite changes of an interesting character on the moon's surface will be discovered.

The Aurora Australis.

The aurora australis was visible at Melbourne, Australia, on the evening of April 11th. The streamers disappeared after about half an hour, leaving a deep red glow reaching an altitude of about 60°, which gradually grew fainter until it faded entirely away. Slight coincident magnetic disturbances were noted.

A New Organic Base.

Bouchardat has succeeded in obtaining a new organic base, containing oxygen, by acting upon one part of dulcite monochlorhydrin with ten parts of alcohol saturated with ammonia gas for six hours at 100°. The chlorhydrate of the new base is termed dulcitamine; its formula is $C_6H_{15}NO_5$, and it resembles glyceramine in many of its properties. Its discovery furnishes a new proof of the close relations between the triatomic alcohol, glycerin and the hexatomic alcohol, dulcite.

A New Fossil Bird.

The skeleton of a fossil bird, found during the past summer in the upper cretaceous shale of Kansas, indicates an aquatic bird as large as a pigeon and differing widely from all known birds in having biconcave vertebræ. The species is termed *ichthiornis dispar*.

New Tertiary Reptiles.

The localities where the following new forms of vertebrate life were found are nearly all in the eocene beds of the Green River basin, first examined by the Yale party in 1870. We select several of the most interesting species from the detailed descriptions given. The *Thinosaurus pucidens* belongs to a genus including a number of large carnivorous lizards. The limb bones preserved resemble those of the iguanas. The remains of the species indicate an animal about four feet in length. The *Thinosaurus grandis* is a gigantic lizard, probably not less than seven feet in length and three or four times the bulk of *Iguana tuberculata*. Another member of the lizard family is the *Glyptosaurus princeps*. The entire body of this reptile was covered with ornamented osseous plates, most of them united by suture. It was about six feet in length.

Three other species of the genus *Glyptosaurus* were also discovered. Of another genus, *Oreosaurus*, which is considered nearly related to that above referred to, five species were determined. A new and interesting genus of extinct lizards, the *Iguanavus exilis* has been predicated upon a number of vertebral and a few other isolated specimens found in the eocene of Wyoming, which belonged to animals of about two feet in length. The *Limnosaurus siphodon*, it has been determined, belongs to a genus quite distinct from the modern *Crocodilus*, the teeth differing widely from those of any known species of the latter.

PROFESSOR BAILLARGE, whose stereometrical tableau was illustrated in this paper on June 1, has been made an honorary member of the Society for Generalization of Education in France.

[From the Boston Journal of Chemistry.]

A Curious Optical Experiment.

By passing a current of sulphurous acid gas through a solution containing selenium (I used selenate of potash), a beautiful pink precipitate is formed, which, while suspended in the liquid, gives to it a light green color by transmitted light, but a beautiful pink by reflected light. I have never seen this circumstance mentioned in print, although a similar phenomenon in the case of the aniline colors is well known. If a strong alcoholic solution of rosaniline is poured upon a watch glass or piece of mica, and evaporated to dryness, the thin scale of aniline is rose red by transmitted light, cantharidis or beetle green by reflected light. A solution of iodine green, very carefully evaporated at a low temperature, becomes copper red by reflected light, bluish green by the transmitted light. If, in preparing the iodine green, too high a temperature is employed, the green is converted into a purple.—*E. J. Hallock.*

Preservation of Wood by Kyanizing.

We were much interested in examining, at the late New England fair, held at Lowell, some specimens of wood exhibited by the proprietors of locks and canals on the Merrimac river. There were twelve different kinds of wood from the valley of the Merrimac, representing the following varieties: 1. Old growth White Pine; 2. Sapling White Pine; 3. Northern Hard Pine; 4. Spruce; 5. Hemlock; 6. Beech; 7. Black Birch; 8. Yellow Birch; 9. Rock Maple; 10. White Maple; 11. Brown Ash; 12. Poplar. They were sawn out in the summer of 1872, at the mill of Messrs. Norcross & Saunders, in Lowell.

Each stick was originally about eighteen feet long and nine inches square. Each was subsequently cut in two; one half was kyanized, and the other half returned in its natural condition. In April, 1863, the whole were set out together as posts, about one half their length in the ground, in dry gravelly soil, fully exposed to sun and weather; and they so remained until taken up, August 28th last, to be exhibited.

On examination of the specimens, it appeared that the kyanized halves showed scarcely any signs of decay, while those not kyanized were all more or less decayed, four of them, namely, rock maple, poplar, hemlock, and old growth white pine, so much so, that at the level of the top of the ground they had come apart. The spruce, Northern hard pine, and sapling pine were also considerably decayed, but held together. The beech, black birch, yellow birch, white maple, and brown were all somewhat decayed, but less than the others.

Kyanizing consists in soaking the wood in a dilute solution of corrosive sublimate. The process takes its name from the inventor, John H. Kyan, a native of Dublin, who died in 1850. It has long been considered the most efficacious method of preserving the timber of ships from dry rot.

Adulterated Cream of Tartar.

We have recently had brought to us two or three specimens of cream of tartar that were sold as perfectly pure. On examination, these were found to contain upwards of 25 per cent of gypsum. This impurity is easily detected, as pure cream of tartar is soluble in hot water, while gypsum is nearly insoluble. Therefore, if half a teaspoonful of the suspected article is put into a tumbler, and hot water poured over it, it will leave a white sediment if it contains gypsum, but will be totally dissolved if pure. It is well to observe in this connection that very little saleratus is now sold, the article commonly known by that name being supercarbonate of soda or "baking soda," as it is often called. We were amused, the other day, at hearing an order given in a grocery store for "one pound of baking soda and half a pound of saleratus." The baking soda was taken from a box containing it in bulk and the "saleratus" was supplied from some brand, that came done up, in paper. Both were really the same article, and sold at the same price. True saleratus is a sesquicarbonate of potash, and is more expensive than the soda salt.

NEW LINE OF ATLANTIC STEAMERS.

The Glamorgan is the pioneer vessel of a new line of steamers about to be established between Cardiff, Wales and New York, by the South Wales Atlantic Steamship Company. The Marquis of Bute, a peer noted for his enormous wealth, has interested himself greatly in the enterprise, and has granted it very extensive concessions, among which are the remission of all dock dues in the Cardiff docks for the space of one year, and the free coaling of the steamer for a similar period at the collieries owned by him. The Glamorgan is a big rigged screw steamer, and is fitted with all the improved marine appliances. Telegraphic arrangements permit of instant communication between the captain and the helmsman, and a patent apparatus furnishes gas for the illumination of the vessel, at the rate of several thousand feet daily. The interior appointments of the ship contain every comfort and luxury, and provide accommodations for 700 passengers. Her tunnage is 2,500 tuns registered, with engines of 1,800 actual horse power.

THE discovery of coal beneath the Permian foundation in the neighborhood of Birmingham is likely to be followed by a similar discovery in the western portion of Lancashire. Mr. Edward Young, of Doughtybridge, who has surveyed and explored the district, is of opinion that there is a coal field of between 400 and 500 square miles, commencing near Southport, and extending to Liverpool one on the side and Lancaster on the other.

DESTROYING CATERPILLARS.—According to Schmidt, a remedy against caterpillars consists of 1 part of sulphide of potassium and 500 parts of water. Syringe the tree or plant with the above.

A Sensitive Water Fall.

BY PROFESSOR EDWIN J. HOUSTON.

The recent developments of acoustics have been rich in their revelation of the wide spread influence exerted by sound waves in shaping and molding matter, when in a condition to easily allow the movement of its particles. The eye as well as the ear can now be appealed to to detect the presence of these invisible waves. At their touch light sand strewn over these membranes is heaped up in miniature hills, with even greater precision and regularity than by grosser waves by the sea shore, the number and order of the hills, together with the relative size of their interlaying valleys, not only witnessing the work of the sound waves, but also indicating their exact nature and number. Water jets, gas jets, smoke jets and flames of most all gases are also under favorable circumstances likewise affected, changing their shape, size, direction and general appearance, in the most curious manner. So delicate, indeed, are some of these methods that waves, too feeble to allow of translation by the ear into sound, are instantly appreciated by the eye as motion.

There are many different ways in which sound waves can thus reveal their presence to the eye; we have sensitive waves both covered and naked, smoky and clear, silent and noisy; we have sensitive jets of gas, water and smoke, and many other instances of this kind of sensitiveness that will recur to the student of acoustics. I propose to add another, of quite a novel character, to the already lengthened list.

While spending a summer's vacation in Pike County, Pennsylvania, I had the good fortune to discover the sensitiveness of water to sound waves on a large scale. Among the many beautiful waterfalls in this portion of our State, I visited one in which a scanty supply of water was dripping from the moss covered walls of a precipice. Each stream poured from the end of a pendant of moss, formed generally of one or two tiny leaflets. The air was unusually still, and the streams preserved for some distance a vein remarkably free from ventral segments. Struck with this circumstance, it occurred to me to try the sensitiveness of these streams to the notes of the voice, and after several attempts I found a tone, a shrill falsetto, to which they would respond. On sounding this note, the grouping of the drops and the position of the ventral segments were instantly changed. As the streams were of different diameters, they were not all sensitive to the same note; but at one portion of the fall's, from which about one hundred of these thin, delicate streams were dripping, a very large number of them responded. A friend who was with me, a gentleman of nice powers of observation, noticed the same phenomena.

I was unable to determine the exact conditions of success, but am satisfied that they are not easily obtained, as at several other falls, where the streams appeared nearly of the same character, none were found that would respond to the voice, although a variety of different tones was tried. At other falls, however, a number of streams were found that were almost equal to the first in sensitiveness.

A heavy rain, which flooded the streams, prevented me from extending the observation. The publication of the facts will enable others to try the experiments for themselves.

The change in the grouping of the drops and the position of the ventral segments is, no doubt, to be ascribed to a vibration communicated by the sound waves to the delicate filaments of moss from which the water flows. These act somewhat in the manner of reeds, and simulate the orifice of the ordinary sensitive jet, by whose vibration the appearance of the issuing stream is altered.

The falls at which the observation was first made are situated on Adam's Brook, near Dingman's Ferry, about two and a half miles up stream from the stage road leading to Milford. —*Journal of the Franklin Institute.*

Economical Portable Engines.

A novel form of portable engine, built by Messrs. Davey Paxman & Co., has recently been tested at Cardiff, Wales, and, it is stated by the *Engineer*, performed admirable duty and was highly commended by the judges. The boiler is of the usual portable engine type, but improved by the addition of ten tubes, which serve to augment the fire box surface, break up and mix the gases on their way to the flues, and also promote circulation in the fire box and over its roof. The regular evaporation may be taken as over 10 pounds of water per pound of coal, as, on the occasion of the trial, the engine (8 horse power) evaporated 1,675 pounds of water with 168 pounds of coal.

There is a peculiarity about the valve gear which is worthy of notice. The ordinary slide valve, worked by an eccentric, is employed, but in the lid of the chest, *slots* are made on which works a grid valve with corresponding apertures. This valve has a throw of not more than one fourth of an inch, and is actuated by a crank on a long rod. The end of the latter is a bowl of hardened steel which takes against two cams on a sleeve on the crank shaft. A powerful coiled spring near the end of the rod pushes it forward and shuts the valve; and the sleeve on which the cams are fixed is traversed back and forward on the crank shaft by the action of the governor. When the latter is open, the narrow ends of the cam plates take the end of the rod, keeping the valve open for one tenth of the stroke; when the balls fall down, the sleeve traverses on the shaft and the bowl runs to the wide end and the valve remains open for about one half stroke. The grade of expansion is thus regulated with great precision by the governor. The gear makes no noise when at work, excepting a slight clicking sound; and, it is of great durability, as, after a months running, it showed no signs of wear, although the cam plates were only of wrought iron hardened with prussiate of potash.

The Utilization of Tide Power.

This question has been discussed lately in several quarters, and amongst others, Mr. Bramwell, in his address delivered as President of Section G of the British Association during the meeting of that body at Brighton, has directed special attention to it.

The plan which he suggests, says *Engineering* is that advantage should be taken of the natural configuration of the coast in certain places to form storage reservoirs, from which the water might be discharged at low tide, and made to work turbines, which should in their turn drive pumps employed in pumping water into hydraulic accumulators. From these accumulators the water, under a high pressure, is to be distributed to the places where it is wanted to drive machinery.

At first sight this appears to be a very plausible idea; but a more careful examination of the features of the case shows that although plausible, it is by no means promising, except under certain unusually favorable conditions. To explain this it will be as well, in the first place, to show the cost of the power producer with which the tide motors will have to compete.

We do not hesitate to say that at the present time no mill engine of any size should be consuming more than 2½ lbs. of coal per horse power per hour. We are quite aware that there are thousands of stationary engines which are consuming more than double this; but this fact does not affect the question, as tide motors, if they are to be successful, must be able to compete with engines of an economical type. Again, allowing for holidays and other stoppages, an ordinary mill engine has to run about 2,800 hours per annum, and, taking the consumption at 2½ lbs. per horse power per hour, this gives the annual consumption per horse power as 2,800×2·5 —7,000 lbs., or allowing for lighting up, etc., say 3½ tuns. The present price of coal is abnormal, and does not, therefore, form a basis for such calculations as those to which we are now directing attention; and taking into consideration the fact that tide motors, if successful, would themselves tend to produce a reduction in the price of coal, we think we shall be treating them liberally if we estimate the average cost of the coal with which they would have to compete at 16s. per ton. Taking it at this price, we should have the average cost of fuel per horse power for a really good engine—3½×16—56 shillings, or £2 16s. per annum; or for a thousand indicated horse power, an annual cost for fuel of £2,800. Besides saving fuel, the tide motor would also render unnecessary the boilers at present employed, and there is, therefore, to be placed to its credit the cost of maintenance of these boilers, the interest of the capital sunk in them, and the stokers' wages. For the thousand indicated horse power which we are taking as our example, these items would probably amount in the aggregate to about £800, thus giving, say, £2,800+800—£3,600, as about the annual sum which a mill owner would be justified in paying for a supply of water capable of developing 1,000 horse power during ordinary working hours. The cost of engine superintendence, oiling, etc., and miscellaneous charges, would probably be about the same, whether steam or hydraulic engines were used, and these matters, therefore, need not be considered here.

Let us now examine the other side of the question. The annual charges, to which an establishment for utilizing the power of the tides would be subject, would be the interest on the money expended on the works and machinery, the cost of maintenance, and the expense of superintendence, collection of rates, wages of sluicemen, etc. In the aggregate these charges could scarcely be estimated as amounting to less than 15 per cent on the capital expended, and in the case of an establishment supplying power in moderate amounts over an extended district, it would probably be even more than this. Taking, however, the annual charges as amounting to 15 per cent on the capital, and taking, also, the yearly rent which might probably be paid for a supply of water capable of developing 1,000 horse power as £3,600, we find that the capital which it would be justifiable to expend on tidal works capable of supplying that amount of power would be £24,000, a sum which, we venture to say, would in but exceedingly few instances suffice for their execution.

It must be remembered that the expenditure of say £24,000 for each 1,000 horse power which the tidal works would be capable of supplying to factories would have to include not merely the construction of the storage reservoirs with its sluices, etc., but also the cost of the turbines, pumps, hydraulic accumulations, and last—but by no means least—that of the pipes by which the water under pressure would be conveyed to the works where it could be utilized; and hence, as we have said, we believe that there are very few situations where the requisite works and plant could be provided for the sum which it would be justifiable to expend.

Surface Friction in Water.

The results of several experiments made by Professor W. Froude may be approximately stated in brief, as follows:—

1. As regards the relation of resistance to speed. With the surface coated with shellac varnish, Hay's composition, Peacock's composition, or tallow, the resistance varied very nearly as the power 1·83 of the speed; with the surface coated with tinfoil, very nearly as the power 2·05 of the speed; but the experiments with the tinfoil are not yet complete.

2. As regards the relation of resistance to quality of surface. With the surface coated with shellac varnish, Hay's composition, Peacock's composition, or tallow, the resistance differed extremely little, such variations as occurred scarcely exceeding one per cent, and being probably not greater than belonged to the small differences of smoothness in the laying on the composition.

With the surface coated with glue, and thus simulating the sliminess of a living fish, three successive experiments were tried at the same speed, so as to test the effect of the gradual growth of the slimy character. The first experiment showed an increase in resistance of two per cent, the last of four per cent, as compared with the shellac surface which the glue resembled before immersion, a proof that the attempted imitation of the fish's surface was not advantageous.

Comparing a tinfoiled surface with one coated with shellac, when the length is one *foot*, the resistance of the former is on the average only two thirds that of the latter; making the comparison with planes of 1·6 in length, the ratio is three fourths; and with planes of 16 feet, more than nine tenths, instead of two thirds; indeed, the total difference becomes progressively less as the planes compared are longer. At higher speeds also the difference tends to become less, in consequence of the higher power of the speed to which it is proportioned with the tinfoiled surface.

3. As regards the relation of resistance to length of surface. There plainly is a very considerable diminution of average resistance per square foot as the length of surface is increased, and this probably from the cause already indicated, though the rate of diminution becomes gradually less as the surface becomes longer; there is, in fact, as great a diminution between three feet and four feet of length as between 30 and 50.

Manufacture of Carbonate of Potash.

In France, carbonate of potash is manufactured from the residues of molasses after fermentation. After taking out the sugar, or as much as possible, and fermenting the uncrystallized sugar, the residuum from the fermentation (*vinasse*) is evaporated and calcined, and the different salts separated in a very complicated manner. The principal product of this manufacture in the end is carbonate of potash, an extremely valuable article; but up to some years ago it was not possible to obtain that article in sufficient purity by this process, particularly owing to the presence of the cyanides. The cyanide of potassium was in itself a most disagreeable ingredient if it was not completely destroyed, and in trying to destroy it, the result was that carbon was formed in the modification of graphite, and it was quite impossible to burn the potash sufficiently white. It had a gray color, and was not marketable, or rather only marketable at a very low price. The furnaces are calcining furnaces, and are constructed rather differently from our carbonating furnaces. The working door is exactly opposite the firehole, and the fire escapes through a flue at the top, just above the working door inside. After a certain time the salt gets to that point that it will be impossible to destroy the cyanides, so as to burn out the carbon completely, without fluxing the salt at the same time, because the carbon would be there as graphite, and it is quite impossible to burn it out at a temperature at which the carbonate of potash does not fuse. When it has arrived at that stage, the furnace man fills his furnace with a thick smoke. He then suddenly opens the working door, which is right opposite the fire, and thus burns the smoke throughout the furnace; and it appears as if by a kind of infection, perhaps by the local heat produced right through the salt itself, the cyanide is completely destroyed, and also the graphite burnt off. The product coming from this process is a most beautiful white carbonate of potash of great strength.—*Mechanics' Magazine.*

The August Meteors.

The meteoric shower of the 9th, 10th, and 11th of August last was observed at several points on the continent of Europe, and the following results were obtained: At Turin, Italy, during the first night 127 shooting stars were counted; a fine aurora also took place, lasting 13 hours. On the second night 334 meteors were noted, accompanied by an auroral light lasting three hours from midnight. The third night being cloudy, but 54 stars were observed. At Marseilles, France, 164 meteors were counted on the first night, and 170 on the second. The point from which all seemed to radiate was in the constellation *Cygnus*. A faint auroral light was remarked. At Geneva, nearly half of the stars composing the shower came from different directions. At Alexandria, Egypt, 1,167 meteors were noted on the second night, and at Barcelona, Spain, 886

M. EISENLOHR, of Heidelburg, has recently translated an ancient papyrus found in a tomb in Egypt, which he considers affords abundant proof of the verarity of the Scriptures regarding the foundation of the Mosaic dispensation. The text of the papyrus is an "allocution" of King Rameses III, concerning the important events of his reign; it recounts how a religious revolution was suppressed, which could be under no other leadership than that of Moses, and describes the series of events ending in the exodus of the Israelites. It has been known, though not on indisputable basis, for some time that Moses was contemporary with Rameses III, and it is believed that the reason his writings do not speak of the conquests of the monarch is that they took place during the wanderings in the desert.

CELERY AS A NERVINE.—A correspondent of the *Practical Farmer* says: "I have known many men and women too, who, from various causes, had become so much affected with nervousness that when they stretched out their hands they shook like aspen leaves on windy days; and by a daily moderate use of the blanched foot stalks of the celery leaves as a salad, they became as strong and steady in limbs as other people. I have known others so very nervous that the least annoyance put them in a state of agitation, who were in almost constant perplexity and fear, and who were effectually cured by a daily moderate use of blanched celery as a salad at mealtimes. I have known others cured by using celery for palpitation of the heart.

IMPROVED SAFETY GUN LOCK.

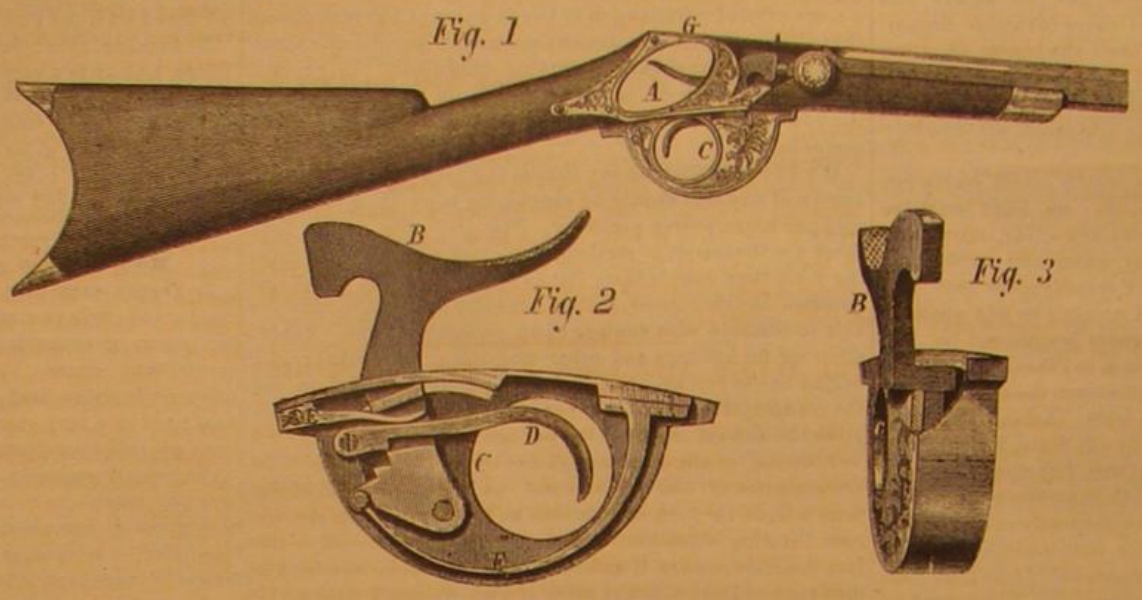
There is no more common accident among sportsmen and others having frequent occasion to use firearms than the premature discharge of the piece caused by the catching of the hammer in a part of the dress, a projecting twig or other obstacle, and its consequent lifting and snapping down upon the cap. The casual slipping of the gun from the hand, so that the shock of the fall is brought on the hammer, even if the latter be not cocked, is another prolific source of unlooked for and often dangerous explosions.

The invention below described and illustrated by the accompanying figures is especially designed to obviate such accidents, while it provides a much simplified form of lock, and, besides, insures for the stock of the piece a much lighter and more symmetrical appearance.

Fig. 1 gives a side view of the gun, showing the stock and part of the barrel. Fig. 2 affords a clear idea of the working parts of the lock. Fig. 3 represents a perspective view of the hammer contained in the trigger guard, the shape of the former being shown by the breaking away of the upper portion of its inclosure. The principal improvement is seen in Fig. 1, and consists in an opening or recess, A, cut entirely through the gun stock and metal guard, G, in which the hammer, B, moves, and is thus protected from accidental blows, etc.

The lock is situated in the forward portion of the trigger guard C, and is represented in detail in Fig. 3. D is the trigger held by the spring, E, directly against and engaging in the notches on the tumbler attached to the hammer. The gun is not impaired by the opening, A, as the metal bands of the lock guard above and below the aperture render the stock of ample strength. The nipple is made in an L form, and is constructed and placed so as to suit the shape of the hammer.

Patented through the Scientific American Patent Agency, Sept. 24, 1872. Further information may be obtained by addressing the inventor, John J. Byers, Delta, Oneida Co., N. Y.



BYERS' SAFETY GUN LOCK.

Selenitic Mortar.

At the recent meeting of the British Association, a paper was read showing the importance of the discovery of General H. Y. D. Scott, whereby a species of limestone, hitherto considered almost useless, is rendered valuable in the manufacture of cements and mortars.

General Scott was the first to observe, about sixteen years ago, that a limestone, which does not possess to any useful extent, if at all, the characters essential to its conversion by burning into a hydraulic lime, may be made to furnish a good cement by simply allowing a small proportion of sulphurous acid gas (obtained by burning sulphur or other well known methods) to pass into the kiln during the burning of the lime. The latter, when subjected to this slight modification of the ordinary kiln treatment, (instead of slaking or combining rapidly with water, with considerable evolution of heat,) undergoes only gradual hydration, unattended by any important elevation of temperature, and sets or hardens after a time, behaving, in fact, in every way like a cement of good quality, and sometimes equaling Portland cement in strength. The production of the so-called Scott's cement, by this simple modification of the lime-burning process, has been carried on to some extent for a number of years, and a medal was awarded to Colonel Scott in 1862 for its invention; but some practical difficulties attended the production of uniform results, and these appear to have retarded any very considerable adoption of this method of manufacturing cement. It was found that in lime so treated a small proportion of calcium sulphate, seldom exceeding 5 per cent and frequently below that proportion, was formed; and that an admixture of a corresponding quantity of a soluble sulphate or of sulphuric acid with the lime yielded similar results, but the difficulty of securing uniformity in the influence exerted by the sulphate upon the lime when employed in this manner upon a scale of actual practice, precluded the attainment of successful practical results. By a most simple modification in the mode of applying them, General Scott has now brought the peculiar influence which sulphuric acid or a sulphate exerts, in preventing the heating and promoting the setting and hardening of lime, to bear with perfect success and uniformity upon lime of the ordinary kind used for mortar and plastering purposes. The sulphuric acid or sulphate (which may be called the selenitizing agent) is first mixed with the water to be used in making the plaster or mortar, in the proportion corresponding to about 5 per cent of calcium sulphate upon the lime used. The lime is then added, and these ingredients are triturated together until they form a creamy paste, after which the paste is mixed with the requisite proportion of sand for the production of the quality of mortar required.

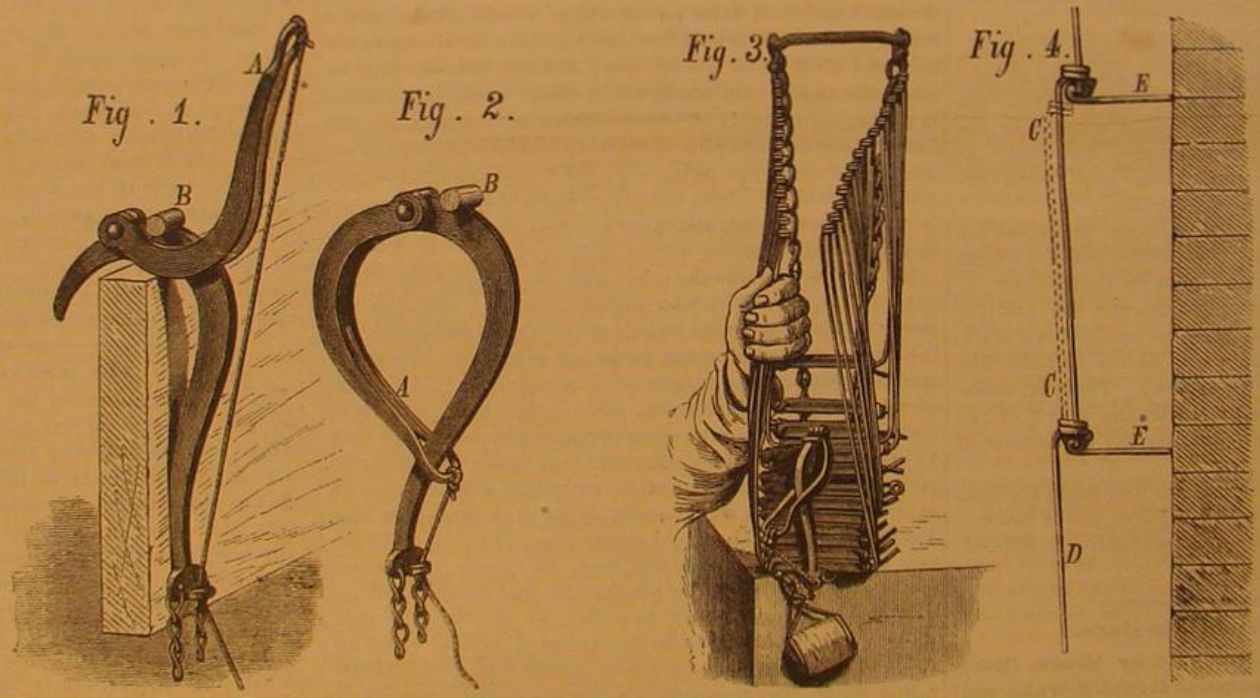
The invention is applicable to a variety of uses, but chiefly to the production of mortar for ordinary building purposes, to plaster work, and to making concrete. It is also adapted to brickmaking, and the preparation of building blocks of any size and in an ornamental form. The Messrs. Bodmer have succeeded in producing with it bricks that are almost as hard as marble, and have faces of great beauty of texture and color. According to the proportion of sand employed in the mixture either a very smooth surface, or one resembling that of a granulous freestone but very much harder, can be obtained. The Scott's cement and the selenitic mortar have been tested in a variety of ways and by different persons, as to their powers of resisting crushing forces and tensile strains and in all cases the results have been highly satisfactory.

The superior adhesion of selenitic mortar to smooth surfaces was markedly shown in experiments made in comparison with Portland cement by bedding two flooring tiles crossways. After fourteen days being allowed for setting, the resistance of the Portland cement mixed with two parts sand to one of cement was 56 lbs., the cement in most cases completely leaving one of the tiles. On the other hand the selenitic mortar gaged with five parts of sand to one of lime, when similarly tested, always broke through the joint and resisted fracturing until weighted with 158 lbs. This is not the only application in which selenitic mortar shows a superiority to Portland cement.

Selenitic mortar in ordinary dry brickwork, with four or five parts of sand and upwards, will give greater strength than Portland cement used under similar conditions.

RAFTER HOOK AND FIRE ESCAPE.

Recent ordinances passed in New York city and also, we believe, in nearly all of the larger cities in the United States, render it obligatory upon owners of hotels, tenement houses, and other buildings in which numbers of people reside, to provide adequate means for escaping from the upper stories, in case of fire. The usual appliance adopted to meet this requirement is a light balcony from which permanent iron ladders extend nearly to the ground. This mode, apart from its expense as a fixture, has the disadvantage of being available only at the point at which it is located, so that if access be cut off thereto, it is virtually useless. This difficulty is overcome in the invention illustrated herewith, which furnishes not only a cheap, but a light, portable and, it is claimed, efficient fire escape. Figs. 1 and 2 represent the hook by which the ladder used is attached to the building. This device is the subject of a separate patent and may be employed not only in the above connection, but also as a rafter hook, or, in fact, for any use in which the object is to furnish a secure support or fastening, and also to permit of instantaneous detachment of the same from the sill rafter or beam on which it hangs. Fig. 1 shows the hook attached. To it is pivoted, as shown, a slotted lever, A, which is turned up when the hook is applied to the support. In this position the lever butts against the stop, B. To detach the apparatus it is merely necessary to pull down on the cord connecting with the end of the lever. The latter is thus caused to roll with its rounded inner part on the support, gradually clearing the same of the hook, with which it finally forms a loop as in Fig. 2. Fig. 3 shows the ladder or fire escape properly folded in portable form, so as to be carried in the hand, and Fig. 4 a portion of the same extended and applied to a wall. The ladder is composed of U shaped sections made of wire or strap metal, and is so constructed that the side bars of one section embrace and are coiled around the upright side pieces of that next above. The dotted lines, C C, in Fig. 4 show the position of the bars of the section, D, when thus raised up. The same engraving also clearly represents the above described method of joining the sections together. It will be seen that, thus constructed, all the sections can slide upon each other, so as to be packed in small compass, as



RAFTER HOOK AND FIRE ESCAPE.

ORNAMENTATION OF CONCRETE WALLS.—A writer in the *Builder*, in the expectation that the use of cement or concrete is likely to become quite extensive for architectural purposes, suggests that ornamental encaustic tiles might be employed to advantage in facing concrete walls. He admits that these tiles are now partially used for the purpose, but demands their employment as the sole vehicle of exterior decoration, in a well studied artistic manner as to color and pattern, in harmony with the design and uses of the building. The idea is a good one, and we hope that architects will reflect upon it.

Scientific American.

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Contents:

(Illustrated articles are marked with an asterisk.)

MORE LIGHT.

The duplex tendency of modern science, to multiply the number of observed phenomena and at the same time to simplify our interpretation of them by bringing, into consistent and comprehensible order, facts that have seemed to be capricious, irregular and isolated, is happily shown in the latest discoveries in regard to the nature of sun light.

Hitherto the sunbeam has been thought to have a threefold character. It illuminates, warms and induces chemical changes; hence the inference has been that it must be composed of three distinct sorts of rays, interwoven like the triple strands of a cord but disentangled when subjected to the refracting influence of a lens or a prism. The evidence for this view has been very convincing. That the maximum illuminating power of the solar beam lies in the yellow portion of the spectrum is patent to every observer. Sir William Herschel found, by careful thermometric study of the spectrum formed with a prism of glass, a very unequal distribution of heating rays: there are very few in the violet end, from which point they increase slowly through the blue, green and yellow, very rapidly in the red, and attain their maximum manifestation in the invisible portion of the spectrum below the red. Dr. Wollaston, experimenting with the sensitive salts of silver, developed a similar inequality in the distribution of the so-called chemical rays, their intensest influence appearing in the violet and ultra-violet portion of the spectrum. From these and a multitude of later observations, telling substantially the same story, the supposed threefold character of the solar emanations has come to be a generally accepted article of scientific belief. Now, however, it appears that, while the observations were correct, the inference drawn from them was a mistake. Nearly thirty years ago, Dr. Draper called attention to an inherent defect in the prismatic spectrum, a defect originating in the very cause which gives rise to the spectrum, namely, unequal refrangibility. The rays toward the violet end are much more widely separated than those of the red end, and consequently a smaller number fall upon any given surface—as for example the bulb of a thermometer—and produce proportionately a smaller thermic effect. The fact, therefore, that the temperature of the violet portion of the spectrum is lower than that of the red does not prove absolutely that a violet ray has a lower heating power than a red ray, though it would seem so at first sight; the observed inequality may, and as experiment shows, does, arise wholly from the nature of the prism.

By an elaborate series of experiments, Dr. Draper has just shown that, if the visible spectrum be divided into two equal portions and all the more refrangible rays be collected into one focal group, and all the less refrangible into another, the heat-producing powers of the two are practically equal, instead of being strikingly unequal as they would be if the current belief were correct. He chooses, as the optical center of the visible spectrum, the ray having a wave length of 5768—the mean between the wave lengths of the less and more refrangible ends—and proves the portions on either side to have heating powers "so nearly equal that we may impute the difference to errors of experimentation." This demolishes the opinion that there exists in the solar spectrum a heat spectrum covering the less refrangible regions. Does the belief in a chemical spectrum in the more refrangible regions also stand on untenable ground?

Dr. Draper promises to publish soon the result of his studies in regard to the actinic power of the sunbeam. From intimations already given, we may infer that he will demonstrate the chemical power of rays of every kind, whether of low or high refrangibility, and thus bring this property of the sunbeam, as he does its heating power, into perfect harmony with the modern doctrine of the conservation and transmutation of motion.

The same result, we may add, has been arrived at by the European observer, Professor Lommel, who remarks, in a recent paper, that the curve of so-called chemical intensity only indicates the relation of the sun rays to certain reagents. Different substances absorb different rays, and chemical action, like light and heat, arises solely from such absorption. The fact that the violet and ultra-violet rays act with special force on the salts of silver is no reason for distinguishing them as *the* chemical rays. Other substances are chemically affected by entirely different *rays*, as for instance the coloring matter of plant leaves, chlorophyll, which is acted *on* chiefly by red light.

It is worthy of notice that, while these important discoveries materially modify scientific opinion, the change is—like all scientific progress—toward a simpler expression of knowledge; the supposed existence of various principles in the solar emanation disappears to give place to a view in harmony with the widest generalization yet made by man, namely, that there is neither heat, light, nor chemical action in the sun ray, but simply motion, which develops any or all of these manifestations according to the nature of the absorbing substance.

THE FRENCH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The well filled pages of the French scientific journals indicate that the many industries of France are rapidly recovering from the disastrous effects of the late war. Not only is this apparent, but the popular belief is becoming strengthened: that, by the advancement and diffusion of scientific knowledge, by the cultivation of a scientific mode of thought and study, and by the union of those learned in theory with others equally skilled in practice, the regeneration of the country may be greatly promoted.

A body has lately been organized on the above principles, termed the "French Association for the Advancement of Science," the first meeting of which has recently been held in Bordeaux. The *séance* was in every way successful, not only numbering among those attendant the names of many distinguished Frenchmen, but also those of Messrs. Gladstone of England, Respighi of Italy, Soret of Switzerland, and others whose celebrity is world-wide. At its commencement, the society has 800 members, a capital of 150 000 francs and a revenue of 16,000 francs per annum. M Quatrefages was elected President, and M. Wurtz, Vice-President, for the ensuing meeting to be held at Lyons in 1873.

A NOVEL NEWS BULLETIN.

Madison Square in this city, at the intersection of Broadway, Fifth Avenue and Twenty-third Street, is one of our most central and notable places. Vehicles and pedestrians converge here from various directions, the square is splendidly illuminated by the new oxygen lights at night, and the locality presents at all times a scene of activity and life. The streets here form a narrow triangle, the sharp apex whereof, covered with a group of small buildings, points directly into the open square. Upon the extreme point of the angle, a diminutive hood or lighthouse has been placed, within which an oxyhydrogen or calcium light and a magic lantern are used to throw pictures, at night, upon a canvas screen, perhaps twenty-five feet high, which is hung from a frame arranged on the roof of the adjoining buildings. The canvas stands in full view from all parts of the neighboring square, and the apparatus is employed in the evening for the exhibition of illuminated advertisements of all sorts. The advertisements are photographed upon glass, and, on being introduced within the lantern, are brought out upon the screen in large characters and beautiful colors. Well executed photographic pictures are also thrown up by way of variety, and the exhibition attracts crowds of people.

On the evening of the recent elections, this magic lantern apparatus and screen was put to use as a news bulletin for the New York *Times* newspaper. As fast as the telegrams of the election returns were received at the telegraph office, which is just across the street, they were written off with India ink on transparent pieces of gelatin, placed in the lantern, and instantly shown upon the screen in huge characters, to the delight of the waiting multitude below. The whole square was thronged with people, who made the welkin ring with their shouts whenever the telegrams particularly pleased them. The lighthouse man would then introduce the *figure of* a huge negro, in scarlet coat, sitting on a stump and laughing as if his sides would split, or some other amusing thing, the appearance of which on the canvas would be greeted with roars of laughter. It is probable that ten or twenty thousand persons were present, all of whom enjoyed a fair view and easy reading of this truly novel, conspicuous, and admirable news bulletin.

PROFESSOR JOHN TYNDALL.

It is with especial pleasure that we announce the arrival in New York of this distinguished scientist, who visits our shores for lecturing purposes, observation, and recreation. His lectures will illustrate the latest researches upon Light, and will command marked attention. He is one of the most clear and interesting speakers, and possesses the happy faculty of making every part of the science which he takes in hand thoroughly understood by his hearers. *It is stated* that he will commence his series of lectures in Boston, returning to New York some time in December. He has been invited to meet the members of the Lyceum of Natural History, in this city, and other societies, before going to Massachusetts. On his arrival here he was welcomed at the wharf by Mr. Hector Tyndall, of Philadelphia, a near relative. In his personal appearance, according to the daily papers, Professor Tyndall is small in stature, of spare face, has bright gray eyes, and a short iron gray beard, wears spectacles, and dresses in black.

AMERICAN STERLING—A NEW AND REMARKABLE ALLOY.

A company has been recently formed here for the introduction of a new alloy, termed "American sterling." The composition is as yet unpatented and its proportions are consequently secret, but results, drawn from a series of careful tests and experiments, point plainly to the fact that the new metal is not only a discovery of great importance, but to all appearances calculated to revolutionize a large and flourishing branch of industry.

In its crude state, this new alloy resembles nickel; but after being worked up, it is almost undistinguishable from silver. Unlike the latter metal, it does not tarnish and is unaffected by sulphurous vapors, so that it is eminently adapted to replace silver, Britannia or the ordinary alloys in the manufacture of table ware. Articles of food have no action upon it; alkalies produce a temporary tarnishing which may be immediately removed by a slight rubbing with the hand. Made in the form of cutlery, the alloy possesses none of the disadvantages of steel or plate; it takes a keen cutting edge, requires little or no cleaning, and is unaffected by ordinary organic acids. Knives made from it show no black edges after short usage as is the case with plate, while they can be ground or sharpened whenever necessary. The metal is unusually flexible and tenacious; a table fork made from it was, in our presence, twisted into a perfect knot, without showing the least flaw or intimation of breakage.

In the manufacture of hollow ware, there is little doubt but that, when this composition becomes widely known, it will prove a formidable rival to, if it does not entirely supplant, German silver and its kindred alloys. It is not only harder but one third lighter than Britannia metal, while its cost is about one half that of plated ware. Although the articles made from the solid sterling present an appearance equal to fine silver, the alloy may, when required, be used as a basis for electro-plating, the smoothness and evenness of its surface rendering it possible to give the deposited silver a much higher finish than can be imparted to ordinary plate. As the silver wears away in course of time, the sterling, being of the same color, gives no evidence of the fact, so that the unsightly brassy edges and backs common to long used plated table ware are entirely obviated.

The effect of hammering or compression on this composition is to give it an increased elasticity. Its strength is so great that it can be, and has been, substituted for steel in the manufacture of pistol barrels, while repeated tests, made at the Colt Armory, at Hartford, Conn., show that it has three times the tenacity of the latter metal. At an experimental trial, a spring of steel wire parted at 3,000 pulls; 82,000 pulls were necessary to break a precisely similar wire of sterling.

The American Sterling Company, Leavitt Hunt, Esq., President, by whom this metal is manufactured, has its offices at Nos. 1 and 3 Dey street, in this city. Among its directors are many gentlemen well known as of long experience in the silverware trade. The works are located at Naubuc, near Hartford, Conn., and consist of substantially built brick buildings, 500 feet long and 50 feet wide. About 120 hands are employed, and some $100,000 worth of tools of every description are in use. A late visit to this interesting factory enabled us to witness the manufacture of the composition and its subsequent transmutation into finished table ware. Five melting furnaces are used, and about 2,000 pounds of alloy are daily finished. The crucibles used contain 150 pounds each of the metal, which, after melting, is run into ingots about two feet and a half in length. In this condition it is largely sold to spoon and fork manufacturers, throughout the country, at the price of one dollar per pound. The annealing of the ingots is accomplished in a furnace of novel pattern. The bars are placed on a low, wide chamber, below which is a large wood fire. The grate is surmounted by a fire brick arch. The upper chamber has a flat floor, and is also arched above. The heat passes through openings at the side of the fire space, up outside of the same, and then enters the annealing chamber through apertures in its side. In this furnace, which is some twelve feet in length, an entire days' melting can be annealed in two hours.

The rolling mills and subsequent processes for reducing the metal to the requisite degree of tenuity are of the ordinary well known descriptions. At the time of our visit, the factory was engaged upon the manufacture of spoons and forks exclusively, although abundant machinery was at hand for the manufacture of the most elaborate table services. Several specimens of the latter, experimental pieces in the shape of elegantly made and designed ice pitchers, salvers, etc., were shown to us, from which we were able to obtain an excellent idea of the perfect adaptability of the material to the purpose.

With the process of manufacturing spoons and forks by means of suitable dies in drop presses, our readers are doubtless familiar. We have therefore only to add that the alloy is worked by this means as readily as pure silver, and much more easily than the ordinary German or nickel silver. But here an important advantage must be noted. In using the last mentioned material, at least three gross, out of every ten, of forks or spoons are spoiled—that is, owing to the brittleness of the metal, they become cracked under the powerful

blow of the drop, and are consequently thrown into the scrap heap. With sterling, none are wasted, for the extreme tenacity of the alloy allows it to be bent into any shape, however intricate, without the slightest deterioration. Polishing is effected by grinding, burnishing and afterwards buffing, leaving the work perfectly brilliant and lustrous. From sixty to eighty gross of spoons and forks are made at the above mentioned works weekly, meeting, as we understand, with a ready market.

For articles subject to the oxidizing influence of the atmosphere, such as harness trimming, reflectors for locomotive lamps, badges, etc., this metal is especially appropriate. In fact, the number of uses to which it may be put in the future seems unlimited, for it appears equally adapted to be made into twenty inch cannon or ladies' jewelry. It can be cast in molds, or wrought, while its remarkable strength, combined with its flexibility, renders its durability unquestionable.

THE WHISTLING LANTERN---WHO IS THE REAL INVENTOR?

In the SCIENTIFIC AMERICAN of May 25th 1872, we published an interesting account of a "New Sensitive Singing Flame," being a communication from Professor W. E. Geyer, of the Stevens Institute of Technology, to the *American Journal of Science*. In that communication, Professor Geyer describes his experiment as an improvement upon the well known singing flame of Philip Barry, which latter is produced by placing a piece of ordinary wire gauze on the ring of a retort stand, about four inches above the burner, and lighting the gas above the gauze. At the least noise, this flame roars and sinks down, and acts in a very curious manner. Professor Geyer stated that his improvement consisted in simply covering Barry's flame with a moderately large tube, resting loosely on the gauze. "A luminous flame," he says, "six to eight inches long is thus obtained, which is very sensitive, especially to high and sharp sounds. If now the gauze and tube be raised, the flame gradually shortens and appears less luminous, until at last it becomes violently agitated, and sings with a loud uniform tone, which may be maintained for any length of time. Under these conditions, external sounds have no effect upon it. The sensitive musical flame is produced by lowering the gauze until the singing just ceases. It is in this position that the flame is most remarkable. At the slightest sharp sound, it instantly sings, continuing to do so as long as the disturbing cause exists, but stopping at once with it. So quick are the responses that, by rapping the time of a tune, or whistling or playing it, provided the tones are high enough, the flame faithfully sounds at every note. By slightly raising or lowering the jet, the flame can be made less or more sensitive, so that a hiss in any part of the room, the rattling of keys, even in the pocket, turning on the water at the hydrant, folding up a piece of paper, or even moving the hand over the table, will excite the sound. On pronouncing the word 'sensitive,' it sings twice; and in general, it will interrupt the speaker at almost every 's' or other hissing sound."

So much for the discovery of Professor Geyer, which is certainly very interesting.

On September 10th, 1872, under the title of "The Whistling Lantern, a new Safety Lamp for Miners," we gave the substance of a paper, read in August last, by Dr. A. K. Irvine, of Glasgow, Scotland, before the Iron and Steel Institute, in which, before reaching the description of the constitution of his lantern, he describes the general principle on which it operates. He stated that, "when a mixture of any inflammable gas or vapor with air in explosive proportions passes through and is ignited upon the surface of a disk of wire gauze of such mesh as to prevent the passage of flame, and a suitable tube or chimney is placed above and surrounds, at its lower end, the disk, preventing the admission to the chimney except through the wire gauze, a musical sound is produced, varying in pitch, etc., with the size of flame and dimensions of the chimney. In this, as in other flames singing in tubes, the sound is caused by the vibration of the flame, determined or intensified by the current up the chimney, and communicated to the column of air or gaseous fluid within the chimney, whose length commands and times the rapidity of the vibrations so as to produce a given note, just as the flutter of the air originating at the *embouchure* of an organ pipe is commanded by the length of the pipe."

It will be observed that the formation and operation of this flame is substantially the same as in the experiment of Professor Geyer.

After some further observations upon other sensitive flames, Dr. Irvine goes on to describe some of the *practical uses* to which he had applied the improved flame. He had made lamps, he said, "for giving light, which, while the atmosphere is not contaminated by fire damp or ether inflammable gas, burn in the usual way, but which, as soon as such a gas mixed with air in explosive proportions enters it, appeals to the ear by a loud musical sound, as well as to the eye by its effects on the appearance of the flame in the lamp—just as in the Davy. In one form of the lamp, which is more particularly adapted for the use of the viewer, the air is made to enter near the top of the lamp, obviating the necessity of turning the lamp on its side, as is frequently necessary with the Davy when but a thin layer of the fire damp is floating at the ceiling of the mine. In another form, the lamp is adapted to the use of the working miner, and a superior light is obtained by the use of paraffin oil. In a third form, specially constructed with the object of being a warning apparatus as well as a stationary light, the sound is given forth when an atmosphere of gas and air under the explosive point enters it. Another application of this singing flame was its use as a *fog horn*, which, on account of its portability, simplicity, and cheapness, might take the place of a costly apparatus, and would be highly suitable for railway junctions or other situations of danger. *All the above apparatus were made to sound during the reading of the paper*, and elicited much applause."

The *Gas Light Journal* states that this discovery will, in consequence of the wide circulation of the SCIENTIFIC AMERICAN, be sown broadcast over the civilized world; and our contemporary is fearful that Dr. Irvine will receive the exclusive credit, which, it thinks, would be an injustice on our part towards Professor Geyer: which is very strange reasoning. But the fears of our contemporary, we think, are groundless.

The position of the SCIENTIFIC AMERICAN in respect to the new discovery is, simply, that it has published the accounts of the new flame, as given by the authors themselves, from which it appears that the priority in date of Professor Geyer's publication is a matter of record.

In regard to the application of the discovery to practical purposes, the credit thereof appears to belong alone to Dr. Irvine, who has adapted it to the use of miners, in the form of a paraffin oil lantern, and has brought it out in several other practical forms, such as fog horns, ship signals, railway junction alarms, etc. In Professor Geyer's paper, no allusion is made to the practical uses of the flame, nor does it appear from that document that he had ever tried to produce it except within loose tubes, for experimental purposes.

SOUP AND SAVANTS.

The old and familiar proverb "Too many cooks spoil the broth" will have to be amended by substituting for the word "cooks" the word "doctors;" at least, so it would seem from the accounts which come to us through some of our transatlantic exchanges. All our readers of course know of Liebig's world-renowned process of procuring the extract of meat. This extract has become an article of great and constantly growing importance. By means of this process, it has been made possible to bring (to countries where, owing to dense population and other causes, meats are scarce and dear) a large portion of the most nutritious qualities, in a concentrated form, of the meat of cattle slaughtered in countries where there is such abundance of it that has not heretofore been worth saving, the cattle being destroyed for their hides and tallow alone. An engineer named Gilbert, under the advice and counsel of Liebig, prepared this extract in South America, whence it was imported to Munich, where it was not allowed to go in the market until subjected to the scrutiny of the eminent chemist who was the inventor of it. Under this careful management, it acquired a great celebrity, was much recommended by the highest authorities, and it was liked and believed in by the people who used it. The soup or broth prepared from this extract was found to be not only harmless, but nutritious and palatable both for the sick and the well.

But among other enterprising savants, one Dr. Müller, perhaps actuated by motives such as occasionally influence some of our savants on this side of the water, has been drawing certain inferences from certain experiments which he has been making, which, if he is to be believed, ought to lead every person who has a due regard for his inner man to utterly discard broth, now, henceforth, and for ever. It has no nutritive qualities, says he. It is only an excitant, and its exciting qualities are due to certain salts of potash to be found in it. One of the experiments given, performed by M. Kemmerich, seems to be conclusive that horse beef broth in large quantities is not good for rabbits. The extract from a pound of horse beef, injected into a rabbit's stomach, killed the creature.

But without going into these experiments, or commenting further upon the subject, we hold, as an "opinion as is an opinion," that the people will continue to eat broth, no matter how many doctors try to spoil it.

LEATHER BELTING---FACTS FOR THE DETERMINATION OF THE QUALITY OF THE LEATHER.

Mr. W. Eitner, a technical chemist at Prague, Bohemia, has communicated to the German press a very elaborate investigation of the above subject, interesting to every mechanic and engineer, of which we translate the following summary:

The author commences by saying that the value of a belt depends mostly upon the quality of the material, and not upon the manner of its manufacture; but it is by no means easy to judge of the quality of the leather, owing to the fact that its appearance varies according to the manner of its preparation. Moreover, although certain kinds may be a criterion by which we can form an opinion on others, all kinds cannot be judged of in this way, as inferior leather may be made to look like leather of good quality. The quality, therefore, cannot be determined by the outward appearance, because a good looking surface is easily made to hide a defective tanning, which can always be recognized by making a vertical cut with a sharp knife.

Belt leather may be divided into two classes, according to the manner of its manufacture: 1. Leather tanned with concentrated tan bark extracts. 2. Leather which, after having been superficially treated with such extracts, has been finally tanned in the old manner (in tan pits). The first method, termed sweet tanning, may be called tanning in the quick way, as it is completed in from three to four months; while the second method, termed sour tanning, requires eight, twelve or sixteen months, according to the thickness of the hide. These figures refer only to belt leather; other kinds of leather require different periods of time. The sweet tanned leather appears on the cut surface as a homogeneous mass, presenting no variety of parts or structure. When viewed with a magnifying glass, it may be seen that it is formed of exceedingly fine fibers similar to the cut edge of felt. Cutting the surface of sour tanned leather, however, reveals two different characteristics. Between the fibers, which are of a bright color, there is a dark, somewhat brilliant ground mass, which appears granular; the larger and darker this part is, the better the leather. This texture is the sign of excellent leather, which is solid, compact and elastic, and also possesses a certain degree of pliancy and flexibility, which are required in belt leather. If, from such leather, a round piece be cut out, well hammered and placed again upon the hole, it should, if it does not exactly fit into it, not have become perceptibly larger; this is a sign of its compactness and elasticity, which are only found in very well tanned products. Leather of this kind can be readily cut, requiring not more force than is necessary for cutting bread two days old; the direction in which it was cut should not be recognizable. When perfectly tanned by the sour process, or when tanned solely with extracts, there are always fine fibers, which lay in the direction of the cut (similarly to the fibers of cloth); these give on cutting a surface bright and brilliant in appearance; on the other side, the leather appears darker and dull, and permits us better to recognize the texture. This appearance is due to the prevalence of the fiber and the less quantity of the granular matter, which imparts to the leather greater solidity, density and resistance to exterior influences.

If it is generally advantageous to employ sour tanned leather for belts, it is especially so for belts for heavy machinery, or for belts to be used in damp places. They possess the very desirable property of non-expansion; they need not to be stretched, they do not tear, and they are very durable. We are far from asserting that bands made from sweet tanned leather are good for nothing; on the contrary, they are advantageously used for light straps, and they can be made of double thickness if used in place of a single sour tanned belt. Besides these two principal kinds of leather for belts, there are several medium kinds, produced by combining the two methods, etc. Leather tanned with extracts can be made to somewhat resemble sour tanned, and leather tanned with bark can be made to resemble the sweet tanned product. However, no kind of leather can be termed good if not thoroughly tanned, and its value is determined by the completeness of this operation. For this reason, its easy recognition is of great importance. Mr. Eitner describes a means by which it may be readily and with certainty ascertained whether a certain kind of leather has been properly tanned or not. The method is based upon the fact that the glutinous tissue is swelled by acids, whereby the fiber increases considerably in volume, being converted into a glutinous and transparent mass. This change does not take place if the tissue is completely impregnated with the tanning material; but, if the glutinous substance is only superficially coated with tannin (whereby, however, the leather attains the appearance of being well tanned), the said substance would invariably be converted by the acid into thick, transparent and glutinous fiber; and this change will take place with more or less rapidity according as the material has been less or more tanned. If a strip of properly tanned leather half an inch thick is placed in a glass test tube containing strong acetic acid, no change will be visible upon its cut surface, except that it will grow somewhat darker, as every substance does when wet; but the texture will remain unaltered. It is quite different with an imperfectly tanned product, in which the slightest defects manifest themselves in such a manner as to be recognizable at once, especially as the surface is magnified by the round shape of the test tube. In acetic acid, the imperfectly tanned parts grow first darker the glutinous tissue swells and is altered in the manner described; at the two edges, too dark, non-transparent stripes may be recognized. These are properly tanned leather. If the tanning is partial, some swelling takes place, if not momentarily, in the course of twenty-four hours.

As a material for tanning hides, young oak bark is best. Leather tanned with such bark is distinguished by a light brown color, and a dark brown surface where cut. Leather prepared with pine bark always exhibits on being cut a light reddish brown color, and is rarely perfectly tanned, owing to the fact that pine bark contains less tannin than oak bark. By using oak bark, six, twelve, or eighteen months are required to thoroughly tan a hide, and twice the time is required in using pine bark; and as hides are never left in the pit for so long a time, leather tanned with pine bark is always more or less imperfect. Leather tanned with valonia is easily recognizable by its dull, grayish brown, sometimes olive brown, color. Such leather is always brittle at first, and becomes more so in time. Leather prepared with extracts, of which hemlock extract (from the *pinus canadensis*) is mostly used, shows always a dark color, with a tinge of red.

Germany and Belgium produce the best belts. Belgian bands even surpass German bands, as, in the dressing, French elegance is combined with the thoroughness of German tanning. French factories produce also very good belts; but, although they are always well dressed, they are not always thoroughly tanned. Austria furnishes a medium product. English belts are highly esteemed and are vastly superior to American goods, which must be classed with medium German leather. America exports large quantities of leather to Europe, where it is manufactured into belts, which are mostly sold as English goods. In tests undertaken for the purpose of ascertaining the tensile strength of different belts, made in the presence of Mr. Eitner, it was found that those from Belgium and Germany ranked first; English belts of the most renowned establishments were greatly inferior, but still better than American belts.

A MECHANICAL EYE.

No mechanic can ever attain distinction unless he is able to detect ordinary imperfections at sight, so that he can see if things are out of plumb, out of level, out of square, and out of proper shape; and unless he can also detect disproportioned or ill shaped patterns. This is a great mechanical attainment. I say attainment, because it can be attained by any ordinary person. Of course there are defective eyes as there are other defective organs; the speech, for instance, is sometimes defective, but the eye is susceptible of the same training as any other organ. The muscles, the voice, the sense of hearing, all require training. Consider how the artist must train the organ of sight in order to detect the slightest imperfection in shade, color, proportion, shape, expression, etc. Not one blacksmith in five ever attains the art of hammering square; yet it is very essential in his occupation. It is simply because he allows himself to get into a careless habit; a little training and care is all that is necessary for success.

The fact is that the eye is not half as much at fault as the heedless mind. Some carpenters acquire the careless habit of using a try square every time they plane off a shaving, in place of giving their minds right to their business and properly training their eyes; and unless they cultivate this power of the eye, they will always be at journey work. Look at the well trained blacksmith; he goes across the shop, picks up the horse's foot, takes a squint, returns to his anvil, forges the shoe, and it exactly fits the foot. Contrast him with the bungler who looks at the foot, then forges a shoe, then fits the foot to it, often to the ruin of a fine horse. Now the fault lies in ever allowing himself to put a shoe on that is not in proper shape for the foot; he should determine to make the shoe fit the foot in place of the foot fitting the shoe, and he should follow it up until the object is accomplished.

A very good way to discipline the mechanical eye is to first measure an inch with the eye, then prove it with the rule, then measure a half inch, then an eighth, and so on, and you will be soon able to discover at a glance the difference between a twelfth and a sixteenth of an inch; then go to 3 inches, 6, 12, and so on. Some call this guessing; there is no guess work about it; it is measuring with the eye and mind. Acquire the habit of criticising for imperfections every piece of work that you see, do everything as nearly as you can without measuring (or spoiling it), or as nearly as you can trust the eye with its present training. If you cannot see things mechanically, do not blame the eye for it; it is no more to blame than the mouth is because we cannot read, or the fingers because we cannot write. A person may write a very good hand with the eyes closed, the mind, of course directing the fingers. The eye is necessary, however, to detect imperfections.

Every occupation in life requires a mechanically trained eye, and we should realize, more than we do, the great importance of properly training that organ. J. E. E.

Trade Marks.

Every person, or firm, doing business, no matter of what kind or nature, so long as it is honorable, should have a trade mark. It serves as an advertisement, and the first mere nominal cost is a trifle, and yet in a year's business the same amount of advertising would cost hundreds of dollars. The trade mark is a distinction that cannot be imitated, as the law protects it. Americans who excel in the manufacture of certain classes of goods, and place their goods in European markets, soon discover that they are not only in competition with the best makers of the same line of goods, but find that their trade mark protects them from imitation and counterfeit. Ingenuity can be called into exercise by the use of trade marks. Some use an almost indescribable monogram; others are eccentric or unique ones, but the most appropriate is the concentration of aptitude in the especial business in which parties are engaged. If a pyrotechnist, he would not use for a trade mark a fire engine engaged in putting out the flames of a building. There should be an eternal fitness of things. There are many people engaged in the same business, yet it would not be at all difficult to have an especial originality in their designs. Let manufacturers put a trade mark upon all their productions, and let dealers do the same to all the wares they send out. It is a protection to the former, and of vast business benefit to the other.

[The above from Gear's *Mechanical Advocate* is good advice. Manufacturers in this country, as a class, do not sufficiently appreciate the advantage of adopting some emblem appropriate to their business and securing it to themselves by registering it as a trade mark. The expense is small, compared with the advantages of such protection. In England, many manufacturers are very particular to register their trade marks, and a great number of them whose goods are sold in the United States register them here also. Parties at home or abroad can receive full instructions as to securing trade marks by addressing the publishers of this paper.—EDS.]

Design Patents to Foreigners.

Strenuous effort was made at the last session of Congress by some of our largest carpet manufacturers to get the law repealed which allows foreigners to take patents on designs in this country. Since the law was enacted permitting foreigners to secure their designs by letters patent, carpet manufacturers in England have availed themselves of the privilege to a great extent, and they have paid considerable money into the Patent Office for fees. In several weeks, hundreds of dollars have passed into the Treasury through this office alone.

Manufacturers here, who have so long found it less expensive and more convenient to adopt the new designs of foreign manufacturers than to employ native designers, are greatly disturbed because they can no longer practice the course formerly pursued by them. We hope Congress will refuse to repeal the law, but strenuous effort will be again made to accomplish it. Foreign manufacturers will do well to consider the probabilities, and such as would make sure of protection will lose no time in seeking it.

A pamphlet containing the law and full particulars as to patenting designs may be had at the office of this paper.

THE FAIR OF THE AMERICAN INSTITUTE.

The Fair is now in the full tide of success. Not only during the evening but throughout the entire day, throngs of visitors fill the building. Articles are still slowly coming in, but the general prediction of an increase in the number of entries over that of last year is, in our opinion, not likely to be fulfilled. The fact, however, can be explained, first, by the excitement attending the elections, which has diverted popular attention to other channels, and, second, by the unusually large fairs of Cincinnati and Louisville, to which many objects have been contributed which otherwise would have found their way to New York. Still the exhibition is highly creditable, and it is certain that there is no place of amusement in the city where an evening, a day, or even a week, may be more pleasantly and profitably spent.

The latest novelty that has been added to the machinery department since our last visit is an excellently designed and compact 3 horse power steam engine, from the Vulcan Manufacturing Company, of Fishkill, N. Y. The cylinder is vertical, and piston valves are employed. The principal point of advantage in the invention is an ingenious automatic arrangement whereby the governor, in event of the belt breaking, is caused by the action of a spiral spring to turn back in such a manner as to close the valve and so instantly to stop the engine.

For the present, and until other new inventions are added, we now leave the department of machinery, to which our notes heretofore have been exclusively devoted, and proceed to extend our rambles through other portions of the exhibition. A word of acknowledgment of our indebtedness for much kindness and courtesy is due to Mr. R. H. Buel, the superintendent of machinery. This gentleman, in his administration of the affairs of his department, is performing a disagreeable task in a most agreeable manner, and is winning well earned praises even from that unhappy class of exhibitors who invariably send their goods to the Fair and as invariably find cause to become indignant over imaginary ill treatment—after the exhibition has concluded.

THE DEPARTMENT OF THE DWELLING

is, to the general visitor, perhaps the most interesting portion of the display. Each year brings a host of new inventions, most of which are calculated to lessen the drudgery of household labor and render "women's work" easier to perform. One of the first articles that attracts our attention is a steam coffee roaster. A tin boiler, of about a foot in length and two or three inches in width, supplies steam to a toy oscillating engine, which turns a wire gauze cylinder in which the berries are placed. It is only necessary to set the machine in motion and leave it to itself until the coffee is roasted. The idea is an ingenious one, and probably an initiatory step to the introduction of steam power for the accomplishment of ordinary household duties; but then it seems to us that the apparatus in question is a shade beyond the intellectual capacity of the general type of Milesian handmaid. Near by is another article for culinary use which is an application of an old principle, and which should have been introduced long ago. It is termed

WARREN'S COOKER,

and consists essentially of two pots placed one within the other, the space between being filled with water. The substance to be cooked is placed in the inner pot and covered tightly, while the water in the outer vessel is caused to boil, when the apparatus is removed from the fire or set back on the range. The vessel containing the water, being hermetically closed, retains the warmth, so that the cooking process continues even after the source of heat is removed. It is stated that articles thus prepared lose none of their natural juices, and are better and more economically cooked than by any other method. For laborers, factory hands and others who generally have to carry their dinner to their work with them, eating that meal cold, the apparatus, we think, may be modified so as to be of considerable value. A small size of interior kettle will hold the meat, vegetables, etc., required for the meal, and the water in the outer vessel may be heated before leaving for work in the morning. Then the entire arrangement may be placed in a wooden box of convenient shape lined with boiler covering or other non-conductor of heat and tightly closed. No more attention is necessary until noon, when, on opening the pot, the dinner will be found excellently cooked and smoking hot. In

WASHING MACHINES,

we note none of especial novelty at present. The porcelain wash tubs exhibited last year are again presented, but we think that the similar conveniences of slate from the Penrhyn Slate Company are in every respect as well adapted for the purpose, while they are far less expensive.

NELSON'S GLASS DECORATIONS,

designed for application to walls, ceilings, etc., are worthy of a word of commendation. Ordinary sheet glass is painted in imitation of marble, wood, or in variegated patterns, and then firmly cemented to the plastering. The effect is very rich, the high polish of the material giving the appearance of elaborate finish.

DURAND'S SILVERED MIRRORS

are remarkably handsome and well worth examination. We notice one large specimen in particular, composed of a single plate of heavy glass surrounded by an exquisite border of filigree work in silver and gilding.

Slate mantels, from the various firms engaged in the manufacture, are displayed in every style. These have been so largely introduced into modern dwellings that we need make no special comment regarding them. The

MATTRESSES

are almost all variations on the well known and excellent network of wire, the points of difference lying in the arrangement of springs, etc. There is one novelty among these: a system of making both pillows and mattresses of bent springs distended by spiral coils of heavy wire. As usual, the inevitable bed to be presented to the President of the United States is on hand. As a matter of curiosity, we should like to be informed when that donation is to take place, as to our certain knowledge the same, or a very similar couch, has been on exhibition under the placard for two previous Fairs.

Messrs. J. and R. Lamb, although they have almost a monopoly in the manufacture of church decorations and furniture, exhibit such excellent work that we cannot refrain from giving it a word of praise. Similar credit is due to Messrs. Mitchell, Vance & Co. for a display of superb designs in gas fixtures, bronzes, and chandeliers. There is an ingenious little invention, attracting considerable attention in this portion of the building, known as Batchelder's

ELECTRIC TORCH,

which consists of two disks of hard rubber and leather which, when rubbed together, generate sufficient electricity to give a spark in the interior of a bell-shaped end of a long bent arm. In shape, the device resembles an ordinary spirit lamp gas lighter, the curve in the arm permitting it to be used while the globe on the fixture is in place. Another similar apparatus is exhibited, made with disks as above, which are attached directly to the burner, instead of being portable.

Passing out of the department of the dwelling and on to the main floor of the hall, we stop before a case of articles made by a process that is rapidly superseding the more expensive, though perhaps more artistic, method of carving in wood by hand. The work is made of

COMPRESSED WOOD.

Ordinary carpenter's shavings are pasted together at the edges in sheets, which are again attached together in layers of fourteen thicknesses. The board thus made is placed between brass dies and subjected to the action of a powerful hydraulic press which forces the wood into the matrices, molding it into the required form. The piece is then removed in the shape of a thin veneer, and is backed by ordinary material cut to the proper size. As the shavings of any kind of wood may be employed, it is evident that the most valued and elaborate carvings may be imitated.

On the right hand side of the hall are a number of tables and shelves covered with a remarkably fine display of the

PRODUCTS OF THE LAND DEPARTMENT OF THE NORTHERN PACIFIC RAILROAD,

including fruits, cereals, vegetables, and minerals. The vegetables are exceptionally large and fine, while the fruits and cereals give abundant proof of the wonderful fertility of the soil. The idea of thus bringing home to the people of the Eastern States the immense resources of our undeveloped Western territories, is worthy of special commendation, while such a method serves to describe a particular section of the country better than any number of brilliantly written and illustrated pamphlets or circulars.

In concluding our notes for this week, we must express our regret that it has been considered proper to admit peddlers to the Exhibition. We would suggest to the management that the "Professor," who executes sundry worn-out tricks of legerdemain to gather a crowd in order to sell political caricatures, and the individual who at stated intervals smears his raiment with a tallow candle for the purpose of removing the grease thereof with a "magic" compound, are not representatives of the industries of the American people. We also have to protest against exhibitors being permitted to cry their wares after the fashion of Chatham street vendors of second hand garments. It is not agreeable to a nervous visitor to be suddenly startled by a yell in his ears like a Comanche war-whoop, or to be further annoyed by bottles of patent cement or vermin exterminator thrust before his eyes. These things may be pecuniarily lucrative to the Fair, but they decidedly detract from its merits and belittle the dignity which it should, at least, strive to maintain.

There is another subject to which we intended to revert some time since, but which has hitherto escaped our memory. We allude to the exceedingly questionable taste that allows of the exhibition of such objects as burial caskets and other receptacles of the dead. To a great many persons the sight of an infant's coffin, particularly such as are here exhibited, decked with satin and lace and opened as if to receive the body, is especially painful and distressing. If such articles must be displayed, let it be by small models, which will serve every purpose and not alloy the pleasure of visitors by forcing into prominence the somber paraphernalia of the grave.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

CLEANING BRASS.—C. G. S., and others.—See pp. 281, 298, 314 and 329, of our twenty-fifth volume.

HYDROGEN IN THE ATMOSPHERE.—F. F. suggests that the ignition, by electricity, of hydrogen in the air may be the cause of many loud thunder claps, and that the combustion may cause the additional rain which often falls after the lightning flash. Answer: The theory is not new, and has been published in many of the ordinary text books.—J. T. N., of N. Y.

DISTANCE OF THE EARTH FROM THE SUN.—Will any one of the wise people who know (?) that the earth is nearer to the sun at one season of the year than at another be kind enough to tell how they know it?—D. Answer: A very little attention to the subject will convince D. that the distance of a heavenly body can be easily ascertained, and will save him from questioning the accuracy of those who are better informed than he is. Norton gives the following method of ascertaining the distance of the sun, simple enough to those who have access to the necessary instruments and books: Measure the altitudes of the upper and lower limbs, and take half their sum for the altitude of the center, and add or subtract the apparent semi-diameter of the body, taken from the *Nautical Almanac*. The observations are facilitated by using the movable micrometer wire in establishing the contact with the limb; then by turning the micrometer screw, measuring the interval between the position of the movable and that of the parallel stationary wire, and adding the measured interval to the mean of the microscope readings.—J. T. N., of N. Y.

OXYGEN AND HYDROGEN.—A. W. asks: Is it dangerous to combine hydrogen with oxygen, having the gases in separate cylinders, and a rubber tubing from the cylinders to a platinum burner? Answer: The combustion of hydrogen with oxygen can be done with safety, and is daily effected by the oxyhydrogen gas light; accidents have, however, taken place from careless handling. A mixture of the gases in a vessel in certain combinations will explode if ignited. One part of hydrogen and eight of oxygen by weight, or, in other words, two volumes of hydrogen to one of oxygen, will explode on contact with an electric spark or any red hot substance. The vessel will be seen, afterwards, to be bedewed with water, which is thus, in the language of the chemists, H_2O.—J. T. N., of N. Y.

PERISHABILITY OF AIR AND WATER.—F. F. of Me., asks: Why is it that water, air, and other universal substances do not wear out? Answer: Nothing ever "wears out." It merely changes its form, appearance, and locality. A textile fabric has its surface abraded, but the cotton, wool, or silk is merely rubbed away; and even if burnt by fire, the elements of which the fibers are constituted still exist in undiminished quantity, ready to unite again to form the same substance. "Wearing out" is an absurd phrase when used in reference to Nature or Science. The quantity of matter in the universe is without doubt the same as it always was; and different substances change their characteristics only. And these changes affect water and air as well as all other matter.—J. T. N., of N. Y.

SAW MILL QUERIES.—M. M. S., of Ill., asks: What is the proper speed for a portable engine, used to drive a circular saw, the cylinder being ten inches in diameter with a sixteen inch stroke? Also what is the power of an engine (it being new and first class) with steam at eighty pounds? What is the rule for measuring the power of engines? Answer: You do not tell us the size of your saw. If you run the engine so that the periphery of the saw travels at the rate of 9,000 feet per minute, you will have a good average speed for ordinary work. To ascertain the power of an engine, you must have the number of revolutions per minute, in addition to the other figures. Your engine, if well built, should give you half a horse power for each revolution per minute. To find the horse power of an engine, multiply the pressure per square inch in pounds by the piston speed in feet per minute, and then multiply the result by the area of the piston in inches, and divide by 33,000. Your piston measures 78·5 square inches; so 80 lbs. pressure x2·66 feet (the travel of your piston to each revolution) x78·5=16701·8, foot pounds, 33,000 of which are a horse power.—J. T. N., of N. Y.

POWER OF LEVERS.—G. D. asks: How much power can be obtained by a lever or series of levers 5 or 6 feet in length? Is there any rule that can be used to calculate the power that may be exerted in that way? I would make the same inquiry concerning cog wheels.—G. D. Answer: Power cannot be obtained by a lever at all. There is no contrivance by which power can be augmented. You raise a greater weight by a lever, but you raise it through a shorter distance; the mechanical force in foot pounds is the same at both ends of the lever. The weight that can be raised at the short end of the lever by that applied at the long end varies with the position of the fulcrum, or, in other words, inversely as the proportion of the two parts of the lever; and the distance through which the weight is raised varies directly as the said proportion. Both levers and cog or gear wheels transmit the number of foot pounds that you apply to them, less the friction. If by a lever you raise double the weight, you may know that you raise it half the distance, that is, that it will take twice the time to raise it the whole distance. The proportions of the efficients of cog wheels may be found by counting the teeth.—J. T. N., of N. Y.

EXTERMINATING SNAILS.—To J. A. D., query 15, page 217.—Cement the well from the platform to the water, plastering it like the wall of a house, using the common brown cement, with about one third sand.—J. W. S., of N. J.

SAW MILL HANDS.—To G. V. V., query 5, page 202.—The chief reason why saw mill owners cannot get men is because they will not pay over $40 a month wages. Men who can run a mill perfectly can be had by paying them wages.—A. M., of Mo.

DISSOLVING SHELLAC.—To L. Q. B., query 8, page 217.—To an ounce of shellac in a gill of water, add a piece of borax about the size of a small hickory nut; let it simmer but not boil, and stir it gently until dissolved. After it has cooled, add water if too thick.—T. A. A., of Mass.

SAPONIFICATION OF LINSEED OIL.—To J. D. E., query 2, page 202.—If the linseed oil in the woolen cloth has become dry, you will have great difficulty in removing it by saponification with an alkali. If the cloth is valuable, probably the best plan will be to soak it in benzine and so dissolve the varnish; you can then thoroughly wash it with soap and water.—E. H. H., of Mass.

BURNING GAS.—To M., query 6, page 217.—The more light from the argand burner is probably due to a better combustion of the gas. According to a report to the London Board of Trade (SCIENTIFIC AMERICAN, Vol. XXV., page 369), if the illuminating power of a Sugg's argand No. 1 be taken as 100, that of the ordinary burners would range all the way from 73 to 19; the pressure of the gas was of course the same in each test, each burner using 5 feet of gas per hour. This, I think, proves that the best (for there is a difference) argand is the cheapest of burners.—P. B. T., of N. Y.

SAW MILL HANDS.—To G. V. V, query 5, page 202.—Yes; the circular saw is a difficult tool to handle, and this accounts for the incompetency of the men and failures of mill owners. The carriage ways must be level and in perfect line, and the saw lined a little into the sag. The saw, being properly hung, and the head blocks running level and true, will do good work, when the saw is properly dressed. The set of the teeth should be alike on both sides, each one cutting the same depth of chip. If you want a good saw operator, let us see your advertisement for references.—J. P. A., of Ill.

BOILER SCALE.—Let E., query 10, page 216, make a mixture of sal soda, 40 lbs., gum catechu, 5 lbs., and sal ammoniac, 5 lbs. Put one pound of the mixture for each barrel of water into the tank. If he perseveres in this treatment, he will find his scale will be removed. After the scale is once removed, sal soda alone will keep it perfectly free from deposit of any kind. I have used sal soda for several years, and find it works charmingly. My boiler was second hand when our firm bought it, and the scale was more than an eighth of an inch thick. By the use of 10 lbs. of soda a week, I have succeeded in getting it as clean as if it had not been used a day. The boiler is as clean of scale as if new. My boiler is 26 feet long by 40 inches diameter. E. can use his judgment as to how much soda to use for his boiler; I give him the amount used for a boiler of that size. After he has tried this, I should like to hear the result.—A. H. G., of Mo.

SLIP OF LOCOMOTIVE DRIVE WHEELS.—To C. T., query 11, page 234.—The crank pin when at its lowest point is stationary, and no power is developed at this point, as there is no motion; but the pin, through the connecting rod, piston rod and piston, forms a stationary abutment for the steam to rest against while the power is being developed against the forward cylinder head, sliding the cylinder along over the piston and carrying with it the engine to which it is bolted. While the sliding cylinder is slowly nearing the end of its stroke, and the piston as slowly begins to move on the return stroke, the crank pin makes a rapid and wide change of position to the upper part of wheel; a change in the development of the power now takes place, for now the piston itself becomes the moving mass, dashing along at a speed much greater than the moving train, carrying with it, through its connections, the crank pin. The wheel, being merely a circular lever with its pivot constantly at the point of contact with the rail, pushes the axle in the center forward against the box and frame, thus propelling the engine, and so on, alternately pushing the train by the cylinder bolts, and by the jaws of the axle box. The power for slipping wheels or propelling engine is the same in both movements, except that there may be an excess of friction against the forward part of axle box when the piston is the mover.—G. E. F., of S. H.

GRAVITY.—J. W. T. attempts, on page 230, to answer the query 20, page 153: "Do bodies weigh more at the poles than at the equator." He says "at the level of the sea there can be no difference between the weight of bodies at the equator and at the poles. If there were, the water of the ocean would sink where it was heaviest and rise where it was lightest, till the equilibrium would be restored and the weight would be the same." He further says "this is what has taken place, for the centrifugal force due to the earth's rotation has enlarged its equatorial at the expense of the polar diameter." Now, his reasoning "If there were, etc.," would be correct if the earth were not rotating, in which case it would have assumed a globular form in consequence of the molecular attraction, on the same principle on which melted metal, that hardens while falling through the air (in which case its particles are free to shift), forms globular shots. But the earth is rotating, as he himself admits. By this rotation a new force, the centrifugal force, diminishing from the equator towards the poles, is generated, which would disturb or has disturbed the globular equilibrium. As he denies greater weight of bodies near the poles, he proves by his reasoning "if there were," etc., that there was no sinking in of the poles, which is contrary to the fact. In saying "this is what has taken place," etc., he admits the sinking in of the poles, in consequence of the rotation of the earth, which is correct. Now, if the result arrived at by a supposition is contrary to the facts, it is obvious that the supposition was wrong. So J. W. T. has erred twice, in adopting a wrong supposition and in contradicting himself.—E. W., of N. Y.

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 New Fungus. With a Stereo-picture.—By G. B. L.

Thermometrical Observations.—By J. P. B.

On the Duration of Time from the Creation to the Present Year.—By H. E. G.

On the Effects of Lightning upon Trees.—By F. H.

On the Changing of Pay Day.—By W. B. D.

On the August Meteoric Shower.—By J. H.

On the Condition of Matter which Constitutes a Vacuum in Electricity.—By D.

On the Dangers of Car Coupling.—By D. M. S.

On Burial Customs in Bavaria.—By R. C. J.

On Science and Religion.—By R. W.

On a New Form of Propeller for Canal Navigation.—By A.T.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

LARD COOLER.—George Carleton Cassard, Baltimore, Md.—The invention relates to that special class of machines in which melted lard is received and stirred continuously until cooled by the application of air, water, or other medium. The invention consists in immersing at intervals, within the lard receptacle, one or more hollow cylinders, or sections of cylinders, in which are placed cooling fluids, or other heat absorbents. It also consists in forming the scrapers, which are employed to prevent adhesion of the lard to the cylinders, of straight vertical slats and straight springs. It also consists in combining the lard outlet valve with a rod passing through but not in contact with the rotary shaft of the machine, and operating it by means of a lever located on top of the machine.

OIL CAN.—Joshua Robinson, Baltimore, Md.—The invention consists in providing the neck of a can with an electric spout or lip held thereto by an inwardly pressing spring, and also with an air chamber having apertures which facilitate the outlet of oil.

WHEEL PLOW.—William Mason, Monmouth, Oregon.—This invention has for its object to furnish an improved sulky plow. The axle is bent twice at right angles, or made with a short offset or shoulder at the land side of the frame, so that the said frame may be level while one wheel is running in the furrow and the other upon the unplowed land. The said frame is supported by and pivoted to the said axle. The forward ends of the beams of the frame are attached to the opposite sides of the rear end of the tongue.

The plow beam is placed between the beams, and through the rear end of all three the axle passes. To a U shaped bracket, the ends of the arms of which are attached to the beams so that the plow beam may move up and down within said bracket, is pivoted a lever, the rear end of which extends back into such a position that it may be conveniently reached and operated by the driver from his seat, and which may have a foot rest or stirrup attached to it to enable the driver to operate it conveniently with his foot. The forward end of this lever is slotted longitudinally to receive the bolt by which it is pivoted to an eye bolt or other support attached to the forward end of the plow beam, so that the plow may be raised from the ground or adjusted to work at any desired depth in the ground by simply operating the said lever. A standard passes down through the rear part of the tongue, and to its lower end is pivoted a caster wheel, which supports the forward part of the machine. The lever is operated to raise and lower the plow beam and plow, while another lever is also operated to move the forward end of the frame in the same direction, thus increasing the effect.

WASH BOILER.—Jacob Davis, Florida, Mass.—This invention has for its object to furnish an improved washer for washing cloth, clothes, bedding, etc., quickly and thoroughly, without wearing the cloth, straining the seams, or injuring them in any way. As the heat is applied, the boiling suds and steam pass up through the flues and are discharged through holes upon the clothes in the interior of the boiler, through which they pass to a slot, and back into the flues, thus keeping up a continuous circulation, cleaning the clothes thoroughly in a very short time.

DIAMOND SETTING.—Ferdinand J. Herpers, Newark, N. J.—This invention relates to a new setting for diamonds or other precious stones or imitations thereof, though more particularly intended for pure diamonds, with the object of obtaining a better display of the beauties of the stone. The invention consists in constructing the setting of a series of arms or prongs that radiate from a common center, thus exhibiting the jewel in all its beauty.

CULTIVATOR.—Calvin D. Perkins, Princeville, Ill.—This invention has for its object to furnish an improved cultivator designed especially for garden use as a hand machine, which may be adjusted to work at any desired depth in the ground, and also to throw the soil more or less toward the plants, as may be desired. The cutters are bent at right angles so that the blades may work in a horizontal position a little below the surface of the ground to cut off the roots of grass, weeds, runners, or other vegetation that may be growing between the rows of plants. The cutting blades may be adjusted to work at right angles, or at any other angle, with the line of draft, as may be desired. Upon the rims of the drive wheels are formed, or to them are attached, ring flanges or cutters to cut off runners that may be thrown out from the rows or hills of plants, such as strawberries, and thus prevent the said plants from spreading. The machine is light and graceful in appearance, and such a digression from the ordinary cultivator that it will likely come into general use.

BALING PRESS.—Joseph P. Taylor, Hudson city, N. J.—This invention has for its object to improve the construction of the baling press described in letters patent No. 70,849, granted to Joseph P. Taylor and Jackson R. Baker, November 5, 1867. To the side parts of the foundation frame of the press, upon the outer sides of the baling box, are attached two side frames. Yokes are pivoted to the outer sides of the baling box or to supports connected with the side frames. Upon the opposite or diagonal corners of the under side of the yokes are formed projections or cams, having smooth inclined faces against which the ends of the levers rest. To the outer sides of the yokes are attached other levers, the outer ends of which, at each end of the press, are connected by a cross bar, and serve as handles in operating the press. The levers first mentioned are bent into U shape to pass around the ends of the baling box, and their ends or long arms project along the sides of said baling box, overlapping each other. The ends of the levers project upward so that they may pass beneath the yokes and operate upon cams or projections furthest from the pivoting points of said levers. The levers are pivoted to the sides of the baling box near its ends. To the center of the middle parts of the levers that cross the ends of the baling box are pivoted the lifting pawls, which are so formed and pivoted that their own weight will hold them forward against the teeth of the rack bars upon which they operate. The holding pawls are pivoted to the end posts of the press or to the baling box frame, and are so formed and pivoted that their own weight may hold them forward against the teeth of the rack bars to hold the said rack bars in place while the lifting pawls are moved down to take another hold. The lower ends of the rack bars are pivoted to the ends of the follower, so that the said rack bars may retain their vertical positions however much the follower may incline, as its ends are alternately raised by the action of the levers and pawls. The follower is grooved for convenience in passing the bands around the bales and moves up and down through the vertical baling box. Doors, which form the sides of the upper part of the baling box, are hinged at their lower edges to the frame. The lower edges of the doors project a little below the bars to which the hinges are attached, said projecting edges entering recesses formed for their reception at the inner edges of the frame to relieve the hinges from the strain. The upper parts of the doors are secured in place by the bars which extend entirely across the ends of the baling box, and which have hooks or catches formed upon their ends to hook or catch upon the ends of other bars which extend longitudinally across the upper parts of the said doors. By this construction the hook or catch bars and the bars form a band or frame surrounding the baling box. The cover of the baling box is made heavy so that, as it is allowed to drop, it may force the material placed in the box downward, packing it more closely into said box; said cover is held down and secured in place by lock bars, which are pivoted at one end to the side part of the ends of the cover, so that they may be swung into grooves in the inner sides of the end posts. Cords, the ends of which are attached to the end parts of the cover, pass over pulleys pivoted to the upper ends of the end posts. To the cords are attached hooks which, when the cover is raised, may be hooked into hooks or eyes formed upon the upper ends of the rack bars to hold the said cover securely while the baling box is being filled. The operating parts of the press are all located upon the outside of the baling box, so as to allow the baling box to be close down to the foundation frame, enabling the press to be made much lower and making it much more convenient than the old press.

[OFFICIAL.]

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For which Letters Patent of the United States were granted

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SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for reissue	$30
On application for Extension of Patent	$50
On granting the extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

2,460.—MANUFACTURE OF STARCH.—S. T. Stratton. Dec. 11, 1872.
2,500.—BEE HIVE.—J. S. Harbison. Dec. 18, 1872.
22,503.—OPERATING VALVES OF PUMPS.—L. J. Knowles. Dec. 18, 1872.
22,514.—SIFTING SHOVEL.—P. A. Sabbaton. Dec. 18, 1872.

EXTENSIONS GRANTED.

21,639.—FOLDING GUIDE.—A. Douglas.
21,698.—HORSE RAKE.—M. Raezer.
21,712.—HORSE RAKE.—G. Whitcomb.
21,712.—HORSE RAKE.—G. Whitcomb.

DESIGNS PATENTED.

6,149.—TOY STEAM ENGINE.—G. A. Brown, Farmington, Mich.
6,150.—STOVE.—E. S. Heath, Baltimore, Md.
6,151.—COCKEYE.—J. Letchworth, Buffalo, N. Y.
6,152.—COCKEYE.—J. Letchworth, Buffalo, N. Y.
6,153.—LAST.—G. D. Melotte, Utica, N. Y.
6,154.—HAIR NET.—G. Osborne, Brooklyn, N. Y.
6,155.—COOKING RANGE.—W. A. Spicer, Providence, R. I.
6,156.—TOY BANK.—D. A. Stiles, Durham, Conn.
6,157.—SHAWL.—F. Wink, Philadelphia, Pa.

TRADE MARKS REGISTERED.

1,000.—SEWING SILK, ETC.—Brainerd, Armstrong & Co., New York city.
1,001.—LAMP BURNERS.—Bristol Brass and Clock Company, Bristol, Conn
1,002.—WHISKY.—J. E. Cassidy, Boston, Mass.
1,003.—FRICTION MATCHES.—J. L. Clark, Oshkosh, Wis.
1,004.—CUTLERY, ETC.—W. Clauberg, Solingen, Prussia.
1,005.—LEAD PENCILS.—Cutter, Tower & Co., Boston, Mass.
1,006.—FLOUR.—Empire Mill Company, St. Louis, Mo.
1,007.—PAINTS.—Maxwell & Clarke, Brooklyn, N. Y.
1,008.—CORSETS.—Ottenheimer, Rothschild & Co., New York city.
1,009.—PLOW.—Springfield Iron Works, Springfield, Mo

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How can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

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To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants or their New York correspondents.

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In order to apply for a patent in Canada, the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

All persons who desire to take out patents in Canada are requested to communicate with Munn & Co., 37 Park Row, N. Y., who will give prompt attention to the business and furnish full instruction.

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Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From September 17 to September 25, 1872, inclusive.

AIR ENGINE.—C. P. Leavitt, New York city.
BUTTON HOLE SEWING MACHINES.—A. L. Wood, Boston, Mass.
CHEMICAL PROCESS.—C. Morfit (of Baltimore, Md.), London, England.
DRIVING SEWING MACHINES.—R. Whitehill, New York city.
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RAILWAY WHEELS, ETC.—J. K. Sax (of Pittston, Pa.), London, England.
RAKE FOR REAPING MACHINE.—L. B. Bruen, New York city.
ROLLING SCREWS, ETC.—R. Boeklen, Brooklyn, N. Y.
SEWING MACHINE.—W. S. Lincoln, W. A. Rayer, Boston, Mass.
TELEGRAPH WIRE.—C. J. A. Dick, Pittsburgh, Pa., and G. A. Dick, London, England.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

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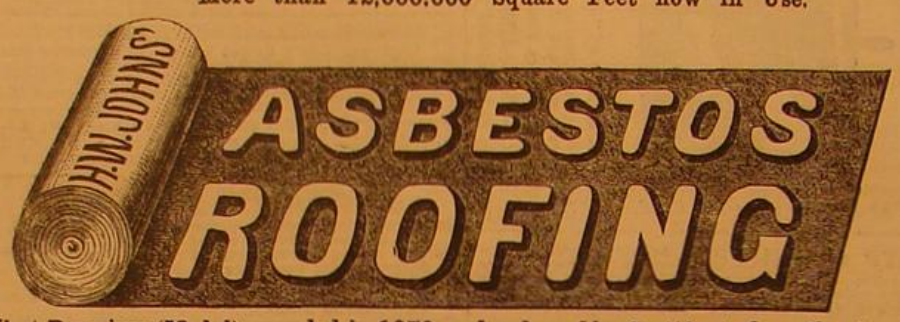

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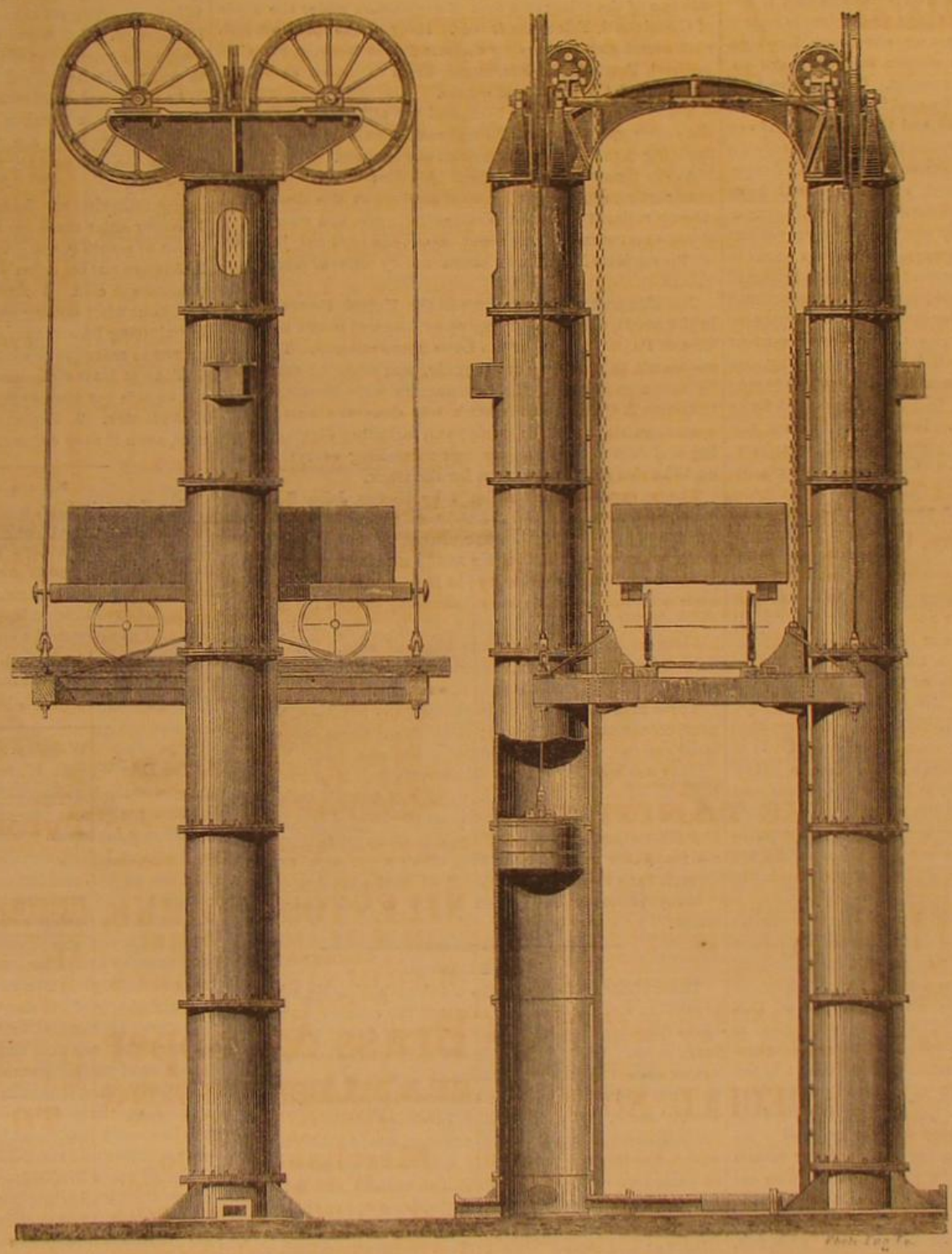
PNEUMATIC ELEVATOR.

At the Ayresome Iron Works, the materials are raised to the level of the top of the range of calcining kilns and store bunkers by a pneumatic hoist, this hoist being situated at one end of the range, while at the other there is a pneumatic drop, by which the empty wagons are lowered. We now give an engraving of the hoist, which will explain its construction.

The lift—which is of a type designed by Mr. Gjers, and successfully introduced by him several years ago—consists of a pair of cast iron cylinders placed sufficiently far apart for the platform on which the wagons are carried to rise and fall between them. Each cylinder is 48 inches in diameter, and is made in lengths of 8 feet each, bolted together by flanges, as shown, each length being recessed at one end to receive a corresponding rib formed on the face of the next length. The two cylinders are 14 feet 9 inches apart from center to center, and at the top they are connected by a cast iron arched girder which ties them firmly together. Each cylinder also carries at the top a pair of short cast iron girders or caps, which serve to support the plummer blocks for the axes of the pulleys around which pass the ropes connecting the platform with the pistons of the pneumatic cylinders. These pulleys are each 8 feet in diameter by 9 inches broad on the face, and they are made with wrought iron arms and cast iron rims and bosses. The two corresponding pulleys belonging to the two cylinders are keyed on the same shaft, this shaft being about 5 inches in diameter; and as the wire ropes from the corners of the table are made to lap once round the pulleys, the pistons in the two cylinders are compelled to move together, and the table is kept horizontal while rising and falling. The shafts of the two pairs of pulleys are situated 9 feet apart from center to center, and there is sufficient room between the pairs of pulleys for a safety chain which is attached to the table, carried over a pulley 2 feet 9 inches diameter, as shown in the front elevation, and thence down to the table. Under ordinary circumstances, however, these safety chains are free from strain, and they are merely provided to act in the event of the breakage of a rope.



PNEUMATIC ELEVATOR AT THE AYRESOME IRON WORKS.

The platform consists of transverse timber beams, 15 feet 4 inches long, 14 inches deep by 12 inches thick, to the ends of which the wire ropes, already mentioned, are attached, these beams being connected by suitable timber framing and by the longitudinal beams on which the rails are fixed. The length of rails carried by the platform is 20 feet. To the framing of the platform are bolted a pair of cast iron brackets, which work against timber guides fixed to the cylinders, as shown. These brackets also form the points of attachment for the safety chains, and from the tops of them truss rods pass diagonally to the ends of the transverse timber beams already mentioned, as shown in the engraving.

The pistons are of cast iron, and are packed with double cupped leathers, ready access to the packing being obtained through openings formed in the sides of the upper lengths of the pneumatic cylinders, these lengths not being traversed by the pistons during the regular working of the hoist. The lift is worked by alternately creating in the cylinders a plenum, or a partial vacuum below the pistons, according to whether the table has to be lowered or raised. In ordinary working, the loads to be taken up vary from 15 to 16 tuns, and the balance is such that with this load an exhaustion equal to about 6 lbs. per square inch is required to lift the table, while a plenum of about 4 lbs. per square inch is required to bring the table down.

The hoist is worked by a pair of engines having the cylinders inclined at an angle of 45°, the two connecting rods being coupled to a single crank at the center of a crank shaft which has at its ends a pair of opposite overhung cranks driving a couple of single acting air pumps, both of which exhaust from one pipe and deliver into another. These two pipes are connected to a casing fitted with a slide valve, the arrangement being such that, by merely shifting this valve, either the suction pipe can be placed in communication with the cylinders of the hoist, and the delivery pipe with the external air, or *vice versâ*. The two cylinders of the hoist are placed in communication with each other by a pipe of rectangular section connecting their lower ends, this pipe measuring 6 inches by 12 inches inside, while from one of the cylinders a pipe leads off to the slide valve casing already mentioned.

The hoist we have been describing lifts the wagons 35 feet, and with the four furnaces in full work, it will have to raise at least 6,000 tuns per week, this quantity being the gross weight of the material and trucks. At present, of course, it is raising but about half that quantity. As we have already stated, pneumatic hoists, such as that we illustrate, were introduced several years ago by Mr. Gjers, and they are now in use at a number of iron works. They work very steadily, are controlled with great ease, and require a very moderate expenditure for maintenance, while their construction is such that working parts are at all times open to inspection—an important point in machinery of this class.—*Engineering*.

Is Electricity Generated by Water Currents?

Zöllner has ascribed the production of the electric currents of the earth to the incandescent molten masses in motion beneath the crust which generate currents in the direction of their own motion; and he has expressed the opinion that all current movements of fluids, especially when in contact with solid bodies, are to some extent accompanied with currents of electricity that have the same direction as the fluids themselves. He inserted the ends of the copper wires of a very delicate galvanometer, of Sauerwald, just within the wall of a caoutchouc tube conveying a stream of water, and observed a deflection of several degrees of the galvanometer scale, thereby indicating the existence of an electrical current whose direction is that of the water. The greater the distance between the ends of the wires—which, by the way, need not be exposed to the force of the current, but may be replaced by metallic plates lying against the wall of the tube—the stronger the deflection of the needle.

While recently repeating Zöllner's experiments, Beetz obtained similar results, but found that the currents have a much simpler origin. The needle is deflected so long as the reservoir in which the water falls is not isolated. The metal tap, the stream of water, and the reservoir, in fact, form a voltaic element (brass, water, lead) whose current it is which deflects the needle. By filling the reservoir, and dipping the free end of the tube, also filled, into it, the current is observed though the water be shut off, nor does any change take place when the tap is opened. By simply inverting the position of the tube, the direction of the current is reversed; this is observed to be the case with or without a flow of water. If the reservoir be isolated, no current is formed; this is so whether the water be allowed to flow or not. When tap and reservoir are of zinc, no current is produced with or without a flow of water, and with or without isolation of the reservoir. According to Beetz's observations, then, no electricity is generated by a stream of water.

SOLAR ECLIPSES AND MAGNETIC VARIATIONS.—In reference to the question of a possible connection between solar eclipses and terrestrial magnetic variations, as deduced from the observations of December, 1870, M. Broun states that a comparison of observations made at Trevandrum (near the central line of the eclipse of December, 1871, on that occasion) with other observations indicates that ordinary slight magnetic disturbances, passing from one region to another, do not appear to undergo any change of character either before, during, or after an eclipse. And hence he concludes that solar eclipses have not the influence in producing terrestrial magnetic variations that Dianilla Müller and others had assigned to them.

ONE hundred and twenty-one patents have been granted on windmills in the United States since 1854.

PLATING WITH ALUMINUM.

[From the *Deutsche Industrie Zeitung*, by Dr. Clemens Winkler.]

Seventeen years have passed since H. Daville first produced aluminum on a commercial scale; but the expectations regarding this very interesting and meritorious invention of the distinguished French chemist have not as yet been fulfilled. Although many of those expectations were somewhat exaggerated, they were not and are not so unreasonable as many people believed them to be; for a metal with so many valuable properties would be useful in many of the technical arts. Among these properties are a beautiful color that does not change in the air, nor yet in sulphurous exhalations, and further, remarkable lightness,an agreeable resonance, and a capability of being worked into any shape. Moreover, in the use or manipulation of aluminum, there have not hitherto been observed any deleterious effects.

It is generally conceded that the cost, and not the absence of properties which make other metals valuable, has prevented the more extensive application of aluminum; and the price, although it is considerably less than it was at first, has remained high during the last few years. The cost of production of this metal, which can only be effected by the use of sodium, cannot possibly be the only cause of its high price; for the commercial manufacture of sodium may be considered as a solved problem, and, as soda ash is very cheap, sodium might be produced at a moderate cost if the demand were greater than it is. Large production is caused by large consumption, and the use of aluminum has been hitherto limited, mainly because custom and use have opposed the introduction of such a novelty. Stories have been told and written about poisoning by cooking vessels made of copper, by glazings containing lead, and the formation of verdigris on spoons of (alloyed) silver; and if people were only determined to produce these utensils from aluminum, all danger from poisoning would be removed, and they would have vessels the appearance and durability of which would scarcely leave anything to desire. They would be more convenient to handle than our light crockery ware, for they can be made as light, and, what is important, cannot be broken. Splendid pitchers, plates, goblets, lamps, etc , might be manufactured from deadened and embossed aluminum; and the lightness of spoons of this metal would make them more convenient than those of silver now in use. It is rather surprising that they have not yet been more commonly introduced, for people are generally more particular as to their spoons and forks than as to any other table utensil. In this case, it is not the price, but only prejudice, which presents itself as a drawback, for the price is only half of that of good silver; besides, the difference in the specific weights of both metals and the consequent cheapness in the use of aluminum are so great that, for the value of one silver spoon, at least seven equally large aluminum spoons might be bought. True, aluminum is neither a rare nor a noble metal, but it possesses nevertheless advantages over alloyed silver which give it a much finer appearance; it does not get black, nor does it form verdigris, and what it lacks in brilliancy and appearance, is well compensated for in its agreeable lightness Otto says very truly: "If spoons of aluminum were even more beautiful and durable than silver spoons, they would nevertheless not be used in the households of the wealthy, merely because they are cheaper than silver spoons. It is surely more agreeable to hold a light spoon than a heavy one, but the silver spoons are made as heavy as possible, and tea spoons are made as large as children's spoons to exhibit the wealth of the owner. The larger the spoon, the wealthier the man." We may let time conquer these prejudices, and hope that all-subduing fashion will make itself useful in this field.

The more important question which now deserves our attention is: Whether it be not possible to plate certain metals and alloys, of unsatisfactory color or which are subject to changes in the air, with aluminum, so as to give them, at least superficially, the advantages and properties of this beautiful metal? For this purpose, as so small a quantity is used to cover a large surface, the present high price would not be any drawback; and the question now remains: Is the coating of ordinary metals with aluminum practicable? This question has lately been propounded in the *Deutsche Industrie Zeitung* as follows: "Does any one know of a recent and reliable process for electroplating other metals with aluminum or its alloys?" This question must be answered in the negative. There are, in general, two methods known, which are employed to coat one metal with another, namely, the galvanoplastic process and plating with foil. The separation of aluminum by the galvanic current succeeds only when the anhydrous double salt of chloride of aluminum and sodium is used; this salt melts at 185° C., and thus an incoherent coating only is obtained, which, besides, contains chloride of sodium, and is in no wise durable. From watery solutions, aluminum has not as yet been precipitated in a metallic state, and Gore certainly errs in stating that, with a weak current, copper may be plated with aluminum. In regard to plating with foils of this metal, it is possible in some degree, but the resulting product is perfectly useless. Plating in this manner requires a sort of brazing and a final intimate unification of both metals by rolling, and these conditions cannot be fulfilled with aluminum. As is well known, the ductility of this metal is almost destroyed by only a small admixture of other metals; iron makes it fragile, and copper imparts to it the brittleness of glass. Although it is possible to melt a sheet of aluminum upon another metal, an alloy is formed at the surface, by contact of the two metals, which possesses no ductility whatever, so that rolling crushes it to powder, and so the foil gets loose and separates. And, even if it were possible to plate with aluminum, it remains very questionable whether there would be anything gained. Aluminum in a compact form is very durable and not readily changed, either by oxygen or sulphur; but it is very changeable in a finely divided state. In sheets and powder it is very oxidizable, and when amalgamated, it heats spontaneously in the air and separates into alumina and quicksilver. The layer of aluminum on the plated metal would in any case be very thin, and it is probable that this otherwise unalterable metal would lose its durability by the extreme tenuity.

The Steam Excavator.

Mr. Isaac Otis, of Houghton, Mich., writing to the *Railroad Gazette*, says that the Steam Excavator, now so commonly used, was the invention of his brother.

His name was William S. Otis, and at the time he was a resident of Philadelphia. The first machine was built for him by Eastwick and Harrison, somewhere about 1837, and they afterwards built several, including two for the Russian Government, which were used in the construction of the Petersburg and Moscow railroad.

Messrs. Eastwick & Harrison afterwards (in connection with Mr. Williams, of Baltimore) went to Russia, where they built all the locomotives and rolling stock of this great Russian railway.

Mr. Otis died in the year 1839: at the time of his death, he was one of the celebrated firm of contractors under the style of Carmichael, Fairbanks & Otis. Many of the foremost railroad contractors now living commenced as foremen for Carmichael, Fairbanks & Otis, among them such men as Sidney Dillon, O. S. Chapman and others.

These excavators have been, and are still, largely used in the construction of railroads and canals, and, in the shape of dredging machines, in digging out our harbors.

At the time of Mr. Otis's death, his firm were engaged in constructing some of the heaviest sections of the Boston and Albany railroad (then the Western railroad), and were using steam excavators; among other points, the sand cut, just east of Springfield, Mass., was taken out by one of these machines.

The cheapest work ever done in the United States, if not in the world, was in the filling up of the great trestle bridge at Girard, Pa., on the line of the Lake Shore railway. This embankment, of a million cubic yards, was made of earth dug by steam excavators. The contractors were Messrs. Dillon, Chapman & Clyde, and the work was done at a cost of not more than six cents per cubic yard, including digging, hauling and dumping, the contractors furnishing everything except the ties and railroad iron for the track.

The excavators are now built by Messrs. John Southern & Co., of Boston, cost about $8,000, weigh some 22 tuns, last indefinitely (some machines are still at work that were built thirty years ago), and will dig and put into cars 1,000 cubic yards of sand or gravel per day; in fact, about the only limit to their powers in soft digging is the ability to take the material away as fast as the machine can load it. They will dig the hardest earth, and in fact some kinds of rock. The shovel holds 1½ cubic yards, and in sand they can fill this and dump the material into cars twice in one minute.

Three men are employed in running the machine, an engineer, cranesman and fireman; it consumes about one cord of wood per day, or its equivalent of bituminous coal.

They are locomotives as well as excavators, and can be fitted with extra wheels to run upon a 4 feet 8½ inch gage. They are used in working sectional tracks of 4 feet lengths, and after digging all the earth within reach move themselves up ready for a fresh bite; they make a through cut wide enough for a single track railroad without widening out.

Many railroads have them in use to load their gravel trains.

Cut Flowers.

Those of our readers, says the *Gardener's Monthly*, who live in what in a social sense we may call the country, have little idea of the growing immensity of the cut flower trade in the large cities. While it is believed that gardening as a fine art, or even the mere cultivation of flowers as a luxury, has not kept up in ratio with the increase of population, the mere florists' trade, that is, that which furnishes plants and flowers for temporary ornament and decoration, has probably doubled within the last ten years. Not only do florists grow flowers of their own in great quantities for baskets and bouquets, but many away from the immediate circle of the cities find it profitable to grow flowers to sell again to those who put them up; and even private gardens frequently contribute to supply the demand. Indeed the tendency of this division between the one who grows the flowers and the one who sells is continually growing greater. Land in the city is high and taxes heavy. Flowers are light and travel easily by rail or wagon, and thus can be raised to better advantage away from the expenses of a large town. The principal flowers grown for this purpose are roses and camellias, but heliotropes, violets and many other popular flowers come into good use. These leading flowers are sold at a price per hundred flowers —camellias in their best time wholesaling at about $20 00 per hundred, and roses at about half this rate. As a general thing, camellias are raised in pots or tubs, but roses are most generally grown in the natural ground under a glass house erected for the purpose. A rose house on this principle is a very pretty sight in the winter season—not quite as gay perhaps as its rival the camellia, but with a fragrance which, if plants have sensation as some wise folk tell us, the camellia doubtless envies. Many roses do not flower freely under glass in winter unless the houses are very tight, or unless they have some age. For most general purposes, Safrano, Bon Silene, Luxembourg, Isabella Sprunt, Archduke Charles, and Hermosa are popular, flowering young and freely where there is room, good light, and a year or two of age. Lamarque and Marshal Niel are great rose house favorites.

THE HEALTH OF THE WORKMEN OF THE EAST RIVER BRIDGE.

Mr. F. Collingwood, in a paper read before the American Institute of Civil Engineers, alludes to the adverse criticisms of the press on subterranean foundations, on account of the danger, to the health of the workmen laboring within them, by the pneumatic pressure, and cites, as a case in point, that of the caissons of the East River bridge. On the Brooklyn side, the men worked 8 hours, in two shifts of 4 hours each, down to the full depth of 44·5 feet without injury. On the New York side, the time was reduced correspondingly from 7½ hours at 45 feet to 4 hours at 77 feet. The first fatal case which was considered as fairly attributable to compressed air took place at a depth of 75 feet, from congestion of the lungs. The man was of full habit, and an examination of but two days before had proved his lungs to be sound. There were perhaps a dozen cases of paralysis, which all recovered in from three days to three weeks. At from 50 feet depth to the end, severe pains in the legs and arms were frequent, but did not last long. The remedies employed were ergot and morphine to alleviate pains in the limbs; stimulants, together with Jamaica ginger, were given for epigastric pains. Where vomiting set in and was persistent, paralysis frequently followed. Coffee was always served to the men immediately after coming out of the caisson, and bunks were provided in which all who wished could rest.

An important conclusion from the records kept of cases is that the greater number of those who have retained their health throughout are wiry, somewhat spare men; while most of the sick and all who died were fleshy men of full or large size.

The following are the rules for the workmen in the caisson: 1. Never enter the caisson with an empty stomach. 2. Use, as far as possible, a meat diet, and take warm coffee freely. 3. Always put on extra clothing on coming out, and avoid exposure to cold. 4. Exercise as little as may be during the first hour after coming out, and lie down if possible. 5. Use intoxicating liquors sparingly; better, none at all. It is dangerous to enter the caisson after drinking intoxicating liquors. 6. Take at least eight hours' sleep every night. 7. See that the bowels are open every day. 8. Never enter the caisson if at all sick. 9. Report at once to the office all cases of illness, even if they occur after returning home.

Steam on the Canals.

The Fountain City, a new boat, is the name of a new canal competitor for the $100,000 prize, which arrived at Albany recently, after a five days' trip from Buffalo. The propelling wheels are described as so arranged that the waves produced by one wheel are broken down by those from the other. Her speed averaged over three miles per hour. The wheel is said to have all the power of a screw in the fore and aft blades, and a square pull, in addition, by one of the side blades, and consequently will develope more power, it is supposed, with fewer revolutions per minute, than ordinary wheels.

Wooden Ware Works.

The Erie Wooden Ware Company's works, at Erie, Pa., occupy a main building 250×125 feet. They have one engine of 70 horse power; two pail lathes, one tub lathe, one automatic saw for broom handles, one broom handle lathe, two top and bottom lathes, three stave saws, one matcher for edging up, one planer, and three saws for slitting staves the right lengths. The workshops, says the *American Manufacturer*, are quite interesting and present a very pleasing picture. First the rough logs are cut up into required shape and length, and then, by a peculiar machine, the staves for the tub are cut from it in a slightly curved form,which entirely does away with the old system of bending them; and from one man to another the staves are handled until the rough pail is made or fixed together; then one man turns the outside with chisel and sand paper until perfectly smooth, and another does the same for the inside; then it sent to another department for the bottom and lid, and then for the hoops. Everything is in place, all are unusually intelligent men, and order reigns supreme. The whole implement reminds us of some magic apparatus. After being made in the shop, the pails are sent to a floor above where the handles are put on, and those intended for dairy purposes are taken to the painter's room, and after receiving his attentions are packed in another department for shipment. We were particularly interested in seeing the drying houses, situated some distance from the main building, of which there are ten, six of which are for steaming purposes, and four are operated upon by hot air, for which purpose the company have four separate boilers. There are constantly 50,000 feet of lumber, about 500 cords of pail bolts, and from 400 to 600 cords of cut staves being operated upon. The specialty of this company is in the manufacture of tobacco tubs, and they are certainly made with great skill and high-finished material. The company own 4½ acres of land here and intend to double the capacity of the present factory as soon as possible. They have sixty-five men and boys constantly employed, and have orders ahead; and, at present, their income exceeds $250,000 per annum. The officers are S. S. Spencer, president; G. W. F. Sherwin is general superintendent, and R. W. Flower, Jr., secretary and treasurer.

THE Academy of Sciences of Bologna, Italy, offers a prize of 1,200 francs ($240) for the best essay on the applications of galvanism. The papers may be written in Latin, Italian, or French, and must be submitted before June 30, 1874.

The American Pneumatic Railway Brake in England.

It is perfectly well known that it forms no part of the policy of this journal to advocate the adoption of patented inventions. It is our policy, however, to advocate the adoption of substantial improvements in the arts of construction, whether they are or are not patented. It is without hesitation, therefore, that we state our conviction that, by the adoption of such a brake as that recently introduced into this country by Mr. Westinghouse, collisions might cease to have any important existence. It is right that we should explain why we single out the Westinghouse from many other systems of continuous brakes, more or less efficient, which have been tested in this country. The reason is this:—No locomotive superintendent or manager is justified in incurring a large expenditure on an unheard-of or comparatively untried invention. We know nothing of the existence of any other form of continuous brake which has been so extensively used as that we have named. In their immediate effect, all continuous brakes are pretty much the same, when once the wheels are skidded. The difference lies in the means by which the wheels are skidded. We believe, in common with a very large body of engineers, that Mr. Westinghouse has solved the problem of constructing a good continuous brake. It is quite possible that a far better brake may be invented, but with this we have nothing to do. The Westinghouse brake has passed far beyond the limits of the first stage. Its construction occupies hundreds of hands and all the resources of a manufacturing establishment of great dimensions in the United States. All the principal American lines use it already, or are adopting it. Many hundreds of the little air-pumping engines have been made. The operation of the brake is eminently satisfactory. Why should it not be adopted extensively in this country? We are not hard to please; we do not, be it understood, write to advocate the adoption of the Westinghouse brake, but we write to advocate, nay, to insist on, the general adoption of a first class continuous brake on our railways, no matter who is the inventor, and we cite the Westinghouse brake because it affords a direct and complete answer to those who argue that there is no good continuous brake in existence, and that they will wait till one is invented and tested. We cut the ground from beneath these gentlemen at once, by asserting that all that can be required is provided ready to their hand. It remains to be seen whether, among the multitude of our readers, one can be found to argue that we have advanced a single statement which is contrary to truth, reason, and common sense.—*Engineer.*

Faraday and Field.

Dr. Gladstone, in his "Memoir of Faraday," just republished here by the Harpers, tells the following story, which is worth reproducing:—

"Inventors and promoters of useful inventions frequently benefited by the advice of Faraday, or by his generous help.

A remarkable instance of this was told me by Cyrus Field. Near the commencement of his great enterprise, when he wished to unite the old and the new worlds by the telegraphic cable, he sought the advice of the great electrician, and Faraday told him that he doubted the possibility of getting a message across the Atlantic. Mr. Field saw that this fatal objection must be settled at once, and begged Faraday to make the necessary experiments, offering to pay him properly for his services. The philosopher, however, declined all remuneration, but worked away at the question, and presently reported to Mr. Field: 'It can be done, but you will not get an instantaneous message.' 'How long will it take?' was the next inquiry. 'Oh, perhaps a second.' 'Well, that's quick enough for me,' was the conclusion of the American; and the enterprise was proceeded with."

Leaves for Flavoring.

The *Garden*, an English periodical, after remarking that leaves are by no means so much used for flavoring as they might be, adds the following practical suggestions:—

One of the most useful and common of all leaves for flavoring is that of the common syringa. When cucumbers are scarce, these are a perfect substitute, in salads or anything in which that flavor is desired. The taste is not only like that of cucumbers, but identical—a curious instance of the correlation of flavors in widely different families.

Again, the young leaves of cucumbers have a striking likeness, in the way of flavor, to that of the fruit. The same may be affirmed of carrot tops, which are as like carrots in taste as may be. In most gardens there is a prodigious waste of celery flavor in the sacrifice of the external leaves and their partially blanched footstalks. Scores of sticks of celery are cut up into soup, when the outside would flavor it equally well or better.

The young leaves of gooseberries added to bottled fruit give a fresher flavor and a greener color to pies and tarts. The leaves of the flowering currant give a sort of intermediate flavor between that of black currants and red. Orange, citron, and lemon leaves impart a flavor equal to that of the fruit and rind combined, and somewhat different from both. A few leaves added to pies, or boiled in the milk used to bake with rice, or formed into crusts or paste, impart an admirable and almost inimitable bouquet.

Moonlight Reflections.

When standing by a lake side in the moonlight, you see, stretching over the rippled surface toward the moon, a bar of light which, as shown by its nearer part, consists of flashes from the sides of separate wavelets. You walk, and the bar of light seems to go with you. There are, even among cultivated people, many who suppose that this bar of light has an objective existence, and who believe that it really moves as the observer moves—occasionally, indeed, as I can testify, expressing surprise at the fact. But, apart from the observer, there exists no such bar of light; nor when the observer moves is there any movement of this glittering line of wavelets. All over the dark part of the surface the undulations are just as bright with moonlight as those he sees; but the light reflected from them does not reach his eyes. Thus, though there seems to be a lighting of some wavelets and not of the rest, and though, as the observer moves, other wavelets seem to become lighted that were not lighted before, yet both these are utterly false seemings. The simple fact is that his position in relation to certain wavelets brings into view their reflections of the moon's light, while it keeps out of view the like reflections from all other wavelets.—*Herbert Spencer.*

Spectroscopic Observations of Fluorescent Light.

In a recent communication to the *American Gas Light Journal* by Professor Henry Morton, containing details of a variety of experiments on the above subject, the author says:

In addition to the vast field already occupied by the spectroscope as a means of discrimination, another useful though limited range may be given to it in connection with that remarkable property of matter, in relation to light, known as fluorescence. This action was first thoroughly investigated by Professor Stokes, who, in 1852, published in the *Philosophical Transactions* an admirable memoir on the subject, in which he conclusively showed that when blue or violet light fell on a vast number of substances it was absorbed and re-emitted; with, however, in all cases, a lowering of its rate of vibration, or in other words a change in its color, from blue or violet, to green, yellow, orange, or red. His observations showed that the colors emitted by different substances varied greatly, and when analyzed with a prism broke up, in many cases, into characteristic groups of bright colored shaded bands. The spectroscope had not then, however, been introduced, and having no means of exact measurement, his results were rather qualitative than quantitative.

Becquerel worked in the same direction and in the same way, until very recently, and several other observers had added more or less to our knowledge on special points.

Some time since it occurred to me that, if accurate measurements were made of the bright bands found in the spectra of fluorescent light emitted by various bodies, these might become a means of recognition and thus of qualitative analysis. With the assistance of Dr. H. C. Bolton, who kindly supplied me with a very large number of fluorescent salts, I carried out during the past summer a system of observation which developed several interesting results, among which, for example was this, that the presence of impurities could be detected in certain chemical salts, without so much as opening the bottles in which they were sold.

Origin of the Puddling Process.

Davy investigated the nature of the flame, and communicated his discoveries in a lecture before a large audience. He demonstrated that it was within our power to produce a flame which, at a state of extreme heat, contained either free oxygen or unburnt carbon; that a large grate with a limited supply of coal would generate the former, the oxidizing flame, while a small grate with a larger amount of coal would yield the other, the flame devoid of oxygen, but in which combustible substances might be melted without the danger of combustion. Among the hearers sat a young man by the name of Cort, who directed his mind to these remarks. Up to that time cast iron was converted into wrought iron by heating it with charcoal and exposing the melted metal to a blast of air. By this process only small quantities of wrought iron were obtained at a time, through the necessity of producing but one bloom in a heat, which might easily be hammered out; and also on account of the cost of charcoal. In this process, mineral coal could not be placed in contact with the iron, because the never failing presence of sulphur in that kind of coal would render the iron unfit for use. From Davy's lecture on the flame, Cort struck upon the idea of decarbonizing cast iron without exposing it to the danger of the contact with coal, by allowing the flames only of the coal to play upon the cast iron. Thus originated that wonderful operation called the puddling process.—*Mohr.*

Glass Spinning.

The latest improvements in spinning glass are due to the Vienna manufacturer Brunfaut, who has already exhibited his talent in this speciality in 1850 at Pesth. After manifold trials, he discovered a composition which may be made at any time into curled or frizzled yarn. The frizzled threads surpass in fineness not only the finest cotton but even a single cocoon thread, and they appear at the same time almost as soft and elastic as silk lint. The woven glass flock wool has quite recently been used as a substitute of ordinary wool wrappings for patients suffering from gout, and its use for this purpose has been, it is stated, successful. Chemists and apothecaries have found it useful for filtering. The smooth threads are now woven into textile fabrics, which are made into cushions, carpets, table cloths, shawls, neckties, cuffs, collars and other garments, etc. They may be used for weaving the figures in brocaded silk or velvet. As a material for fancy dresses, tapestry, for covering furniture, for laces, embroidery, hosiery, etc, the glass tissue will probably at some future time occupy a prominent place. Owing to its brilliancy and the splendor of its colors, it is the most beautiful material for dressing the hair, neck, and head. In softness, the glass yarn almost approaches silk; and to the touch, it is like the finest wool or cotton. It possesses remarkable strength; and it remains unchanged in light and warmth and is not altered by moisture or acids. Spots may readily be removed by washing. Being non-inflammable and incombustible, it is especially valuable for making dress materials for ladies. Clothes of glass fabrics are much warmer than those of cotton or wool; and at the same time, they are of low specific gravity. They are also adapted for veils, as they repel the dust remarkably well. The composition of the material is still a secret; and the spinning requires extraordinary dexterity and constant attention. This part of the business is said to be very trying to the sight. It is stated that, with a wheel of a diamster of five Austrian yards, one operative is able to spin 3,000 yards per minute. The *loth* (which is equal to about eleven drams avoirdupois) is sold for two florins—ninety-three cents gold. Some manufactures of glass yarn are sold at the following prices:

Bedouin tassels from 46 cents to 69 cents; eagle feathers from 37 cents to $1.39; ostrich feathers from 46 cents to $2.80; bouquets, 76 cents; cuffs, 1.15; ladies' neckties 70 cents; gentlemen's neckties from 46 cents to $2.30; watch chains from 23 cents to 93 cents; chignons from 46 cents to $4.60; trimmings 36 cents and upwards per yard; ladies' cloths from 12 to 18 cents per yard; ladies' hats from $4.60 cents to $14.40 cents. In conclusion, we may state that the Austrian Minister of Commerce has already organized schools for glass spinning in the principal seats of glass manufacture in Bohemia.

Cheap Life Insurance.

A novel form of life insurance policy was brought to our attention a few days since, and the inventor has secured it by copyright. By it, the insurance company is only liable for its assurance in case the protected party survives the assured, and thus the insurer is enabled to provide for his surviving wife and children at greatly reduced expense. By it, he does not risk spending his efforts on heirs who may not need the money or in whom he takes but a comparatively small interest. Further, if the insurer prefer, the policy provides for payment of an annual sum during life, instead of the whole at once.

The advantages claimed are such that, under ordinary circumstances, the company can afford to pay, to the protected party, an annuity equal to five times the interest of the sum now secured by a like premium. For instance, a man 30 years of age may secure to his wife of equal age an annuity during her life, after his death, equal to the income of $2,500, by an annual payment of not more than $12.50 (twelve dollars and a half) thus opening the privileges of life insurance to the poorest class. Life insurance companies may obtain full details of the proposed new scheme by addressing the inventor, Henry H. Swift, Millbrook, N. Y.

Origin of Electro-magnetism.

The experiments of Volta resulted in the pile named after him. Two heterogeneous metals, such as zinc and copper, are immersed in a glass of water, to which a few drops of sulphuric acid have been added; both metals we connect by a long wire, and then we find the wire possessed of a new force which can transmit a motion through the distance of a hundred miles and over. For a long time, the voltaic pile had been the subject of unsuccessful experiments for the purpose of finding its relation to the magnet, to which, on account of its poles, it bears a certain resemblance. One day, Oersted, at a lecture in Copenhagen in 1819, noticed that a magnetic needle on his table was disturbed by a communicating wire that happened to pass over it. He removed the wire, and the needle resumed its polar direction; he then replaced the wire, and the needle again turned aside.

Electro-magnetism was thus discovered. At once he recognized the immense bearing of the phenomenon, repeated the experiment in presence of the magistrate, a notary public and other witnesses, and made a Latin affidavit; this places his name, for all time to come, among the benefactors of the human race. The advantage of his invention is enjoyed by all of us who daily read telegrams from distant parts of the world as if this rapid transmission of news were a matter of course. The wonder has become a fact of daily occurrence; it it rises with us and accompanies us through the day.

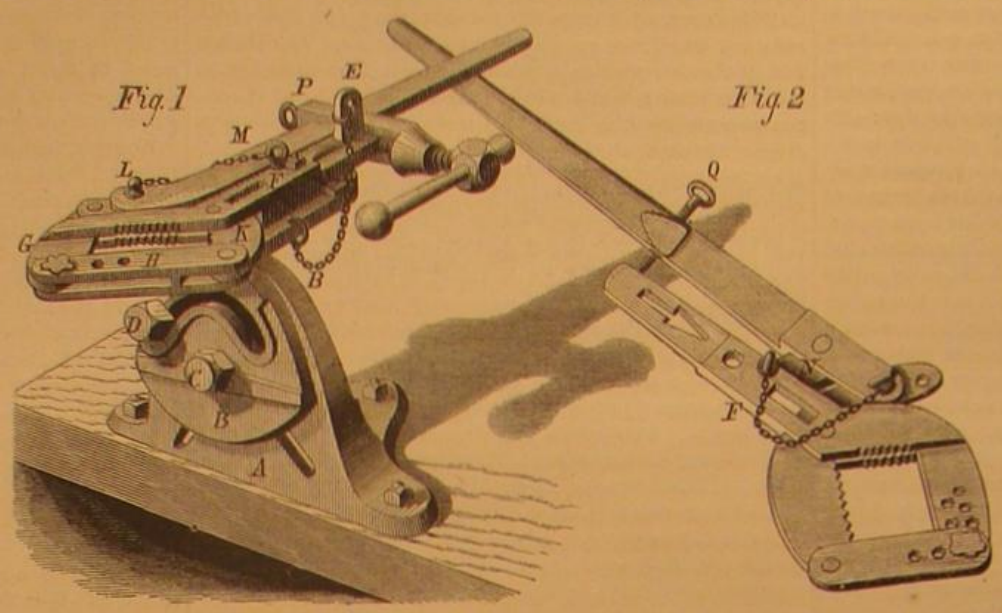
PREPARATIONS are being made at the Woolwich Arsenal for the erection of the 30 tun Nasmyth steam hammer, the largest ever constructed. It will be able to strike a blow equal to the weight of about 800 tuns, and the bed for the anvil has therefore to be of enormous strength. An excavation 45 feet square and 20 feet deep has been made, then piles, about 100 in number, driven into the solid gravel about 20 feet and the interstices filled up with concrete; on these was placed a block of iron 30 feet broad and 11 inches thick, weighing 160 tons, and on this two layers of oak balks. On this timber was next placed another iron plate, 10 inches thick and 27 feet square, weighing 121 tuns, and then followed a number of oak balks as before, standing vertically and bound together with wrought iron bands. Two more iron plates, weighing together 214 tuns, have also been lowered upon the oak balks, and one heavier than any yet placed will shortly follow. Upon this the anvil block, shortly to be cast, which is to weigh 102 tuns will rest, and it will be surmounted by the anvil face, which will be 12 feet in diameter and weigh 60 tuns.

MR. A. D. BREAZELE, of Alabama, has patented a mosquito frightener composed of the following formidable ingredients: Oils of pennyroyal, savin, origanum, terebinthe and sassafras, tinctures of lavender, chloroform and arnica; gum camphor, niter, alcohol and kerosene oil. If the Alabama mosquitoes can stand such a preparation as the above, they are proof against anything, and the only remaining thing to be done is to set mouse traps to catch them.

COMBINED PIPE WRENCH AND VISE.

The device illustrated herewith is an ingenious combination tool, which may be used either as a vise for holding gas pipe while cutting screw threads upon it, as shown in Fig 1, or it may be detached (Fig. 2) from its stand and employed as a gas pipe wrench, or square wrench for large bolts.

A (Fig. 1) is the bracket secured by bolts to the bench. B is an angle plate pivoted to the bracket by the bolt, C. By the curved slot in the former, through which passes the bolt, D, the tool may be inclined as required. B' is the upper and horizontal portion of the angle plate, to which the instrument is detachably secured by the bolt, E, through the bar, F. The forward end of the latter is inclined, and upon it are formed teeth. G is a bar, one end of which is rigidly fastened to the bar, F, and the other pivoted to the double bar, H. By means of the holes shown in H, the position and angle of the bars, H and F, can be altered at pleasure. Pivoted to the bar, H, is a curved bar, K, which passes through a slot in the bar, F, and has several holes in it to receive the pin, L, by which it is suitably adjusted to the lever, M. Upon the inner edge of the bar, K, are also cut teeth. The forward end of the lever, M, is slotted to receive the end of the short bar, N, Fig. 2, to which it is pivoted and which serves as a fulcrum. The other end of the short bar, N, enters a slot in the bar, F, to which it is detachably secured by a bolt. The lever arm, M, passes through a slot in the clevis, P, which has a vise screw, as shown, which, when turned inward, presses together the lever arm and the bar, F. By taking the tool from its support, and also removing the vise screw and other portions, substituting for the former the thumbscrew, Q, it becomes, as before stated, a square or gas pipe wrench.



NEAMES' COMBINED PIPE WRENCH AND VISE.

When used as a vise, this invention can be adjusted for holding pipe of various sizes, from three eighths of an inch to four inches. Employed otherwise, two sizes are all that are required, as it forms a square wrench, square to the diameter of the pipe. The inventor states that the tool is especially valuable in the sinking of pipes forming drive wells, the former, after being driven some time, frequently becomes stopped with fine sand, so that it is necessary to withdraw them. This, although it requires increased leverage, can, it is claimed, be readily done with the wrench by slipping a piece of gas pipe over the lever, while the compression on the pipe need not be increased. Using the wrench in this manner, it is stated that a drawn copper tube can be screwed together without injury.

The device can be used in closer quarters than ordinary gas tongs, as the grip can be loosened and another taken every sixteenth of an inch, around the periphery of the pipe, with absolute certainty. The instrument can be made to answer the purpose of a pipe cutter at a small additional cost. It is made of steel castings, and weighs, complete, seven and a half pounds.

Patented January 9, 1872. The inventor desires to sell the entire patent. Further information may be obtained by addressing Charles Neames, Lock Box 293, New Orleans, La.

Work and Play.

Men differ in their opinions in regard to what is work and what play. He who through the long summer day swings a sledge, pushes a plane, or follows a plow, naturally enough imagines that having nothing to do is a blissful condition of affairs, and that play is a state of rest or idleness; on the other hand, an able-bodied man, possessed of an active brain, finds doing nothing the hardest kind of work.

In these later years, no small amount of attention is paid to muscle. Brain feels the need of brawn. Vigorous physical exercise, even though it be for the time fatiguing, is not necessarily an unpleasant excitement, and the reward it brings, in red blood, digestion, and sleep, is well worth having. A great deal of our play is work of the roughest kind. This is true of rowing, swimming, ball playing, and a hundred other delightful exercises. He who follows a trout stream all day may call the sport by whatever name he chooses, but it is work nevertheless.

Of all work, brain labor is the most fatiguing. One can drop the implements of his trade, and the day's work is ended; but the cares of the office and the business across the threshold of home, mar the peace of the dinner hour, and frighten away sleep, or at least haunt one's dreams.

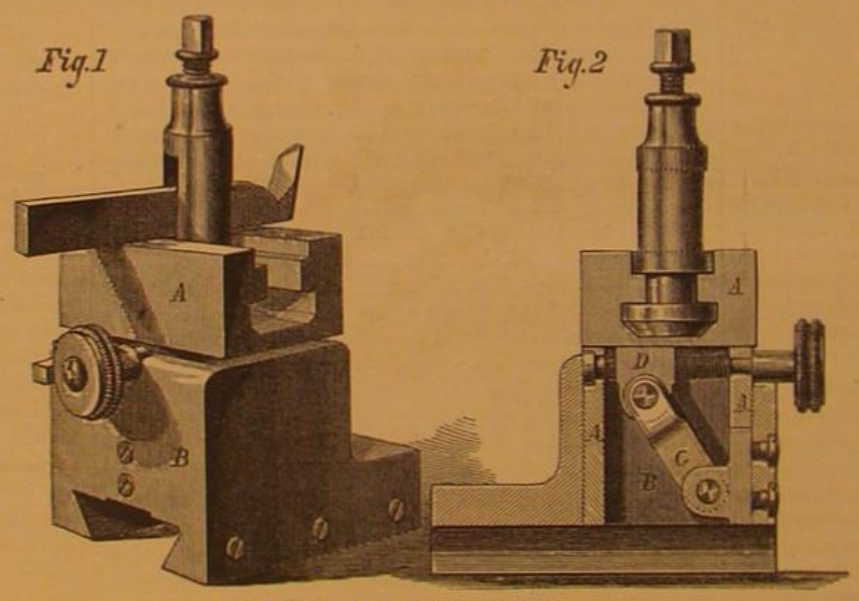
Work is agreeable and enjoyable very much in proportion as the object sought is desirable and attainable. It is not very much to be wondered at that men work with increasing earnestness as they achieve notable successes in life, for man is so constituted that he loves power, and money gives him this. The more money, the more power.

Habits of economy are very important in the relation they bear to the happiness of the individual. He who gains and holds has encouragement to go on gaining, whereas if one's gains slip through his fingers, so that he finds himself as poor at the end of the year as when he began, he naturally grows discouraged, and work becomes irksome.

The love of money may be, and without a question is, the root of much evil, but it is also the germ of much good. Wherever it exists, there are cities, commerce, manufactures, agriculture, education, art; and where it does not exist, there is barbarism. The right thing for every man to do is to try to get on in life. Considered by itself, a cottage and a narrow lot of land is a small thing to have in possession. But the man who earns a home by days' work, finds toil sweetened by the prospect of possession, and coming to it at length, even though it be humble, he is prepared to go on and accomplish better things in the future.—*American Builder.*

IMPROVED TOOL REST.

The principal defect of the ordinary form of tool rest is its difficulty of adjustment. It is fitted with no appliances for making slight changes in its position, particularly such as are constantly required in the execution of fine work, so that for every needed alteration, in the point of application of the tool, considerable time must be wasted in properly setting the rest. The device herewith illustrated, the invention of Mr. C. F. Hadly, overcomes this disadvantage in a very simple and effective manner.



IMPROVED TOOL REST.

Fig. 1 is a perspective, and Fig 2, a sectional view. The tool is shown held in a vertical slot in the upright standard by means of a screw bolt from above. This standard fits in a mortise in the upper portion of the device marked A, in which it freely moves, so that its lateral position may thus be adjusted. Pivoted on its end, as shown, to the interior of the metal sleeve, B, is an arm, C, the upper extremity of which is similarly attached to the movable piece, D. Through the latter, a thread is cut in which works the thumbscrew as represented.

The upper portion, A, of the instrument extends down inside the sleeve, B, in which it slides freely. It is evident that, by turning the thumbscrew, the piece, D, will be moved to the right, the arm, C, will be raised to a nearly perpendicular position, and the upper portion, A, carrying the tool, will be lifted. Opposite motion will, of course, take place by a corresponding reversal of the movement of the screw. The hight of the tool in the rest may thus be nicely graduated to any desired position, without necessitating the removal of either tool or rest from the machine.

For further information address the manufacturers, the Ames Manufacturing Company, Chicopee, Mass.

CORUNDUM OF NORTH CAROLINA AND GEORGIA.

Professor Charles U. Shepard, Sen., of Amherst College, states that corundum has been recognized for above thirty years at several of the gold washings in the mountainous counties of North Carolina and Georgia, though rarely occurring in masses larger than would be called a coarse gravel. The corundum localities occupy a section of country 170 miles in length and of about 10 miles in breadth, situated in a subalpine region, partly within the northeastern corner of Georgia, and extending thence, in the direction of the crest of the Blue Ridge, into several counties of North Carolina.

Corundum is known to occur only in a single formation, which may be designated as chrysolitic rock—which exists in lenticular beds inclosed in the prevailing gneiss. The principal exposure of the corundum has been effected at the Culsagee mine in the township of Elegée, in Macon county. The chief excavations have been made on the northern slope of a mountain at an elevation of about 2,700 feet above tide water. The workings have been carried down to a depth of about 50 feet.

The form of corundum crystals is that of six sided prisms or pyramids, sometimes the two combined, exhibiting occasional triangular faces belonging to the primary rhombohedron. The crystals are remarkable for showing cleavage lines, whereby their faces are transversely ruled off into lozenge-shaped areas. The prevailing colors are blue and red. The blue is intense only in small patches, and shades off into gray or pale yellowish gray. The tendency to cleavage renders the crystals unfit for purposes of jewelry. In size they vary from a quarter of an ounce up to a pound in weight, though the latter are rare; while two have been found of extraordinary magnitude. The largest of these is red at the surface, but bluish gray within. Its general figure is that of a six sided pyramid, and it weighs 312 pounds. The smaller crystal is 11¼ pounds in weight, is a regular hexagonal prism, and has a grayish blue tint.

A Distilling Stove Wanted.

We have entertained a pet project for the last twenty years, not that we expect to carry it out and make a hundred thousand dollars ourselves by it, but whoever will do it will make all the money he needs. Our project is this: let there be a cooking stove so constructed that water can be distilled. Then rain or any other water, from a puddle, brook, or pond, or brackish well, or sea water, might be used, and the fire which warms the house and cooks the food can be made to distil all the water the family might require for cooking and drinking. This apparatus should be so constructed as to be simple, easily attended, not liable to accidents, and not to increase the cost of the stove more than ten or fifteen dollars. It can be made larger and more elaborate for hotels and large families, and the extra expense would, in such cases, be easily borne.

Who will put his wits to work to make this invention, thereby securing a fortune and ministering to the health and happiness of millions of human beings?

Who will study and work out the invention and, while thus doing good, get abundantly paid for it? A cheap invention to give to the great West pure water in every house would be worth to the nation more than a sum equal to our national debt. Who can estimate the health of an empire in money? —*Phrenological Journal.*

Joint for Earthenware Pipes.

The parts of the pipes which are in juxtaposition are cylindrical, scored on their exterior surface, and covered by a socket of greater diameter, having at its two extremities two flanges which fit the cylindrical surface of the pipes. A rectangular opening at the upper part of the socket is intended to give passage to the liquid cement which fills the interior of the socket and penetrates into the scoring of the pipes. When the cement is dry, the compact whole, formed by the pipes, the socket, and the cement, affords a perfectly water tight joint. There is, however, one precaution to be observed in the manufacture of this joint. The cement must be prevented from running into the interior of the pipe through the space left open between the two ends to be joined. This is effected by an india rubber ball fixed to the extremity of a tube, the other end of which is provided with a tap. The ball is introduced uninflated into the interior of the pipe at the part where the joint is; it is then inflated, the tap is closed and the cement is poured in. The inflated ball prevents the cement from running into the interior of the pipe. When the cement is dry the tap is opened, the ball becomes disinflated, and is withdrawn.

These joints have resisted pressure of thirteen atmospheres, attained in experiments with an hydraulic press. In practice, however, a much lower resistance must be anticipated. Besides which, earthenware pipes cannot of themselves support such high pressure as in these exceptional cases, and it is useless to require from the joints a resistance greater than that of the pipes.

AT the shops of the London and Northwestern railway, at Crewe, England, steel axles are rolled in rolls having grooves of varying depth by which necessary variation in diameter is given. Axles of any length can be rolled, and with collars at any part. This method not only saves time and produces an axle of superior finish, but also, it is said, prevents the flaws which occasion so many accidents to trains.

ROAD-BUILDING IN THE CAUCASUS.

The military engineers, who during our late war found themselves compelled at times to build roads over all but inaccessible localities in the mountainous regions of Virginia, Tennessee, and the Carolinas, will doubtless admit that, though arduous as their labors may have been, the exercise of no such consummate skill was required as was necessitated in the construction of a substantial way over such precipitous steeps as are represented in our full page illustration. In fact, if we may judge from the delineation presented, the threading of such mountain fastnesses seems impossible save to goats or chamois, and yet history tells us that the work was not only undertaken, but carried against every obstacle to successful completion.

The military path, represented as in course of construction, was projected by the Russians in order to carry their vast army, operating against Schamyl the famous Circassian chief, across the Caucasus Mountains. This range lies in the east of Russia, where the bleak, inhospitable climate added still further difficulties to the many already to be encountered by the engineers; but after a lavish expenditure of skill, money, and human life, the forces of the Czar succeeded in building a solid and enduring road, which, extending over crags and across crevasses, eventually afforded a means of cutting the enemy off from his base of supplies, and so victoriously ending the war.

Our engraving gives an excellent idea of the mountain declivities, into which the path had to be fairly carved or hewn, through the rock of summits elevated far above the plains below.

[From the New York World.]

PROFESSOR TYNDALL'S FIRST LECTURE IN AMERICA.

Professor Tyndall made his debut before an American audience on the evening of October 15th in the hall of the Lowell Institute, on Washington street Boston. It was packed with people, and his reception was exceedingly warm and hearty. The tickets to the lectures, which will continue for six alternate nights, were given out the previous morning, and twenty minutes sufficed to dispose of them all, although but one ticket was allowed to each person. The lectures are free, and are the gift to the public of this splendid institution, which does in another way something of what the Cooper Institute does for New York. The front seat at these lectures is always for Mr. Lowell's friends, and among those who attended him to-night were Robert C. Winthrop, Josiah Quincy, Professor O. R. Gray, of Harvard College, Dr. A. P. Peabody, Professor John Fiske, Rev. Dr. Neale, and many other distinguished people. Otherwise it was a typical Boston audience. Though so exceedingly plain, the hall is well adapted for the purposes of a popular lecturer.

Professor Tyndall's apparatus was arranged chiefly upon a large table, arranged as three sides of a square, in the center of which he stood while speaking. A long, narrow bridge was built out from the front of the platform over the heads of his audience, and on this was placed the auxiliary instruments with which the professor produced his most brilliant effects, in analyzing a ray of light upon a canvas at the back of the platform. He was as prompt as his audience.

At half-past seven he emerged from the anteroom and began to talk in a rapid, unassuming, polished way of the circumstances of his coming to America.

In person, Professor Tyndall is a gentleman of medium *hight* and rather slight in build. His features are shrewd and kingly, and his manner betokens the accomplished and genial gentleman. He was clad in a full evening dress, and was followed by his two assistants, who were kept busy throughout the evening in preparing for his experiments. With that happy faculty of speech which is his most charming trait, the Professor settled down immediately into the good opinion of his hearers, who cheered him so warmly that he intimated at once that he felt quite at home.

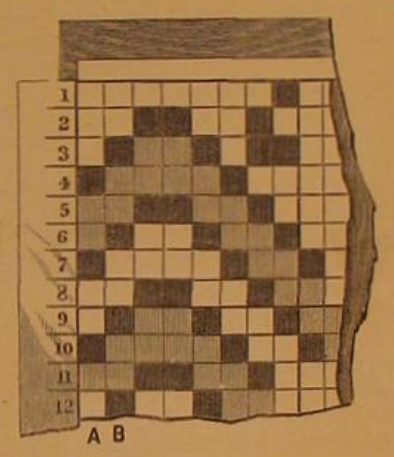
He told how, many years ago, he was besought by Mr. Lowell to come to America, and how last year the summons came with such a force from many distinguished men that he could not longer resist it. So here he was before a Boston audience. He spoke of his indebtedness to Mr. E. L. Youmans and Professor Henry; and, when the ice was fairly broken, he set his assistants to work, and, while they were preparing the batteries and wires and electrical lamps and prisms, he gave a little discourse on the pursuit of science for the truth's sake, vindicating the investigator and claiming for his apparently aimless labors an importance equally as great as the practical work of the worldly without the scientific experimentalism of 300 years ago. He showed there could be no industrial England or industrial America *to-day* without such labors. Next he spoke of the importance of the work of the scientific demonstrator, and then turned to his instruments. His lectures, he said, were to be confined to the exposition of the laws of heat and light.

By the aid of a platinum wire and battery, he explained the electrical light which he uses in all his experiments. Bidding the gas glare begone, he caused a platinum wire, stretched across the table in front of him and no thicker than a horse hair, to glow with an intense brightness and then melt by electricity, which sufficed to *demonstrate* the principles of electrical action. Then substituting his lamp for the circle of gas jets of the hall, he proceeded by a series of rapid and beautiful experiments to analyze a ray of light. Through a tiny aperture in a bit of tinfoil, he took the single ray and showed the process of combustion and the laws of refraction. Then with a prism he resolved the ray into its component fragments, and afterwards gave the synthesis of light, by those wonderfully brilliant and marvellously simple methods which have given him a world-wide reputation as the greatest living popular scientific demonstrator. His fascinated audience cheered him to the echo, and went away to hunt up new adjectives with which to praise him.

HOW PATTERNS IN CARPETS ARE MADE.

The following description, gleaned from notes made of an interesting visit to one of the largest carpet manufactories, that of the New Brunswick Carpet Company, in the vicinity of New York, is of course not applicable to all the different varieties of floor coverings found in our large warehouses. For the kinds known as tapestry Brussels, it is, however, in the main correct, while it will give a general idea of the ingenious processes in an industry which, in this country, is rapidly assuming extended proportions.

In carpet manufacture, two principal materials are employed: carpet worsted for the warp and a coarse cotton packthread for the woof. The latter, previous to being used in the loom, is starched by being conducted from its spools down into a starch trough, after its exit from which the superfluous mixture is removed by pressure of rollers, and the fibers laid by revolving brushes, after which the thread is allowed to dry. This portion of the fabric, however, plays no part in the formation of the pattern, so that our attention must be directed to the worsted and the different manipulations through which it passes. First in order is scouring and then bleaching, leaving the wool pure and white. Meanwhile, the artist is preparing a pattern. This he draws on paper, marked in a peculiar manner. The sheet is just the width of a breadth of carpet, and is divided by printed horizontal and vertical lines into a number of squares, each of which is about an inch in dimensions. Each of these divisions is subdivided into several smaller squares; for example, eight on each side, or sixty-four in all. This may be better comprehended by examining the paper patterns used as models for embroidering on canvas. The artist, in coloring his design, lays each tint over so many squares, thus making the picture, as it were, a mosaic of small blokcs of different hues. The pattern, when completed, is pasted on a thin board, varnished, and then cut into longitudinal strips, each of some six inches in width. These are passed to the workman whose duty it is to make a record of the colors on each thread.



This operation is somewhat complex, so that, to make it clear, we must refer to the accompanying small engraving. A section of the pattern divided into squares, as above described, is represented. The first perpendicular line of small subdivisions, marked A, represents one thread of warp, B another and so on. Beside this first thread is placed a paper gage, as shown, numbered perpendicularly and divided off to correspond with the small squares. The workman now notes down the different tints on thread A, corresponding to the subdivisions of the gage. Thus, in our engraving, 1, 2, and 3 are white, 4 is black, 5 and 6, for example, red, 7 black, and so on in regular order throughout the whole length of the pattern. Then the gage is applied to thread B, a similar memorandum made, and this is repeated throughout the whole design. Consequently, when this work is completed, there are as many memoranda as threads of warp; as there are eight threads to a square, and, for instance, 27 squares is the breadth of the carpet, there will have to be made no less than 216 different records.

During the above operation, the worsted is being wound about a number of large wooden cylinders, each of which is some six feet in width and of a circumference equal in length to three times that of the design. Why this is the proportion we will shortly explain. The wool is laid on smoothly in a single layer over the whole periphery, but is divided into a number of skeins, each of which may be separately removed. All of the worsted on a single cylinder *is dyed according* to the memorandum of one thread; so that there are 216 windings of worsted, and consequently that number of repetitions of the dyeing process.

The pattern, as drawn by the artist, represents the finished carpet; therefore, in dyeing threads, allowance must be made for the extra amount doubled up, so to speak, in the finished fabric. In other words, space corresponding to one small square, as indicated by the paper gage, must be considered and allowed as three times the size, in the unwoven warp, and consequently on the cylinder. Around the *edge of* the latter is attached a series of teeth all numbered exactly similar to the gage. On the principle above stated, the distance between any two of these teeth is made three times that between any two numbers on the gage. These teeth engage in a ratchet which, worked by the operative, holds the cylinder at rest at any desired point. Under the cylinder is a track, on which is a carriage actuated by a belt moved by steam power. In the carriage is a pot of dye in which rotates a wheel which has a circumference of rubber or other suitable material. The wheel dipping in the dye also rubs against the worsted on the cylinder above it. The width of the edge of the wheel is exactly equal to the distance between two of the teeth on the edge of the cylinder.

In beginning the operation, the workman turns the cylinder until the tooth marked 1 is directly in line with the dye wheel—this is indicated by suitable means—so that the latter will, if set in motion, draw a line lengthwise the cylinder from that point. Let us suppose that the dye is red and the first thread, A, to be the one under operation. Referring to the engraving, we find that the first three divisions are white; they need no *dye*, so the cylinder is turned until the first red point (*No. 5*) is reached. Now the machinery underneath is started. The carriage runs *along* the track and the wheel leaves a red line across the worsted. The next space is also red; the workman rotates the cylinder ahead one tooth, and again sets the wheel in motion; the red line is now twice as wide as before. Then he goes on to the next red space, and so on until all are marked. A pot of black dye is substituted; the cylinder is turned back to tooth No. 1, thence on to No. 4—the first black space according to our memorandum; and thus the work continues until all the colors are printed. The skeins of worsted, between which and the surface of the cylinder is a sheet of oil cloth, are easily slipped off. They are then placed in a steam bath. Chemical decomposition ensues, the base or mordant is precipitated in the cells of the wool and becomes the chemical reagent for absorbing or reflecting the different quantities of rays of light according to the base and dye used; so that, when the worsted, emerges it is ready to be rewashed and, thus cleansed from the glutinous matter, employed to hold the base and dye in place during the printing and steaming processes.

The above operations are repeated, differing of course for every thread. Finally, when all is completed, the skeins are placed on an apparatus which winds the worsted on spools. This requires great care, because an exact point on every thread must be determined, which must correspond in all, so that when they are laid side by side the pattern will be plainly formed. This point is marked while the worsted is on the cylinders, in a manner which renders it easily detected.

Each thread is wound on a separate spool, which is numbered, that holding the thread furthest on the *left* of the pattern being No. 1, on the right No. 216; the others are intermediate. All the spools are placed upon spindles in regular order on a large movable table. The end of each thread in proper order is led through an orifice in a metal reed and fastened on a large beam. As the threads are side by side, the pattern is corrected by girls who, with the design before them and further assisted by the threads passing over a setting board correspondingly divided off into squares, readily place them in proper relative position. As fast as a certain length of pattern is arranged, it is wound on the beam, and this continues until all the threads are expended. The beam then is placed in the *loom*, where the worsted is arranged as the warp. The shuttles, carrying the woof of cotton and the filling, generally of jute, are in readiness, the almost magical machine is started, and, lastly, we see the material, that we have traced through its many processes, emerge in the shape of finished carpet.

THE MANCHESTER SCIENTIFIC AND MECHANICAL SOCIETY.

At the last meeting of the above society, held in Manchester, England, the subject discussed was the "steam jacket." The question at issue was whether the unavoidable liquefaction of steam, due to condensation from radiation, conduction and convection, as well as to work done, was to be allowed to take place in the cylinder itself, or whether it was more advantageous to employ a separate casing to supply heat to the steam inside the cylinder, and let the condensation take place in the casing, so that the propelling steam might be uninfluenced by loss of heat from convection.

During the argument, a speaker advocated the jacket because it was a safeguard against breakage, resulting so often from accumulated condensed water in the cylinder. This view was, however, strongly opposed. The result of the discussion was the general opinion of the members that no advantage could be gained from the steam jacket, nor did they object to its use, but they were convinced that efficient protection against radiation and conduction of heat from the cylinder was the best and only means to attain true economy.

The Good Butter of Philadelphia.

Many have been the attempts to account for the superior reputation of Philadelphia butter. Perhaps the most popular notion was that it was due to the prevalence in our pastures and hay-fields of the "sweet vernal grass," which often gives so peculiar a fragrance to meadow hay. But it needed very little reasoning to demolish such a theory as this. This grass is one of the poorest for hay or pasture purposes, and scarcely exists except on cold clay lands, in partially shady places near groves or low woods. We owe much more of the sweetness of our butter, suggests the *Germantown Telegraph*, to the abundance of springs and spring houses in our State, than to anything peculiar which grows in our pastures. Milk has a particular affinity for any odors in the atmosphere, and water has some; hence whatever impurities may get into the atmosphere of the spring-house are drawn out by running water, and the very best security is provided against their being absorbed by the cream.

SINCE the completion of the Mont Cenis tunnel, the quantity of wine imported into France from Italy, by that route has greatly increased.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Cheap Microscopes.

To the Editor of the Scientific American:

"This little microscope is an optical wonder. It reveals the thousands of hidden wonders of Nature; is of permanent use and practical availability. . . . It magnifies ten thousand times, a power which is equal to that of other microscopes of many times its cost. Price $3 00."

The above is the advertisement of a so-called microscope, which is so worded as to convey to novices in microscopy the idea that it is an instrument of real value and utility, and, without actually saying so (which would be a criminal fraud), the farther idea of equality in value to instruments of many times its cost.

Microscopes have now become indispensable to the physician, the physiologist and the naturalist; they are also an attractive educator in the school and the family, and their use and study form an elegant, delightful and instructive pursuit wherewith to occupy the leisure hour. Thousands of instruments are in use in Europe, and almost as many in this country, and the general use of them is rapidly increasing. But there are hundreds of youths, ambitious to procure instruments, who have not the slightest conception of the construction, performance or cost of a good instrument. Such are liable to be, and no doubt often are, misled by such claims as are advertised above, and it is the purpose of this paper to put them on their guard. Such an instrument is not an "optical wonder," is not of "permanent use" and is not of "practical availability." Neither can any microscope, made and sold at any such price, possess those qualities. It may magnify "ten thousand times" in area, but that is only one hundred in linear dimensions, which is the only nomenclature now in use by microscopists; and one hundred linear is a very low power in modern microscopy, where powers of 500 to 1,500 linear are in common use, and powers of 10,000 linear are not uncommon. Mere magnifying power is a comparatively unimportant matter. A good performance of 50 diameters is preferable to a poor one of 100 diameters. Such instruments are not corrected either for color or sphericity, and no good performance can be obtained without both. These instruments, from the above deficiencies, can be used only a very short time without injury to the eyes.

But how shall the inexperienced obtain a good instrument, or a best one? Of all instruments made, there is none of which there is such a variety of shapes and forms. Some of these are patterns made 30 to 50 years ago, and now utterly condemned by experts. Then the difference in quality is as great as the difference in form. What is the buyer (a novice, I suppose) to do? The best advice I can give him is to consult some friend who has used or knows all about the instruments of different makers, and has personal knowledge of the merits and demerits of different forms.

A recent writer on this question suggested that the best reliance of the buyer is on the reputation of the maker or the dealer. I regret to say that that will be a frail support on which to rely. There are very few dealers who really know anything of the qualities or properties of good microscopes. There are a great many makers in Europe, and, if one can believe their catalogues and advertisements, every one puts in the best work and makes better instruments than any one else; while it is notorious to many who have tried the instruments that some who make the greatest pretensions turn out the poorest work.

There are a few makers in this country who, I believe, make better work than the second or third class work in England; while some of them stand at the very head of the art. In the words of Dr. Barnard, President of Columbia College in New York city, in his report on the *Exposition Universelle*, Paris, 1867: "It is not necessary for Americans any longer to go abroad in order to obtain microscope glasses of any description of the highest order of excellence." But buyers of microscopes should not, must not, expect to obtain a good working instrument for an insignificant sum of money. It is the instrument, if properly made, that involves the highest mechanical skill and scientific knowledge of any. No decent efficient instrument can be obtained under a cost of about $50, and from that the prices run up easily to $2,000. The only utility of such instruments as served for the text of this paper is that, now and then, they may come into the hands, or rather under the eye, of some one whose curiosity or interest may be excited enough to induce him to procure a real microscope. C. S.

Boston, Mass.

Splitting of Trees by Lightning.

To the Editor of the Scientific American:

I noticed in a recent number of the SCIENTIFIC AMERICAN an article which ascribed the splintered and shattered appearance of trees which had been visited by lightning as due to the sudden conversion of the sap into steam, and producing those results by explosion. Now this may be true in the live tree, but why does the same result occur in dead and seasoned timber? Whenever a mast or telegraph pole or fence is struck by a bolt, the same effects are produced; and I know of a fence in my neighborhood, that was struck last August, which was fairly converted into kindling wood for a part of its length.

I merely state these facts to show that, in trying to assign a satisfactory explanation of some phenomena, conclusions are sometimes made which may indeed apply in a cited case, and the same manifestations, which occur where the conditions are essentially different, are overlooked. H.

New Haven, Conn.

Changing Pay Day.

To the Editor of the Scientific American:

I notice several articles on the subject of paying men on Monday instead of Saturday. I have followed that course for several years. During the second year of the war, I found a great deal of trouble in keeping men, and in getting them to work on Monday morning. The railroad ran two trains through here on the Sabbath, morning and evening. Wages were high, work was plentiful, and men could get work anywhere and at any place. Getting their pay on Saturday night, with nothing to do on Sunday, some would take a trip on the cars and not get back in time for Monday or perhaps not at all; others would get on a spree and would not be fit to work on Monday. I at once changed my pay day to Monday; after that all hands were on hand on Monday morning, ready for their pay and for work. I pay my men during the morning while at work. Each man's money is put in an envelope and handed to him at his place of work, so he loses no time in getting his money. The plan works to my entire satisfaction. Some men do not like it, but I say to them that it suits my business and works well.

Geneva, N. Y. W. B. DUNNING.

Cider versus Juice.

To the Editor of the Scientific American:

Your correspondent, E. H., Oct. 12, is right. To obtain good cider, the expressed juice must remain a short time with the pomace, which has been crushed or bruised, not cut as is done by most patent cider mills. The old mills bruised the apples, the new ones cut them. We found, 50 years ago, that, with the advantage we then had of the old fashioned mills, it was better to grind or crush the apples and then let the pomace remain in the trough at least 10 or 12 hours; and if the weather was cool, let it remain 24 hours.

Lima, Ohio. A. G. K.

[For the Scientific American.]

Patent Extensions.

There has never yet been a government or institution of any kind which, though perfect in its vital organization and correct in its leading and great principles, has not had some weak point. So far as the history of the world has shown us, there never was anything, though complete as a system, perfect in all its details, always excepting the "wonderful one horse shay." And as we plume ourselves that the world is gradually approaching perfection, it behoves us to examine, critically and carefully, our old systems, that we may as much as possible correct their faults and verge nearer that desirable perfection. It is my object in this article to point out a hardship, suffered by an ingenious class of our citizens, which should receive the prompt attention of the Congressional Committee on Patents.

Patents prior to 1861 were granted to inventors for a term of fourteen years from their date; and the inventor was expected, within that time, to realize a sum sufficient to remunerate him for the benefit he had conferred upon the public, and the time, ingenuity, and money spent by him in costly experiments and introducing his invention into public use. Through poverty, and in some cases sickness, sometimes on account of the public not at first appreciating the value of the improvement, and at others through the machinations and combinations of unscrupulous capitalists who infringed his patents, his efforts were utterly futile, and toward the close of the term of his patent, he finds himself almost perfectly undone, and worse off than if he had never made the invention; but his energy and faith led him to persevere in it to the detriment of his other business. The inventor thus gets either nothing or a pittance of a few thousand dollars, for a benefit to the public of hundreds of thousands. Seeing the injustice of this, Congress has passed a law to protect him by granting him, on certain conditions, an additional term, or an extension of time for seven years more than the fourteen originally granted, making his protection in all last for a term of twenty one years in patents granted before April, 1861; since which time, in consequence of a second act, patents are originally granted for a term of seventeen years with no extension. But it is with the first that we have to deal. There remain yet about ten thousand unexpired patents granted between October, 1858, and March, 1861, inclusive, among which are thousands of patents covering valuable inventions whose inventors are in the condition set forth above; the original term of the last of these patents expires in 1875. These extensions are conditional, and it is at the discretion of the Commissioner of Patents that they are granted. If in his judgment the invention, the patent for which is sought to be extended, was not new at the time of its grant, or in other words, if it was substantially the same as a prior known device, or if the patent for any reason was bad when it was granted, he refuses the extension, and from his decision there is no appeal, and the protection expires. It is thus given to the Commissioner of Patents to decide finally a question equivalent to a question of infringement; a matter in which even the Judges of the United States Circuit Court are not given the power to make a final decision, as an appeal lies from them to the United States Supreme Court. This glaring example of one man power is not a state of affairs brought about after a long experience and established as a result of investigation and research; it is more the result of accident or oversight, in a department once considered of slight importance, but now grown, with all its defects clinging to it, into a vastly important branch of our governmental organization. Though the judgment of the present Commissioner is good, that of his successor may be poor and deficient; and the accidents and changes of life and office may place this successor in the Commissioner's seat at any time.

An appeal should be had either to the United States Circuit Court, to be tried as an ordinary case of infringement, with a second appeal to the Supreme Court, or it should be directly from the Commissioner's decision to the Supreme Court. Why cases of such difficulty and importance should be finally decided by the judgment of one individual who may in many instances be a political party appointee, entirely disqualified for such service, when cases of no more difficulty and often of less importance are submitted to a skillful judge or judges in the Circuit Court, with an appeal from them to the Supreme Court, is hard to understand.

Let the Congressional Committee on Patents bestir themselves and institute a reform in the matter, or the wrong will exist for three years longer, before the last of the extensible patents expires, and the highest talent and inventive skill will often go unrequited. TACITUS.

Patent Decisions of the Courts.—United States Circuit Court, Southern District of New York.

UNION PAPER COLLAR COMPANY *vs.* VAN DEUSEN *et al.*

BLATCHFORD, *Judge.*

The bill in this case is brought by the Union Paper Collar Company, a corporation, against Isaac Van Deusen and others, composing the copartnership of Van Deusen, Boehmer and Company. It alleges the infringement by the defendants of the following letters patent, named by the plaintiffs: Reissued patent No. 1,646, granted to Solomon S. Gray as inventor March 29, 1864, for an "improvement in shirt collars," the original patent, No. 38,961, having been granted to him June 23, 1863; reissued patent No. 1,828, granted to William E. Lockwood as assignee November 29, 1864, for an "improvement in shirt collars," the original patent, No. 11,376, having been granted to Walter Hunt as inventor July 25, 1854; reissued patent No. 1,867, granted to said Lockwood as assignee February 7, 1865, for an "improvement in shirt collars," the original patent being the one of July 25, 1854, above mentioned; reissued patent No. 1,926, granted to said Lockwood as assignee April 4, 1865, for an "improvement in shirt collars," the original patent being the one of July 25, 1854, above mentioned; reissued patent No. 2,306, granted to the plaintiffs as assignees July 10, 1866, for an "improvement in shirt collars," the original patent being the one of July 25, 1854, above mentioned, and a reissue thereof, No. 1,927, having been granted to said Lockwood April 4, 1865; reissued patent No. 2,309, granted to James A. Woodbury, as assignee July 10, 1866, for an "improvement in paper shirt collars," the original patent, No. 38,664, having been granted to Andrew A. Evans as inventor May 26, 1863; patent No. 56,737 granted to said Woodbury, as assignee of said Evans as inventor, July 31, 1866, for an "improvement in paper cuffs or wristbands," and reissued patent No. 1,980, and reissued patent No. 1,981, granted to said Lockwood as inventor June 6, 1865, for "improvements in collars," the original patent, No. 23,771, having been granted to him April 26, 1859.

The defendants admit, by a written stipulation, that they have infringed each and all of the said patents set forth in the bill "by making, using, and selling to be used the things respectively described and claimed as new." The contest is as to the validity of the patent.

The following is a brief of the decision:

The original Hunt patent having claimed a shirt collar composed of paper and muslin and polished and then varnished: Held, that, inasmuch as the collar is a complete article when it is polished or burnished, the varnish only adding further to its useful qualities, a reissue which omits from the claim all mention of the use of varnish is valid.

The Hunt reissued patent for a polished collar of paper and muslin sustained.

A starched linen collar with its surface embossed having previously existed, and also an imitative surface representing starched linen, there was nothing of patentable novelty in the idea of embossing such imitative surface as claimed in Lockwood's patent.

Printing having been done before on a smooth, white, enamelled surface, and a surface imitating starched linen being old, there was nothing of patentable novelty in printing upon such surface (as in Lockwood's patent), nothing being claimed as new in the appliances, machinery, or process for producing the printing.

Calling an embossed or printed collar (Lockwood patent), a new *article of manufacture* confers upon it no quality of patentable novelty, when there is no such novelty in the process or instrument for producing it.

The Lockwood patents for embossed and printed paper collars and cuffs declared invalid, as not covering patentable novelty.

The Gray patent for a turnover paper collar declared invalid by reason of prior inventions.

The Evans invention, as described in the reissue of July 10, 1866, defined to consist in the making a collar out of a long fiber paper possessing the qualities specified, and not in any process for making a paper possessing these qualities.

Collars having been made of other qualities of paper, and of other materials, the making of a collar out of this particular paper by a person who did not invent the process of manufacturing the paper itself, held not to be patentable.

Where E announced to C, a skilled paper maker, that he desired a paper possessing certain qualities, but made no suggestions as to the process by which it could be produced, and C succeeded in producing such paper after many experiments as to the character of the materials used and the mode of treating them. Held, that at the very utmost E can properly assert nothing more than that he and the paper maker were joint inventors of the paper.

The Evans patent of July 31, 1866, for a reversible paper cuff, held valid.

Wm. Whiting and *C. A. Seward* for complainants.

J. J. Coombs and *E. Wetmore* for defendants.

AT some of the English mines, steam, generated in boilers located on the surface of the ground, is conveyed in pipes to the engines within the mine. In one example the steam is conveyed in pipes of four inches diameter, through a total distance of 2,338 feet, and the loss of pressure is stated to be only half a pound per square inch.

A TURK TAKES A PATENT.—Among the patents issued September 24, by the United States Patent Office, was a grant to Mr. Ljubomir Kleritj, of Belgrade, Servia, for a Drill for Boring Wells.

The Hardware and Metal Trades in England.

The last monthly report of Messrs. Blakemore in "Hardware, Metals, and Machinery," Birmingham, England, says:

The enormous demand for hardware and every kind of iron work, which for so long a period has prevailed, now displays many and unmistakeable signs of slackening. Few large orders are being given out, but producers are still heavily engaged, and the numerous orders for inconsiderable parcels of goods, which are being issued, show that the necessities of consumers are yet pressing, and that stocks everywhere are light.

Although the price of iron is now falling, the large establishments are too much occupied with orders received some time ago to permit of their accepting (in the face of a still rising market for fuel, raw material and labor) specifications at prices much under the makers' quotations given in the trade journals. It is only in second class qualities that any palpable reduction has so far to be reported; and, compared with the prices of best iron, what are called the common brands are at this moment disproportionately low. While best Staffordshire bars, for instance, are £16 12s. 6d. and £16, common bars may be had at £13 10s.. The relief to manufactures is, however, very slight; for goods of a reliable quality can be made only out of the more valuable descriptions of iron. What is true of bars is equally true of strips, hoops, sheets, and plates, and of the goods which are made from them.

Pig iron is twice the price it was a year ago; a similar rise has taken place in coal, and labor at the ironworks has advanced between 30 and 40 per cent. Pigs of a good quality cannot be obtained from the furnaces of this district, either by the finished iron makers or the engineers (for foundry purposes), under £8 a ton. Notwithstanding the quotations which these prices necessitate, some good foreign orders for massive goods are still reaching our leading machinists and engineers.

The establishments engaged in the manufacture of railway plant continue very busy. Steam, gas, and water tube makers have their books very full of orders for home and foreign markets; and, if they would accept orders for forward delivery, they might be obtained even at the existing high quotations. The edge tool firms are not busy, yet they have just been compelled to advance operatives' wages from 10 to 20 per cent.

Wares of the domestic class are keeping their producers in active operation. Great quantities of hollow ware are being sent abroad, and the demand for tinplate goods still exceeds the supply, while japanned goods continue to afford ample employment to their makers. It must be observed, however, that prices are not firm, and, though nominally unchanged, orders are being accepted at a reduction. The iron of which japanned goods are made has been reduced £2 in the month; but £29 a ton has still to be paid for that which twelve months ago might have been bought at £16. Then tin plates are 20s. a box dearer than they were a year back; and to keep them at that price, the makers have met, and 30 firms have agreed to employ their workpeople only four days a week, at the same time giving them higher wages. Further, English block tin, that in September, 1871, was £136, is now £158 per ton.

There is not much demand for builders' requirements; and, considering the price of materials, they are not dear, though much higher than in past times.

Galvanized goods keep up, though prices have a downward tendency for all but the best qualities.

There is an excellent demand for brass season goods, such as tubing, chandeliers, and the like. Owing to a sensible drop in copper, prices have been reduced about five per cent., and the further fall of £10 a tun, in the officialquotations of English smelters, which has just been announced, would, in ordinary times, cause a corresponding alteration in the value of manufactured goods. But this is neutralized now by a general advance of 15 per cent in operatives' wages, which employers have been obliged, very reluctantly, to grant.

Notwithstanding the considerable advance the colliers have already obtained, those in this district are demanding an addition of 6d. a day, and in North Staffordshire a further 25 per cent. If their demands should be conceded, the price of coal will be again increased one or two shillings a tun, which may occasion some embarrassment to ironmasters and manufacturers, but need not trouble consumers. Such demands, though powerful to stimulate an upward movement in prices, are incapable of arresting a backward tendency when the flood has ceased and the ebb of the tide has manifestly begun.

Comet Prizes.

The Academy of Sciences of Vienna instituted in 1869, for the purpose of encouraging astronomers to search for comets, eight special prizes, which it has kept up each year since as part of its programme. Each of these prizes consists of a gold medal of the value of 20 Austrian ducats (between $45 and $50). They are intended to reward observers who discover a telescopic comet, or a comet visible only by telescope at the time of its discovery. One condition is that the comet has not previously been seen, and that *its appearance* has not been previously proved with certainty. The discovery should be immediately announced to the Academy by telegraph or otherwise without waiting for further observations, the Academy undertaking to notify at once to the different observatories the fact of the discovery. The place and time of the discovery ought to be indicated, as well as the position of the comet and its orbit as exactly as possible with the first intimation; the data should be completed at leisure by further observations if it be possible to make them. When the comet has not been seen by other observers, the prize will be presented only when the observations of the discoverer have been sufficient to enable the orbit to be determined. The prizes are decided each year at the general meeting of the Academy held at the end of the month of May. If the first announcemen. of the discovery reaches the Academy between March 1 and May 31, the prize cannot be decided till the following year.—*Nature.*

MALLEABLE IRON.

Mr. Russell W. Davenport, Ph. B., of the Sheffield Laboratory of Yale College, communicates to the *American Journal of Science and Arts* an interesting paper on a chemical investigation of some points in the manufacture of malleable iron. Analyses were made of two samples of ¼ inch in thickness, each annealed twice and analyzed before and after each annealing to show what influence the process has upon the impurities contained in the iron. The material used was a fairly good charcoal iron, the unannealed castings showing a white fracture. The annealed castings, when broken, were up to the average toughness of malleable iron, and their strength did not materially decrease after the second annealing. The conclusions drawn were: first, that the silicon, phosphorus, and manganese are in no way affected by the annealing process; second, that the amount of sulphur is not diminished and may be slightly increased; and third, that the amount of carbon is reduced by each annealing until a mere trace remains. It appears that, when a casting does not exceed 1 8 of an inch in thickness, the carbon is approximately eliminated throughout the whole mass by the ordinary annealing process; when, however, the casting is thicker, the elimination only extends from the surface into the mass for a certain distance, but may be carried farther in by a repetition of the process. It would also seem that, in the interior of a thick casting, where the amount of carbon is at all events only partially reduced, that which remains is, by the high heat and subsequent slow cooling, changed its state of occurrence from combined carbon to a species of uncombined or graphitic carbon; for where the iron before annealing is white and very hard, after annealing it shows a dark fracture and is quite soft.

The manufacturers of malleable iron are occasionally troubled by a lack of toughness in the annealed castings when these are exposed to a sudden blow or a bending strain. This weakness is at times doubtless caused by the natural rottenness of the iron, owing to the presence of an excessive amount of silicon, phosphorus or sulphur; but it also must be frequently due to a crystalline structure, which the iron under certain unknown conditions assumes while being annealed. This structure shows itself in the fracture of an annealed casting in the form of bright crystalline faces, which occasionally extend entirely across the fracture. Analyses made afforded no explanation of this crystalline structure, so that its cause must be determined by future careful experimenting. Another analysis was made of an annealed casting which, when bent, showed a greater degree of toughness than common. It was of circular section, ½ inch in diameter, and was bent cold through an angle of 90° without showing fracture.

From this analysis, it was inferred that the silicon may run as high as 0·7 per cent without affecting the toughness of the annealed product, while it also tends to show, what might certainly be expected, that an iron low in phosphorus and sulphur is most suitable for making malleable iron.

NEW METHOD FOR SENSITIZING COLLODION.

"Dried carbonate of soda, prepared by heating a little of the best bicarbonate of soda to low redness for a quarter of an hour, eighty-seven grains, dissolved in four ounces of water. Half an ounce of nitrate of silver solution, containing thirty-five grains of the salt. Mix half an ounce of the soda solution with the above; agitate with glass rod." The precipitate of carbonate of silver will subside in a few minutes; then pour off the clear liquid, add two ounces water, agitate, let it subside, and pour off the water. Wash the precipitate with half an ounce of spirits of wine; pour off and add half an ounce of absolute alcohol; agitate well and add the whole to two ounces of Wortley's uranised collodion. Then add, drop by drop, nitric acid to convert the carbonate of silver into nitrate, testing with litmus paper until a distinctly acid reaction is reached. The editor of the *British Journal of Photography*, in suggesting the above method, states that at no period of its preparation does this emulsion exhibit a tendency to precipitation. It is perfectly smooth, and not at all granular-looking. On glass, it gives a more dense film than the usual emulsion, and is free from air bubbles. On the whole, it seems to be a convenient, economical and reliable method, and in view of the increasing uses of sensitized collodions, is likely to be of value to photographers.

FILIFORM SILVER.—J. H. Gladstone has shown that metallic silver might be obtained artificially in the same filiform condition in which it frequently occurs in a mineral, and thus throw light on the origin of this native variety. Specimens of the metal were exhibited, from Kongsberg in Norway, associated with calc-spar, and from Chili, associated with greenstone, and in each case the silver resembled twisted threads or wires, noncrystalline but often bending at sharp angles. Under the microscope were exhibited precisely similar threads of silver produced by the decomposition of nitrate of silver by suboxide of copper. The latter substance is partly dissolved and partly converted into the black oxide, while filaments of the white metal shoot forth and bend in every direction. Most of these are extremely fine, perhaps $\frac{1}{25000}$ of an inch in thickness, so that, as was said, a gramme of such wire would stretch from London to Brighton. Since suboxide of copper is no rare metal, it seems probable that filiform native silver may often, if not always, originate from it.

The Manufactures of the United States.

The tabulation of the statistics of manufactures of the United States, for the year ending June 1, 1870, as returned at the ninth census, has just been completed at the Census Office. The number of establishments is 252,148; number of steam engines, 40,191, with a horse power of 1,215,711; number of water wheels, 51,017, with a horse power of 1,130,416. The average number of hands employed during the year was 2,053,988, of whom 1,615,594 were males above sixteen years of age, 323,768 females above fifteen, and 114,626 children and youths. The amount of capital invested was $2,118,247,069; of wages paid, $775,621,593. The value of materials consumed was $2,488,291,952; of products, $4,232,625,892. Of this production $13,040,644 is returned from Alabama, $185,410 from Arizona, $4,629,234 from Arkansas, $66,594,556 from California, $2,852,820 from Colorado, $161,065,474 from Connecticut, $178,570 from Dakota, $16,791,382 from Delaware, $9,292,173 from the District of Columbia, $4,685,403 from Florida, $31,196,115 from Georgia, $1,047,624 from Idaho, $205,620,672 from Illinois, $108,617,278 from Indiana, $46,534,322 from Iowa, $11,775,823 from Kansas, $54,625,860 from Kentucky, $24,161,905 from Louisiana, $79,497,521 from Maine, $76,593,613 from Maryland, $553 912,568 from Massachusetts, $118 394 676 from Michigan, $23,110,700 from Minnesota, $8,154,758 from Mississippi, $206,213,429 from Missouri, $2,494,511 from Montana, $5,738,512 from Nebraska, $15,870,539 from Nevada, $71,038,249 from New Hampshire, $169,237,732 from New Jersey, $1,489,868 from New Mexico, $785,194,651 from New York, $1,921 327 from North Carolina, $269,713,610 from Ohio, $6,877,387 from Oregon, $712,178,944 from Pennsylvania, $111,418,354 from Rhode Island, $985,898 from South Carolina, $34,362,626 from Tennessee, $11,517,302 from Texas, $2,343,019 from Utah, $32,184,606 from Vermont, $38,364,322 from Virginia, $2,851,052 from Washington Territory, $24,118,051 from West Virginia, 77,214,326 from Wisconsin, $765,424 from Wyoming.

Tempering Steel.

A valued correspondent, Mr. P. McCormick, of Newark, N. J., comments on the specification of Siegfried's patent, described by us on page 239 of our current volume. He states that he has been engaged in working steel for the past 30 years, and finds, in new processes, always the same story of "imparting extraordinary hardness and durability to the poorest quality of steel;" and he says that all external working of steel, after the forging is done, has but one effect, namely, that the outer portion cools and contracts first, and so impresses and compacts the interior, so that, when a piece is broken, it shows a closer granular appearance after dipping, but will often be so brittle as to break with a slight blow. And if annealed to its previous condition, it is no better than at first. He would like to know how to make poor steel into good steel, but fears that he will have to wait for the knowledge till he can go to Sheffield in a flying car driven by a perpetual motion.

The Coast Survey.

From the report of Professor Benjamin Pierce, superintendent of the coast survey, we learn the following:

In all the northern sections, parties are yet in the field and will so continue until the approach of winter, when operations will be resumed on the southern coasts. Work has also been done and is in progress along Lake Champlain. Magnetic elements have been determined in the vicinity of Philadelphia and at Washington, D. C.; tides have been regularly recorded at Old Point Comfort, Va.; a geodetic reconnoisance is in progress near Harper's Ferry; the detailed survey of James River, Virginia, has been extended upward to Warwick River; twenty new charts have been published during the year, and nine others, which show extensive additions in comparison with their first issue, and tide tables for the ensuing year have been prepared, and will be published as heretofore.

Caffein from Roasting Coffee.

Caffein is much employed as a valuable medicine, but, as now usually prepared, is difficult to obtain, and is very expensive. According to Thomson, the waste of this valuable alkaloid could be prevented in the process of roasting coffee if an adapter, nine feet long, were to be attached to the axi of the drum, through which the fumes could be passed and condensed. A pound of coffee yields, on the average, 75 grains caffein. According to this, in England, with an annual consumption of 13,000 tuns of coffee, the yield would be 140 tuns of caffein. The United States would yield nearly as much more, so that a little economy in roasting coffee would give us a surfeit of this medicine, and very possibly result in its being found applicable to other useful purposes. Caffein is insoluble in a concentrated solution of carbonate of potash; it can therefore be separated by this reagent from sugar, gum, resins and extractive stuffs. If the tannic acid be precipitated from an infusion of tea or coffee by means of acetate of lead, and filtered, the caffein can be precipitated from the filtrate by carbonate of potash, afterward dissolved in alcohol, and obtained in crystals by sublimation. If an aqueous solution of caffein be evaporated to dryness in a sand bath, a few drops of chlorine water added, and again dried, a blood red residue will be obtained. In this way 1-1,000th of caffein can be detected.—*Journal of Applied Chemistry.*

WHERE personal interests come into play, there must be, even in men intending to be truthful, a great readiness to see the facts which it is convenient to see, and such reluctance to see opposite facts as will prevent much activity in seeking for them. Hence a large discount has mostly to be made from the evidence furnished by institutions and societies in justification of the policies they pursue or advocate.—*Herbert Spencer.*

RUSSIAN SAPPERS AND MINERS CONSTRUCTING A MILITARY ROAD IN THE CAUCASIAN MOUNTAINS.—SEE PAGE 275.

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Contents:

(Illustrated articles are marked with an asterisk.)

A MILLION DOLLAR TELESCOPE.

The *Manufacturer and Builder*, in noticing the fact that Congress has appropriated $50,000 to pay for a 27 inch refractor for an Astronomical Telescope, calls attention to the want of liberality usually shown by our public men, in respect to expenditures for scientific instruments. It thinks there is no difficulty in obtaining money to build engines intended for destruction, such as monitors, but, when it comes to devices that are solely capable of adding to human knowledge and augmenting human happiness, then the purse strings are drawn tight, and money grudgingly given. Our cotemporary thinks that an appropriation of a million dollars to build a large telescope ought to be passed, and that science ought to be aided and encouraged in the same liberal style on all suitable occasions. The editor further believes that if such a telescope were to be capable of killing people at the rate of a thousand souls a minute, the million dollars would have been paid out and the machine constructed long ago.

It may be interesting, in regard to this matter, to give an account of the largest telescope constructed, and a few hints about what we may expect of a million dollar telescope.

The large telescope, commenced by William Herschel in 1785, was finished in 1789; its objective was a reflecting metallic mirror of 4 feet diameter and of nearly 2,000 pounds weight; the focal length was 36 feet. It magnified objects 6,000 times in their linear dimensions, or 36,000,000 times their superficial area. Herschel found, however, that the penetrating power depended on the size of the objective. A small objective of long focus causes the rays to be diffused so much that little light is left; and by using the telescope with different sized diaphragms, he found that, while with a small opening he could only see to a certain distance in the heavens beyond the stars visible by the naked eye, he saw much farther by using the full opening of his telescope. By the latter, he saw nebulæ so distant as to totally escape vision when using diaphragm with smaller opening, which was equivalent to a smaller objective. He further found that some nebulæ could be resolved into stars, and others could not; and it was supposed that this was a confirmation of La Place's nebular theory, these nebulæ being assumed to be future planetary systems in their incipient condition.

The next large telescope was constructed by the late Lord Rosse. It had a reflecting objective of 6 feet diameter, and a focal length of 53 feet, and magnified objects over 10,000 times in linear dimensions, or 100,000,000 times in their superficial area. With this telescope, many of the nebulæ not resolvable into stars by Herschel's telescope were resolved, and it was a question whether all nebulæ could not thus be resolved, if only a still larger telescope than that of Lord Rosse was used.

This problem, however, has since been solved without building such a large telescope, as the spectroscope has proved that most of these unresolvable nebulæ consist of glowing hot hydrogen gas.

The magnifying power of a telescope is found by dividing the focal length of the eye piece into the focal length of the objective. It follows from this that the magnifying power increases with the focal length of the objective, which regulates the length of the tube, and is in an inverse ratio to the focal length of the eye piece. Some very long telescopes have been made, of over 100 feet length, mounted on a stick in place of a tube; but as the objectives were very small, the great magnifying power was counterbalanced by the small amount of light they received; and they had a total lack of penetrating power, and could be of use only for observations of such highly luminous celestial objects as the sun. For a successful instrument, the size of the objective must, therefore, be proportional to the length of the focus; and an objective of say 12 feet diameter, with a focal length of 120 feet, would be the thing to be desired, unless, indeed, these dimensions could be exceeded. If such an objective is ground to a very true parabolic curve, it can stand a very strongly magnifying eye piece, that is, one of very short focus. Suppose that the objective is so truly ground and polished that it could stand an eye piece of one twentieth of an inch focus, with which to magnify the image of the distant object formed in the focus of the objective; the magnifying power would then be equal to 120 feet divided by one twentieth of an inch, or 1,440 multiplied by 20—28,800 times the linear dimensions, or over 800,000,000 times the surface.

Such a degree of magnifying power would make the moon an interesting object for the geologist, showing the results of ancient volcanic action undisturbed by the effects of air and water. As the moon is at a distance of nearly 240,000 miles, a magnifying power of 28,800 would bring it to a distance of about 8 miles, and then the theory that the moon cannot be inhabited would be practically verified.

In regard to the planets, Mars would be brought to within 4 000 miles, and thus would be apparently 60 times nearer than the moon; and it would have a visual diameter of 50', or 100 times that of the moon. As this is the only planet which, according to the latest scientific revelations, has conditions so similar to those of our earth as to make it highly probable that it is inhabited, the observations of the same would perhaps be the most interesting of all, as the works of men, such as cities and roads, could certainly be distinguished.

It is impossible to speculate on what such a telescope would discover in regard to the other planets or the vast regions of the firmament; let us hope that some day the amount of capital necessary will be forthcoming, on the most liberal scale, for the progress of the most sublime of all the sciences.

DOWNFALL OF THE PAPER COLLAR RING.

For several years past the members of a Clique, organized for the purpose of attempting the control of the Paper Collar business, and known as the Union Paper Collar Company, have set up and operated on the pretence that they were in possession of certain Patents which covered the exclusive right to manufacture paper collars. Anybody who made paper collars of any sort was, so they claimed, an infringer of their patents, notwithstanding the well known fact that such collars were known and used for many years before their patents were thought of.

By dint of threats of prosecution, and by actual resort to legal persecutions in some instances, this unscrupulous Clique has for a long time held sway over the smaller dealers, compelling them to take licenses and pay unjust tribute money or submit to the meanest annoyances. Indeed, some dealers have been compelled to abandon the business.

In view of these circumstances, it is with considerable satisfaction that we observe that the Collar Clique have at last been brought into Court, where their pretensions have been curtailed to reasonable proportions. We publish an abstract of the case in another column, from which it will be seen that their principal patent claims are declared invalid.

DISCOURAGING PROSPECTS IN ENGLAND.

The late English journals are filled with gloomy forebodings as to the prospects of the poorer classes and the working people for the coming winter. In the cities, and especially London, the repeated building strikes have brought poverty to hundreds; while in the rural districts, where the agricultural laborers have been carrying on a war for higher wages, acres of productive land have lain uncultivated during the best months of the year.

The potato crop, which forms a staple industry among a large number of farmers, has utterly failed. The London *Times* states that growing potatoes are offered at one shilling a rood, without customers. The produce should be worth ten shillings. The face of the country where the potatoes are lying is blackened, and in the most cases the stench plainly indicates the presence of the disease before it is detected by the eye. The retail price is one penny per pound, and the wholesale, seven pounds per ton instead of less than half that sum. An agricultural weekly estimates the loss, if the disease continues its spread as it bids fair to do, at 1,630,000 acres at 4¼ tuns per acre, in all 7,735,000 tuns, which, at £4, comes to £29,340,000, or the value of say 10,000,000 quarters of wheat.

Various methods have been tried to prevent this fearful scourge, with but little success. Dr. Hooker, curator of the Kew Gardens, publishes, at the request of Premier Gladstone, the information that parts of the diseased vegetable may at least be saved, by grating and washing, thus extracting the starch. He also suggests that efforts should be made to spread among the poor the use, as food, of the beet root, and the foliage of the turnip and other vegetables, which are now given to cattle.

Another calamity is threatened in the shape of the foot and mouth disease among the domestic animals, which will result in the material increase in the price of meat. The London *Daily News* quotes from a Parliamentary speech, in which it is asserted that, in the five weeks previous, 10,000 cases of cattle and 50,000 cases of sheep had been returned as affected with this contagious disorder.

The outlook is further darkened by the probability of the price of bread being raised. A general strike of the bakers is threatened in London, which, it is feared, if carried into effect, will give rise to extensive and formidable bread riots.

In addition to these other evils, coal is selling at rates largely in advance of previous years. This may be accounted for, both by the troubles among the miners, large numbers of whom have struck for eight hours work, forcing many colliers into idleness, and also by the unusual demand for coal by the iron and metal working trades, the rate of whose yearly consumption has largely increased. Whether the advantage gained by the activity of these industries will compensate for the hardships entailed upon the poorer classes by the enhanced cost of fuel, is, as in all cases where one portion of a population is benefited at the expense of another, at best questionable.

With coal doubled in price, meat advanced and perhaps unhealthy from disease, potatoes, the great substitute for bread, scarce, and bread itself dearer, the prospect for the English working people is not very encouraging.

AN IMPORTANT PATENT EXTENSION DENIED.

The application of Perry G. Gardner, for an extension of his patent of Sept. 28th, 1858, for Improvements in Car Springs, has been rejected by the Commissioner of Patents on the ground that his statement of receipts and expenditures under the patent is vague and insufficient. The patentee granted licenses to use his invention to certain Companies, taking stock in compensation, and alleges that he has received no dividends therefrom; although nothing appears to show that his stock is not of great value, and no pretence is set up that the companies are not doing a profitable business. The Patent Office infers that the patentee has received a large remuneration for his invention, respecting which he withholds, in his statement, all information. Nothing is more common, says the Acting Commissioner, among manufacturing companies than to withhold all dividends, even while making enormous profits, devoting the latter to the enlargement and improvement of their works.

PROFESSOR J. H. PEPPER.

We are pleased to observe the arrival, in this city, of Professor J. H. Pepper, Director of the Royal Polytechnic Institution of London. He comes to this country on a tour of observation.

During his stay, we are to be favored with a few of those striking and marvelous scientific lectures for which he is celebrated, and which have attracted so much attention in London. The first lecture is announced for October 30th, at Steinway Hall in this city. Some of Professor Pepper's experiments with light and electricity are said to be quite astonishing, his appliances for direct illustration being very effective and original.

UNDERGROUND RAILROADS.

The London *Telegraph* gives a vivid picture of the horrors of the underground railroads of that city. It speaks of "the incessant hurry at the subterranean stations, the nerve shaking slamming of every carriage door, the hideous yells of the engines, the difficulty of distinguishing one train from another, or of getting a coherent answer to a question from the fevered and inarticulate officials," and says that "all these peculiarities, with the oppressive atmosphere and the spine-convulsing way of putting on the brakes, render the underground lines as terrible as they are useful."

Is the underground railroad which Mr. Vanderbilt is supposed to be building in this city, or to be making preparations to build, to be of this sort? Already we have troubles of our own in the way of travelling about the city. These are due in a degree to what some one has happily called the "natural depravity of inanimate objects," it is true; but they are none the less a grievance on that account, while the torments already inflicted on us by some of the horse car conductors, the stage drivers, and the hackmen, are worthy of the Spanish Inquisition in its worst days. But if the *Telegraph's* portrayal of the characteristics of the underground railroads of London be not wholly imaginative, what a pandemonium are we preparing for ourselves!—*Evening Post.*

The London Underground Railway is a model of its kind, pandemonium though it is, and the steam road proposed to be built in New York by Mr. Vanderbilt, will not be substantially different from that of London. The presence of the

locomotive in underground tunnels is always productive of many nuisances.

There is but one really practicable plan by which the annoyances recited by the *Post* can be avoided, and a rapid, safe, and agreeable mode of conveyance secured; and that is by the pneumatic system. A working section of this form of railway has now existed here for the past two and a half years, having been built for the express purpose of showing to our citizens how excellent and practical the plan is, and how well adapted for the special purposes of rapid city transit.

The section referred to consists of a nine foot railway tunnel extending under Broadway from Warren to Murray street. A strong current of pure air, produced by a gigantic blower, moves through the tunnel, which is thus always kept thoroughly ventilated. A handsome passenger car, carrying twenty persons, traverses the track, being moved back and forth by the air current, which acts upon the ends of the car like the wind upon a sail. Many thousands of people have enjoyed the ride on this pneumatic railway, and have expressed their unbounded satisfaction at the complete, effective, and splendid manner of its operation. The noise, cinders, gas, dust, jerks, and other disagreeable accompaniments of the locomotive are done away with, while a speed equal to the ordinary steam train is easily maintained.

The practical success of the pneumatic method for passenger cars was long ago settled. It cannot compete, in the open country, with the locomotive, in point of economy; but for underground rapid transit, in large cities like New York, where the travel is immense and cars are to be dispatched every minute or two, the pneumatic system promises to be the most comfortable, and the expense of its running is estimated to be about the same as the locomotive plan.

One of the most singular circumstances connected with the introduction of this pneumatic system has been the action of the present Governor of the State, Hoffman. The amended charter of the Beach Pneumatic Transit Company, which gives authority to carry freight only, was signed by him. The great success of the method and the urgent demands of the citizens of New York for the application of the system to passenger transit induced the Company to ask an extension of their privileges to passenger service.

The plans of operation, construction, and route—the latter being from the Battery under the whole length of Broadway—have been widely discussed by the press and approved by the public. For two successive years, both branches of the State Legislature have, by very large majorities, passed the necessary measures authorizing the Company to proceed with its works and construct a passenger road; but each year the Governor has withheld his signature and vetoed the enactment, one of his chief assigned reasons being that a city engineer, an appointee of the notorious Sweeny, had advised him that the construction of the works under Broadway would be impracticable. This was in the face of the direct testimony of all the leading architects and several of the most experienced civil engineers that the construction was entirely practicable.

The Governor has, however, signed several other bills for steam roads in New York, one of which, the Vanderbilt, soon, it is said, to be commenced, is to run under Fourth avenue; another, the Swain Three-tier, that is, a combined underground, surface, and elevated steam railway, is to be located west of Broadway; another, the Gilbert, an elevated railway, also to be located west of Broadway. In addition to these, passed last year, the Governor had previously approved the Central Underground charter for a steam road, now nearly defunct by its own conditions; also the Sweeny Viaduct charter, for an elevated steam road.

The construction of every one of these roads involves more engineering difficulties than that of the Beach Pneumatic Transit road. The latter has the most central, the straightest and best route; this is admitted by all the engineers.

It will thus be seen that the city of New York is blessed with a superabundance of steam railway charters; but the only corporation that has so far actually done anything underground, to meet the wants of the public, is the Pneumatic Transit Company. It is a shame that the consummation of this important enterprise should be so delayed. The Legislature meets again in January, when a new Governor will be inaugurated. The Company will renew their application for the privilege of carrying passengers, and, as soon as it is granted, proceed with the extension of their works.

HANGING WALL PAPER.

Many persons living in remote places defer re-papering their apartments on account of the difficulty of procuring skilled labor in this branch of industry; but it is really such a simple task that there is no reason why any one of ordinary capacity should not do it with as little trouble as whitewashing. The directions here given are the result of practical experience and, if observed, will enable any one to hang paper as well as an expert.

Supposing you have decided to paper your apartment anew: the first thing to be done is to remove the old paper, if there is but one thickness on the wall, it is not necessary, as this will not do any harm. It is only where layer after layer is put on that the apartment becomes offensive from the condensation of vapors, accumulating with years until at last they become dangerous sources of disease. This is a well established fact, as recent investigation by a Board of Health in London disclosed that the several layers or thicknesses of wall paper, in houses in a crowded part of the city, were absolutely damp with noisome deposits accruing from defective ventilation.

To remove the old paper, take a common whitewash brush and a pail of water. Wash the wall all over and you can easily tear the paper off in long sheets and so render the surface clean again. Care must be taken not to remove or break the surface of the under layer, or ground; for if this is done, there will be a ridge or seam wherever it is torn that will show badly if your new paper has a light ground; if it is dark and the pattern is in arabesque, it matters little, as it will not show.

Having cleaned or removed the old paper, take a roll of the new that you desire to apply and hold it up to the wall; arrange it so that the pattern will show evenly at top and bottom, if possible, and then cut off one length. Have ready a table or a board long enough to take the whole piece; then use the first strip cut as a guide, and match all the rest to it. You may cut all the paper up for the straight part of the wall, leaving the intervals over the door and windows to be done at leisure, or with the waste pieces that always accumulate. In cutting the length, be careful to cut the bottoms and tops perfectly square across, and not zigzag, or at hap hazard, for it looks badly to see the pattern mismatched, or a ragged end where it meets the wash board. There are two white edges or selvages on wall paper, one of which must be cut off. Be sure and cut off the right one, or the one that you intend to paper from, and cut all the others at one time. In applying the paper, you will doubtless find that between the doors and windows the pattern will not come out right, leaving a hand's breadth or so to fill up between the frame and the last piece applied. This is of no consequence, as it can be easily filled up by a piece specially cut for it. Be careful and see that you do not reverse the paper or get it upside down in hanging. You can easily tell the right side up if the pattern is in vines, leaves, or geometrical shapes, by noticing which side the shading of the figures is on.

Having cut all the paper ready to apply, roll it up and lay each piece on one side, or lay them all in a pile. Have ready a smooth boiled paste of wheat flour (sound flour, not sour), a whitewash brush, and a board, or table, long enough to take the whole sheet in one length. Make the paste quite thin, not thicker than molasses and as smooth as a custard. Have a chair, step ladder, or table ready, on which you can stand and reach to the top of the wall. Then take your first piece of paper, lay it on the table and apply the paste; not too thickly, being particular to touch the edges and top and bottom well. Then take the sheet by the top, raise it off of the table and support it with one arm (on the right or dry side, of course), and put it up to the wall. Keep it entirely clear of the wall until you fasten the head of the sheet, but previous to this, run your eye down the side and see if it hangs square with the door frame. If it does, have a clean towel or cloth ready, and move it *horizontally* in wavy strokes over the sheet until the bottom is reached, but do not in any case rub up and down or draw the paper in folds; if you do, there will be ridges and wrinkles in it, which destroy the appearance and can never be got out. Hang the sheet properly at first and then follow it down from the top, rubbing across it; and there will not be a wrinkle in it. Apply the second sheet in the same way, and be careful that you match the figures properly. Success depends on this, for nothing looks worse than to see the continuity broken off or a white seam showing between the pattern, up and down the wall where the sheets do not meet. When the corner is reached, if the sheet does not come evenly to the opposite wall, it is better to cut it lengthwise and paste it on; then take the fellow to the piece and apply it also, matching the figures of course. If you endeavor to make the sheet reach round, you will make a bad job of it. Always clean well the table where you paste, so that no paste will get on the pattern; if it does, the colors will run or smudge, and soil the sheet. Gilt papers with delicate lavender grounds require great care in this respect, as the least spot shows badly. This is all there is to be observed in hanging paper, and there is nothing that any one cannot do with a little practice.

Some care or discretion must be taken in selecting papers for the purposes or places they are intended to be put in. Rectangular or geometrical patterns do not look well in a bed room or a sitting room, as they impart a severe and formal appearance that is especially wearisome after a few weeks. Neither is a paper with dark stripes at frequent intervals desirable; the stripes give the effect of battens nailed over boards or rough carpenter's work, and divide a room off with hard lines that tire the eye whenever it rests upon them. All paper ought to impart a clean, cheerful aspect to a room, adding to the homelike appearance and bearing evidence of the taste of the occupants. Never put bordering on the bottom of the wall, as it takes from the hight and makes a boundary for the eye to rest upon where none is desirable. Dark grounds in papers render rooms not fully lighted darker still, and give a somber effect which is very depressing; while open chambers with white hangings have a cold and chilly aspect which it is equally desirable to avoid. No rules can be given for selecting papers; what seems desirable in one case or to one person is objectionable to others, and every one will of course suit themselves in this respect.

EDWIN MARCUS CHAFFEE.

Edwin Marcus Chaffee, a well known and prominent manufacturer of india rubber goods, died recently at Bristol, R. I., in the 65th year of his age. Mr. Chaffee was contemporary with Goodyear, Hayward and Day, and like them was also an inventor, having devised, in 1836, the devices known in the rubber business as the "Machine Patent." He began his career in 1830 and was one of the organizers of the Roxbury Rubber Company; during the past five years, he has been connected as director and secretary with the Providence and National Rubber Company.

Mr. Chaffee did not meet with the pecuniary success to which his inventions and industry entitled him, but, far from being discouraged at misfortune, he persevered in experimenting upon and perfecting new machinery up to within two weeks of his demise. He was one of the sufferers of the poisoning affair at the National Hotel in Washington some years ago, a circumstance which rendered him an invalid and eventually proved the direct cause of his death.

PROFESSOR JOHN W. FRAZER.

We much regret to announce the death, suddenly, on the 12th of October, of Professor John W. Frazer, one of the editors of the *Franklin Journal*, and Professor, for more than thirty years past, of Natural History and Chemistry in the University of Philadelphia, Pa. He was 63 years of age. Professor Frazer was a man of extensive learning and varied attainments.

WILLIAM PRESCOTT SMITH.

Mr. William Prescott Smith, Master of Transportation on the Baltimore and Ohio railroad, died on the 13th of October last. Mr. Smith was closely identified with the railway interests of the country, and more especially with those of the road of which he was the actual manager at the time of his death.

SCIENTIFIC AND PRACTICAL INFORMATION.

BALL LIGHTNING.

An esteemed correspondent, J. R. A., of R. I., was surprised at the letter of J. H. P., published on page 148 of our current volume, and states that in 1859 in the Shetucket valley, Conn., he had a view of a stroke of this kind of lightning at about eight rods distance. It struck a tree, rent it from top to bottom, passed off to a cart tongue laying near, into and through a pile of railroad ties, and into the railroad track about two rods distance. It was seen by six other persons, and the size, as it appeared to all, seemed to be as large as a bushel basket. They were in a building on a rise of ground facing the tree, and had a most perfect view of it. Undoubtedly there are a good many in the United States who have seen such strokes, if they would take the trouble to answer.

THE SUN AND THE ORIGIN OF STORMS.

Mr. John Hepburn says: "I have seen that all gusts coming up in the morning come from the eastward, all about noon from the southward, and all after sunset from the westward; thus clearly proving, to my mind, that the rays of the sun drive the storm, as it were, away from him after their electricity has fired and lit it up. Let the interested please observe, and they will find it so, I believe, in all cases."

NEW GALVANIC PILE.

A new galvanic pile, invented by M. Morin, is intended to avoid the inconvenience caused by the deposit of copper upon the surface of the zinc, or upon the porous cup. The pile consists of a cylinder of copper surrounded by a concentric cylinder of zinc, between which two cylinders is a third cylinder of filtering paper. There is difference enough in the size of these cylinders to leave concentric annular spaces between the paper and the copper and the paper and the zinc. The former space is filled with sand, and the latter with a stratum of flowers of sulphur. The whole is immersed in sulphate of copper.

Such a pile, it is said, has operated during five months with so little variation that the inventor believes it would work equally well for an additional five. During these five months, the current has been continuous without the need of once touching the battery.

A SIMPLE HYGROMETER.

A new hygrometer has been invented by M. G. Smiths, of Paris, France, in which a salt of cobalt is the essential ingredient. A solution is made of the salt of cobalt, common salt, and gum arabic; into this, strips of paper are dipped and allowed to dry. They will take on a blue color in a dry atmosphere, and become rose colored if the atmosphere be humid.

FORMATION OF CERTAIN METALLIC SULPHIDES.

Privoznick finds that copper, in contact with sulphuretted sulphide of ammonium is transformed into a blue bisulphide and a protosulphide. This is a means for obtaining the sulphides of ammonium, potassium and sodium in a colorless state. Silver becomes covered with a gray crystalline crust of sulphide of silver. Tin and nickel dissolve in appreciable quantities in the polysulphides of ammonium. Iron is covered with a black deposit. The solutions of hyposulphite of soda transform also, slowly, copper and silver into sulphides, with the formation of sulphite of soda.

CONCENTRATING SULPHURIC ACID TO 66° BAUMÉ.

M. de Heuiptume proposes to use a lead-lined vacuum pan for this purpose. The lead is not sensibly attacked by the acid unless the temperature is 200° or over, while in air the sulphuric acid will not boil except at 325°; in the partial vacuum of the pan, 3 to 4 centimeters of mercury, it will readily boil at 190°. The lead, however, softens at this temperature, and is subjected to a considerable pressure from without; and to avoid this difficulty, it is proposed to place in the pan sandstone balls, etc., which are not attacked by the acid.

CRYSTALLINE PHOSPHIDE OF IRON.

J. Sidot reports the following result: Phosphorus vapor was passed over metallic iron in the ordinary method of making phosphide of iron. The product was then calcined in an ordinary crucible with the intention of volatilizing the excess of phosphorus. On breaking the fused mass when cool, the

interior was covered with beautiful crystals, nearly a centimeter in length. These crystals were right prisms with a square base, iridescent upon the surface, strongly magnetic, and were nearly as hard as steel. The formula Fe_8 P very accurately corresponds with the analysis of this phosphide.

SOLUBILITY OF OXIDES IN ALKALIES.

M. Prud' Homme has published the fact that some oxides which are insoluble, or but slightly soluble, in an alkali may be rendered soluble by the addition of an oxide which dissolves in that alkali. Thus chromic oxide dissolves in ammonia when a salt of copper is added, and cupric oxide dissolves in potash if a salt of chromium be present.

MORPHINE IN THE DEVELOPER.

J. Kruger, in *Licht*, suggests the addition of morphine to the ordinary sulphate of iron developer, for photographic negatives, in the proportion of 8 grains of morphine and ½ an ounce of glacial acetic acid to 2 ounces of distilled water. One part of this liquid is to be added to eight parts of the iron developer. The latter is composed of 16 ozs. of water, 1 oz. of sulphate of iron, ½ oz. of alcohol. The author asserts that the use of the morphine as above yields clean, brilliant, and soft negatives, and he desires that practical photographers will satisfy themselves of the correctness of his statement by actual trial.

TUNGSTEN IN STEEL.

Professor Herren has found 8·3 per cent tungsten and 1·73 manganese in Mushet's steel. This steel becomes soft when heated and suddenly cooled, and hard when cooled slowly, just the reverse of ordinary steel.

A CHLOROFORM MASK.

M. Demarquay states that the action of both chloroform and morphine is to lower the animal temperature, and that a combination of the two causes a decrease of 2½° C. It is asserted that the use of both agents combined as an anæsthetic is extremely dangerous. During an operation performed upon a patient under the double influence, it was remarked that the circulation became interrupted, the arterial blood turned black, and repeated fainting fits took place. In order to avoid these grave consequences, M. Demarquay considers that chloroform should be used singly, but not administered in the ordinary manner. He proposes, instead of saturating a compress or sponge with the agent, to use a flannel mask, on which the chloroform contained in a graduated bottle is turned drop by drop. The evaporation is continuous, and the patient breathes without effort. A year's experience with this apparatus proves that by its use all struggling during the period of excitement is obviated, and that insensibility is easily and gradually attained.

PHOTOGRAPHING AN AQUARIUM.

In photographing the interior of an aquarium, the water must be illuminated by strongly reflected solar rays, which may be either transmitted or directly projected. To cause a transmission of the light into the water, recourse must be had to a heliotrope mirror, placed behind the rear face of the aquarium. In front of the latter, the camera is situated, the intermediate space between its lens and the aquarium being surrounded by a pasteboard screen, so that no light is admitted to the instrument, except that directly passing through the object. By this means opaque bodies, such as shells, plants, etc., are naturally lighted by the diffusion of the rays in the liquid, which gives them the photogenic qualities necessary for their reproduction. The second mode of proceeding consists in directing the solar rays at a convenient angle on the forward face of the aquarium, on the bottom of which a mirror is placed, so that all objects contained are brightly illuminated. The water, of course, must be perfectly limpid.

WATER FREEZING AT BELOW 32° FAH.

It is generally admitted that water congeals at 0° Centigrade or 32° Fahrenheit, and that it is only in perfectly tranquil places that it can be kept liquid even at a certain number of degrees below the freezing point. *Les Mondes* mentions in this connection a curious fact, which it considers due to a supersaturation, so to speak, of the water. If in water, at a temperature of —3° C. (about 27° Fah.), which may even be slightly agitated without congealing, the least particle of hoar frost or ice be introduced, crystals of ice instantly form and expand through the mass, producing remarkable and beautiful effects. The eye can watch the formation of the needles of ice, see them group together and obey those mysterious affinities which produce the exquisite forms with which we are all familiar.

TO CASE HARDEN WROUGHT IRON.—To case-harden wrought iron, take prussiate of potash, finely pulverized, and roll the article to be hardened in it, if its shape admits; if not, sprinkle the powder on it freely, while the iron is hot. This is applicable to iron axletrees, by heating the axle red with heat, and rolling it in the powder spread out for that purpose, turning it up quickly and pouring cold water upon it, then dip it in cold water as quickly as possible. The axle can be used for years without showing wear.

To protect delicate drawings in pencil or chalk, such as are easily smudged if roughly handled, and to give them more permanence and solidity, it is well to coat them with ordinary collodion, sold by all dealers in photographic materials. The same may, if desired, be used with an admixture of paraffin stearine, or castor oil, and affords then an excellent coating. Pencil sketches are in this way rendered clearer, and may therefore, be copied the more easily when so treated.

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Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.

1.—TURNING WIRE ROLLS.—What is a good plan for turning or cutting taper wire rolls?—C. E. A.

2.—SILICATE OF SODA.—Is water glass again soluble in water or oil after once becoming hard?—W. K. L.

3.—TINNING PINS.—How are pins and other small brass articles tinned?—G. W.

4.—VARNISH FOR BOILER HEADS.—What is a good varnish for a locomotive boiler head?—C. G. S.

5.—AN ELECTRIC VACUUM.—Has science ever determined what substance, species, or condition of matter constitutes a vacuum or void in electricity?—D.

6.—PURIFYING BICHROMATE OF POTASH.—How can commercial bichromate of potash be rendered chemically pure?—G. B. M.

7.—PURIFYING ZINC.—How can commercial zinc be made chemically pure? The zinc is to be used in the hydrogen test for arsenic and antimony.—G. B. M.

8.—LIGHT FOR MAGIC LANTERN.—How can I make a light suitable for a medium sized magic lantern? Gas or oil makes too much smoke.—A. B.

9.—OIL PROOF WOOD.—What cheap and harmless substance can I use on small wooden boxes to make them hold oily substances without the grease soaking into or through the wood?—W. K. L.

10.—HARDENING WOOD.—Can anything be applied to wood to render it hard enough for a cylinder or roller for a printing press? Can wood be used for such a purpose, and is it already so used? If so, what is the kind of wood?—S.

11.—BREAKING STRAIN ON IRON RODS.—What weight will break an iron rod, of ⅝ inch diameter and 40 feet length? The rod is to be fastened rigidly at the ends, and the weight suspended in the middle.—D. R. R.

12.—REMOVING INK STAINS.—Is there any chemical that will remove ink from paper without discoloring the paper?—W. W. W.

13.—CEMENT TO RESIST THE ACTION OF BRINE.—Is there any cement or pitch that will do to line a vat to hold brine, the temperature of which will range from 25° to 110° Fah.?—P. Q.

14.—FREAK OF BOILER.—A boiler has something that jars or thumps inside it, as I can feel by placing my hand on some of the pipes. There is some scale at that end where I hear it; the last sheet, a little from the bottom, is from 1-16 to 2-16 of an inch thick. Is that the trouble? If so, how shall I remove it?—C. H. C.

15.—COMBUSTIBLE PAPER FOR CARTRIDGES.—How is the paper for sporting and other cartridges made? What combustible solution is used to cause the paper to ignite from the percussion cap?—B. F. R.

16.—A RUBEFACIENT WANTED.—Last year a sickness left upon my face a mark more original than agreeable. My right cheek is as red as a cherry, while the left remains with its usual color. As it is impossible to remove the red mark, I should like to know if there is any way in which I can render my left cheek as red as the right.—A. T.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

C. M. K. asks, what space will the oxygen and hydrogen, evolved by the decomposition of a cubic inch of water, respectively fill? Answer: The oxygen will fill a space equal to 800 cubic inches, and the hydrogen, 1,600 cubic inches.

PROPELLER.—Cannot a propelling wheel be made from a flat circle of iron or steel, cut into segments which are left attached at the center, the segments being twisted obliquely to the axis?—A. T. of Pa. Answer: Yes. But the plan is not new.

THE WORLD'S ANTIQUITY.—What does Professor Thurston mean by saying, on page 212 of your current volume, that "a hundred thousand years this wonderful water power has been uninterruptedly in existence"? Does he intend it as a statement of fact, or is it a hyperbolic figure of speech? The Hebrew text of the Scriptures states that the creation took place 4,004 years before the Christian era, and the Septuagint, 5,872 years.—H. E. G., of N. H. Answer: It is now a common belief, among men of science as well as among some theologians, that the periods or stages of the creation, described by Moses as seven days, cannot possibly be seven of our days of twenty-four hours each. And if the word "day" is a figurative expression, it may be taken to signify an epoch of any length, and so harmonize with the known facts of the inconceivable antiquity of many of the works of Nature. Professor Thurston no doubt judged the time he mentioned by a personal inspection of the work done by the water on the rocks of Niagara.

FRICTION.—Is it practically a fact that friction decreases as speed increases: that is, would the cross head of a stationary engine wear less if it were run at 600 feet per minute than if it were run at 200 or 300 feet per minute, the engine doing the same amount of work?—W. E. C. S., of Ohio. Answer: It is laid down by all the the modern authorities that friction is proportional to the pressure forcing the surfaces together, but it is independent of the velocity with which one body is drawn across the surface of the other, that is, that it requires the same amount of energy to surmount the friction, or to make a body pass over a given distance of the surface, whatever may be the velocity of its motion. (See Nichol's "Physical Sciences," article "Friction," and Professor Willis, page 258 of our current volume.) It follows from this that the friction or wear of any part of a machine will be proportional to the distance travelled, whether the same be done in a long or short time. The common notion that the friction diminishes as the speed increases has been attributed to experience in cases where the pressure is so slight as to allow of some occasional separation of the surfaces when the velocity is high.

CENTRIFUGAL FORCE.—What is the law governing centrifugal force? Having the weight and velocity of a body, and the diameter of the circle it describes, how can I determine its outward pressure?—C. H. C. Answer: The centrifugal force varies as the square of the velocity and is in inverse ratio to the distance of the body from the center of the circle; but if the figure described be an ellipse or other non-circular curve, the calculation must be made as for a circle which is tangential to the point at which the moving body is. The following is a formula: Multiply the square of the number of revolutions per minute by the diameter of the circle in feet, and divide the product by the constant 3670; the quotient is the centrifugal force in pounds when the weight of the body is 1 lb. Thus a body, revolving in a circle of 4 feet diameter at the rate of 150

revolutions per minute, will give 100x100x4=40,000, which, divided by 3870=6·8413 force for every pound of its weight. If the body weighs 100 lbs., the centrifugal force, or the tension on the string which holds the body, will be 684·13 lbs.

W. S. P., of Ky., sends a mineral specimen, asking what it is. Answer: The specimen is iron pyrites (bisulphuret of iron). It crystallizes in cubes, often, however, greatly modified, as in this case. When abundant, it is a source of sulphur and of copperas.

S. C. H. says:—I send you a small specimen of mineral. Will you tell me what this rock contains, and what is its name? Answer: The mineral is iron pyrites in a calcareous rock.

G. B. L., writing from Bridgeport, Conn., says:—Enclosed I send you a stereoscopic view of a fungus found, a few days since, growing upon an old anvil block in an unused blacksmith shop. It was of a pure white color, and about nine inches in extreme length, seven wide, and five high. The finder, considering it a thing of beauty and of a perishable nature, concluded to have a photograph made of it, and knowing that you took an interest in the beautiful works of Nature, I thought I would send you a copy. It had more the appearance of a piece of marble sculpture than of vegetable origin, and was much admired by all who saw it; and parties here have endeavored to preserve it in alcohol or naphtha, but it has lost its beautiful white color and turned yellowish or faded. I have seen many fungus growths upon wood, but never saw anything as beautiful in form as the enclosed copy. Answer: The photograph is excellent, and we are much obliged therefor. It represents the *Hydnum coralloides*, one of the most beautiful of hymenomycetous fungi. For the preservation of fungi, the following mixture has been recommended:—Sulphuric acid, two pints, water, 8 pints; mix and add creosote, 1 pint. Bottle the fungi in this and cork tightly. It is said to preserve them perfectly, without change of color. Fungi may be preserved by drying by bedding them in silver sand, gills upward, in tin boxes, and placing them in a slow oven for two or three hours.

DEW POINT.—What is the formula for calculating the dew point from the data of the hygrometer?—C. A. De S. Answer: To calculate correctly, a condensation hygrometer must be used; the hygroscope (wrongly called hygrometer), of De Saussure, and similar instruments do not indicate the quantity of moisture. The dew point is the number of degrees by which the temperature must be lowered to induce a deposit of the atmospheric moisture. Daniell's and Regnault's instruments are specially constructed for this purpose; and there is a third, invented by Professor Connell, of Scotland, which also shows the dew point.

A. B. McC., of Mich., asks whether he can make steam easier with water in his boiler up above the third gage cock than with "steam and water" at the lower cock. Answer: We presume that he is using one of the ordinary forms of boiler, and, if that is the case, he will probably keep steam easier, but with less safety, with the lesser quantity of water, as he will be likely to work drier steam. With a boiler which superheats its steam, there might be a possibility that three gages of water would cause the more rapid generation of steam and greater efficiency. The result would also depend somewhat upon the way in which the boilers are set. We should not advise him to secure economy by the sacrifice of security. Our correspondent also has trouble with his draft when the wind blows from the eastward. This may be caused by neighboring buildings, trees or elevated land, or it may be that an east wind in that locality is usually damp and accompanied by a fall of the barometric column. We have no means of judging which. Increased hight of chimney will probably remedy this evil, whatever its cause.

EXTRACTION OF SILVER.—To J. H. P., query 1, page 217.—Mix your refuse with an equal quantity of wood charcoal, place in a crucible and submit to a bright red heat. A silver button will be found at the bottom.—E. H. H., of Mass.

BLEACHING SHELLAC.—To L. Q. B., query 2, page 217.—Purchase bleached shellac at an apothecary's or paint shop. Small quantities are troublesome for an amateur to bleach.—E. H. H., of Mass.

DISSOLVING SHELLAC.—L. Q. B., query 3, page 217.—Shellac may be dissolved in either a strong solution of borax, or a solution of ammonia.—E. H. H., of Mass.

DISSOLVING GLASS.—To D. R., query 14, page 217.—Dissolve glass in a concentrated solution of caustic soda by submitting it to a pressure of from 30 to 50 pounds per inch. When used, it may retain a certain amount of gloss, but will be acted on by a damp atmosphere or water.—E. H. H., of Mass.

CEMENTING WOOD TO GLASS.—To W. R., Jr., query 3, page 234.—Cement your wood first with two or three coats of isinglass in acetic acid, then the surface of the glass; press the two together, and allow to dry.—E. H. H., of Mass.

ELECTRIC LIGHT.—To F. D., query 5, page 234.—Use 6 half pint cells of Bunsen's battery, and attach carbon electrodes to the terminals of your wires; approximate the electrodes, and you will have a fine beam of light.—E. H. H., of Mass.

MOTHS IN FURS OR WOOLENS.—Persons do not need cedar or camphor to keep out moths. Let them sew their furs or other articles up in linen when they put them away, and moths will not trouble them. I have done this every spring and have never yet been troubled with moths.—T. E. L.

ELECTRO-MAGNETISM.—N. B. D. says: I am constructing an electro-magnet, and wish to know whether my magnets will have greater attractive power if the cores be made long and small, or short and thick? Answer: An electro-magnet having short and thick poles will have a greater attractive force than a magnet with long and slender poles, other conditions being equal.—What would be about the right diameter for cores three inches long? Answer: It depends on the intended use. A diameter of three quarters of an inch may suit you.—Would the portable battery, described by Professor Rains in No. 13 of your current volume, generate sufficient electricity to make a very powerful magnet? Answer: We have not tried this battery.

Communications Received.

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

On the Temperature of the Moon.—By J. H. R.

On the Kinds of Lightning.—By W. A. A.

On the Rotation of the Earth.—By H. B.

On Science and Theology.—By J. F.

On the Philosophy of Light.—By E. S. G.

On the True Solution of the Least Square, with Sundry Chemical, Optical and Meteorogical Suggestions.—By J. K.

On A New Theory of Electricity and its Influence on Planetary Motion, Aurora, Needle, Meteorites, Comets, etc.—By H. H. P.

On Car Coupling Dangers.—By C. E. D.

Perpetual Motion Made Possible.—By R. C.

On A New Geometrical Problem.—By J. S. E.

On the Transmission of Motion.—By J. W.

On A New Method of Propelling Canal Boats.—By C. B. M.

On the Cold Water Engine.—By E. L.

On the Rotation of the Earth.—By A. W. L.

On Mr. Coleman Sellers' Illustrations of Plate Coupling.—By J. G.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

CHURN.—William P. Messick and Harvey T. Messick, Clarksville, Texas.—This invention relates to a new churn mechanism whose parts can be easily taken apart or put together, and which operate in conjunction to rapidly reduce the milk to butter. The invention consists in constructing the dasher in two parts, which rotate in opposite directions, and in supplying to their shafts upper detachable ends hung in a slide to be conveniently thrown into and out of gear.

SPRING MOTIVE POWER.—John B. Howell, Wilkesbarre, Pa.—This invention consists of a series of coiled springs and cases or drums therefor, arranged side by side on a shaft and combined together and with the winding up mechanism and transmitting mechanism in such manner as to constitute in effect one spring of great length but in separate coils, which gives much better results in practice than a single spring, of the same length in a single coil, for driving light machinery.

BAG TIE.—John Bowers, Brookville, Ill.—This invention consists of a small rectangular piece of thick leather, or any equivalent stiff flexible substance, with an eyelet near one end and a slit, which is fastened to the bag by one end of a cord long enough to wind several times around the sack and around the coils of itself, between the leather and the sack, and then introduced to the eyelet through the slit, where it is held fast by the knot in the end.

ICE CREAM FREEZER.—Edwin Halloway, Belvidere, Ill.—This invention relates to the class of freezers wherein the revolving cream holder has a rotary stirrer or dasher within it, and is arranged in an ice holder placed in a wooden tub. The ice holder has small holes in the bottom near the center, to allow a draft of cold air contained in the tub to circulate up through the ice, which greatly facilitates the freezing.

SASH HOLDER.—Henry W. Stephenson, Jr., Cincinnati, Ohio.—This invention has for its object to furnish an improved sash lock, locking the sash into any position into which it may be raised; and it consists in the construction and combination of a weighted lever, the middle part of the outer end of which is cut away, and the arms thus formed are bent to one side at right angles, thus forming a space in the forward end of the lever through which a ball or block, made of rubber or other suitable material, may protrude to come in contact with the side of the casing or frame. To the lever is attached an inclined plate which takes hold upon the ball or block. The inner end of the lever is weighted so as, when left free, to always hold the ball or block in contact with the face of the casing. By this construction, when the sash is released after being raised, the friction of the ball or block against the casing will force the said ball or block upward into the narrower part of the space between the said casing and the inclined plate, securely holding the sash. When it is desired to lower the sash the inner or weighted end of the lever may be raised, lowering its outer end and withdrawing the ball or block from the casing. A bolt locks the sash in place.

COMPOUND FOR DESTROYING WORMS AND INSECTS ON TREES, ETC.—Zeno Fen de Moss, Pleasanton, Kansas.—The object of this invention is to furnish a compound to prevent the depredations of the worms and insects which prey upon fruit and other trees, especially the worm known as the "borer," and it consists in strong lye from potash, soft soap, petroleum, and kerosene.

HAY AND STRAW STACKING APPARATUS.—Daniel W. Baird, Lebanon, Tenn.—This invention relates to a new apparatus for elevating and depositing at a suitable place hay, straw, or other material; and consists in a new windlass mechanism for swinging the hoisting beam on its pivot, which is done by means of a sliding carriage on the upright, and by a brace extending therefrom to the beam.

STREET GUTTER.—Hugh O. Ames, New Orleans, La.—This invention consists in the construction of curbs and gutters for streets of cement in molds of the form required, the said cement being rammed hard in the molds, which may either be constructed of boards or plank in two parts, representing the upper and lower sides of the gutter and curb, or the earth bed of the street may constitute the lower side of the mold, while the upper side will be formed of a half mold of planks. The curb and gutter will be formed together in one structure, or each may be formed separately. When the curb is high, buttresses of metal or stone may be arranged behind in the earthbed for strengthening it, and the gutter and curb or either may be strengthened by one or more metal rods incorporated with the cement when being packed in the mold.

GRIPING BLOCK FOR PRESSES.—George W. Swinebroad, Bolivar, Tenn.—This invention consists of steel bars, combined with the inner walls of the griping blocks in presses and other machines, for griping hold of straight bars passing through them by tilting on said bars, so as to gripe and hold for working said bars short stages at a time by levers, the said steel bars being used in the parts most subject to wear to resist the same, and because of the superior capacity of steel to gripe the bars and retain its hold; also, because they can be removed when worn out and new pieces put in.

BOOT AND SHOE CLEANER.—John Malarkey, New York city.—This invention has for its object to furnish a simple and convenient device for cleaning boots and shoes from dust, mud, etc., and it consists in a scraper for removing mud or dirt, and also a kind of box formed with bottom, sides, and top. These portions are covered with bristles, and are so arranged as to clean various parts of the shoe at once.

SMOKE CONDUCTOR FOR LOCOMOTIVES.—Alfred Storm, Matteawan, N. Y.—This invention has for its object to furnish an improved device for conducting the smoke to and discharging it at the rear end of the train, and self adjusting to the various positions that the cars may take with respect to each other in passing around curves, etc. In the rear side of the smoke stack of the locomotive is secured the end of a pipe, the other end of which terminates at the rear end of the locomotive. To the top of each car of the train is attached a similar pipe. The pipes are all stationary, and their ends are all at the same level, so as to coincide with each other when the cars are run together. Upon the ends of the pipes are fitted sleeves which are held outward by coiled or equivalent springs placed upon guide pins, which pass through lugs attached to said pipes and sleeves, and against which lugs the ends of the said springs rest. The outer ends of the sleeves are made bell shaped and are flanged, which ends abut against each other, and are held in contact as the cars play upon their couplings by the springs. A flanged ring cap receives the adjacent ends of the sleeves to cover the openings formed between them when the train passes around a curve, and thus prevent the escape of smoke through said openings.

CLOTH RACK.—Alexander W. Voegtly, Hannibal, Ohio.—This invention relates to a new rack, for use in stores or warehouses, for the support of rolls or pieces of cloth for display. The invention consists in the use of a standing frame, having horizontal arms, which form the supports for the cloth. The inconvenience which is now experienced by merchants in taking goods from the lower parts of large piles is overcome by this invention, as any piece of goods can be taken off any part of the stand without disturbing the balance, and is easily replaced. The frame may, if desired, be made high enough to stand on the floor, and provided with casters so it may be rolled from one place to another.

PLOW.—Willis H. Smiley, of Bentonville, Ark.—This invention has for its object to furnish an improved subsoil plow, which may be attached to any ordinary plow, whether used for preparing land to receive the seed, or for cultivating crops, and which shall be so constructed that it may be readily adjusted to work deeper or shallower in the ground, as may be required; and it consists in the subsoil plow, made with a point at each end, so that when one point becomes dull the plow may be detached and reversed, so that the plow need be sent to the shop to be sharpened only one half as often as a single point plow. It is adapted to be attached between the handles and alongside the beam of an ordinary turn plow.

BEE HIVE.—George F. Hixson, of Gallipolis, O.—This invention comprises a peculiar construction and arrangement of the strips composing two of the sides of the hive with a view to facilitating opening of the case to examine the condition of the bees and comb, and to obviating the necessity for the use of other or separate means for preserving the proper spaces between the comb frames. It also consists of a peculiar construction of the hive to adapt it for utilizing the animal heat of the bees for warming the honey boxes.

WASHING MACHINE.—John H. Doyle, of Williamsburg, O.—This invention has for its object to furnish an improved washing machine, and it consists in a rectangular box supported upon legs or an ordinary round wash tub, as may be desired. Two parallel bars are pivoted at one end to the sides of the tub to keep them from sliding about. Rollers, any desired number of which may be used, revolve in holes in the inner sides of the bars. The bars and rollers form the bed upon which the clothes are rubbed. The rubbing board, the lower surface of which is so arranged as to enable the operator to apply any desired pressure to the clothes while rubbing them, or to conveniently raise the rubber from the clothes when desired.

EGG BEATER.—William O. Crocker, of Laconia, N. H.—This invention has for its object to furnish an improved device for beating eggs, butter, etc., churning small quantities of cream, and for other similar purposes, and it consists in an outer beater formed of sheet metal, and having its sides flared in opposite directions, in combination with the inner beater, the same being connected with mechanism, so as to be driven in reverse directions; also the combination, with the beater, of a downwardly extended arm, provided with a notch, as specified, whereby said beater may be supported on the edge of the dish containing the material to be operated on.

GRATE BAR.—Philip Umholtz and Augustus Umholtz, of Tremont, Pa.—This invention has for its object to furnish an improved grate bar, so constructed that its parts may expand freely in all directions without breaking or straining said parts, and without interfering with each other.

SAW MILL.—Morgan A. McAfee, of Talbotton, Ga.—This invention consists of the application to saw mills of a "liner," by which to gage the stuff to be sawn in adjusting it on the blocks in advance of the saw, and show to the operator when the stuff is in the right position to have the desired amount slabbed or edged off, the said liner being a line or cord stretched, in advance of the saw in its plane, on levers or other devices, by which it can be readily let down close to the stuff to be gaged by it or raised up out of the way.

BEE HIVE.—Frederick Grabbe, of North Topeka, Kan.—This invention relates to a bee hive so constructed that the fixed support for the same forms two of its sides, while the other sides are made removable to permit easy access to the interior, the hive being set in an inclined position.

BASIN COCK.—Alfred Crossley, of Philadelphia, Penn.—In this invention a T headed valve piece on the lower end of the nozzle pipe, working horizontally in a chamber below the stuffing box, and closing at each end against an eccentric seat, through one of which the water enters from below, has an escape passage leading to the nozzle through the side instead of at one end, acting on the seat, through which the water enters, as heretofore, so that the valve is turned away from the seats to open the passages instead of being closed upon it, and so that the water first enters the space in which the valve turns, and then passes through it to the nozzle, thereby allowing of opening and closing the valve with a shorter movement, and saving in wear upon it.

STOVE PIPE DAMPER.—Robert R. Ball, of West Meriden, Conn.—This invention relates to a new and useful improvement in dampers for stove-pipes and other purposes, and consists in the construction of the rod or spindle of the damper and the parts connected therewith, especially in a tapering washer and screw nut, and in a non-conducting material at the knob end of the spindle. By this arrangement the damper may be adjusted without danger of burning the fingers, and will be held securely in any desired position. The friction is entirely on the edge and not on the sides of the ring. The ring is not, therefore, compressed between collars, but produces friction where it will be uniform and readily overcome.

SPRING BED BOTTOM.—William D. Mason, of New York city, and Cornelius H. Jacobus and Robert Millen, of Newark, N. J.—This invention has for its object to furnish an improved spring bed bottom. Two longitudinal bars or stretchers are placed near the side boards of the bedstead. To the ends of the stretchers are secured eyes, to receive the hooks formed upon the ends of the coiled wire springs, the hooks formed upon the other ends of said springs being hooked upon hooks or eyes attached to the end boards of the bedstead, each stretcher being thus entirely independent of the other. Two cross bars are placed in such positions as to properly balance the weight upon the bed, and they are notched to the stretchers to keep them securely in place. Upon the cross bars, at suitable distances apart, are placed elastic longitudinal slats, said slats resting in notches formed to receive them in the cross bars. The slats are kept from getting out of place longitudinally by stop pins.

BEE HIVE.—Don J. Arnold, of Brownville, Neb.—This invention relates to a new construction of bee hive, whereby the frames are secured in their appropriate places when the hive is shut, but liberated to be easily removed when the hive is open, and whereby the surplus honey boxes are held confined to the lid when the same is opened, and are not necessarily exposed. The invention consists, first, in applying wedges or inclined blocks to the lid of the hive for holding the frames together while the lid is closed. The invention also consists in such a combination of the upper hood or cover with the lid of the homestead and with the surplus honey boxes that the latter will be confined in the hood, which they fit exactly while the lid is opened.

MOTOR.—Charles J. Schumacher, of Portland, Maine.—This invention relates to an apparatus for storing up power for driving sewing machines and other light machinery. It consists in a series of spiral springs arranged on stationary spindles and revolved by means of gearing and crank, ingeniously constructed and arranged to accomplish the desired object.

MACHINE FOR MAKING BOXES FOR ELEVATORS.—William L. Young, of Marthasville, Mo.—This invention consists of certain arrangements of apparatus in one machine, whereby the workman can perform all the special operations required to make conveyer-flights by power machinery, and govern each particular operation by a standard gage, so that the flight will be much more uniform in respect of the dimensions and finished better than when done by hand, besides being made very much cheaper.

GUN LOCKS.—John J. Byers, of Delta, N. Y.—The invention consists in the relative arrangement of the hammer and the trigger with their respective springs so as to lessen the aggregate space required for them and improve the outside form of fire arm without sacrificing convenience of location in the stock. The stock is recessed, to receive the hammer and trigger, a projecting lip being above the hammer for guarding it. The stock has a perforation through it, whereby the trigger can be reached. The lower part of the stock, under the perforation, is arched like an ordinary trigger guard, but made hollow to receive the hammer spring. When the hammer is drawn back, a tooth of the trigger snaps into a notch on the hammer and holds the hammer cocked. This invention will be found fully illustrated and described on page 262 of the present volume of the SCIENTIFIC AMERICAN.

PLOW.—Francis P. Brannan, of Richmond, Va.—This invention has for its object to furnish an improved plow. The body of the plow is cast solid with the standard or bolted to said standard. The throat of the plow is formed by curving the standard back from the colter of the plow, so that rubbish from the furrow slice or land cannot collect in the throat, and thus clog or choke the plow. In the case of a cast beam, the rear end of the said beam and the forward end of the standard are made with circular offsets to fit upon each other, and through the centers of which passes the bolt by which the said standard and beam are secured to each other. The beam and standard are further secured to each other by a second bolt, upon which is placed a polygonal washer, the flat faces of which rest upon the straight flange formed upon the standard for that purpose, so that by adjusting a face of the eccentric nearer to or further from the bolt to rest upon the flange, and tightening the nuts of the bolts, the plow will be adjusted to work deeper or shallower in the ground as may be desired.

WASHING MACHINE.—John Barnes, of Spartanburg, Ind., assignor to himself and J. W. Locke, of same place.—This invention has for its object to furnish an improved washing machine. The working chamber of the machine is made into a circular form by bars or rounds, placed in the

corners and arranged in a curve across one end of the machine, thus forming, also, a chamber into which the water may flow. To the bottom of the box are attached radial ribs, over which the clothes are rubbed to be washed. A wheel, a little less in diameter than the washing chamber, is arranged, to the lower side of which are attached a number of downwardly projecting pins, which take hold of the clothes and carry them over the ribbed bottom of the box. The said wheel moves up and down upon the said shaft to adjust itself to the thickness of clothes being operated upon, and is revolved first in one direction and then in the other, sweeping the clothes through the box and rubbing them upon the ribbed bottom of the said box, the clothes being held down upon said bottom by the weight of the said wheel.

FENCE POST.—Frank Miller, of Warsaw, N. Y.—This invention relates to the use of gas pipe for the lower part and wood for the upper part of a fence post, with the object of economizing wood and avoiding its rapid decay in the ground.

GARBAGE BOX.—Theodore Jarvis, of New York city.—This invention has for its object to furnish an improved garbage receptacle, being so constructed that the garbage can be readily shoveled from it into the cart without being scattered over the sidewalk.

WASH BOILER.—George Sinniger and Sheridan S. Sabine, Chatham, Ill.—This invention has for its object to furnish an improved clothes washer, in using which, the heat applied to the bottom of the boiler forces the hot water up through a pipe into a head piece through the holes in which it is discharged upon the clothes in the boiler. The upward flow of water from the central chamber tends to form a vacuum in the end chambers, so that the descent of the water through the clothes into said end chambers is assisted by atmospheric pressure.

COFFEE ROASTER.—Job Brown, Southampton, Ill.—This invention relates to a new coffee roaster or corn popper that is provided with a corrugated bottom and supported on rockers, and intended for use in the oven of a stove or range, in which it can be moved back and forth and rocked to turn the grains to prevent burning.

FEED REGULATOR FOR MIDDLINGS SEPARATORS.—Alfred G. Mowbray, Stockton, Minn.—This invention relates to an improved apparatus for separating middlings from bran. The weight of the material in the hopper serves to hold the side open sufficiently to allow the escape of the middlings, and, when no more remains in the hopper, a bar will close the side.

PRESS.—Allen Laswell, Springfield, Texas.—The object of this invention is to furnish a cheap, durable, and effective press for pressing cotton, hay, and other articles; and it consists in a double lever arranged in combination with fulcrum plates and a frame and follower, and with or without a wheel and axle. To press a bale of cotton or other commodity, the lever is started at one of the upper fulcrum holes, and travels down, and, as the bale is compressed, the fulcrum pin is changed from one side of the center to the other, alternately, until the proper degree of compression has been obtained. The fulcrum is now changed, and the power is applied to the other end of the lever. The wheel and axle at the lower end of the lever, being loose, will revolve as one end is raised, while the other end of the lever is brought down, and the operation is repeated until the bale is pressed.

CAR COUPLING.—Henry Allen and Addison H. Baldwin, Houston, Texas.—This invention has for its object to furnish an improved car coupling, and it consists in the draw bars, connected with the car body in the ordinary manner. The outer ends of the draw bars are slotted longitudinally, and in said ends, upon each side of said slot, are secured blocks of rubber, which may be boxed or banded and let into or bolted to the said ends. The hook, the forward or hooked end of which is beveled, slides over the pin when the cars are run together, with the said hook in a horizontal position. The rear or inner ends of the hooks are curved downward, and are pivoted to and between studs or projections attached to or formed upon the under side of the slotted outer end of the draw bar. Upon the under rear part of the hook is formed a shoulder, which rests against a pin passed horizontally through the forward end of the draw bar, and which is designed to support the hooks in a horizontal position and to sustain the draft strain. The pins also serve for the hook of an adjacent car to hook upon in coupling the cars. A hook is designed to be attached to each draw bar of each car, and when not in use may be turned back to rest in the inner end of the slot in said draw bar; or, by removing the pin, it may be allowed to hang beneath the draw bar so as to be entirely out of the way.

WASHER AND BOILER COMBINED.—John Runkle, Reading, Pa.—This invention has for its object to furnish an improved machine by means of which the clothes may be boiled and washed at the same time, and it consists in a cylindrical vessel supported upon legs of such a length as to raise the vessel to such a hight that a furnace may be placed beneath it. The edge of the projecting top plate of the furnace is secured to the edges of the bottom of the cylinder by convenient means. To the top edges of the vessel is attached a cross bar, to which are attached bearings for a horizontal shaft, to the outer end of which is attached a crank for operating the machine. To the inner end of the shaft is attached gearing, which communicates with the upper end of a vertical shaft which passes down through and revolves in bearings in the center of the cross bar, and its lower end revolves in a step or socket in the center of the bottom of the vessel. The body of the shaft is made square in its general form and with concave sides. There are four rollers, so arranged as to be carried around by and with said shaft in its revolution. A circular plate is made smaller than the interior of the vessel, and to its upper side are attached rounded projections, which act upon the water and clothes to throw them into violent commotion. To the inner surface of the sides of the vessel are attached vertical ribs, which operate, in connection with the projections and rollers, to throw the water and clothes into violent agitation and clean the clothes in a very short time.

PISTON PACKING.—William F. Williams, Schenley, Pa.—The object of this invention is to provide means for making joints steam tight, and to form a substance for making gaskets and for packing pistons and piston rods, which shall be pliable and self lubricating when applied to frictional surfaces; and it consists in a composition for steam packing, consisting of long strips of wood and asbestos saturated in oil and placed in a flexible case.

CLOTH DRYING MACHINE.—Nelson P. Akin, Philmont, N. Y.—This invention consists in subjecting cloth to steam and hot air treatment, or hot air alone, for economizing time in drying it after it is washed, to remove the oil, etc. It contains when it comes from the loom, which is done by means of a perforated hollow cylinder, whereon the goods to be heated are wound. The cylinder is mounted on a stand or support adapted for the application of the steam and hot air by being forced into said hollow cylinder and through the cloth, said cylinder being provided with both a steam pipe connection with a steam generator, and a hot air pipe connection with an air condenser; the object being to subject the cloth first to the steam treatment for vaporizing the water contained in it, and then follow up the steam with air so heated by compression or otherwise that it will rapidly expel the moisture remaining after the steam is shut off, or the steam may be dispensed with and the air alone used.

BEE HIVE.—Harris Scovell and John C. Banker, Wasecа, Minn.—There is an idle and vagrant class of bees, as well as of men, who are disposed to prey upon the industry of others, and who plunder the hoarded treasures of the more thrifty occupants of the hive. There is also the destructive "miller," which is constantly seeking an entrance to the hive. Now, the robber bee and the "bee-miller," being strangers to the hive, will light upon the side or front of the hive, and will crawl about to find an entrance. They are accommodated in this matter, by being provided with one or more entrances which lead them astray and into a chamber in the top of the hive, which contains no honey, and where the industrious bees do not go. At the base of one or more hollow columns orifices or entrance holes are made, and at the top of the column is an orifice for egress into a vacant chamber in the top of the hive. In crawling on the front of the hive (or on this attachment to the hive) the robber bee or bee miller will find one of these entrances, by which he will be led to the top of the hive into the vacant chamber before mentioned.

FELTED FABRIC FOR SURGICAL SPLINTS.—John Cocking, London, Eng.—This invention and discovery relate to the preparation of proplastic sheets for surgical splints, composed of wool, or other animal fiber, felted together. The porous sheets are saturated with a proofing solution, composed of gum shellac, frankincense, resin, borax dissolved in water, and methylated spirit, applied cold. The fabric is then dried, after which it is subjected to steam and then exposed to a heat of from 160° to 180° for a space of from twenty-four to thirty-six hours, according to the weight of the fabric. The fabric thus proofed and dried is steeped in a solution of sulphuric acid and water, which destroys the borax and hardens the proof. The sulphuric acid is in its turn destroyed by steeping the fabric in urine and water, and it is then immersed in running water until perfectly cleansed. The fabric is then dried and is fit for use.

WHIFFLETREE.—James L. Darden, Cotton Plant, Miss.—This invention is an improvement over the trace detaching apparatus of John Laughlin, patented October 28, 1862, No. 36,786, and consists in levers which may be raised out of the notches in the tug bars, allowing said tug bars to be withdrawn from the singletree, thus detaching the horse. Thus attached to the rear side of the singletree, the detaching devices are not liable to be injured by contact with any object, and are not noticeably exposed to view, while their efficiency and reliability of action are increased.

ORE CRUSHER.—William P. Hammond, Napa City, Cal., assignor to himself and Henry Mygatt, of same place.—This invention has for its object to furnish an improved device for raising the stamps for crushing rock, working with less friction and requiring less power to operate it than the ordinary devices for such purposes. The shaft passes up through guide holes in the frame so that it may always move up and down vertically. To the driving shaft is attached a cam, which is made slightly spiral so as to slightly rotate the stamp while being raised. A small roller, the face of which is grooved, fits upon the face of the cam and is pivoted to the tappet through which the shaft passes, and which is kept in place upon the said shaft by collars placed upon the said shaft, the one below and the other above the said tappet. The upper collar is adjustably secured to the said shaft so that the stroke of the stamp may be regulated as desired. The tappet is so arranged that the axis of the roller may be directly over the shaft. By this arrangement the cam will lift the stamp vertically, and with the greatest advantage of leverage, so as to require the smallest amount of power. A guide keeps the roller in proper position and thus diminishes friction.

ASH BOX.—George Dunlop, Williamsburg, N. Y.—This invention has for its object to furnish an improved box for ashes, garbage, etc., which will not absorb and afterward give out offensive and unhealthy odors, can be readily cleaned, will be convenient in use, and will prevent the ashes and garbage from being scattered over the sidewalk and street. The bottom ends and sides of the box are formed of flag stones or stone slabs. The box is designed to be set in the sidewalk.

[OFFICIAL.]

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Trap, fly, W. De Puy	131,813
Trap, fly, W. B. Clark	131,848
Tweer, J. H. Gartside	131,750
Tweer tester, R. A. Fisher	131,866
Umbrella, folding, Walcott and Berry	131,918
Valve for closets, etc., hopper, L. Wolff	131,924
Vegetable slicer and stripper, Sawyer and Goodridge	131,787
Vessels, propulsion of, H. P. Miller	131,770
Washing machine, Kirkpatrick and Bell	131,881
Water elevator, steam, W. Burdon	131,737
Water wheel, turbine, J. J. Faulkner	131,865
Wheel, balance, H. Randall	131,783
Whiffletree stub, W. C. Shipherd	131,792
Whiffletrees, attaching, H. Clough	131,809
Window glass, setting, J. M. McMaster	131,894
Wrench, rotary, A. Pitcher	131,828

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants or their New York correspondents.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

Reissues.

A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co., 37 Park Row, for full particulars.

Rejected Cases.

Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate. Address MUNN & Co., stating particulars.

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Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row, New York.

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Canadian Patents.

On the 1st of September, 1872, the new patent law of Canada went into force, and patents are now granted to citizens of the United States on the same favorable terms as to citizens of the Dominion.

In order to apply for a patent in Canada, the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

All persons who desire to take out patents in Canada are requested to communicate with Munn & Co., 37 Park Row, N. Y., who will give prompt attention to the business and furnish full instruction.

European Patents.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels, Berlin, and other chief cities. A pamphlet, pertaining to foreign patents and the cost of procuring patents in all countries, sent free.

MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an *honest opinion*. For such consultations, opinions and advice, *no charge is made*. Write plain do not use pencil, nor pale ink: be brief.

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In all matters pertaining to patents, such as conducting interferences, procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of instruction and advice,

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This is a paper, read before the Literary and Historical Society of Quebec, by the inventor of the stereometrical tableau illustrated on page 339 of our volume XXVI. It is a valuable and interesting document.

THE MENTAL CURE, illustrating the Influence of the Mind on the Body, both in Health and Disease, and the Psychological Mode of Treatment. By Rev. W. F. Evans, author of "The Celestial Dawn," and other works. Boston: William White & Co. New York: The American News Company.

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We are also receiving, every week, the best scientific journals of Great Britain, France, and Germany; thus placing in our possession all that is transpiring in mechanical science and art in these old countries. We shall continue to transfer to our columns copious extracts, from these journals, of whatever we may deem of interest to our readers.

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OFFICE, GRAND CENTRAL DEPOT.,
NEW YORK, October 11, 1872.

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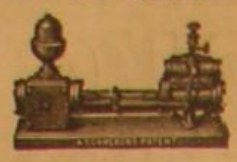

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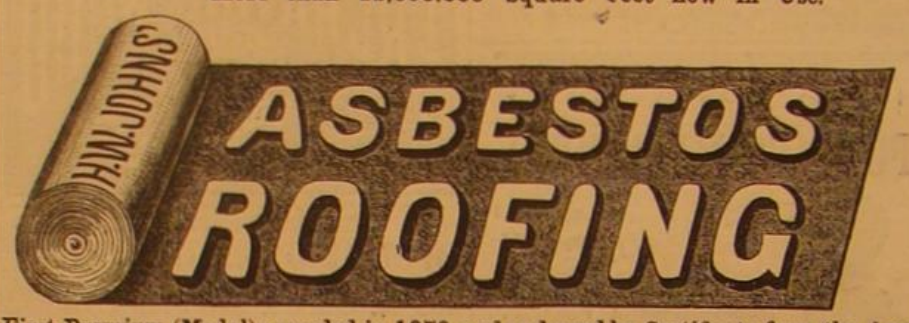

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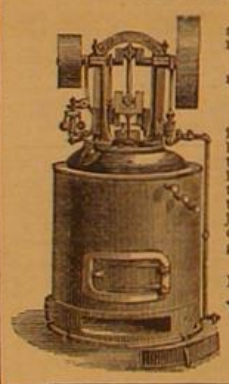

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THE TANITE CO. have no Agencies in New York or New England.

THE TANITE CO. do not Exhibit or Compete at any Fair in the United States this Year.

STROUDSBURG, September, 1872.

SPECIAL NOTICE.

In their efforts to diffuse information on the subject of Emery Grinding Machinery, and to excite the interest of Mechanics in a class of goods not properly appreciated, THE TANITE CO. have given publicity to a branch of Manufacture previously but little known. This publicity has stimulated the acquisitiveness of Capitalists and Inventors. The result has been that within the last three years an unusual number of sanguine and inexperienced Inventors have deluded Capitalists into an unfounded enthusiasm on the subject of Emery Wheels. A large number of *new* Solid Emery Wheels have been put on the Market, and a frantic effort to gain trade has been made by flooding the country with large stocks of untried goods, whose practical value has never been thoroughly tested. These goods are offered *on trial, in almost any quantity, and for almost any length of time. They are sold at varying prices, are forced on unwilling purchasers, and are even given away.* It follows from this that legitimate trade has been disturbed, and the whole class of business brought into odium and disrepute with the Manufacturing Public.

THE TANITE CO. take this means of assuring that Public that even the possession of Patents for a *PERFECT* Solid Emery Wheel would not suffice for the successful introduction of the goods, *unless the Patent was backed by expensive machinery, by years of experience, by chemical and mechanical skill unfalteringly applied, by a wide practical knowledge of all the countless manufacturing processes of the day, and by the employment of men skilled in all the Manufacturing Arts.*

All these qualifications THE TANITE CO. possess; and if users, or would-be users, of Emery Grinding Machinery, want to *avoid the failures and obtain the advantages* of such goods, they will buy STANDARD GOODS, of an ESTABLISHED MAKE, regardless of price, rather than risk the poor economy of untried, low-priced goods.

THE TANITE CO.,
T. DUNKIN PARET, President.

THE TANITE CO.S

GOODS are kept in Stock, and sold at *Factory Prices*, by CHAMPLIN & ROGERS, 155 *Fifth Avenue (Vermont Block) Chicago*, who are also Exclusive Western Agents for the New York Tap and Die Co.'s goods, and Dealers in Railway, Mill, and Machinists' Supplies.

KEEP YOUR BOILERS CLEAN.

ANTI LAMINA

prevents and removes scale in Steam Boilers—does not injure the iron. In use over five years.
J. J. ALLEN, Patentee, Philadelphia, Pa.

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SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

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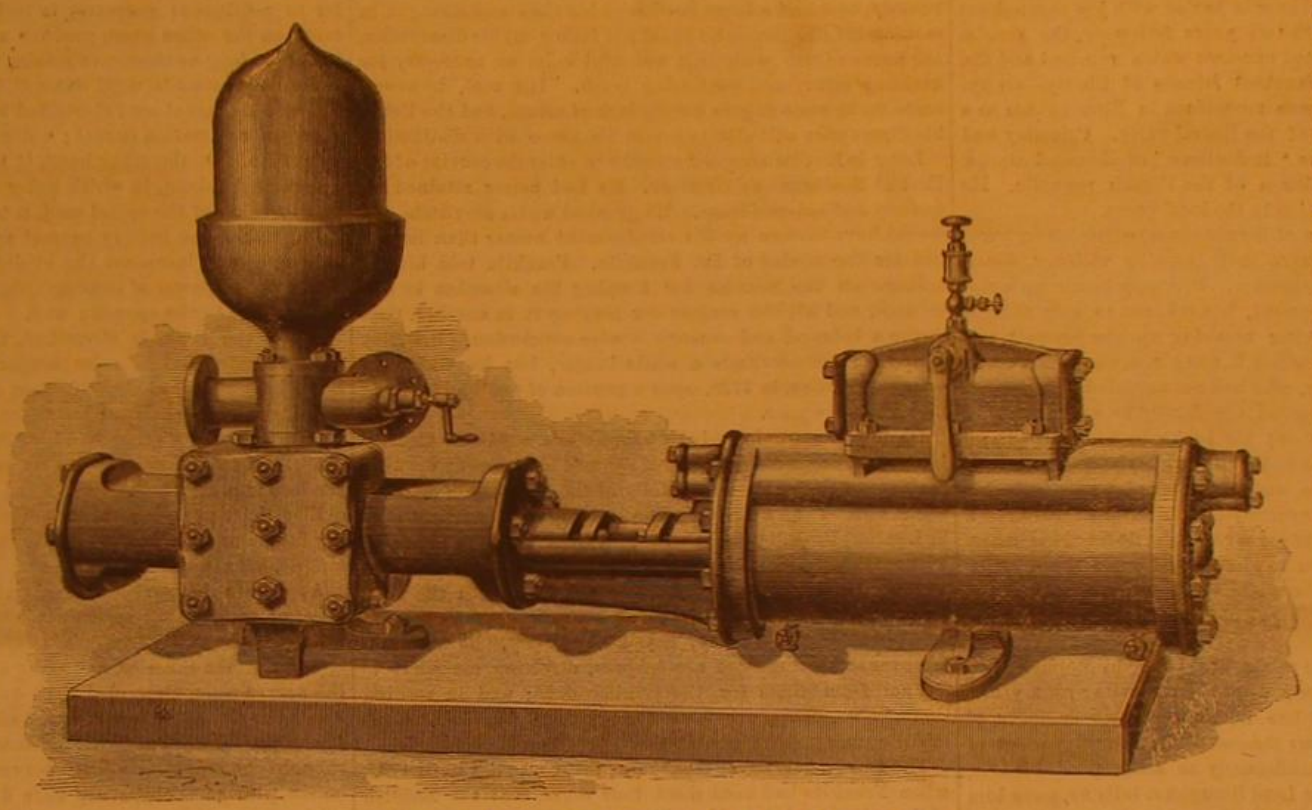
THE CAMERON SPECIAL STEAM PUMP.

Two thousand steam pumps, known as the Special, have been manufactured in England, under the patents of Mr. A. S. Cameron, since the introduction of the invention into that country, some four years since, by Messrs. Tangye Brothers & Holman, of Soho, Birmingham. At first only small machines were made, but as their usefulness became developed, the manufacturers designed pumping engines on the same principle for use in collieries. At the close of 1870, 130 machines were at work in the Durham and Newcastle coal districts, where their performances proved so satisfactory as to justify the conclusion that the pump might be constructed to do still heavier work. As a result, an engine was built by the firm above mentioned for the Adelaide collieries at Bishop's Auckland, in general style and form similar to that shown in our illustration, Fig. 1. Of this machine, the dimensions and points of construction are as follows:



THE CAMERON SPECIAL STEAM PUMP.

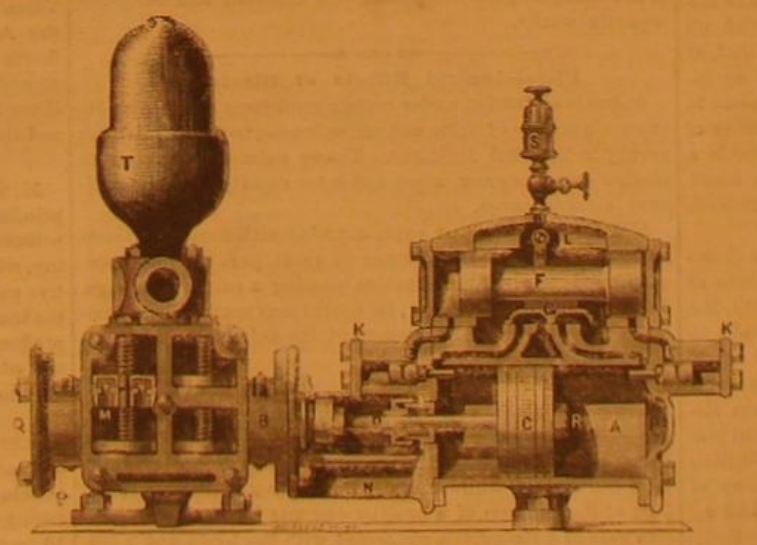
The steam cylinder is 26 inches diameter, and the pump—which is double acting—is 6½ inches diameter, with a 6 foot stroke. The slide valve is steam moved, and its alternate action is effected by means of two steel reversing valves, operated by the piston in the interior of the cylinder at either end. Hence there is no external mechanism except the piston rod, a few inches only of which is seen reciprocating between the stuffing boxes of the steam and pump cylinders. In the contract it was stipulated that the engine should raise 120 gallons per minute 1,040 feet high in a single lift, and this it more than accomplishes with apparently as much ease as if its load was delivered at only 100 feet high.

The pump barrel is lined with gun metal one half inch thick, and is itself 1¾ inches thick in the body. The valve boxes are 2 inches thick in the body, and 2½ inches thick in the center of covers, each being secured with sixteen 1⅜ inch bolts and nuts. The piston rod is of steel, 3¼ inches diameter; the steam piston is 6 inches deep, and packed with a single broad packing ring, tongued and set out by six curved springs adjusted by set screws. The engine is bolted down to a massive bed plate, the holes at the back end of the cylinder being slotted to permit of expansion and contraction. The joints of the pump and valve boxes are made by means of gutta percha rings, let into grooves in one flange and compressed by projecting tongues on the other. The engine has an air vessel 30 feet high, 30 inches in diameter, and 2¾ inches thick. Intermediate valves have been provided to relieve the load on the pump as much as possible. Before leaving the works, the engine complete was tested up to a pressure of 700 lbs. per square inch.

Figure 2 is a sectional view of the pump, from which a clear idea of the simplicity and fewness of parts of the device may be obtained. At A, the steam cylinder is shown in section. C is the steam piston rod, and D the piston rod. At L is represented the steam chest, F the plunger, G the slide valve, and at H a starting bar connected with a handle on the outside; I I are the reversing valves, and K K the bonnets covering them; N is the body piece connecting the steam and water cylinders; B is the water cylinder with the valve chest bonnet removed; M is a valve seat which, with the valve above it, is shown in section, and, lastly, T, is the discharge air vessel. To understand the operation, it is necessary to suppose the steam piston, C, moving from right to left; when it reaches the reversing valve, I, it opens it, and exhausts the space on the left hand end of the plunger, F, by the passage, E, which leads to the exhaust pipe; the greater pressure inside of the steam chest changes the position of the plunger, F, and slide valve, G, and the motion of the piston, C, is instantly reversed. The same operation, repeated at each stroke, makes the motion continuous. The reversing valves, I I, are closed by a pressure, on their larger ends, of steam conveyed by an unseen passage direct from the steam chest.

Having explained both construction and operation, we turn to our file of *Engineering* for a report of the performances of the pump. The engine room at the Adelaide collieries, we are informed, is situated at a depth of 1,040 feet below surface, and is an arched chamber about 100 feet long by 20 feet wide, and 10 feet high at the center. At the far end of this chamber is a double-flued boiler 27 feet long and 7 feet diameter. Placed between the boiler and the shaft is the pumping engine we have been describing. It was started on the 6th of June, 1871, and after working for six weeks its duty was measured, and 137 gallons per minute, at 10½ strokes, was found as the average of seven trials. Later experiments gave a duty of 12½ gallons per stroke, the engine running at the rate of 10 strokes per minute.

A still larger Special steam pump, calculated to raise 22 500 gallons per hour 540 feet high, has also been made by Messrs. Tangye, and eight engines are about to be constructed for coal mines in Germany. They are employed on similar work to a much larger extent in the United States, where there are upwards of 4,000 of them in use, adapted to all kinds of work, from feeding boilers to supplying cities with water.



The works of Messrs. A. S. Cameron & Co., which are engaged exclusively in the manufacture of these engines, are situated at the foot of East 23d street, New York city; they cover 16 lots (just one acre of ground), and are conducted on the co-operative plan. The establishment has grown to its present proportions in the course of a few years; it is an example of what can be accomplished by ingenuity and enterprise under the beneficent influence of our patent laws.

Mr. Cameron's first patent was secured through the Scientific American Patent Agency, when he was but seventeen years of age.

A Wild Pigeon Roost.

For the past ten days the annual migration of wild pigeons, to the forest regions of the Alleghany mountains, has been going on, and, according to the *News*, of Cumberland, Md., the town of Oakland, in that State, and the farm of Mr. Wm. Schley, have become the temporary nocturnal roosting place of the birds.

The pigeons collect nightly on a tract of ground covered with alder bushes, occupying about six acres. The pigeons first appeared about ten days ago in countless flocks. The Cumberland *News* says: The inflocking pigeons gradually settle down upon the bushes, until they are bent to the ground by the weight of the birds. Still more pigeons come flying in from distant points, and continue to settle down upon the already living mass, until the whole five or six acres are completely covered. So great is the number of birds that they pile upon each other, in places from one to two feet in depth. The pigeons continue flocking in and settling upon and among each other from about 4 o'clock in the afternoon until nightfall, when at last they become still and prepared for their night's rest. With the early dawn of the morning, flock after flock arise and fly away in all directions until about 9 o'clock, when the place is deserted, and not a living bird is to be seen, during the remainder of the day, until toward evening, when they again begin flocking back to the same roosts, and the scenes of the evening before are witnessed.

It is estimated that all the flocks of pigeons, for perhaps fifty or sixty miles around, thus gather at the one spot each evening, preparatory to their flight to the Alleghany Mountains, in quest of the heavy mass of acorns abounding there. This is the only roost known this season in this or any of the bordering counties, and is, perhaps, the only one within a circle of several hundred miles. It is a well established fact that these birds have but one roosting place within a very large territory, and in their transit to warmer climates, and during their stoppages by the way, use one place only as a roost at night. At this wonderful roost, on Colonel Schley's place, thousands and thousands of pigeons have been nightly captured by men and boys, with guns, clubs, and bags. After nightfall a person can go among the birds and scoop them into the mouth of a bag. It is needless to add that thousands of them have been wantonly shot, and allowed to remain upon the ground where they died.

Crystalized Silica from Aqueous Solutions.

In a paper published some time ago, in which the author had attempted to obtain quartz crystals from aqueous solutions of silicic acid, at ordinary pressures and at both ordinary and elevated temperatures, only negative results could be reported. In this series of experiments, attempts were made to obtain crystals after Senarmont's method, in water heated to 200° or 300°, and therefore under pressure. Crystals, under these circumstances, were obtained, but small, and evidently consisting of hydrated silicic acid, and with these crystals were numerous granules of silicic acid, consisting of two distinct parts, a nucleus and a coating. Tridymite appeared to have formed, and over it a coating of minute crystals of hydrated silicic acid, which evidently had formed as the temperature had lowered.

His conclusion is that quartz cannot be formed under any circumstances, at ordinary or even at slightly elevated temperatures, or under ordinary pressure, in aqueous solutions.—*O. Maschke.*

[From the New York Ledger.]

JOSEPH PRIESTLEY.

BY JAMES PARTON.

Time brings its revenges. I read, in a recent number of the London *Athenæum*, a quiet advertisement informing the public that "it is proposed to honor the memory of Dr. Priestley, and to commemorate his discoveries and his services to the scientific world by the erection of a statue in Birmingham, where he lived so many years."

The advertisement goes on to say that, as no other public memorial of Dr. Priestley exists, it is believed that a large number of persons interested in science will be glad to contribute something to perpetuate the memory "of the father of pneumatic chemistry, the discoverer of oxygen, and one of the most illustrious men of science whom the last century produced." Then follows a list of sixty-six subscriptions, varying in amount from fifty pounds to ten shillings. Among the names we recognize those of Professor Huxley, Mr. Martineau, Dr. Russell, Sir Rowland Hill, and seven other members of the Royal Society.

A statue to Priestley in Birmingham! Does the reader happen to remember how Dr. Priestley left Birmingham seventy-nine years ago? July the 14th, 1791, some of the liberal people of that city proposed to celebrate by a public dinner the anniversary of the destruction of the Bastile, which had taken place only two years before. But two years in revolutionary times is equal to a century. When the Bastile was destroyed in 1789, the event was hailed with joy throughout the world; but during the two years following, the revolutionists of Paris committed excesses which repelled and disheartened all but the stanchest friends of liberty—all but such as Priestley, who was recognized in Birmingham as a chief and representative of the liberal party. Priestley had published a reply to the "Reflections" of Edmund Burke. He had been named a citizen of the French republic. He had defended the revolution in the local press.

The aristocratic faction of Birmingham, whose instinct was then, and is now, to advance their cause by violence, determined to prevent the celebration. It is easy to stir up a riot in times of popular excitement, but it is not so easy to limit or check its ravages. After breaking up the banquet, and destroying the tavern in which it was given, the mob rushed to the house of Priestley, who had not attended the dinner, broke it open, and compelled the family to seek safety in flight. The rioters took out his books in armfulls—those precious books, the solace of his life, which he had been fifty years in gathering, for he was a hoarder of books from his infancy. His library was scattered over the road for half a mile, and his torn manuscripts covered the floors of his house. His apparatus was broken to pieces; and when the destruction of the interior was complete, the house was set on fire. The fire, however, was extinguished before further harm was done.

This disaster, strange to relate, made the philosopher's fortune; for although the jury, after a trial lasting nine years, awarded him but twenty-five hundred pounds damages, of his claim of more thanfour thousand, the liberal portion of the public subscribed handsomely to make good his loss. His own brother-in-law, as Lord Brougham tells us, gave him ten thousand pounds, besides settling upon him an annuity of two hundred pounds for life. As he already had a pension of one hundred and fifty pounds a year from Lord Shelburne, whose librarian he had formerly been, he was now in very liberal circumstances for a philosopher. In Pennsylvania, where he spent the residue of his life, such an income, at that period, was even superabundant.

There is an error in the advertisement quoted above. It is not true that no "public memorial" of Dr. Priestley has been erected. Every soda fountain is his monument; and we all know how numerous and how splendid they are. Every fountain, too, whence flow the home made waters of Vichy and Kissingen, is a monument to Priestley, for it was he who discovered the essential portions of the process by which all such waters are made. The misfortune is, however, that, of the millions of human beings who quaff the cool and sparkling soda, not one in a thousand would know what name to pronounce, if he were called upon to drink to the memory of the inventor. And really his invention of soda water is a reason why Americans should join in the scheme to honor his memory. He not only did all he could to assist the birth of the nation, but he invented the national beverage.

Yet he always protested that he was very little of a chemist; and often said that his making chemical experiments at all was a kind of accident. A Yorkshire man by birth, the son of a cloth finisher, he was one of those boys who take to to learning as a duck takes to the water. He was an eager, precipitate student from his childhood up. Not content with the Latin and Greek of his school, he must needs learn Hebrew in the vacations, and push on into other ancient languages of the East, Chaldaic, Syriac, Arabic, not neglecting such trifles as French, Italian and German. This way of passing youth never fails to do lasting injury. He had an aversion to the sports of the playground, and to all the lighter literature. Need I say, then, that before he was eighteen years of age his health had completely broken down, and he was obliged to lay aside his books for months?

Beginning life as a Calvinist minister, he gradually adopted a milder theology—became, in fact, a Unitarian, and abandoned the pulpit for a time. Then he set up a school. He spent many years in teaching and writing school books, his first publication being an English grammar for children. At one school, where he taught for awhile, a course of lectures was given upon chemistry, a science of which he knew nothing not even its object or nature. Attending these lectures, his curiosity was awakened, and he began to experiment.

It was Dr. Franklin's influence, however, that weaned him from other subjects, and caused him to devote his main strength to science. In 1761, when Dr. Franklin was in London Priestley, who was in the habit of visiting the city once a year, sought the acquaintance of Franklin, and became intimate with him. Franklin related to him the history of those delightful six winters, during which he and his Philadelphia friends were experimenting in electricity. The young schoolmaster, who had already had some success in bookmaking, now offered to write a history of electricity, if Franklin would put him in the way of getting the material. Twelve months after, Franklin had the pleasure of receiving from his industrious friend a copy of the work, one of those square massive quartos in which the science of that age was usually given to the world. In this work was printed, for the first time, a narrative of Franklin's immortal experiment with the kite, which Priestley received from the experimentors own lips. It is a curious fact in the history of science that Dr. Franklin himself never took the trouble to write out an account of this experiment—the most daring, ingenious and celebrated which science records. The work was remarkably successful, passing through three editions in nine years. From this time onward, Priestly was almost wholly a man of science, and no year passed without his adding something to human knowledge. He very greatly increased our knowledge of the air we breathe and its constituent gases.

He would have been even more successful, if he had been more favored by fortune. Being compelled, through his poverty, to spend a large portion of his time and strength in earning his livelihood, he could not follow out his discoveries, nor pursue them with that watchful calm so necessary for avoiding error, and perfecting truth. His zeal, however, made up in some degree for his lack of means, and the list of his discoveries will always invest his name with distinction.

Later in life, he accepted an offer to enter the service of the Earl of Shelburne as librarian. He had better retained his poverty and independence. He groaned under servitude, and would have thrown up his employment sooner than he did, but for the advice of Dr. Franklin. Franklin told him to arrange all the reasons for keeping his situation in one column, and all the reasons for leaving it in another, then strike a balance, and so reach a wise conclusion. Priestley supported his servitude a while longer, but he was glad enough to retire, in 1778, upon a pension of one hundred and fifty pounds a year.

During the whole period of Franklin's residence in England, Priestley aided him by his pen and influence by opening the eyes of the public to the folly of the Ministry in estranging the American colonies. The last day of Franklin's stay in London, Priestley spent with him from morning to night, without interruption, looking over American newspapers just arrived. Franklin was completely overcome with the prospect of a civil war, and the dismemberment of the Empire.

"A great part of the day," says Dr. Priestley, "he was looking over some American newspapers, directing me what to extract from them for the English ones; and in reading them, he was frequently not able to proceed for the tears literally running down his cheeks."

The two friends never met again; for it was not until 1794, when Franklin had been dead four years, that the English philosopher landed in New York. He had a distinguished public reception in the city, and, proceeding to Philadelphia, he was invited to become Professor of Chemistry in the University of Pennsylvania. He declined on the ground that he did not know enough of the subject. He refused also an offer, most munificent for that day, of a thousand dollars, for a course of scientific lectures in Philadelphia. His labors in America were chiefly theological, and he resided usually on his son's farm in Northumberland county, Pennsylvania. He died in 1804, aged seventy-one. He was an immense personage in his day. The public were constantly reminded of his existence by some publication bearing his name. According to Allibone, he gave the public one hundred and forty-one separate works.

Physiological Effects of Electricity.

Animals electrified under certain conditions produce an increased quantity of urine and carbonic acid, indicating greater energy in the vital functions. Young animals subjected to electric currents grow larger and more rapidly than in ordinary circumstances.

MM. Robin and Legros, experimenting with noctilucæ, those little organisms which produce in great part the phosphorescence of the sea, found that on passing a current through some sea water in the dark, its course was marked by a luminous trace, the phosphorescence of the animals being excited by the electricity.

Induction currents retard or arrest the circulation, by contracting the blood vessels. Continuous currents, however, generally have an opposite effect. MM. Onimus and Legros have further established the law that a descending current dilates the vessels, while an ascending current contracts them. Part of the cranium of a healthy dog was removed, the positive pole of a strong pile connected with the brain, the negative pole with the neck. The superficial vessels of the encephalon were visible contracted, and the organ appeared to be weakened. On reversing the position of the poles, the opposite effect was observed. By means of an ophthalmoscope, the fine blood vessels on the retina of a living person's eye may be observed; and if the head be electrified, these will be visibly distended.

The effect of an electric current on bodies newly dead was studied by Aldini, who thus produced violent motions in the bodies of guillotined persons. Similarly, Ure experimented in Glasgow on the body of a man who had just been hanged. Using a battery of 270 couples, he connected one pole with the spinal marrow at the nape of the neck, and the other with the heel, whereupon the leg was moved so vigorously as to knock over one of the attendants. He succeeded also in producing motion in the chest, the abdomen, and the features of the face.

Recent research has defined the conditions of such influence on the muscles. Continuous currents applied directly cause contractions at the moments of opening and closing; but the shock on closing is much the stronger. While the current is passing, the muscle remains in a state of semi-contraction, the nature of which is not agreed upon by physiologists. Under excitation frequently repeated, and prolonged a certain time, the muscles get into a state of contraction resembling that in tetanus. While in this state, they are in constant minute vibration.

Induction currents cause more energetic contractions, but this energy does not last long, and, if the electrification is continued, gives place to cadaverous rigidity. In both the foregoing cases, there is a local elevation of temperature, proportional to the force and duration of the electric action. This reaches its maximum (sometimes 4°) in four or five minutes after the electric action has ceased. The muscular contraction disengages heat.

The action on the nerves is more complex. MM. Onimus and Legros state that, in the case of motor nerves, the direct or descending current from a battery acts more energetically than the other, the reverse being the case with the sensatory nerves. The sensation experienced in these cases (which refer to continuous currents) is insignificant; induction currents, on the other hand, produce a pain, which continues to be felt so long as the nerve retains its excitability. If a frog is kept some time in tepid water at 40°, it dies. If then taken out, and its spinal cord electrified by an ascending current, vigorous contraction ensues; a descending current produces no motion. On the other hand, if the latter be applied to a decapitated animal, in which reflex motions are being caused by excitation of the spinal cord, it tends to paralyse them.

In general, the battery current applied to the cord, if an ascending one, increases the excitability of this organ, and therefore its power of causing reflex action; the descending current acts in the opposite way.

When the brain is electrified, the animal does not give signs of pain, but of calm stupor and tendency to sleep. Some have proposed electrification as a means of developing the intellectual faculties; but there is no evidence that it will thus act. On the other hand, extreme care is necessary in electrifying the encephalic parts, as a strong current may produce rupture of the vessels and serious hemorrhage.

Electricity stimulates all the other organs of sense, producing luminous effects in the eye, sound in the ear, taste in the tongue, odor in the nose.

Applied to the nerves of the nutritive organs, it has the effect of suppressing spasmodic movements which are not subject to the will.

The German theories as to the electrotonic properties of the nerves when electrified were opposed by Matteucci, who urged the obvious phenomena of electrolysis, that is to say, the chemical decompositions caused by the currents. He thought the modifications in nervous excitability produced on the passage of electricity were due to acids and alkalies arising from the decomposition of salts in the animal tissues. To this class of phenomena may be added the electro-capillary currents recently discovered by M. Becquerel.

A COMPANY has been formed for the construction of a telegraphic cable from Rio de Janeiro to the River Plate. A recent report presented by the directors states that the sea distance from Rio de Janeiro to Lobos Island, off Maldonado, at the mouth of the River Plate, is 1260 miles, and a few more miles of cable will be required from the island to the main land. The shore once reached, a land line of 90 miles will establish communication with Monte Video. Monte Video is connected with Buenos Ayres by a cable, and from the Argentine capital a message can be sent quite across South America, the Andes included, to Valparaiso on the shores of the Pacific. The capital of the Rio de Janeiro and River Plate Telegraph Company has been fixed at $3,000,000, and the work is to be pressed forward with vigor.

M. Marion, of Paris, has devised a method of photographic printing which consists in impregnating paper with ferroprussiate, by which it is rendered sensitive to light. The drawing, which is made on tracing paper, is laid upon the sensitive paper as a negative, and exposed to light, after which the sensitive paper is washed in water, when the copy is found produced thereon in white lines on a blue ground. By the use of a tannin solution, the ground can be changed from blue to black, the work remaining white.

ZINC GREENS.—M. Elsner uses five parts of zinc oxide, with one part cobaltic sulphate, and sufficient water to form a paste; on being well mixed and then heated to redness, this gives a fine dark green powder. A grass green may be prepared by using 10 parts of zinc oxide instead of 5, and by the use of 20 parts, a light grass green is produced. The latter is capable of being used as a safe substitute for the dangerous Schweinfurt green.

DESPATCHES from Dakota announce the arrival at Fort Rice of General Stanley's Yellowstone military expedition. The track laying on the Dakota division of the Northern Pacific railroad is progressing at the rate of three miles per day. The grading is nearly complete to the Missouri river, and trains now run to within forty miles of the crossing. The Yellowstone division, extending into Montana, is preparing for the contractor.

NEW TERTIARY AND POST TERTIARY BIRDS.

Some new species of birds were found by the Yale party during their explorations of last year in the lower tertiary strata of Wyoming. We give the following descriptions, and add an account of a few species of interest from the post-pliocene of the Atlantic coast.

The *Aletornis nobilis*, new both in species and genus, was a large wading bird, nearly equal to the flamingo in size. It is indicated in the collections by the distal end of a tarso-metatarsal bone and by a few other fragmentary remains. The *Aletornis pernix* is a smaller species of the same genus, represented by portions evidently belonging to one skeleton. It was about as large as a scarlet ibis. Another species of wading birds, apparently belonging to the genus *Aletornis*, is indicated by the distal part of a tibia in perfect preservation, showing the bird to have been of about the size of a curlew. The *Aletornis gracilis* was another small aquatic bird, not larger than a woodcock. It is represented in the Wyoming collections by the proximal end of a humerus in excellent preservation and by some less important remains. A diminutive species of about half the size of that just mentioned is the *Aletornis bellus*. The remains found somewhat resemble similar bones in the killdeer plover. A small bird belonging to the *Scansores* and evidently related to the woodpeckers is termed the *Uintornis lucaris* and is represented by the distal end of a tarso-metatarsal in perfect condition. The specimens indicate a bird about as large as the golden winged woodpecker—(*Colaptes auratus*, Su.) A new species of *Catarractes* termed the *Catarractes affinis* may be based upon a right humerus, which is entire and in an excellent state of preservation. The *Meleagris altus* is determined on portions of four skeletons and resembled most nearly, in size and general features, the common wild turkey of North America. It may readily be distinguished, however, by its more slender proportions, and especially by the more elongated posterior limbs. A much smaller species of the same genus is the *Meleagris celer*, represented by two tibiæ and the proximal half of a tarso-metatarsal, which were found together and probably belonged to the same individual. The remains indicate a bird of about one half the size of the *M. altus*. The *Grus proavus* is an extinct species of crane, somewhat smaller than the *Grus Canadensis*, Temm., and is indicated in the Yale museum by a nearly perfect sternum, a femur and a few other less important remains, which probably are parts of the same skeleton. The sternum apparently resembles most nearly that of the sand-hill crane, but differs from it in many particulars.

The Throw Stick.

Sir Walter Elliot has traced to East India a curved "throw stick" resembling, but differing from, the Australian bomerang, inasmuch as it does not return to the hand when thrown. The Indian "throw stick" is found among the rude races inhabiting the mountain and forest tracks of Central and Western India. In waste and jungle tracks, the people turn out in great numbers during the hot season, commencing on the first day of the Hindu new year in March, and continued on every succeeding Sunday till the monsoon begins. Hares, deer, hog, pea-fowls, partridges, etc., raised by this lowly race of beaters, each carrying a "throw stick," are knocked over by showers of these weapons, thrown with great force and precision.

From the form of such sticks, which are from 1½ to 2 feet long and 3 to 6 inches broad, thrown with the concave side foremost, the author deduced the form assumed by the iron weapons subsequently formed by the same races. Professor Huxley, in classifying the varieties of the human race exclusively for physical characters, had included under one head the people of New South Wales, of the Highlands of Central India, and of Ancient Egypt, all of whom he includes under the term Australoid. Now it is a remarkable coincidence that among these three far distant peoples the "throwstick" was the weapon of the chase, and that examples do not occur in the intermediate countries. The pictures in the tombs of the kings at Thebes represent hunting scenes in which the curved sticks found at this day in India are extensively represented. The bomerang of Australia is precisely of the same form, but, being thinner and lighter, is so fitted as to have a recoiling property.

The Fruit Garden.

A fruit tree never suffers from too much manure, if the roots are healthy. If a tree seems to suffer after a heavy manuring, it is only that it was in a bad way before this. Of course, if one were to empty a cesspool, a cart load of fresh lime, or some other inordinate mass of food under a tree, it would suffer; but our meaning is that no amount of manure that would be found of benefit to any regular garden will be otherwise than beneficial to a fruit tree, if the roots be healthy.

Many trees suffer from the scale insects, as well as from many other minute animal forms, some of which take up their winter quarters in some form or another in crevices of the bark, or in the crotches of the trees. There is nothing which "pays" better than to have these trees washed in the winter with a compound of sulphur and whitewash, colored with anything which may be desirable, so as to make a shade agreeable to the eye. Many of the small twigs in a badly infested tree may be cut away, so as the better to cover with the mixture the parts which are left.

In regard to pruning, many recommend to defer it till spring, in order to see what may be killed in the winter before cutting away much. Many trees are pruned which do not need any cutting; but where it is necessary, we should operate as soon as possible after the fall of the leaf. There is less danger of any part of the tree dying in the winter, when it is pruned in autumn or early winter. This is particularly the case with the grape vine, unless the plant has been mildewed during the growing season, in which case the wood does not mature. There is no better way to save from winter killing than vigorous fall pruning.—*Gardener's Monthly.*

Graphotyping.

The art of graphotyping had its origin in the accidental discovery, by Mr. De Witt Hitchcock, an American engraver, that it was possible to remove the white surface of an enameled visiting card by means of a brush, leaving the inked letters in relief. He was hence led to conceive the idea of drawing upon a surface which might be similarly treated, so that the lines of the artist should remain prominent and capable of being copied by stereotype or electrotype in a form that could be printed from in the usual way. For this purpose, a surface is prepared by placing a layer of finely powdered French chalk upon a zinc plate. A thick steel plate is then placed upon the powder, and the whole subjected to very strong pressure, equivalent to that of a weight from 80 to 100 tuns, in a hydraulic press. By this pressure, the powder is compacted into a slab of a perfectly smooth surface, and of moderately coherent texture. The slab is further strengthened by being moistened with size and dried in a hot chamber, and it is then fit for the draftsman, who draws upon it with a peculiar ink prepared for the purpose. The ink has two chief qualities. It remains fluid in the brush, so as to flow readily; but when deposited on the chalk, it dries very rapidly, and hardens the chalk in drying. Hence, when a sketch is completed, the chalk lying between the lines can be rubbed away by a dry brush, while the lines themselves resist the friction and remain prominent. As soon as the interspaces have been cleared out to a sufficient depth, the plate is saturated with a chemical solution which renders it as hard as marble, and is then ready to furnish the mold for an electrotype. For this, a flat dish of sufficient size is filled with a melted mixture of beeswax, stearine, and lampblack, and as soon as the composition is sufficiently set, it is dusted over with finely powdered plumbago, and the chalk plate is placed upon it face downwards, and hydraulic pressure is applied to force the composition into every line and point. The chalk plate is then lifted out, and the wax mold is placed in the cell of a galvanic battery, where copper is deposited upon it in the usual way. The copper is backed up with type metal, fitted to a wooden block, and the plate is then complete and ready to be used in an ordinary letterpress printing machine. In this way, plates for book illustration may be produced at small expense, and with the merit that they are absolute fac similes of the work of the artist. Every line placed by him upon the chalk will be reproduced in the print with unimpeachable fidelity, and with no possibility of being altered or distorted in any of the intermediate processes. Besides this, the art is applied also to the reproduction of photographs; or, more correctly, the action of light is employed to supersede the work of the draftsman upon the chalk. By this means, accurate copies that are either larger or smaller than the originals can be obtained. The electrotyping cells derive their force from a magneto-electric machine worked by a small steam engine; and the same machine feeds also an electric light in the photographing room, by which the operations are rendered independent of the solar beams or of the frequent murkiness of the atmosphere. Processes of color printing have been lately introduced, and for these the principle of exact reproduction seems likely to be of great value. Some very good colored cards and colored pictures for advertisements were exhibited lately by the Graphotyping Company at their works, but, perhaps, the most interesting work of this description has been in the way of designs for pottery supplied to Messrs. Minton, and transferred to tiles, dishes, and wares of various kinds. Patterns are also made for japanners of toilet hardware, and the possible applications of the graphotyping art seem to extend to almost every kind of decoration.—*British Trade Journal.*

Elastic Force of Witch Hazel Capsules.

At a recent meeting of the Academy of Natural Sciences of Philadelphia, Mr. Thomas Meehan stated that, while traveling through a wood, he had been struck in the face by some seeds of *Hamamelis virginica*, or common witch hazel. He gathered a quantity of the capsules of this plant in order to ascertain the cause of the projecting power and to measure its force. Laying the capsules on the floor, he found the seeds were thrown generally from four to six feet, and in one instance as much as twelve feet. The cause of this immense projecting power he found to be due simply to the contraction of the horny albumen which surrounds the embryo. The seeds are oval and are enclosed in a smooth bony envelope; and when the albumen has burst and expanded sufficiently to get just beyond the middle where the embryo narrows again, the contraction of the albumen causes the embryo to slip out with force, just as we should squeeze out a smooth tapering stone between the finger and thumb.

A Chinese Funeral in New Jersey.

At Belleville, New Jersey, Captain Harvey has a large Laundry which is worked almost exclusively by the "Heathen-Chinee," natives of the Celestial Empire, over two hundred in number. One of them, Li Chow Chin by name, recently died, and the unique ceremonies of a Chinese funeral were performed in his honor. The latter days of Li Chow Chin's life were spent in communion with an ugly wooden god, to which he remained desperately loyal, in spite of the efforts of a Christian minister to convert him. His funeral was attended by 220 Chinese, the total number of Captain Harvey's imported washermen. Dressed as usual in wooden shoes, flabby pantaloons, loose shirts and far-extending pigtails, they assembled in the spacious ironing room of the laundry, awaiting the removal of their departed brother. When all was ready, they moved gravely down to the burial place in the field below. They surrounded the grave and each threw a piece of lighted paper down upon the corpse. A volume of smoke arose from the grave, and the spirit of Li Chow Chin was believed by his brethren to have ascended with it to the clouds. As the clay was being heaped upon the corpse, little sticks and pieces of nickel currency were mingled with it, and money was distributed among the strangers who witnessed the ceremony. After the funeral, the Chinamen's supper bell rang, and they repaired uproariously to their chop sticks and unseasoned tea and rice.

Japan as a Naval Nation.

A report by the captain of the Russian corvette Boyarin published in the *Cronstadt Messenger*, gives some curious details on the present state of the naval armaments of Japan. On the 14th of July, 1871 (he says), five Japanese ships of war entered the harbor of Yokohama. One of these ships is a corvette of English construction, armed with six long cast iron guns and two bronze guns. The second ship is an iron clad ram, the Stonewall Jackson, formerly part of the American Confederate fleet. It is armed with a 300 pounder and two Armstrong rifled 70 pounders. The three other vessels are screw gunboats of English construction, each armed with three guns. The crews of these vessels are composed exclusively of Japanese, with a uniform exactly the same as that of English sailors. On the 28th of March a casemated Japanese corvette, the Reuzeokan, armed with eight guns, also entered the harbor. The Japanese army is equipped and armed in the French manner, and its rifles are according to the Albini system. In the Gulf of Yeddo there is an arsenal, situated on a terrace cut into the side of a mountain. This arsenal is provided with a large dock 407ft. long, 82ft. wide, and 21ft. deep. The largest ocean steamers can enter it for repairs. The water of the dock is exhausted in ten hours by three large steam pumps. Its construction occupied eighteen months, and cost the Japanese Government $240,000. Thirty vessels have already been refitted in this dock. Another dock of smaller dimensions is being constructed, by the side of the first, for ships of small tunnage. The Admiralty also has a rope manufactory, a foundery, a boiler manufactory, a mechanical forge, a steam sawing machine, and all the appliances necessary for repairing ships. Engines and boilers are now being constructed for river steamers. The buildings are all of wood; they are not supplied with much machinery, but what they have is sufficient for the wants of the harbor. This small establishment will evidently never become the naval arsenal of Japan, but it forms an excellent nucleus for the young Japanese fleet, and will afterward be of great use for the squadron which the Japanese Government is apparently about to keep up in the neighborhood of the capital. The arsenal was built by a French engineer, M. Verny, who has been retained as manager of the establishment. Thirty Frenchmen are attached to it in the capacity of foremen, assistants, and instructors. The maintenance of the works costs $300,000 a year; and since they were begun, five years ago, the expenses of the establishment have amounted to $1,500,000.

Samuel Wheeler the Ironsmith.

Samuel Wheeler was the most eminent ironsmith of his time in the United States, and probably equal to any in the world. During the Revolution, General Washington desired to put a chain across the Hudson River in order to stop the ships of the British. He happened to mention this one day in the presence of General Mifflin, saying, "I wish much that I could get a chain made; but that is impossible," "I think," said the other, "I know a man who can make such a chain." "Who is he?" "Sam Wheeler, a friend and townsman of mine," replied Mifflin. "I should like to see that man," said Washington earnestly. "He is here now in the army," said Mifflin; and sending a messenger to him, Mr. Wheeler soon presented himself. "I wish a chain made," said Washington, "to put across the river to stop the British ships. Can you make it?" "I can." "Then I wish you to do so." "I cannot do it here." "Then," said Washington, "I cheerfully give you dismission from the army. Badly as we want men we cannot afford to keep such a man as you."

Mr. Wheeler made the chain. It was hauled in links across New Jersey, was hung, and did good service. It was cut ultimately by building a fire about a link, and then using a chisel and sledge hammer.

THE Belgian industrial journals are jubilant over the astonishing demand, in their country, for coal which, in consequence in the great rise in the British prices, is now shipped in large quantities to England. They state that the prices given are so great that it is impossible to trace the course of the market. The proprietors of mines not only sell the coal as fast as it is extracted, but are actually obliged to refuse large numbers of foreign orders on account of being unable to fill them.

DR. PETERMANN, the distinguished German geographer, has received intelligence, bearing date August 24, of the successful progress of one of the Polar expeditions, commanded by Captain Altmann. This officer found the east coast of Spitzbergen to be remarkably free from ice, an encouraging circumstance on account of the many vessels now seeking to penetrate to high latitudes. He also rediscovered and landed upon King Carl's land, and reports that it consists of three large and many small islands, lying in the throat of the Polar stream that pours around Spitzbergen.

Putting up Stoves.

We have no doubt but that a great many of our readers will find their own experience reflected in the following amusing account, by an unknown author, of a disagreeable task to be performed at this season of the year in many households:

The first step a person takes is to put on a very old and ragged coat, under the impression that, when he gets his mouth full of plaster, it will keep his shirt bosom clean. Next he gets his hand inside the place where the pipe ought to go, and blacks his fingers, and then he carefully makes a black mark down the side of his nose. It is impossible to make any headway in doing this work until this mark is made. Having got his face properly marked, the victim is ready to begin the ceremony. The head of the family—who is the big goose of the sacrifice—grasps one side of the bottom of the stove, and his wife and the hired girl take hold of the other side. In this way the load is started from the woodshed toward the parlor. Going through the door, the head of the family will carefully swing his side of the stove around, and jam his thumb nail against the doorpost. This part of the ceremony is never omitted. Having got the stove comfortably in place, the next thing is to find the legs. Two of them are left inside the stove since the spring before; the other two must be hunted after for twenty-five minutes. They are usually found under the coal. Then the head of the family holds up one side of the stove while his wife puts two of the legs in place, and next he holds up the other side while the other two are fixed, and one of the first two falls out. By the time the stove is on its legs, he gets reckless, and takes off his old coat, regardless of his linen. Then he goes off for the pipe, and gets a cinder in his eye. It don't make any difference how well the pipe was put up last year, it will be found a little too short or a little too long. The head of the family jams his hat over his eyes, and, taking a pipe under each arm, goes to the tinshop to have it fixed.

When he gets back, he steps upon one of the best parlor chairs to see if the pipe fits, and his wife makes him get down for fear he will scratch the varnish off the chair with the nails in his boot heel. In getting down, he will surely step on the cat, and may thank his stars if it is not the baby. Then he gets an old chair, and climbs up to the chimney again, to find that, in cutting the pipe off, the end has been left too big for the hole in the chimney. So he goes to the woodshed, and splits on one side of the end of the pipe with an old axe, and squeezes it in his hands to make it smaller. Finally he gets the pipe in shape, and finds that the stove does not stand true. Then himself and wife and the hired girl move the stove to the left, and the legs fall out again. The next move is to the right. More difficulty with the legs. Moved to the front a little. Elbow not even with the hole in the chimney, and he goes to the woodshed after some little blocks. While putting the blocks under the legs, the pipe comes out of the chimney. That remedied, the elbow keeps tipping over, to the great alarm of his wife. He then gets the dinner table out, puts the old chair on it, gets his wife to hold the chair, and balances himself on it to drive some nails into the ceiling. Drops the hammer on his wife's head. At last gets the nails driven, makes a wire swing to hold the pipe, hammers a little here, pulls a little there, takes a long breath, and announces the ceremony completed.

Job never put up any stoves. It would have ruined his reputation if he had.

Disinfectants.

In the Central Chemical Department of Public Health at Dresden, numerous researches have lately been made with various disinfecting materials for the purpose of disinfecting liquid manures; the chief results are appended below. The value of chloride of lime and sulphuric acid, which form the most effectual disinfecting material, is here expressed by 100, while the remaining numbers show the value of the other materials as compared with this standard;

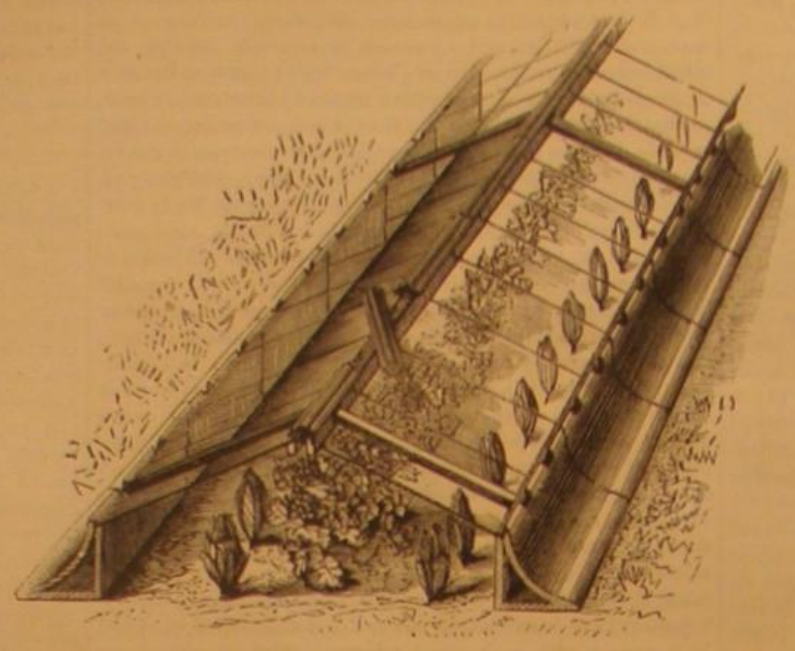
Chloride of lime with sulphuric acid	100·0
Chloride of lime with sulphate of iron	99·0
Luder and Liedloff's powder	92·0
Carbolic acid—disinfecting powder	85·6
Slaked lime	84·6
Alum	80·4
Sulphate of iron	76·7
Chloralum	74·0
Sulphate of magnesia	57·1
Permanganate of potash with sulphuric acid	51·3

A NEWLY erected four story building recently tumbled down at Louisville, Ky., at 7 P. M. Two adjoining buildings were crushed, in one of which a family of eight persons, five of whom were children, were seated at supper; all were killed except three of the children. The accident is reported to be due to bad mortar, which had the appearance of wet mud. The architect and contractor have been arrested for murder.

THE aeronauts Mr. Glaisher and his companion Mr. Coxwell reached an altitude of 37,000 feet or seven miles from the earth, where they found a temperature of 80° Fah. below freezing

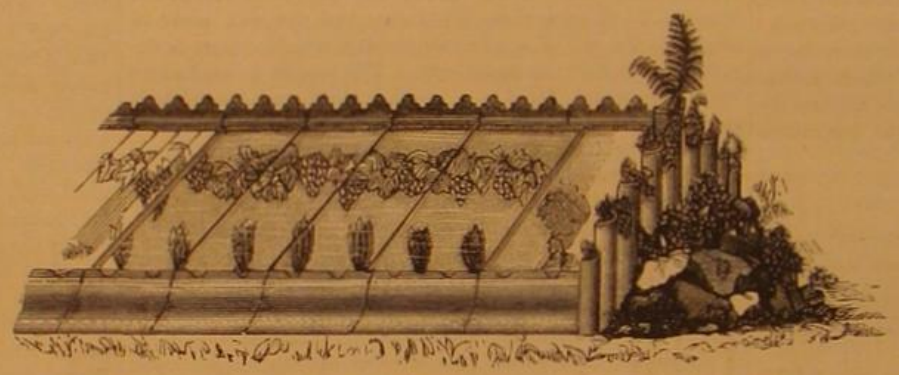
EARTHENWARE HOTBED FRAMES

This is a cheap and effective combination of glass and earthenware for horticultural purposes, wherein is obtained complete facility for perfect ventilation, without removal of the glass, or risk of fracture. The sides of the frame, Fig. 1, are formed of chairs or slabs of terra cotta or earthenware, somewhat of an L section, with a recess at the top to receive the glass, set side by side, and in pairs, at suitable distances



EARTHENWARE HOTBED FRAMES.—FIG. 1.

apart. At intervals, angle pieces, doweled at the ends and securely fixed to the chair tiles, support a light double wooden ridge, the opening in which thus admits of ventilation, throughout the length of the frame; being also closely fitted with bevel-ended earthenware caps, any one or all of which



EARTHENWARE HOTBED FRAMES.—FIG. 2.

are readily removed and replaced. Thus not only is there adequate provision for easy ventilation, but, on the removal of the cap, any one or more of the glass sheets can be removed to permit the plants to be watered. The ends of the frames are closed by means of half round hollow earthenware tubes, Fig. 2, of varying lengths, arranged so as to form a kind of gable end, to which an ornamental appearance can be given by filling the tubes with mold and planting ferns and other suitable plants therein. These frames, says the *Mechanics' Magazine*, are useful and ornamental as

FIG. 3.

garden accessories, and are well adapted for every description of flowers, vegetables, or fruit, or as forcing pits and frames when placed on sunk brickwork or heated by a system of pipes with hot air or water.

The same principles, on a smaller scale, are applied in the cover, Fig. 3, made of red earthenware with sloping glass

FIG. 4.

covers. The propagating box, Fig. 4, is made of the same material. These improvements are the designs of Benjamin Looker, and were lately exhibited at the Horticultural Exhibition, Birmingham, England.

CEMENT FOR STEAM BOILERS AND GAS PIPES.—This cement offering a great impermeability and more strength than the cement generally used, is prepared by an intimate mixture of six parts of graphite finely ground, three parts of slacked lime, eight parts of sulphate of baryta, and seven parts of linseed oil varnish.

Black Varnish for Wood.

There are two kinds of black varnish: 1. The ordinary black varnish for different kinds of wood; 2. The black ebony varnish for certain woods which approach nearest to ebony in hardness and weight. The ordinary black wood varnish is obtained by boiling together blue Brazil wood, powdered gall apples, and alum, in rain or river water, until it becomes black. This liquid is then filtered through a fine organzine, and the objects painted with a new brush before the decoction has cooled, and this is repeated until the wood appears of a fine black color. It is then coated with the following varnish: a mixture of iron filings, vitriol and vinegar is heated (without boiling), and left a few days to settle. If the wood is black enough, yet for the sake of durability, it must be coated with a solution of alum and nitric acid, mixed with a little verdigris; then a decoction of gall apples and logwood dyes is used to give it a deep black. A decoction may be made of brown Brazil wood with alum in rain water, without gall apples; the wood is left standing in it for some days in a moderately warm place, and to it merely iron filings in strong vinegar are added, and both are boiled with the wood over a gentle fire. For this purpose soft pear wood is chosen, which is preferable to all others for black varnishing.

For the fine black ebony varnish, apple, pear, and hazlewood are recommended in preference for this; especially, when these kinds of wood have no projecting veins, they may be successfully coated with black varnish, and are then most complete imitations of the natural ebony. For this varnish: 14 oz. of gall apples, 3½ oz. of rasped logwood, 1¾ oz of vitriol, and 1¾ oz. of distilled verdigris are boiled together with water in a well glazed pot, the decoction filtered while it is warm, and the wood coated with repeated hot layers of it.

For a second coating a mixture of 3½ oz. of pure iron filings, dissolved in ¾ of a liter of strong wine vinegar, is warmed, and when cool the wood already blackened is coated two or three times with it, allowing each coat to dry between.

For articles which are to be thoroughly saturated, a mixture of 1¾ oz. of sal ammoniac, with a sufficient quantity of steel filings, is to be placed in a suitable vessel, strong vinegar poured upon it, and left for fourteen days in a gently heated oven. A strong ley is now put into a good pot, to which is added coarsely bruised gall apples and blue Brazil shavings, and exposed for the same time as the former to the gentle heat of an oven, which will then yield a good varnish. The pear wood articles are now laid in the first named varnish, boiled for a few hours, and left in for three days longer; they are then placed in the second varnish and treated as in the first. If the articles are not then thoroughly saturated, they may be once more placed in the first bath and then in the second.

Metallic Printing.

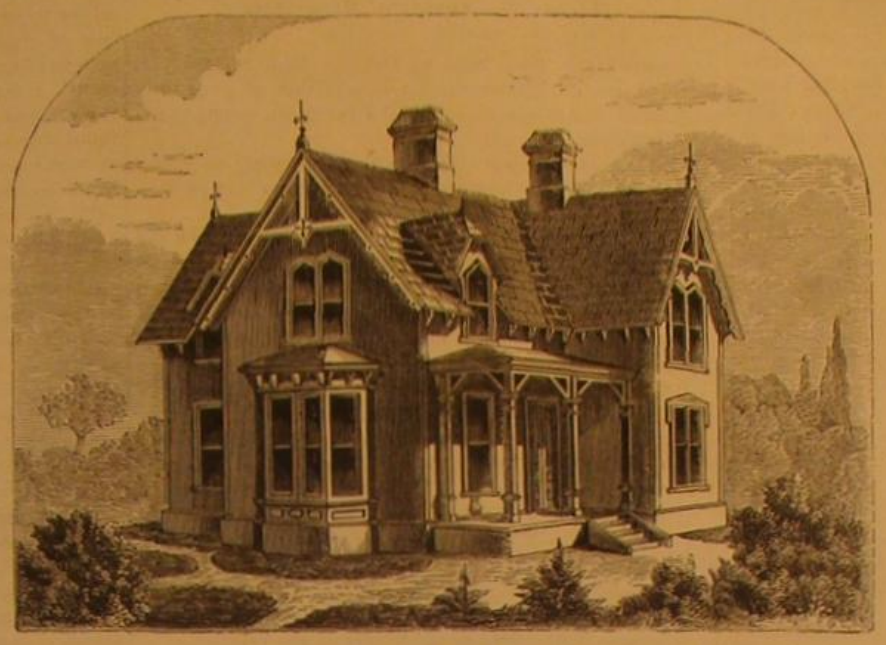
Many attempts have been made to produce patterns upon cotton, worsted, and other tissues, by depositing reduced metals upon them. One of the most successful experimentalists in this direction was the late Mr. W. Robinson, of Clifton Vale Print Works, Brighouse, Yorkshire. He found that lead, tin, bismuth, copper, etc., could be deposited in given designs in a metallic state upon woven tissues, producing a variety of novel and striking effects. One serious drawback remains, however, to be overcome before this new style of printing can be adopted on the large scale. The metals capable of easy reduction and deposition have all, with the exception of gold, which is too costly for general use, a strong affinity for sulphur. When exposed in thin films to the action of the air, they are consequently easily tarnished and lose their beautiful metallic luster. Vial moistens tissues of cotton, silk, etc., with a solution of nitrate of silver, dries slightly, and then lays upon the cloth a metal plate with an engraved design in raised lines. Wherever this metal touches the cloth, the silver is reduced in fine black metallic powder, which adheres very tenaciously to the fiber and reproduces the design with great sharpness and delicacy. The process is most successful on fine, compact goods. A slight previous dressing or sizing is of use. The designs thus produced are permanent in air and light, and are not affected by washing in water, soap leys, or dilute acid and alkaline liquids. They are, however, of no value, as they are devoid of that metallic luster which alone is wanted. Black designs, perfectly permanent, can be produced to satiety with much cheaper materials than the nitrate of silver.

THE RISE IN TEMPERATURE OF DISCHARGED LEADEN SHOT.—The motion of the leaden bullet, if all converted into heat, would be three times the amount sufficient to melt the amount of lead found to be melted by actual experiment. J. Bollynski explains this as having been actually expended in denting the iron plates used. By using a hard stone target, he was able to melt all the lead by firing the bullets against it.

THE tooth of a mastodon is reported to have been found in Clay county, Ind., which weighs ninety-two pounds. With an ordinary row of teeth, the lower jaw of the animal must have weighed at least fifteen hundred pounds.

CHEAP COUNTRY HOMES.

There is an immense number of people, whose daily labor necessitates their residing in close proximity to our great cities, and who, owing to the high rents and advanced cost of living, are forced to dwell in the suburbs or in villages situated on the radiating lines of railroad. To meet the requirements of this class in New York, during the past few years, villages and, indeed, towns have sprung up as if by magic, from the hitherto vacant fields of New Jersey and Long Island. The streets of our city are placarded with flaming posters, setting forth, in glowing terms, the advantages of a country residence; enterprising auctioneers vie with each other in lavishing money on sensational announcements, offering grand collations, free railroad passes, and the easiest of terms of payment to allure purchasers; banks and capitalists in the vicinity of the land, with unaccountable liberality, advertise building loans, taking a mortgage on the prospective dwelling for the sums advanced toward its erection, and, in fine, every attraction that human ingenuity can suggest is presented to induce those in moderate circumstances to leave the city and become the owners of rural homes. While it is not our province to comment upon the desirability of the building sites, or on the value of the apparently overwhelming advantages so freely proffered, we perhaps may suggest to those contemplating such investments that it is a much better policy to invest their savings in a small but inexpensive house for which they can wholly pay, and thus be possessed of a clear title, than by the aid of borrowed capital to erect a more pretentious mansion, from which, in the hour of misfortune, they may be ejected by the process of a foreclosure suit.

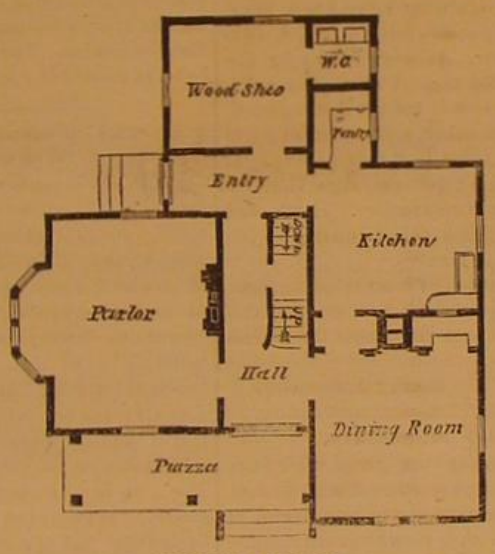


CHEAP COUNTRY HOUSE.

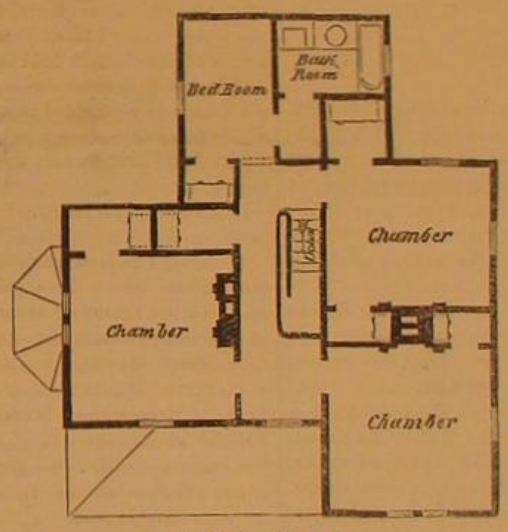
With this view, we present, in the accompanying illustrations, the plans and elevation of a neat, cheap, and commodious cottage, for which we are indebted to the *Supplement to Bicknell's Village Builder*, and which, we are informed, may be erected in the vicinity of New York for three thousand dollars, or in some other sections of the country for five hundred dollars less. The dwelling is designed to be no hastily thrown-together structure, but a substantial and durable house.

The gothic roof, with which the dwelling is surmounted, is appropriate and tasteful, while it affords ample room in the apartments in the upper story. The plans explain themselves, and are so designed as to leave no space unutilized.

To those desiring to avail themselves of this design, we may add, that it is only necessary to decide upon the size of the dwelling, which, of course, will be based upon the size of the building lot, and to obtain the estimates and specifications which ordinary carpenters, plumbers, and masons can readily furnish, to carry out the construction without the aid of either architect or professional builder.



GROUND FLOOR.



UPPER STORY.

American Gas Wells.

Dr. J. S. Newberry, State Geologist of Ohio, gives the following particulars: The town of Fredonia, in Western New York, has for more than forty years been fully or partially lighted by gas which issues from springs at that place. In the borings made for oil in the various oil districts of the Western States, the gas which has been produced so abundantly has been regarded as a useless, frequently an inconvenient and dangerous, product. Within a year or two past, however, this gas has been utilized in numerous localities, and already a large number of wells have been bored for the express purpose of obtaining it. In some cases these gas wells have been highly productive, furnishing an abundance of material for heating and lighting in its most convenient and manageable form, so this deserves to be reckoned as one of the important elements in the mineral resources of our country. As this method of procuring carburetted hydrogen gas forms a new industry and one which will probably assume considerable importance, a few words in reference to its present condition and prospects may not be without interest to the public. I therefore extract from my notes a few facts in regard to some of the most interesting of our gas producing districts. On the Upper Cumberland, in Kentucky, gas accumulates in such quantities, beneath the sheets of Lower Silurian limestone, that many hundred tuns of rock and earth are sometimes blown out with great violence. These explosions have received the local name of "gas volcanoes." In Ohio, gas escapes from all the wells bored for oil in the oil-producing districts. Of these, two, bored by Peter Neff, Esq., near Kenyon College in Knox county, present some remarkable features. These wells were bored in 1866, at the same geological horizon as that which furnishes the oil on Oil Creek, Pa. At the depth of about 600 feet, in each well, a fissure was struck from which gas issued in such volume as to throw out the boring tools and form a jet of water more than 100 feet in hight. One of these wells has been tubed so as to exclude the water, and gas has continued for five years to escape from it in such quantity as to produce, as it rushes through a two and a half inch pipe, a sound that may be heard at a considerable distance. When ignited, the gas forms a jet of flame three feet in diameter and fifteen feet long. The other well, which has never been tubed, constantly ejects, at intervals of one minute, the water that fills it. It thus forms an intermittent fountain, one hundred and twenty feet in hight. The derrick set over this well has a hight of sixty feet. In winter it becomes encased in ice, and forms a huge translucent chimney, through which, at regular intervals of one minute, a mingled current of gas and water rushes to twice its hight. By cutting through this chimney at its base and igniting the gas in a paroxysm, it affords a magnificent spectacle—a fountain of water and fire which brilliantly illuminates the ice chimney. No accurate measure has been made of the gas escaping from these wells, but it is estimated to be sufficient to light a large city.

At West Bloomfield, N. Y., Erie, Pa., Conneant and Painesville, Ohio, quite a number of gas wells have been bored and yield large supplies of gas which are used for manufacturing and domestic purposes.

A Steamship Race of Eleven Thousand Miles.

For many years the Cunard Steamship Company enjoyed the reputation of running the fastest steamers that crossed the Atlantic, the Scotia being the fastest of a very fast fleet. Mr. Inman challenged the Scotia with the City of Paris at last. Then came the Cunard boat Russia, rivaled by the Inman steamer City of Brussels. There was not much to choose between those vessels as regarded speed. Last year, says a correspondent of the *Engineer*, the White Star line came into existence, and raced with the Inman boats between New York and Liverpool, starting on the same days; but the Inman fleet always won with one ship at least, the City of Brussels beating the Republic, a new ship of the White Star fleet, on her last trip. The Republic is now on her voyage from Liverpool to Callao in Peru, and she is racing the Tacora, one of the Pacific Company's fleet. It is 11,000 miles to Callao, quite enough in all conscience to settle the merits of the two ships.

The Republic was built in the early part of 1872 by Messrs. Harland, Wolf, and Co., of Belfast, and furnished with engines and boilers by Messrs. G. Forrester and Co., of Liverpool. The former are of the inverted cylinder direct-acting type, on the compound system. The high pressure cylinder has a diameter of 41 inches, and the low pressure one 78 inches. The stroke is 5 feet. The engines are furnished with surface condensers, the water for which is supplied by means of two of Gwynne's centrifugal pumps, each worked by an independent engine. The screw is a four-bladed common screw, with feathering blades, 23 feet in diameter, and having a pitch of 31 feet 6 inches. The engines are remarkably easy to start, stop, and reverse, the chief engineer, with two assistants, handling them as if they were toys. They work with great ease and quietness; in fact the total absence of vibration on board the Republic is most remarkable, it being frequently impossible to tell whether the engines are in motion or not. This is due not only to the excellent workmanship which has been bestowed upon the engines, but also to the immense strength of the vessel herself. The maximum number of revolutions per minute at which these engines are usually worked is fifty. The steam is supplied to the engines by means of twelve main boilers, and one boiler is devoted to supply steam to the various donkey engines. The boilers are all tubular wagon boilers semicircular at top and bottom, with flat sides. They are placed on each side of the vessel, with a passage 10 feet wide down the center, from which they are fired. Each boiler has two furnace tubes, 3 feet 2 inches in diameter, and the grates are 6 feet in length. The whole of the furnaces are fitted with Mr. Symes Prideaux's patent furnace doors, and the smoke box doors are all furnished with the shields invented by the same gentleman.

Three objects are expected to be attained by the introduction of these inventions, namely, the entire consumption of smoke, economy in the consumption of fuel, and the reduction of the temperature of the stokehole. These three items are all of the most vital importance to all steamships, but more especially to those, like the Republic, which have to undertake extremely long voyages in very hot climates. The principle upon which the doors are constructed is that, in order to insure the total absence of smoke and the proper combustion of fuel, a very much larger quantity of air is required to be admitted to the furnace, above the fuel, immediately after firing than at any other time, and as the green fuel becomes coked the supply of air should be gradually diminished.

Spontaneous Ignition of Oiled Cotton.

Mr. John Gellatly has published some very interesting observations on these so-called spontaneous combustions. He took a handful of cotton waste, soaked it in the oil to be experimented upon, wrung out the excess of oil, and then put it into a box along with some dry cotton. The box with contents was then heated to 170° Fah., and in 75 minutes the cotton saturated with boiled linseed oil was found to be on fire. Boiled linseed oil and seal oil (sp. gr, 0·928) were found to be the most combustible. Next in order came lard oil (sp. gr. 9·16) which took four hours. Raw linseed oil took four to five hours. Rape oil and gallipoli olive oil appear to take a little longer than the last. It is interesting to note that all the oils just enumerated are ethers of glycerin. Castor oil, which is not an ether of glycerin, takes two days to ignite spontaneously. Sperm oil, too, does not ignite; and the petroleums actually stop the spontaneous combustion of the oils above mentioned. Chemists are in the habit of keeping potassium and sodium in petroleum, which excludes the atmosphere from these metals. It is curious that dangerous cotton should be preserved in a similar manner.

A NEW invention has been adopted this year at the Prince Consort's farm and the Norfolk farm at Windsor, England, for the preservation of hay ricks from the heating occasioned by confined air and moisture. A long perforated tube, fixed in short lengths which fit into each other, is built into the body of the rick as it is carried up, and surmounted by a cowl, which turns with the wind and provides a constant down current; an upward current is also arranged for in an inner tube, which is solid, opens at the bottom, and so completes the circulation. This invention is also adapted to granaries and ships in transit, but in these cases several arms are provided, running out from the central shaft at right angles, so as to distribute the air through the body of the grain. The use of perforated tubes for preserving grain, meal, etc, in storehouses, granaries, and in barrels, is an American invention and has long been in use in the United States.

ACTION OF ACTIVE OXYGEN UPON PYROGALLIC ACID.—H. Struve in an essay treats on the action of peroxides and other oxidizing substances upon pyrogallic acid alone or in the presence of gum, blood, saliva, malt extract, etc. It appears that pyrogallic acid yields several colored products of oxidation, among which purpurogallin is one of the most prominent.

THE Marquis of Bute is preparing for the Philadelphia Centennial Exhibition of 1873 a complete assortment of metals and ores from Wales, the county of Durham, and the entire basin of South Wales, including Monmouthshire.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Transmission of Motion.

To the Editor of the Scientific American:

In your issue of No. 16, present volume, page 243, is a lecture delivered by Coleman Sellers on the above subject Speaking of shafting being enlarged at the ends to receive couplings, which is the English practice, he says: "Shafts so enlarged at the ends cannot be made to receive carefully bored pulleys unless the pulleys be made in halves and then bolted together upon the shaft." For the information of your readers, allow me to throw a little light on this matter. To my knowledge, 15 years ago, pulleys were bored out taper, large enough to pass the enlarged part or "coupling end." Suitable bushes were cast with three slots of three eights inch width, equidistant, and three fourths inch shorter at each end than the bush, the bush itself being about one inch longer than the hub of the pulley was. Through these bushes holes were bored to suit shafts, and their outsides turned to same bore and taper of pulleys. When complete, a chisel was inserted in each slot, and the bushes burst in three parts. One chipping on any one of the parts that hold the bush together is sufficient to allow of the three pieces impinging the shaft when driven in the hub of the pulley with a hand hammer. This method makes a neat finish, and with it pulleys can be moved at pleasure. An advantage claimed for this method is that there is no set screw head whirling around while in motion, which is dangerous, especially when persons have to approach the pulleys fastened on shafting in that way.

There is another thing I would mention for the benefit of your readers; that is, a method of using a loose pulley, so that, when the machine is stopped, the driving belt is stopped also. This is accomplished by suspending the loose pulley (at the driving end) on a sleeve, through which the shaft runs; the fast pulley, running up against the loose, will keep the loose pulley on the sleeve. A collar on the sleeve on the opposite side will keep the loose pulley in its place. The bearings of a hanger would suffice for the sleeve, if they were extended long enough on the required side to receive the loose pulley, the loose pulley being bored and the outside of the bearings being turned to suit each other, and the fast pulley of course being bored to suit shaft. It is said that the extra work is soon paid for in the saving of belts and countershafts, which are stopped with the machine, to say nothing of the oil used on the ordinary loose pulleys and their constant racket and noise, all the time calling to be re-bushed. J. W.

Sheet Lightning.

To the Editor of the Scientific American:

Sheet lightning does not differ from zigzag lightning, except that sheet lightning, so called, is confined wholly to the clouds, and is not generally accompanied by rain. Sheet lighting is most frequently noticed in the evening, and on the horizon, but it oscurs, perhaps, quite as frequently in the day time and overhead, though, owing to change of circumstances and position, it is not recognized as sheet lightning. Here are two notable instances:

Some 30 years ago, when the writer was a boy, the father called up the family at midnight, and, laying a feather bed upon the floor, directed the children to get upon it for security. A fearful thunderstorm was approaching, and if every stroke of lightning, he said, should fall to the earth, not a building, tree or fence stake would escape. And so it seemed. For more than half an hour the thunder was continuous, while the dazzling flashes of lightning were almost as frequent as the tickings of the clock. But no rain fell, no lightning descended to the earth, and no loud peals of thunder were heard, but only a subdued, yet variable and continuous rumbling. The same phenomenon was witnessed by another member of the family who was then 60 miles west of this.

A similar but less fearful and equally harmless storm occurred here in the past summer and at midday. For more than 25 minutes the thunder was incessant, and the lightning flashes fearfully frequent and vivid. Yet only a few drops of rain fell, and only one or two loud peals of thunder were heard, indicating a descent of the lightning to the earth. Both of these are instances of sheet lightning occurring overhead. The form of the lightning in these, as in every other similar instance, was zigzag, yet confined wholly to the clouds.

Franklin, N. Y. JAS. H. PARSONS.

The Temperature of the Moon.

To the Editor of the Scientific American:

I was recently interested in reading the article entitled the Latest News About the Moon" (on pages 247 and 248 of your current volume). In this article, it is stated that the temperature of the moon is undoubtedly below 70° below zero, Fahrenheit, and possibly reaches even 460° below that point. The moon reflects light and heat rays upon the earth. These rays are obtained from the sun. Part of the heat rays must necessarily be absorbed by the moon. The moon receives, proportionately, the same amount of heat rays that are received by the earth. Now, the question is, how can the moon, receiving the same proportion of heat rays received by the earth, be destitute of all heat, when it is otherwise with the earth? I confess I cannot comprehend how it can be.

A case is supposed, in the article referred to, of a mountain on the earth's surface, 240,000 miles high, and it is stated that there would evidently be no more heat on the surface of the moon than on the summit of that mountain. I hold that this is not a parallel case, for the reason that, on the peak of a high mountain, the rays of the sun are reflected off its precipitous sides into the surrounding atmosphere, and do not serve to heat its surface. There are many plateaus, 10,000 and 12,000 feet above the sea, where tropical vegetation flourishes; but notwithstanding that, there are many single peaks of that hight whose summits are far above the snow line.

The article above referred to further asserts that there are evidences of volcanic action in the moon. Plainly, there must be a considerable amount of heat accompanying such action. This fact also tends to show that it is probably not so cold that there is an "entire absence of heat." J. H. R.

Rochester, N. Y.

Mr. J. M. Jaeger's Propeller.

To the Editor of the Scientific American:

On page 246 in your issue of October 19, I noticed Mr. James M. Jaeger's claims for his new method of propelling canal boats, and in several points the invention seems to me to be defective.

1st. There is no power either to back the boat, or to stop it when making a landing, the want of which would prove a serious disadvantage in practice.

2d. The point of contact with the water is so far below the point of support that there would be a constant strain sidewise on both the guide rods and the piston rod, wearing not only these but also the cylinder, and making constant repairs necessary, beside detracting much from the effective power of the engine by unnecessary friction.

3d. Mr. Jaeger states "that it utilizes a large amount of power." Let us look at this. When the propeller is drawn toward the boat, and ready to start back, a part of the stroke must be made before the floats are closed, making this part of the stroke of little effect. If the floats are raised at nearly right angles with the "supports," then the loss must be considerable; if they are not raised so far, then the resistance on the return stroke must be considerably increased. We must consider two facts: 1st, that the return stroke through the water must be at twice the speed of the boat; and, 2d, that the resistance is increased as the square of the velocity.

4th. He states that "it wastes no power by slipping." This, in regard to any form of propeller, is simply absurd.

Westerly, R. I. C. B. MAXSON.

How Trees are Killed by Lightning.

To the Editor of the Scientific American:

On page 229 of your current volume is an article from the *Building News*, under the above head, which conveys the idea that the way in which the lightning splits trees is by changing the sap to steam, the expansive force of which does the work. This I think is an error. Whatever may be the action of the electric fluid in killing trees, I think the splitting is due to another cause. It is well known that substances similarly electrified repel each other, and different parts of the same substance repel each other in the same way. It seems a self-evident fact that if this force is stronger than cohesion, the substance must be thrown asunder. Earth and stones are sometimes lifted; I suppose this is owing to the repellent force being stronger than gravity.

As far as I have observed, dry and half dead trees are shattered where green ones are unharmed or torn out by the roots by the lifting of stones, without fracturing the bodies of the trees.

Charlotte, Me. HENRY A. SPRAGUE.

Fireproof Gunpowder Magazines.

Some experiments as to the storage of gunpowder have been recently tried at the Practice Range, Plumstead Marshes, at the instance of the Home Secretary and by permission of the Secretary of State for War. With a view to guard against the danger of explosion, Messrs. Milner & Co., of Liverpool, have designed a fireproof safe, to hold small quantities of gunpowder, and the experiments were made to determine how far these miniature magazines will preserve their contents from explosion when exposed to the action of fire.

Four magazines were put to the proof. In form, says the *Mechanics' Magazine*, they differ in no respect from any ordinary fireproof safe. There is no intricate combination of bar and lock, for they need not, of course, be thief-proof, and a burglar would, if he knew it, be hardly likely to break into such a strong box. On the other hand, the walls are of unusual strength. They are formed of four inch chambers, between each of which is a stuffing of alum and sawdust. The action of heat dissolves the alum, which contains 53 per cent of water, and the liquid portion finds its way through small holes in the safe, wetting any loose powder, while that contained in canisters is so protected as to be non-explosive. This, at least, was the theory of the manufacturers. The value of the theory was now to be tested.

In the open air, several hundred yards apart, four furnaces had been erected, each seven feet in internal diameter, and each heaped up with wood, shavings, coal, and a dash of petroleum to assist ignition. All the magazines were of the same size, and made to hold 100 pounds of powder loose or in canisters, as it is generally kept by retail dealers and sportsmen; but for the purpose of experiment, only a small quantity of powder was placed in each, put up in different ways, some in paper, some in canisters, some in barrels, headed up and open. In each magazine, there were placed two of Negretti and Zambra's self registering thermometers, with 21 little sticks of alloy (tin and lead,) so made under Professor Abel's directions as to melt, according to the varying proportions of the alloy, at varying degrees of temperature from 340° to 558° Fahr. Gunpowder explodes at a temperature of 560°; but long before this degree of heat was reached, it was expected that the sulphur would be volatilized, when the remaining constituents would be robbed of their chief powers for mischief.

By 11 30 A. M, all four furnaces were in a blaze, and there could be no doubt as to the rough reality of the ordeal which the magazines were undergoing. The superintendents of the principal fire brigades in the United Kingdom had been previously asked what length of time a magazine, to be really safe, should be able to resist such a fire as might occur in an ordinary dwelling house. The longest time assigned by any of these officers in their replies was six hours. Captain Shaw, and the more experienced men on the ground were of opinion that this length of time was excessive. However, three of the magazines were constructed on the assumption that, if they could resist fire for six hours, they would afford all the protection which was actually necessary. The fourth was of stouter construction than its fellows; it had 6 inch instead of 4 inch chambers, and was made to resist fire from eight to nine hours. As the wall of coal gradually burnt through and the flames rose high above the buried magazines, there seemed to be no wish among any visitors to disobey the earnest request addressed to them: not to approach the furnaces during the progress of the experiments. There was little, indeed, to tempt visitors from cover. The rain poured down incessantly during the greater part of the day, and Plumstead Marshes, at no time very lively, became a dismal swamp indeed. Meanwhile the fires burned furiously, nursed by the wind and quite unchecked by the rain. It was admitted by most people present that, if the test was severe as to time, the exposure of the magazines to a heat so intense and continuous during that time was a test severer still. At last the end came, amid general impatience. At four o'clock, there had been no explosion anywhere. A few minutes afterwards, magazine No. 5 was disengaged—no easy task—from the glowing mass around and over it. It was then opened, and its contents were inspected by Major Majendie. One of the thermometers was broken. The other marked 210°. Of course none of the rods of alloy were fused. The "pinches" of loose powder were thoroughly wetted, and the paper containing them was pulp. The powder in the canisters came forth unharmed, and its properties were unchanged, portions taken from each canister exploding readily when a spark was applied. The magazine had been sorely tried. In two places the flames had eaten holes through the exterior plate of iron into the first chamber. The outer plate of the door had also slightly bulged, partly, perhaps, from expansion, partly owing to pressure from within—the generated vapor seeking an outlet. But all admitted that the magazine has passed successfully through the fire, and had fulfilled the promise of its makers that it would not merely, during the stipulated time, resist fire but preserve its contents from explosion. The other furnaces were left to burn out, to be examined the following day.

The Whitworth Breech-Loading Gun.

Sir Joseph Whitworth has advanced the claims of his system of ordnance to meritorious recognition another step, by the results of the recent practice made with his 9 pounder homogeneous steel field gun on the sands at Southport. The weapon, says *Engineering*, was made from a solid ingot of Whitworth metal, and is mounted on a carriage constructed of the same material. The gun is 6 feet 2 inches long, weighs 8¾ cwt., its carriage weighing 10 cwt., and its ordinary charge being 2¼ lbs. of R. L. G. powder. It is constructed with an enlarged powder chamber 6·8 inches long by 3·4 inches diameter, beyond which is a shot chamber $\frac{3}{100}$ of an inch larger than the hexagonal bore of the piece, which measures 2·72 inches in the major, and 2·47 inches in the minor axis. The gun is 4½ inches in diameter externally at the muzzle, and 10½ inches at the breech. The rifling has a twist of 1 in 55 calibers, and the ordinary projectiles are 3½ diameters in length, and are fired as cast, without being trimmed up. The breech end of the piece is slotted longitudinally, leaving an upper and under jaw. The opposite surfaces of these jaws are grooved diagonally by fine ridges 1 inch in width, and having ¼ of an inch rise. The breech block is a mass of metal 9 inches wide by 4½ inches high and 6 inches deep, is similarly grooved, and is moved along the grooves in the jaws from side to side by a handle actuating a pinion working on a rack behind the grooves; and by this means the breech chamber is opened and closed. The gun carriage is fitted with Madras wheels 4 feet 6 inches in diameter, with two ammunition boxes for three rounds, each fitted over the axle, and serving as seats for gunners. The trail is formed of two solid deep plates of Whitworth steel, tapering, from 9 inches deep and ⅝ inches near the axle, to 4 inches deep and ¼ inch thick at the ground end. At the upper end is a strong hollow cylindrical stay, and at the lower end the cheeks are riveted to the iron shoe. There are two similar hollow stays at intermediate distances, the first of which affords the bearing for the elevating screw which passes through it. The support of the gun is midway of the lever, and the fulcrum immediately under the axle. There are also several pivot holes, to permit the shifting of the fulcrum, for high elevations.

With the weapon thus mounted and equipped, some remarkable practice was recently made with results as follows:

In the first series of experiments, ten rounds were fired, elevation 40°, solid shot, R. L. G. powder 2¼ lbs. mean range 10,225 yards, mean deflection to right 44 feet, the shot 4 diameters in length, with taper rear; wind strong and blowing down against flight, and slightly across range.

In the second series, with same elevation, same number of rounds, same charge of powder and a common 9 lb. shell, the mean range was 4,359 yards, deflection to right 3·7 yards.

In the third series 5 rounds were fired: elevation 3°, common 9 lbs. shell, same charge, mean range 1,931 yards, deflection 1 foot to right.

The fourth and last series for the day consisted of three

rounds fired at a 3 inch armor plate made by Cammell, and inclined at angle of 45°. The range was 100 yards, the projectile a 15 lb. 14 oz. Whitworth metal shot, 5 diameters long, and the powder charge 2¼ lbs. R. L. G. The first shot struck close by the bull's eye, and broke up, the flat end nearly penetrating through the plate. The second shot missed the plate, was recovered and fired again, going clean through the plate.

By way of testing the Whitworth metal, a cylinder, 21 inches long and 10 inches external diameter, having a bore of 3·722 inches, representing the chamber portion of a 9 pounder field gun, was charged with 1¼ lbs. of R. L. G. powder. One end of the bore was closed by the shot being screwed in, and the other by a steel plug, also screwed in. The vent was of steel, the touch hole being only one tenth of an inch in diameter. This charge thus enclosed was fired, and the whole discharge escaped with a loud hissing report through the touch hole, which was enlarged to double its original diameter. The steel cylinder, weighing over 3½ cwt., was driven forward like a rocket for 32 inches by the outrush of the gas against the air. The cylinder was not injured, nor even distended, and the plugs were easily unscrewed after the discharge.

The second day was mainly devoted to practice for rapidity. The first trials were with shrapnel shells of 3½ inches diameter, fuzed with special Pettman concussion fuzes; weight of shells, 9 lbs.; gun charges, 2¼ lbs.; powder, R. L. G.; bullets, 40 in number, gage 20 to the pound; bursting charge, 9 drams. Practice was made at a target at 2,000 yards, but the strength of the wind and its gusty nature prevented any remarkable attainments. The shooting, however, was fair. The gun was served by Mr. Leece and some assistants from the works, and they made good practice in the rapidity trials. The first series of five rounds with common shells were fired in 50 seconds. The second series of twenty rounds occupied 3 minutes, 37 seconds, including replacement of three faulty friction tubes. The third series of ten rounds was fired in 1 minute 44 seconds. A series of trials with case shot followed; ten rounds were fired with a result of 22·6 throughs per round, there being 83 bullets in each case. The concluding rounds—two in number—were with 5 diameter shells, weighing 12 lbs. The first was fired, empty, with 1 oz. of powder as in mortar practice, and with 42° elevation, the shell falling 509 yards away. The second was fired as a live shell with a Pettman special concussion fuze, and burst on graze at 2,000 yards range, the elevation being 4°. The experiments, which were highly satisfactory, were witnessed by Colonel Campbell, R. A., Major Alderson on the part of the Director of Artillery, and a number of other English and foreign officers and engineers.

New Process for Bleaching Salts.

Tessié de Motay has now succeeded, by operating on the whole mass or a part of the muriatic acid employed, in producing pure chlorine in a separate form, which combines with the alkalies and alkaline earths into the so-called bleaching salts without any loss.

The inventor describes the method employed by him for this purpose in the following manner:

I. I conduct a stream of muriatic gas into a retort containing peroxide of manganese, or a mixture of peroxide and lime heated to a dark red glow. In this way chlorine gas and steam are liberated, while oxide of manganese and chloride of calcium remain behind in the retort. The chlorine is seized by the water, or conducted into a chamber for the preparation of dry hypochlorites.

I allow a stream of atmospheric air, at the same temperature as before, to pass over the mass remaining in the retort; this liberates the chlorine contained in the *chloride of* calcium and the resulting chloride of manganese. This chlorine, mixed with air or with nitrogen and oxygen, is conducted into stoneware receivers containing a quantity of lime and oxide of manganese (previously prepared by the decomposition of chloride of manganese with excess of caustic lime), while the resulting solution of chloride of calcium is poured off from the manganese.

In presence of atmospheric oxygen and chlorine, a quantity of oxide of manganese and hypochlorous acid is formed, the latter of which combines with the lime, and remains behind as hypochlorite of lime. The mixture of peroxide of manganese, chloride of calcium, and hypochlorite of lime, I treat in the usual way with *liquid* muriatic acid; chlorine gas is evolved in consequence of the action of this acid, on the one hand upon the permanganate, on the other upon the hypochlorite of lime, which is conducted into chambers for the recovery of the chloride of lime. A mixture of chloride of manganese and chloride of calcium remains behind in the receivers. I treat this again with excess of lime, and obtain once more the above named mixture of manganese, chloride of calcium, and lime.

The dissolved chloride of calcium is drained off, and a mixture of manganese and hydrate of lime remains behind, which is preserved for future operations of the same kind, as it is converted by the action of chlorine and atmospheric air into peroxide of manganese, chloride of calcium, and liquid hypochlorite of lime.

It follows from this;—

1. That first of all, by the action of gaseous muriatic acid, air or oxygen in the retorts containing peroxide of manganese or a mixture of it with lime heated to a red glow, a quantity of pure chlorine is produced, which passes into the chambers fitted for the preparation of the dry hypochlorites.

2. That the mixture of pure chloride of manganese and chloride of calcium left behind in the retorts being decomposed by means of atmospheric air (oxygen), mixtures of gas are generated, containing chlorine and oxygen. These mixed gases, on their way through the receivers containing the mixture of manganese and excess of lime, convert this mixture into peroxide of manganese and liquid hypochlorite of lime, which, on being treated with liquid muriatic acid, yield up chlorine; the latter is also conducted to the chloride of lime chambers. Instead of treating the mixture or manganese and excess of lime, as before said, with the chlorine mixed with air, as it comes from the retorts, milk of lime may be simply used, which is then converted into hypochlorite of lime. The latter yields pure chlorine just as the mixture of permanganate and hypochlorite of lime, when treated with liquid muriatic acid, which is then conducted to chambers used for preparing dry chloride of lime. The chloride of calcium left behind as a solution at these different stages is heated in receivers with carbonate of magnesia, or with magnesia and carbonic acid gas, by which carbonate of lime and chloride of magnesium is produced. The latter yields, on distillation, muriatic acid, which is utilized for the production of a further quantity of chlorine. The distillation products of magnesia are employed for a fresh decomposition of chloride of calcium solution. The whole of these reactions leads consequently to the following results:

a. The oxides of manganese employed for the recovery of chlorine are continually renewed.

b. The muriatic acid is entirely utilized for the production of chlorine.

c. All the chlorine evolved is pure, consequently quite fitted for the preparation of dry hypochlorites.

II. The second method differs from the one previously described only in this, that I employ magnesia directly in place of lime, since the resulting chloride of magnesium remains unchanged, and can supply again, by simple distillation, the muriatic acid required.

Patent Decisions of the Courts.---United States Circuit Court, Southern District of New York.

The Wet Tan Furnace Patent.

BLACK *et al. vs.* THORNE *et al.*

A suit in equity, brought by Charles N. Black, as administrator of the estate of Moses Thompson, deceased, and Eliza W. Fitzgerald, as administratrix of the estate of Wm. P. N. Fitzgerald, deceased, against Samuel Thorne, James McFarlane, and Jonathan Thorne, Jr., engaged in business under the firm name of Thorne, McFarlane & Co.

This suit was brought on two patents of Moses Thompson, the original patent having been granted to him April 10, 1855, and extended April 8, 1869, for seven years from April 10, 1869. The second patent was granted December 15, 1857, and extended for seven years from December 15, 1871.

The contest between the parties has been very severe. The suit was brought after the extension of the 1855 patent and before the extension of the 1857 patent. The extension of the 1857 patent was strenuously opposed by the same parties who have conducted the defense of this suit, and on substantially the same evidence, on the question of the novelty of the inventions covered by that patent, which is adduced on the same question in this suit. It appears from a paper in evidence that seventeen different persons and firms, including the defendants, representing thirty-eight tanneries, including the three tanneries involved in this suit, have joined together to resist the claim of the plaintiffs under the said patents, agreeing to share *pro rata* all legal expenses incurred in defending against said patents. The defense of this suit has been conducted under that arrangement.

The answer sets up that the 1857 reissue of the 1855 patent was obtained by Thompson for the purpose of further including therein, and did include therein, more than Thompson originally contemplated, specified or showed to be his alleged invention on the application for his original patent, and matter which he had no right to include and claim therein, and that such reissue is not for the same invention as the original patent of 1855, but is for invent ons and things substantially and materially different. It also sets up that the first claim of such reissue is invalid, because it is indefinite and equivocal, and does not refer to the process specified and described in the language preceding such claim. It avers that the extension of the 1855 patent was obtained by misrepresentation and fraud, and denies any infringement of either patent. It sets up want of novelty in regard to both patents, and specifies, in respect to each, prior knowledge by nineteen persons, and prior description in eight printed publications, fourteen English patents, and two United States patents. Twenty-six witnesses have been examined on the part of the defendants and twenty-one on the part of the plaintiffs. Of these, two on each side are chemical experts—Benj. Silliman and Wm. H. Plumb for the plaintiffs, and Chas. F. Chandler and Adolph Faber du Faur for the defendants. The printed case on the part of the plaintiffs covers over six hundred pages; that on the part of the defendants covers nearly one thousand printed pages. The direct examination of the plaintiffs' experts occupied six days, and covers sixty-five printed pages, embracing seventy-six interrogatories. The cross-examination of those experts occupied twenty-five days, and covers two hundred and seventy-two printed pages, embracing six hundred and five interrogatories. The direct examination of the defendants' expert, du Faur, occupied six days, and covers fifty-six printed pages, embracing one hundred and fifteen interrogatories. The cross examination of the same expert occupied seven days, and covers sixty-seven printed pages, embracing three hundred and thirty-one interrogatories. The direct examination of the defendants' expert, Chandler, covers fifteen printed pages, embracing thirty-two interrogatories. He was not cross-examined. These observations are made for the purpose of showing how thorough has been the investigation of the question at issue.

Judge Blatchford fully sustains both patents, and closes his decision as follows:

It is satisfactorily shown that the wet tan furnaces of the defendants, in their tanneries at Albion, Laporte, and Thorndale, which are the three proceeded against, infringe each of the patents. All of the claims of each patent are infringed by the furnaces at Albion and Laporte, and all, except, perhaps, the second claim of the reissue of 1857, are infringed by the furnace at Thorndale.

The claims of the Thompson patents are none of them successfully attacked on the ground of a want of novelty. There is nothing in the Crockett furnace, or the Morrison furnace, or the Woodstock, Sparrowbush, or Newark furnaces, or any of the other American furnaces adduced in evidence, so far as such furnaces are shown to have existed, in construction or in description or drawings, before the dates of Thompson's inventions, which destroys the novelty of those inventions. So far as such furnaces burned wet fuel successfully before Thompson's inventions, to what extent they did, they did so on different principles from those developed by him, and in structures arranged and operated in a manner not embraced in his claims. In regard to all the foreign patents and publications put in evidence, it is sufficient to say that none of them anticipate Thompson's inventions. It is not an unimportant consideration that both of his patents have been extended by the Patent Office after, as there is every reason to believe, a full consideration of substantially everything on the question of novelty that is brought up in defense in this suit.

It is apparent from the evidence that Thompson was the first to discover and put in practice the true method of economically burning wet fuels and obtaining from them better results than from equal quantities of dry fuels. In respect to the tanning business, tanners can by his inventions certainly obtain all the heat they need by the use of no other fuel than their spent tan, wet from the leaches. The combined resistance by them to his patents is a tribute to the merits of his invention.

I have examined with care all the evidence taken in this case, and considered the views advanced by the counsel for the defendants, but I am unable to resist the conclusion that the plaintiffs have fully established their case.

As to the point that the cause of action respecting the furnace at Albion arose in the Northern District of New York, where that furnace is situated, the objection is one which may be voluntarily waived. The defendants in this case have waived it by not raising it in their answer.

There must be a decree for the plaintiffs for a perpetual injunction and an account, with costs.

Chas. N. Black, for Complainants.
A. J. Todd and *C. A. Seward*, for Defendants.

Fire Arm Patent.

RENWICK *et al. vs.* POND.

This was a suit in equity, brought by E. S. Renwick, W. C. Hicks, H. Smith, and D. B. Wesson against Chas. H. Pond for the alleged infringement of letters patent for an improvement in fire arms, granted W. C. Hicks, March 10, 1857, and reissued a second time January 18, 1870.

The answer of the defendant sets up a prior description of the invention in the said patent to Smith and Wesson of the 14th of February, 1854, and in a patent granted by the United States to George W. Morse, October 28, 1856; and also prior knowledge and use of the invention by various persons named. It also sets up that the invention had been, with the knowledge and consent of Hicks, in public use and on sale more than two years prior to the application by him for a patent therefor. It also sets up that the reissue of March 1, 1870, was obtained by Hicks for the fraudulent purpose of enabling him to include therein matters of which he was not the original and first inventor, and that it includes such matters, and that they, on the face of the patent, (especially in connection with the state of the art as it existed at the date of the original patent and subsequently), clearly appear to be different from the invention described and claimed in the original patent, and that the reissue is, therefore, void.

It is insisted by the plantiff that the defendant has infringed the first three claims of the patent by selling fire arms manufactured by the Winchester Repeating Arms Company, of New Haven, Connecticut, containing the inventions covered by those claims.

Judge Blatchford, in his decision, sustains the patent and says:

There can be no doubt, on the evidence, that Hicks was the first person who devised a practical mechanism for certainly withdrawing a loaded cartridge from its chamber in a breech loading fire arm under all conditions, as well when its rim or flange has not been expanded by the blow of a striking instrument as when it has been so expanded, by effecting such withdrawal through the engagement, within the periphery of such chamber, of a hook, actuated automatically, with a metallic flange forming part of the cartridge. In devising such mechanism, he made an important invention. Sometimes it is desired to withdraw the loaded cartridge without attempting to fire it. Before the invention of Hicks, the only certain means of doing so was to insert a rammer in the muzzle of the barrel of the fire arm and push the cartridge out through the breech end. This was dangerous, because liable to cause the cartridge to explode by striking its fulminate against the breech-closing piece.

No such combination and arrangement as that described in the patent to Hicks, and covered by his first three claims, to effect the result of withdrawing an unexpanded loaded cartridge, existed before his invention. The same combination and arrangement, operating in substantially the same way, to effect the same result, is found in the defendant's fire arm.

There is nothing to impeach the validity of the plaintiffs' patent, and it is established that the defendant's arm infringes the first three claims. There must be a decree for the plaintiffs for an account in respect of such infringement, with costs.

E. W. Stoughton and *Geo. Gifford* for Complainants.
J. S. Beach and *Keller & Blake* for Defendant.

METEORIC IRON FROM GREENLAND.—The iron had the appearance of gray pig iron, its fracture being partly leafy and partly granular; it had no action on a copper solution unless in contact with ordinary iron, when it became quickly covered with copper. The specific gravity was 5·82 at 20°C. Heated to redness, it evolved about one hundred times its volume of gas. The oxygen in it, determined by loss on heating in a current of dry hydrogen, was found to form 11·09 per cent of its weight. An analysis showed: iron, 80·64; nickel, 1·19; cobalt, 0·47; phosphorus, 0·15; sulphur, 2·82; carbon, 3·69; oxygen 11·09; total, 100·05.

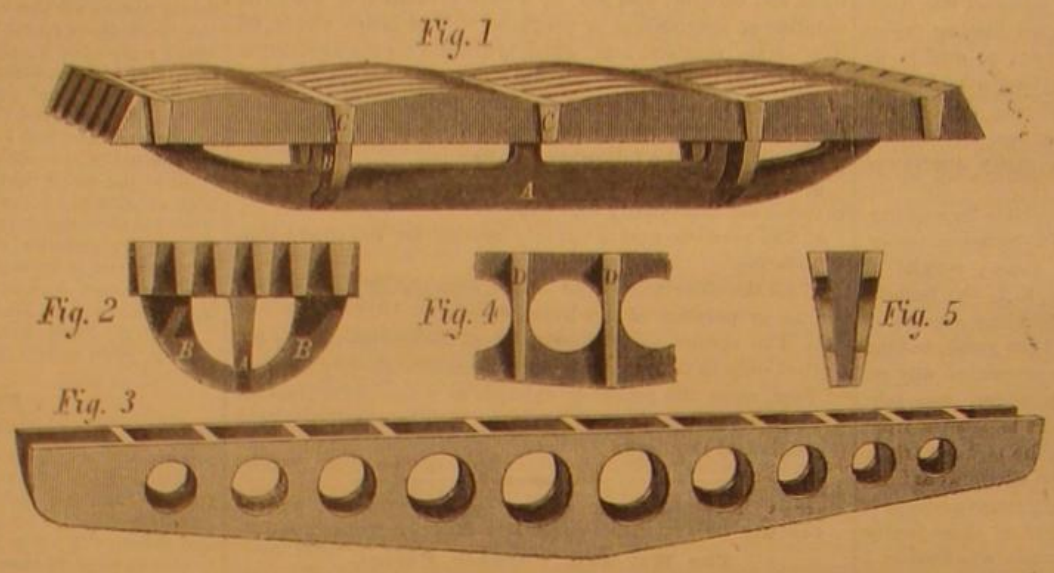
STABILITY OF DYES.—Professor Chevreul has made an extended series of experiments on the stability of dyes imparted to silk, more particularly damasks and fabrics used in furnishing. The blue colors produced by indigo are fast and stable; Prussian blue resists moderately the action of air and light, but not of soap; scarlets and carmines produced by cochineal and lac dye are fast; the fastest yellows on silks are produced by weld.

THE newly discovered Colorado silver ledge is reported to be sixty-three feet in width and five miles long, and produces $5,000 to the ton, more or less.

IMPROVED GRATE BARS AND BEARER.

Our engravings illustrate a new form of grate which, it is claimed, is not only of unusual durability, but it also offers the advantage of a considerable saving in the cost of fuel. Fig. 1 shows a perspective view of the bars, of which a suitable number are joined together to form convenient sized sections.

A is a longitudinal brace, to which are attached the transverse bridges, B B, of one of which an end view is shown in Fig. 2. The same illustration represents an end section of the bars, and the manner in which the latter are connected by the transverse blocks, C. It also will be noticed that the interstices or slots between the bars are widest at the bottom. The upper surface of the grate is corrugated, the object being to give an equal amount of metal at every point, and thus obviate the warping due to unequal contraction and expansion. There is also another and important advantage gained by this mode of construction. On the perfectly flat surface which would be afforded were the bars even on top, a thick layer of coal would easily pack, and, forming clinker, would make an air-tight covering, and thus effectually hinder the draft. This difficulty, it is claimed, is entirely avoided by the corrugations, which admit of a free circulation of air under the fuel, from the fact that there will always be portions of the bars—generally the lowest points of the curves—on which the coal will not directly rest, so that open spaces will be formed, through which air can pass. Moreover, the irregular surface serves as a guide to the fireman to inform him, in cleaning the fire, when his slice bar has reached the grate. The shape of the interstices between the bars, to which attention was directed above, is favorable to the ready passage of the ashes, while it aids in preventing clogging by clinker or otherwise.



KEARNEY'S GRATE BARS AND BEARER.

The ends of the bars are open and beveled as shown, the points of the extremities of two contiguous sections meeting on the upper surface of the bearer. This construction, as will be more clearly apprehended when considered in connection with the form of the bearer, by affording open ends, admits of a free circulation, and also prevents the bars from warping, and thus becoming useless before they are half worn out.

Fig. 3 represents a side view of a bearer on which the sections of grate rest. Figs. 4 and 5 are respectively longitudinal and vertical sections of the same. The bearer consists of two parallel bars pierced with a number of circular openings and connected together by transverse pieces, D D. The appliance is, therefore, in fact, a frame which, from the small amount of metal it contains, opposes but slight resistance to the passage of the draft. It is evident that a prominent merit of this invention is the ingenious combination of the hollow bearer and open ends of the sections of bars, so that the part of the grate which, in ordinary use, is the most liable to become packed and difficult to keep clean, is here as free and as clear as any other portion. A uniform circulation of air is consequently afforded through the entire length of the grate, and also a transverse current through the open supports on the under side.

The device, we are informed, has been thoroughly tested for a considerable period of time, during which a continuous fire has been maintained. The result of a year's experiment at the Jersey City water works, at Belleville, N. J., was a direct saving of ten per cent in cost of both fuel and grates. Other testimonials appear to substantiate fully the claims advanced.

Three patents (two dated Aug. 2 and Nov. 1, 1870) have been granted on this invention: one for the bearer and two for the bars. Further information may be obtained, by letter or otherwise, of the inventor, Mr. William Kearney, engineer, Jersey City water works, Belleville, N. J.

Railroad Accidents.

During the month of September last, there were seventy railway accidents in this country, from causes as follows: Unexplained, 16; by cattle, 5; by misplaced switches, 3; by spreading of rails, 3; by broken axles, 2; by open draw, 1; by broken beam, 1; by defective rail, 1; by fallen rock, 1; by rail removed for repairs, 1; by running through switch, 1; by breaking train in two, 1; by broken tire, 1. Collisions; Head collisions, 13; rear collisions, 11; unexplained, 3; crossing collision, 1; boiler explosions, 2; broken bridge, 1; fire, 1; broken car wheel, 1; total, 70.

These seventy train accidents caused the death of 22 and more or less severe injury of 100 persons. By the collisions 19 were killed and 69 injured by the head collisions alone. In the 37 derailments, one person was killed and 28 injured, and in 24 out of the 37 of these accidents, no one was hurt. The other two persons killed lost their lives by the breaking of a bridge, by which also two of the other three wounded persons were hurt, the other suffering from a boiler explosion.

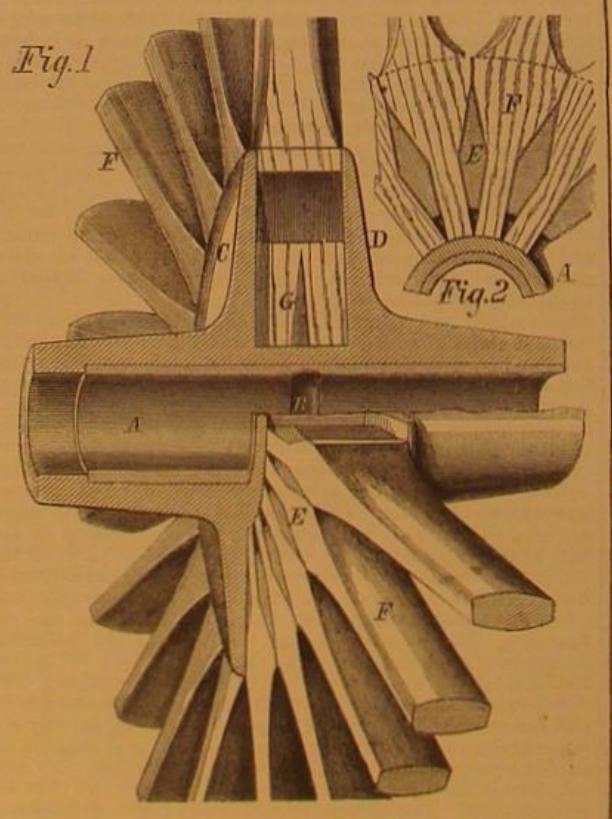
Salt Production in Portugal.

The sea salt works of Portugal are very extensive, and produce annually 250,000 tuns of a salt which is in great request. The centers of the manufacture are Setubal, Lisbon, Aveiro, and Algarve. The arrangement of the salines at Setubal is very simple. They form a vast reservoir 2¼ to 5 acres in extent, divided into squares of 400 to 650 feet in surface, and 8 inches deep, separated from each other by roads 3½ feet wide, and all communicating with a main reservoir destined to store up the sea water. The water is admitted directly into these square tanks, where it evaporates and deposits its salt without any previous concentration or purification. In autumn, the water is allowed to flow in so as to cover the entire salt marsh to the depth of 20 inches. In spring the water evaporates, and in the month of June the separation roads appear above the surface. The tanks are then cleaned out and are then left to themselves, and recharged from time to time with new supplies of water.

Under the influence of the northeast winds which prevail at this season, the evaporation is very rapid, and after about twenty days each tank is covered with a layer of salt nearly two inches thick and almost dry. This is the first crop. The salt is collected, sea water is introduced anew into the reservoirs, and twenty days afterwards a second crop of from a half to one inch in thickness is gathered. But this is not evaporated to dryness, and the salt is covered with nearly an inch of mother liquor, which is left behind on gathering the salt. If the season is favorable a third crop is attempted, and in September the marsh is flooded over for the winter. This process is repeated each year without any modification.

FETTA'S IMPROVED WAGON WHEEL.

The invention illustrated herewith consists in a new method of constructing wheels for vehicles, by which greater strength



and a more secure fastening together of parts is obtained. The hub is a single piece of cast metal recessed to receive the lining, of Babbitt metal or other non-frictional material, which forms a bearing for the axle. In Fig. 1, a sectional and perspective view of the general arrangements is represented. A is the axle bearing, grooved as shown at B, in order to furnish a reservoir for the lubricating substance. On the hub are two circumferential flanges, C and D, which are connected by a series of ribs, E, made in double wedge shape, as shown in Fig. 2. The tenons of the spokes, F F, having their sides tapered radially, fit in the divisions made by the ribs, E, and reach nearly to the metal at the bottom of the mortises, where they come in close contact with each other, forming the arch around the hub.

In Fig. 1, it will be noticed that the space at the bottom of the mortise, measured in the direction of the axis of the hub, is greater than at the top. This permits the tenon to be firmly wedged in place by slitting its lower end and inserting a wedge, G. The spoke is then driven, and the butt end of the wedge, coming in contact with the bottom of the mortise, is forced in, causing the tenon to spread and fit tightly, so that all danger of the spoke becoming loosened, through shrinkage of the wood or other cause, is prevented. Patented Aug. 27, 1872. For information relative to the furnishing of castings, sale of rights, etc., address the inventor, Mr. H. H. Fetta, Richmond Malleable Iron Works, Richmond, Ind.

Alcohol from Sawdust.

Into an ordinary steam boiler, heated by means of steam, were introduced 9 cwts. of very wet sawdust, 10·7 cwts. of hydrochloric acid (sp. gr.—1·18), and 30 cwts. of water; after eleven hours' boiling, there was formed 19·67 per cent of grape sugar. The acid was next saturated with chalk, so as to leave in the liquid only a small quantity (¼ degree by Ludersdorf's acid areometer); when the saccharine liquid was cooled down to 30°, yeast was added, and the fermentation finished in twenty-four hours. By distillation there were obtained 26·5 liters of alcohol of 50 per cent at 15°, quite free from any smell of turpentine, and of excellent taste. It appears that the preparation of alcohol from sawdust may be successfully carried on industrially when it is precisely ascertained what degree of dilution of acid is required, and how long the liquid has to be boiled. When all the cellulose present in sawdust might be converted into sugar, 50 kilogrammes of the former substance would yield, after fermentation, 12 liters of alcohol at 50 per cent.—*M. Zetterlund.*

Action of Salts of Lime upon a Decoction of Cochineal.

A black colored carminate of lime is obtained by treating carminic acid or a decoction of cochineal with a solution of bicarbonate of lime, whereby an abundant precipitate is formed, which is insoluble in water and alcohol, and yields with lime water a violet-colored basic carminate of lime; while, when the black carminate is heated along with a solution of neutral acetate of lead, there is formed a bluish violet-colored carminate of lead. It is necessary to employ, in these reactions, lime salts quite free from iron, because the decoction of cochineal is precipitated by the salts of that metal, yielding with it black colored compounds. It appears that the action of salts of lime upon cochineal is so characteristic that it may be used as a test for lime; the author states that several commercially sold products, such as glue and starch, for instance, which have been prepared with water, containing lime salts are colored black by a decoction of cochineal.

Fine Wire Cloth.

Would any ordinary person conceive it possible that brass and copper wire could be woven of so fine a mesh that the number of perforations, or *holes* as they are technically called, exceeds 19,000 in a square inch of surface? Such, however, is proved to be possible; and, moreover, these perforations are so regular and uniform that they may be readily counted by a magnifier of small power. Fine meshes such as these are seldom used by paper manufacturers, but chemists occasionally sift their impalpable powders through them; indeed, they are exhibited more as curiosities, to show the extremely fine threads of wire which may be woven, rather than for the use to which they are put by ordinary manufacturers.

The chief meshes of woven wire used in the manufacture of paper are comprised between those of 2,300 and 6,400 holes to the square inch. Brass webs of these meshes are woven in lengths of 30 or 40 feet, ranging between 4 and 10 feet wide; they are finished by joining their ends together so as to make endless bands, and are then ready for use on the paper machine as a band of "paper machine wire." Several of these paper wires are exhibited by Mr. Potter of Barbican, London, at the International Exhibition; some suitable for machines on which coarse browns are made, others for making fine writing paper, and the rest of fine mesh adapted to meet the requirements of thin tissue and cigarette paper makers. Mr. Potter also exhibits paper molds watermarked for the hand made process, millboard molds of a new and improved kind, specimens illustrative of the methods adopted for making watermarks, and various models of larger machines connected with paper manufacture.—*Chemical Review.*

FIREPROOF PAINT FOR WOODWORK.—Owing to the fact that waterglass is gradually dissolved out of the wood, while chloride of zinc is volatile at the temperature where wood ignites, the author, F. Sieburger, proposes the following: Two coats of a hot saturated solution of 3 parts alum and 1 part ferrous sulphate are first applied and allowed to dry. The third coat is a dilute solution of ferrous sulphate into which white potter's clay is stirred until it has the consistency of good water colors. Another method is to apply hot glue water as long as it is absorbed into the pores of the wood. A thick coat of boiled glue is then applied, and, while fresh, is dusted over with a powder composed of 1 part sulphur, 1 part ocher of clay, and 6 parts ferrous sulphate.

A CORRESPONDENT of the *Philadelphia Photographer* strongly recommends the following as the best retouching varnish he has ever seen: Spirits of turpentine, 1 ounce; balsam of fir, 4 drops. With a small tuft of clean cotton, just moisten the surface of any previously varnished negative, and, when dry, it is ready for any grade of pencil. Try it, and you will be pleased with the result.

Scientific American.

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NEW YORK, SATURDAY, NOVEMBER 9, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

THE MOLECULAR PHENOMENA OF EVAPORATION.

A correspondent writes from Tennessee to ask us: "Why is not all the water in a steam boiler converted into steam at once? Might it not be possible for such an event to occur under certain circumstances?" Our readers, if desirous of obtaining a solution of the question, will find all the information required in back volumes of the SCIENTIFIC AMERICAN, under the head of "Mechanical Equivalent of Heat and Evaporation;" but it may be useful to make here a *resumé* that will give satisfaction to our correspondent and will afford information to those who are unable to look it up for themselves.

The labors of scientific men, in the field of experimental investigation, have shown, as we have often had occasion to state, that heat and mechanical energy can both be measured by similar effects, can be converted, the one into the other, and that they have definite and well known quantitative relations to each other. One pound of water requires an amount of heat to be communicated to it, for each degree Fahrenheit that its temperature is raised, which is equivalent in energy to the mechanical action required to raise 772 pounds one foot high. In other words, as usually expressed, a thermal unit has a mechanical equivalent of 772 foot pounds. The combustion of a pound of coal liberates an amount of heat which, although variable, may be taken, with good fuel, as equal to about 13,000 thermal units.* The evaporation of a pound of water from, say, 60° Fahrenheit and at 75 pounds pressure, requires the expenditure of 260 units of heat to raise it to the temperature of 320° Fahrenheit, which is its boiling point; and then, before it can be compelled to expand into steam of 75 pounds pressure, an amount of work must be done which demands the expenditure of 891 additional thermal units, equivalent to the enormous quantity in mechanical work of 697,852 foot pounds, enough to raise over three tuns to the hight of 100 feet. We then have a pound of steam at a pressure, as indicated by the steam gage, of 75 pounds per square inch and occupying a volume measuring a trifle over five cubic feet. The evaporation of steam of 150 pounds pressure would require about one per centum more heat than has just been estimated, and a pound of it would occupy about three cubic feet. A moment's calculation will show that a pound of our fuel is capable of developing heat enough to evaporate about 11 pounds of water from 60° Fahrenheit, but, in practice, a considerable proportion is invariably wasted, and an evaporation of 8 pounds into dry steam is an unusually good result.

If, then, a pound of fuel is burned under an ordinary steam boiler, not more than about 8 pounds of water can be vaporized, for the simple reason that the fuel only supplies just heat enough to evaporate that amount; and if the fuel occupies one minute in combustion, the boiler can only deliver eight pounds of steam per minute. If the supply of heat is cut off, the evaporation of the water ceases at once; if the heat is supplied rapidly, steam is made rapidly, and is always at a rate precisely proportioned to the rate at which heat is applied. We can conceive of no circumstances under which the fuel can supply sufficient heat to evaporate all the water in a steam boiler in any very short space of time.

*Report of Committee on Steam Boiler Trials; American Institute, 1871.

INDUSTRIAL PROGRESS IN RUSSIA.

Next to our own country, there is no nation in the world that gives evidence of such rapid progress in industrial matters as Russia. Her mechanical and metallurgical interests are almost daily developing, and new means of utilizing her great resources are constantly coming into existence. The correspondence of the Brussels *Chronique de l'Industrie* informs us of a gigantic establishment recently founded by MM. Struve Brothers, situated near the city of Kolom, which, it is stated, rivals in magnitude the finest workshops of England or Belgium. It has been in operation but five years, and is at present engaged in the manufacture of iron bridges and railroad freight cars, though recently locomotives and passenger coaches have also been produced. At times during the year just past, the works employed 4,000 hands, at wages of from one rouble (78 cents) and one rouble and a half per day for ordinary operatives to three roubles for foremen. The fuel used is Torbane mineral, the anthracite of the country and coke; the blasting and melting apparatus was obtained from England. To give an idea of the importance of the establishment we may add that since its foundation it has completed 3,000 cars; and since it has begun the manufacture, 79 locomotives have left its shops.

THE AURORA BOREALIS.

On the evening of the 14th of October, a magnificent display of the aurora borealis was visible in many parts of the United States. In New York city, the suffusion of the sky began with the coming of darkness, and at eight o'clock the north threw out a brilliant belt of rose light that mounted to the zenith and deepened in color till over the city a belt of richest crimson seemed suspended. For hours this tint, varying in intensity from the faintest blush to the most brilliant carnation, and moving from north to east by gradual pulsations, rested in the heavens. At eleven o'clock the northwestern horizon sent forth shafts of a steel blue light and of a white light, sheeny like quicksilver, that tremulously darted directly overhead, while the intermediate space between these shafts and the ruddy eastern section of the sky seemed shut out from us by a pale green curtain, that rose and fell at intervals, and that had for its floor a horizontal line of dun colored cloud edged with gold.

At one period, the glare that lit up the heavens was so brilliant that one of our local fire companies became convinced that an extensive conflagration was in progress, and consequently rushed tumultuously to put it out. The only result of this enthusiastic performance was, we learn, the demolishing of a horse car, with which the heavy hose cart collided.

A correspondent in Westville, N. J., informs us that, at the time the phenomenon first appeared in that locality, about half past six, P. M., the sky was over two thirds clouded, and the auroras, which at times were very brilliant, appeared to be at least two hundred feet lower than the clouds.

The enterprising scientist who writes up auroras for the *Herald* will now doubtless propound a new theory. He has already advanced two ideas, as striking as they are ingeniously novel. The first is that the zodiacal lights are due to the reflection of the rays of the sun on minute ice crystals in the upper strata of the atmosphere; and the second, that the light is caused by a similar reflection of the above mentioned luminary on the ice fields of Labrador. Our witty contemporary, the *Commercial Advertiser*, sarcastically dissents from the "*Herald's* Aurora Borealist," as it terms the philosopher, and proposes for his consideration the theory that the aurora is not due to the causes he suggests, but to the phosphorescent glare of the immense heaps of decaying mackerel situated somewhere in Upper Canada.

STEAM ON THE CANALS.

Another new canal boat, a candidate for the $100,000 prize, named the William Baxter, has recently made some successful trips on the Erie Canal. This boat exhibits no special peculiarities of construction or propulsion. She is fitted with a pair of ordinary screw propellers, which are operated by Mr. Baxter's new steam engine. It is upon the economy resulting from the use of this engine that the inventor relies to obtain that advantage, over horse power in the propulsion of canal boats, which alone is what the prize law calls for. The boat has made trips from Buffalo to New York and back, carrying some 200 tuns of freight on 10 tuns of coal for the round trip. Total steam expenses, 12½ cents per mile. Towage by horse power costs 35 cents per mile.

The parties interested in the Baxter are reported to be so well satisfied with the success of the present boat that they intend to put a fleet of fifteen or twenty of them on the Erie Canal, on the opening of navigation in 1873.

A FEARFUL HORSE EPIDEMIC.

A virulent epidemic disease has broken out among the horses, which within the past few days has spread with such alarming rapidity as to create a well-founded apprehension lest it prove a formidable pestilence throughout the entire country. The disorder first appeared in Toronto, Canada, where it reached such a hight as to necessitate the stoppage of all business depending upon drayage and the running of the public conveyances. From that city, the infection spread to Montreal and Ottawa on one side, and to Western New York on the other, appearing at Buffalo and Niagara Falls, and within three days breaking out in Rochester. Thence its march can be distinctly traced to the eastward to Albany and Troy, and thence southward along the banks of the Hudson, until, at the time of writing, it is causing terrible havoc among the horses of New York city.

The disease is termed by veterinary surgeons "Epizootic influenza;" but no cause has been assigned for its sudden appearance. The early symptoms are a light hacking cough and general dullness, with an indisposition to move, cold ears and legs, with a watery discharge from the nostrils. At first, the nasal membrane is pale; but, as the disease advances, it becomes highly colored, and the mucous flow changes to a greenish or yellow color, the pulse becoming more rapid. The malady is common to horses of every class, those carefully attended in private stables becoming affected as quickly as the animals in the street cars and stages.

There seems to be little difference of opinion as to the proper course of treatment to be pursued. We select the following prescriptions as vouched for by the best veterinary authorities. As soon as the disease appears, place the animal in a well ventilated stall, blanket him thoroughly and give warm mashes, allowing perfect rest. Wash the entire stable with a solution of carbolic acid or with carbolic or cresylic soap, and sprinkle chloride of lime freely around every morning. The food should be laxative and mingled with water. Bran, with a little oats and a moderate quantity of hay, may be given. Administer the following prescription: Nitrate of potash, 1½ oz.; tartarized antimony, 1½ oz.; digitalis, ½ oz. Pulverize all together and make 12 powders—give one every morning and evening. Should the disease be light, omit the digitalis. If the throat seems very sore, rub upon it a liniment composed of a mixture of 1½ oz. linseed oil; 1½ oz. turpentine; 1 oz. liquor ammoniæ fort. Tar, dissolved in fluid extract of belladonna, is in some cases used as a substitute for the first mentioned remedy. So long as the disease is confined to the larynx there is little danger; but should it descend to the lungs—which will be indicated by the continued standing up of the animal, cold extremities, and labored breathing—a half pound of mustard should be mixed with two ounces of turpentine and water to the consistency of thick cream, and the mixture rubbed well in behind the fore legs and over the region of the lungs. The legs should be bandaged, if cold. If the pulse should be over fifty-five per minute, 15 drops of Flemming's tincture of aconite should be given every two hours; and if the breathing still continues labored and the pulse grows more rapid, apply the mustard again and give 1½ drams of calomel for two mornings.

This treatment is, in substance, that practiced in nearly all the large stables of the city. Tar seems in many cases to be a favorite remedy, and is given in different forms. Taylor's compound, manufactured by the Manhattan Feed Mill Company, is used by some, and is regarded as an excellent preventive. It looks like meal, and has a salty taste; not being posted as to its ingredients, we are unable to vouch for its value.

We advise all in whose sections of the country the pestilence has not yet appeared to lose no time in preparing for it, by cleansing and disinfecting their stables as above stated, and by exposing their animals as little as possible to the inclemency of the weather. The seed of disease once planted, it spreads with astonishing rapidity. No less than seven thousand horses were stricken in this city within twenty-four hours. Happily, but few cases have been fatal; nor is it believed that the malady will be productive of great mortality if promptly met. Still, its attacks are very injurious, incapacitating the animal for work for a considerable period of time, and, in many instances, rendering him permanently useless.

THEOLOGY VS. SCIENCE.

The observations recently given by us under the above heading have so far served the purpose intended, namely, to direct general attention to this most important subject, and to elicit responses both of assent and dissent, specimens of which we have published.

As we expected and hoped, the religious press is now taking the matter up; and in the different organs of the many conflicting orthodox sects, into which, alas! this Christian community is divided, we are overhauled more or less severely, according to the degree of importance which the individual editors accord to common sense and reason. The *Lutheran Standard*, published in Columbus, Ohio, in a lengthy article entitled "Oppositions of Science, So-called," bewails the fact that "times have changed and Science has become haughty and arrogant," and that "reason usurps the place of faith," and further, that "the abuse of Science has brought it into contempt, and men of superior abilities, who believe in the Lord, decline to labor in a field which is largely occupied by self-sufficient scoffers at Divine revelation. Thus the domain

of physical science is in danger of being entirely given over into the hands of infidels," etc. And then the editor uses the following remarkable sentence: "In a late number of the SCIENTIFIC AMERICAN, the editor, mistaking *a certain species of theology which admits of sense and reason* as a criterion in matters of faith for Christian theology proper, exultingly alleges that whenever science and theology have occupied antagonistic ground, the former has triumphed, while theologians had to give in, and acknowledge, however reluctantly, these triumphs." (The italics are ours.)

We are here informed that we were mistaken if we supposed that Christian theology proper recognizes the authority of sense and reason as a criterion in matters of faith, that it is only *a certain species of theology* which is guilty of such a criminal theory, and that thus the primary cause of our erroneous conclusions is that we recognize the claims of common sense and reason as a criterion of what we have to believe. Now we take the liberty to ask our theological critic: How are we to know which are the genuine Divine revelations which we must believe, if we are forbidden the use of sense and reason? How are we to decide in our choice between the Bible, Talmud, Mormon Bible, Koran, Sendavesta or the writings of Confucius or Zoroaster, which all claim to be direct Divine revelation? How are we to decide which version of the Bible must be our guide? How are we to decide between Romanism and orthodox Lutheranism, which both reject sense and reason? What will guide us in the intricate labyrinth of mutually conflicting Christian sects, so as to find the truth?

The very same page, on which science and its advocates are overhauled by our ultra orthodox Lutheran critic, contains a remarkable revelation of another kind, namely, that the Lutheran church is now split up into two sects, at war with one another. Dr. Seiss, one of the warmest supporters of council circles, calls the members of the Lutheran synod of Missouri, Ohio, Wisconsin, Illinois, Minnesota, etc., "poor impotent imbeciles, fascinated by the wiles of crafty and politic men, who only seek the extension of the filthy and polluted worship of themselves." The editor of the *Lutheran Standard* (our critic), who belongs to the thus abused Synod, does not relish a treatment of this sort; and by way of a revenge, among other counter accusations, he answers thus: "Dr. Seiss for years has been poisoning the flock of Christ with General Synod heresies. Has he ever publicly atoned for the sins thus publicly committed? His old General Synod liturgy is still published as before. . . . His attention has been called to the Calvinistic heresies in his book called *Holy Types*; but has he ever seen fit to inform the church that those heresies shall be expunged in future editions of the book?" etc., etc. In the same article, we are informed that the Lutheran pastor Stephan induced 707 persons to follow him from Germany to our western wilds, which they did, husbands forsaking their wives, parents their children and *vice versa*; that they trusted him with all their property, which he squandered in debauchery, leaving them to perish; and then they deposed and banished him.

If scientists are accused of arrogance in believing that common sense and reason are Divine gifts which it is sinful to despise, and that the wonders of Nature are an unquestionable Divine revelation of the power and wisdom of the Creator, what is the word which we must apply in censure of the class of men who, having such records of their own, deny the value of the greatest gifts of God to man, his sense and reason, by which alone he is above the brute: a class of men who, after all, try to use this same sense and reason to prove the necessity of adopting a written revelation for our guide in faith, despising the created revelation of the glorious Universe?

EXTENSION OF PATENTS--THE ACCOUNTS.

Applications for the extension of patents often fail from mere ignorance or inadvertence as to what is required in the accounts of receipts and disbursements. Every one is aware that the patentee must furnish a statement of what he has received by means of the invention, and what he has expended upon it, in order to satisfy the Commissioner that he has not been sufficiently remunerated. He must embrace what he has obtained for royalties, if he has given licenses; what his profits have been, if he has manufactured under the patent; and what he has collected for damages on account of infringements. All the profits which he has derived from the invention, from whatever source, should be included, even though obtained in foreign countries. On the other hand, he may charge the expenses attendant upon experimenting and on perfecting the invention, on obtaining his patent, and upon introducing into public use.

This is apparently plain, but it sometimes happens that the same mistake is fallen into as in ascertaining the value of an invention. Instead of furnishing the Commissioner with data from which he can form an independent opinion of his own as to what has been realized, the petitioner presents mere estimates as to what has been expended, and what has been obtained in return, and makes oath in general terms to correctness of the estimate.

If he has been engaged, for instance, in manufacturing and selling his productions, he frequently designates a certain proportion of his gains as being "manufacturer's profits," and the rest as profits due to the invention. He supplies no means of determining whether the sum set down as "manufacturer's profits," is a just proportion or not. It is true that this is a difficult thing to ascertain; so difficult that in England, the Board which grants extensions have declined to enter into the calculation, and have charged the inventor with all he has made over the expense of manufacturing. The practice of our Patent Office has not been entirely uniform on this point. Where the patentee had given no license, but had kept the manufacture under his patent entirely in his own hands, a pretty decided intimation was dropped that he ought to be charged with all his profits as due to the invention. In other cases, an applicant has been allowed to deduct something for manufacturer's profits, where no such refusal to license appeared. Where the patentee has not only manufactured himself but has allowed others to do so on paying him a royalty, the royalty has been considered as a fair measure of what he has realized from the invention on a corresponding amount of business transacted by himself. More frequently, no such standard can well be obtained. However difficult it becomes to divide the gains in such cases, it cannot be expected that the patentee should be permitted to determine the question, or that the Commissioner should adopt his opinion, without having any information from other sources. The applicant may be able, for instance, to show how much other manufacturers of similar articles have been in the way of making from their business. This way constitutes a fair criterion by which to ascertain how much should be deducted from the entire gains as the regular profits of carrying on such an art, leaving the remainder to be set down as derived from the invention. This will afford some idea of the preparation which should be made under such circumstances. Other methods of arriving at the result will frequently be found.

It is quite common that the patentee has made several inventions relating to the same machine, and that they have all been patented and carried on by him together. It becomes necessary then to divide the profits which have been made between the several patents, in order to decide whether the one for which an extension was asked, has been adequately remunerated. But it is quite unusual to send in any evidence as to the comparative importance and value of the several inventions, so that the fair proportion of profits to be credited to the one in question can be ascertained. Sometimes the petitioner divides their profits equally among all of them, without assigning any reason for so doing, or so much as giving an assurance that the invention under consideration would only average in value with the rest. In one instance, where the inventions covered by three patents were all used in the construction of an article, only one fourth of the net gains was credited to the patent for which an extension was asked. In view of the difficulty which frequently exists, of arriving at any such apportionment in a way that shall inspire confidence in its accuracy, very great indulgence has been shown to the suitors on this point. But the applicant, who shall show that he has endeavored to supply all the information in his power, and all the means he has of forming an intelligent estimate, may justly expect to meet with a more favorable consideration than one who manifests no such disposition to aid the Office in its inquiries.

Those who deal in similar articles are frequently able to tell, to some extent, how much each improvement on a machine adds to the expense of producing it, and how much more it will bring in market in consequence, or, on the other hand, how much it diminishes the cost of manufacturing it. From these and other like circumstances, some conclusions can be formed as to the comparative worth of each. The testimony of such witnesses might be obtained and laid before the Commissioner. It should embrace not merely their estimates, but the circumstances on which their estimates are founded. This is suggested as an illustration of the course to be pursued.

For it must be understood that there is no rule which requires such evidence, or restricts the applicant to any particular proof on these points. All that is asked by the Office is that there should be some testimony from which it can frame an intelligent opinion of its own, one which has been formed in view of what is shown to exist, without relying upon the mere naked opinions of those who are under no responsibility for them. The Commissioner is responsible; the public trust to his judgment, and has a right to the best exercise of that judgment, founded on the facts, and not on the views of others. HETH.

SCIENTIFIC AND PRACTICAL INFORMATION.

RESONANT FLAMES.

M. Planeth, says *Les Mondes*, has found that if a flame burning in the open air be approached to a vibratory tuning fork, the sound of the latter is considerably increased, as if it were placed in contact with the box of a stringed instrument. The sound acquires its greatest intensity when the flame is placed between the two branches of the fork. This phenomenon is believed to be analogous to the singing flame, only, in such case, it is the flame that excites the vibratory movement of the tube in order to place itself in similar synchronous vibrations; while, in the above mentioned instance, it is the fork that gives the tone and the flame takes up vibration in unison.

ANTISEPTIC PROPERTIES AND PHYSIOLOGICAL ACTION OF SILICATE OF SODA (WATER GLASS).

MM. Rabuteau and Papillon have called the attention of the French Academy to the influence of the silicate of soda on alcoholic fermentation, that of urine, milk, and the action which gives rise to the essence of bitter almonds. Silicate of soda, like borax, in a certain quantity hinders all manifestation of the agents which produce putrefaction; while, being much more energetic than borax, a smaller amount is required to produce the desired effect. On the superior animals, the silicate exercises a poisonous action much more pronounced than that of borax. Two grammes of borax will not kill a dog; one gramme of silicate carries sure death. The substance, in brief, from its nature is of peculiar value in suppressing the development of the infectious or virulent germs to which a large number of diseases may be traced.

SOLAR EXPLOSIONS AND MAGNETIC TEMPESTS.

The Astronomer Royal of the Greenwich Observatory in England communicates to *Les Mondes* the following: "In a recent number of the *Comptes Rendus*, I find a paper by Father Secchi regarding a remarkable explosion on the limb of the sun, visible in Rome for about three hours on the afternoon of July 7. Now a magnetic tempest manifested itself at Greenwich at five o'clock on precisely the same day. The indications commenced suddenly and with extraordinary force, acting upon the magnetic instruments in a direction of nearly northeast and southwest. The perturbations continued, diminishing by degrees, until the evening of July 9, and, during a part of the time, were accompanied by an aurora.

Though not wishing to commit myself on the question as to the connection which may exist between the solar explosion and the terrestrial magnetic storm, I have noticed that if there be such connection, the transmission of influence from the sun to the earth ought to occupy about 2 hours and 20 minutes, or somewhat longer, in case Father Secchi did not see the explosion at the precise moment of its commencement. If this point is established, it will be an important cosmic fact. In any case, the notification of this apparent retardation may direct the attention of observers of similar phenomena in the future toward a new element for interpretation."

THE ACTION OF CHARCOAL AND OF IRON AT A RED HEAT ON CARBONIC ACID.

M. Dumas, in a note of experiments communicated to the Academy of Sciences, draws the following conclusions: That carbonic acid absolutely dry, passing over charcoal entirely free from hydrogen, is converted, at a bright red heat, into carbonic oxide; that if the charcoal is in excess, the carbonic acid disappears entirely, and is replaced by perfectly pure carbonic oxide. Charcoal, to whatever degree it be heated, retains either hydrogen or water, from which it can only be freed by the prolonged action of chlorine at a red heat. Charcoal which has not been submitted to the treatment by chlorine, when used to convert carbonic acid into carbonic oxide, always yields a gas accompanied by traces of hydrogen. A slow current of dry carbonic acid is partially converted by iron, heated to a bright red heat, into carbonic oxide, a considerable proportion of carbonic acid, however, remaining unaltered or undergoing regeneration.

A DREDGING SHIP VOYAGE.

A dredging vessel, built in England for the government of the Argentine Republic, has safely crossed the ocean and arrived in Buenos Ayres from London after a 45 days passage, by way of Madeira. This is the first instance of a ship of this kind accomplishing so long a journey by her own motive power. The vessel has twin screws, is 157 feet long, and is what is termed in this country a "double ender," that is, she will sail equally well ahead or astern. She is at present engaged in dredging the harbor of Buenos Ayres.

THE STRONGEST DERRICK IN THE WORLD.

A great floating derrick has been built for the Department of Docks of this city by Mr. Isaac Newton, assistant to General McClellan, the engineer of the department. It is constructed for the purpose of transporting and laying under water the huge blocks of artificial stone or *béton* which form the lower part of the river wall which is to surround the water front of the city. The dimensions of the machine are as follows: float, 77 feet long, 66 feet wide, by 13 feet deep. Length of hoisting boom, 63 feet, 3 inches. Length of back boom, 50 feet 3 inches. Length from end to end of booms, 110 feet and 6 inches, and hight from bottom of float to top of king post, 127 feet three inches. Lifting power, 100 tuns.

There are several excellent points in its construction, among which may be mentioned a novel arrangement of the wire grip on the back boom, spreading the strain over a large section of the traversing circle. All the machinery is placed on the float under the tower, the operating levers being brought to the platform thirty-five feet above the deck, so that the engineer has full view of the load that is being handled.

HINTS FOR USING THE CALLAUD BATTERY.

In using the Callaud battery for telegraphic purposes, it often happens that the connecting wires are eaten off by its energetic action. The remedy, says the *Telegrapher*, is to attach the wire at the bottom of the copper plate, and have gutta percha to protect it all the way down to its lowest point. When oil is used on the surface of this battery to prevent evaporation, the zincs may be readily cleaned, of the deposit of black oxide with which the oil combines, by dipping them in a solution of caustic soda and water and scrubbing with a common battery brush. It is a good plan in telegraph offices to place the Callaud locals in a case with shelves and glass doors, on the walls of the room some four or five feet from the floor, in order that they may always be in plain sight.

GERMAN TELEGRAPH STATISTICS.

At the end of last year, there were in Prussia alone 3,385 German miles of telegraphs, with 11,896 miles of wire, 1,130 stations belonging to the State, and 1,485 belonging to railways. 4,956 officials are employed. In 1871, 5,213,837 domestic, 2,846,176 foreign, and 33,641 official messages were forwarded. The receipts were 2,500,007 thalers, showing a profit over expenditures of 80,469 thalers. The *Telegrapher* adds that the Prussian telegraphs, like those of all other States of Germany, are now all amalgamated and worked for account of the empire, forming a separate branch of the Chancellor's Department.

CADMIUM, TIN, AND LEAD.

A remarkable coincidence, between cadmium, tin, and lead, has been noticed by Dr. Schenck, in that the same total quantity of caloric is required to bring an equivalent of either body from a temperature of —273° C., which is assumed as that of absolute absence of heat, to a state of fusion.

UTILIZATION OF TIN SCRAPS.

A corporation known as the Manhattan Metal and Chemical Company has recently been formed in this city for the working of a chemical process for the recovery of valuable material from tin clippings. The process, which has been lately patented, is as follows: The tin scraps are first treated with hydrochloric acid of 20° Baumé until the bath is exhausted; two or three per cent of nitric acid and about one and a half per cent (of the amount of hydrochloric acid) of chlorate of potash is then added, which in a measure regenerates the bath, so that 500 pounds of hydrochloric acid is found sufficient to treat one tun of scraps. About 1,200 lbs. of clippings are placed in a drum which revolves successively in several vats or tanks charged with the liquors used in the process, being transported from one to the other on an elevated tramway. The first vat contains hydrochloric acid. The tin being dissolved, the drum is inserted in the second vat, which is filled with water, and then allowed to rotate for a few minutes. A second washing in water follows in order that the iron scraps may be completely freed from acid, and finally the drum is plunged in a weak solution of silicate of soda, which forms a coating over the scrap iron and prevents its rusting. The time required to treat one charge averages about one hour and fifteen minutes. The tin is precipitated by spelter in a metallic form ready for melting, while there remains in solution chloride of zinc and chloride of iron, which are valuable for the preparation of paint, as disinfectants, or for the preservation of timber. The estimates of the company show a gain as follows:—From one tun of 2,000 pounds tin scrap, there will be obtained 1,800 pounds best refined scrap iron, $36.00, 100 pounds pure metallic tin, $35.00, 50 gallons chloride of zinc and iron, 29° Baumé, $12.50. Total, $83.50. The total cost of chemicals, labor, fuel, etc., $29.05, leaves a net profit of $54.45 per tun.

PROTECTING PLANTS FROM FROST.

Gardeners in this country have for a long time practiced the art of protecting plants in autumn from the withering effects of frost, by building fires at night in the vicinity and to the windward of the flower beds. The smoke and rarefied air is found to be a pretty sure protection against the destruction by cold weather. At a recent congress of vinegrowers in the south of France, discussion was had on the subject of protecting vines from frost, and several practical experiments were made, the result of which was the recommendation of the smoke process as producing the most satisfactory effect. The mode of producing the smoke was as follows: Iron vessels, containing a preparation principally of tar, having been disposed at intervals over the vineyards, were set fire to, and produced thick clouds, which hovered over the land and spread for miles around.

RESULTS OF VIBRATIONS IN LIQUIDS.

The resistance of liquids destroys with great rapidity any movement of vibration which submerged bodies may possess. A cord thus placed gives a subdued sound of short duration, of which the musical tone is difficult to appreciate.

The precise determination of the nodal points is a matter of considerable difficulty when the cord is covered by the liquid, especially if observed by the naked eye. In order to render the nodes clearly visible, M. Gripon, in *Les Mondes*, says: "I cause an electric current to pass through the cord so that hydrogen is generated from the decomposition of the surrounding water. A platinum wire placed in the fluid serves as a positive electrode. By causing the cord to vibrate, bubbles of hydrogen detach themselves therefrom and describe in the liquid small ellipses, of which the axes diminish in size according as a node is approached. These bubbles form two contiguous spindles, of which the common summit marks the nodal point. The general result of these experiments is that the distance of the consecutive nodes, or the length of a cord or of a rod which makes a determinate number of vibrations, is less in liquids than in air."

WATER NOT AN ELECTROLYTE.

Bourgoin has investigated this subject experimentally, and has proved that water is not itself an electrolyte. His apparatus consists of a cell divided into two equal compartments by an impermeable septum, which septum is pierced with an opening so minute as to prevent any mixing of the liquids on its two sides, while yet it allows the passage of the current. The cell is so arranged that the gases evolved from the electrodes may be collected and measured. Both compartments are filled with water acidulated with sulphuric acid, and the current is passed for a given time, the hydrogen being collected. By analysis after the experiment is concluded, it is found that in the positive compartment the acid has increased in amount by a certain quantity, a, while in the negative, it is diminished by the same amount. But this quantity of acid can furnish only a third of the hydrogen obtained. It is therefore certain that it is not H_2SO_4 which is decomposed, but $H_2SO_4 + (H_2O)_2$ or H_6SO_6. The current therefore decomposes a definite compound, H_6SO_6; and $H_6SO_6 = (SO_3 + O_3) + H_6$.

This hypothesis is proved by experiment, as it is found that the ratio of the acid decomposed to the hydrogen evolved is always that above given, which would not in all probability be the case were the acid and water separately electrolyzed. Moreover, an acid of the constitution H_6SO_6 has been rendered probable by the maximum contraction observed when one molecule of H_2SO_4 and two of water are mixed.

In the case of nitric acid, the action of the current appears to be upon the group $N_2O_5(H_2O)_4$, a body conceded to exist. Crystallized oxalic acid, when in solution, is electrolyzed alone, water taking no part. The hydrogen disengaged corresponds to the equation $C_2H_2O_4(H_2O)_2 = (C_2O_4 + O_2) + (H_2)_2$. As only carbonic dioxide is set free at the positive electrode, it must be that the oxygen evolved reacts upon and destroys another portion of the acid. The quantity of the acid destroyed, therefore, should be much greater at the positive than the negative electrode, for the

acid destroyed is { (1) at N electrode. By current 1 molecule. (2) at P electrode. { By current 1 " By oxygen 2 "

Experimentally this is supported; the loss of acid at the positive electrode is exactly three times greater than at the negative.

Again, in electrolyzing formic acid, only carbonic dioxide is disengaged at the positive electrode. The current acts on the acid only thus;

Positive electrode. Negative electrode.
$$(CH_2O_2)_2 = (C_2H_2O_3 + O) + H_2,$$

and then at the positive the further reactions occur, $C_2H_2O_3 + O = CO_2 + CH_2O_2$. On this hypothesis, if a represent the amount of acid electrolyzed, the loss will be nothing at the positive and equal to $\frac{a}{2}$ at the negative electrode. Now experiment shows that there is no loss of acid at the positive electrode, and hence the hypothesis is true. The same general results were obtained in the electrolysis of alkalies and salts. Bourgoin concludes that "water is *not* decomposed by the electric current, which plays the part of a solvent only."

POCKET SPECTROSCOPE.—M. Hofmann has perfected a very convenient form of spectroscope that can be carried in the waistcoat pocket, and is yet capable of really wonderful effects, considering its diminutive size, producing a large and brilliant spectrum, the violet rays of which extend far beyond the line G. It has a lens of rock crystal, with perfectly flat parallel faces at each end to keep out all particles of dust, etc. The organ of dispersion and analysis is a compound prismoid formed of three alternating prisms, one, of the most powerfully dispersive flint glass that can be procured, between two reversed prisms of crown, the angles being specially and skilfully arranged. The combination is completed by an ordinary compound doublet lens, of suitable focal length.

THE Rev. M. J. Berkeley describes, in the *Gardener's Chronicle*, a very remarkable instance of luminosity in fungi. It occurred in the mycelium of an unknown species growing on a trunk of spruce or larch, and was so powerful as to make a perfect blaze of white light in the track where the trunk had been dragged, and vividly illuminating everything in contact with it. It gave almost light enough to read the time on the face of a watch, and continued for three days.

THE Brighton aquarium has lately received two pairs of beautiful specimens of the Paradise or Peacock fish. These fish came first from China, and have been acclimatized by M. Carbonnier, the great pisciculturist of Paris; they are very lovely little creatures. Some of their habits are singular; thus M. Carbonnier states that "as the eggs are laid, the male carries them away in his mouth, and deposits them in a nest which he builds for them. He will not allow the female to come anywhere near the nest, and if she ventures to approach, he swings himself round and drives her away."

ON the 15th of April, a very violent volcanic eruption took place from the volcano Merapi in Java, which had been quiet since 1863. Great destruction of lives and property occurred, many villages being totally destroyed. The outburst was entirely unexpected, and the showers of stones and ashes and the streams of lava were very destructive. At Solo and other places, the showers of ashes lasted for three days, and it became so dark that the lamps had to be lit. By the last accounts, some 200 dead bodies had been found on one side of the volcano.

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Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.

1.—VALVE JOINTS.—What will make a good joint under a false valve seat of a steam engine?—Z. A. C.

2.—PRESERVING SHINGLES.—I have about 17,500 square feet of cedar shingle on a roof of a building which is a hollow square, of which two sides never see the sun. They never had anything on them. What is the best lasting and cheapest wash, paint, or mixture to preserve the shingles?—W. E. F.

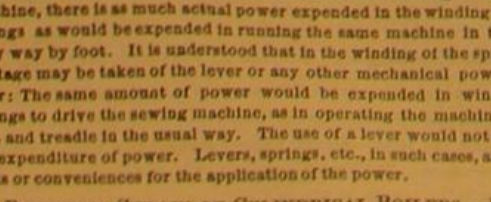
3.—WATERPROOF PASTE.—How can I make a paste that will be suitable for pasting directions for use to a painted board, and not be effected by moisture?—L. B.

4.—RESTORING LOOKING GLASSES.—I would like to know if a looking glass plate of which the amalgam is damaged can be restored. The mercury seems to be separated from the tin foil, and lays between the foil and the plate like dust. Is there any solution that can be put on the back side, or how can it be done?—H. B., of Wis.

5.—SAWING STOCK LUMBER.—What power will it take to drive sixteen 30 inch 12 gang circular saws through six inch stock at the rate of 36 feet per minute. There are 18 teeth in each saw. The saws run at 900 revolutions per minute. What size and how wide a belt is required?—W. B. N.

6.—A SPRING OF WATER AS A BAROMETER.—What is the cause of water turning blue whenever there is a prospect of rain, and becoming clear again as soon as the weather is clear? The water is the best I ever drank in my life. I have used it for three months at one time and two months at another time for drinking, cooking, and washing, and it is excellent for all these purposes.—T. C. H.

7.—GEOMETRICAL PROBLEM.—Will some one send a solution of the following problem? Within any triangle, to draw three circles, the circumference of each of which shall touch two of the sides of the triangle and also the circumference of each of the other two circles.—J. S.E.



Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

To C. F., of O.—The casting of platinum is a very troublesome process, requiring much chemical knowledge. The method was discovered by Wollaston, and is described in Miller's "Elements of Inorganic Chemistry."

To C. F., of O.—The specific gravity of copper is about 8·93; nickel, 8·82; platinum, 21·5; freestone, 2·14. For tables, refer to any cyclopædia.

Are the different shades of bronze on builders' hardware produced by a battery or by dipping? Answer: It is generally done by the application of a species of paint or varnish, containing bronze powder, to the iron.

J. T., of Colorado, asks:—Which is the cheapest process for making oxygen gas? Also the amount of chloride of lime and of protoxide of cobalt, required to make 100 cubic feet of oxygen? Answer: The cheapest process at present in vogue for producing oxygen is that of Tessie du Motay, now carried on in New York city at the works of the New York Oxygen Gas Company. It consists in subjecting manganese to heat in combination with steam, whereby the oxygen is liberated. The manganates are then regenerated by directing air upon them, and are thus used over and over. The process of Mallet, which is supposed to be still cheaper, consisting in the separation of the oxygen from the nitrogen of the atmosphere by passing air through water, has not as yet come into practical use. An easy, comparatively cheap, and very commonly used mode of producing oxygen on a small scale is to heat in a retort chlorate of potash, mixed with a little black oxide of manganese. You will require about 12 lbs. of cobalt and the same amount of lime salts to make 100 cubic feet of oxygen.

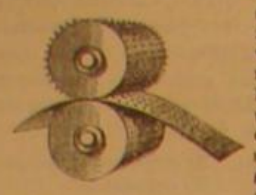
H. J. P., says:—Can you inform me if the manufacture of illuminating gas from paraffin is a success? Does it give as good a light as that made from coal? Is it more expensive than coal gas? Do you know of any objections in using or manufacturing it? The interests of a smart western town are involved in the above questions. Answer: Good illuminating gas can be made from paraffin. The light is as good as that from coal. The only objection to the use of paraffin for gas purposes is its cost. In most places it is dearer than coal.

C. T. S. says:—In a conversation a few days ago, a gentleman remarked that any person can use a patented article or machine in his business, provided he constructs the machine himself. In doing so, does he not infringe on the rights of the patentee? Answer: He does.—And cannot the patentee prevent any party using his invention without compensation? Answer: He can. No person has the right to make, or use, or sell a patented article, whether for private purposes or otherwise, without the consent of the patentee.

B. F. H., says:—To settle a disputed point I wish to ask if, in the application of springs or clock work to the running of a sewing machine, there is as much actual power expended in the winding up of the springs as would be expended in running the same machine in the ordinary way by foot. It is understood that in the winding of the springs advantage may be taken of the lever or any other mechanical power. Answer: The same amount of power would be expended in winding the springs to drive the sewing machine, as in operating the machine by the foot and treadle in the usual way. The use of a lever would not diminish the expenditure of power. Levers, springs, etc., in such cases, are simply tools or conveniences for the application of the power.

THE BREAKING STRAIN OF CYLINDRICAL BOILERS.—R. C., in commenting on Mr. Bakewell's letter on page 244, current volume, suggests that a strong casing be made, semicircular in shape on one side and flat on the other, and as the pressure would be much greater on the curved than on the flat side, such a vessel could be used as a motor. The proposition is not more absurd than many that we have received; but R. C. must surely be aware that Mr. Bakewell's statement is that the bursting strain of the whole boiler is as the semi-circumference and not as the diameter, and not that there is more pressure on one part of a boiler than on another. R. C. also errs in calling his motor a perpetual motion. Whence does he propose to get his steam?

PERFORATION OF POSTAGE STAMPS.—A reader asks: "How was it done? To understand this process, the reader must imagine two cylinders placed horizontally above each other," SCIENTIFIC AMERICAN, Oct. 12, 1872. Well, I have tried my imagination to the utmost, turned my brains over and over, stood on my feet and on my head, and still I cannot imagine the "two cylinders" into such a position; and consequently I cannot "understand the process." Will the writer furnish a diagram of this curious relative position of the cylinders, and Messrs Editors, will you print it, for the use of the world? Answer: To assist our correspondent and others who, like him, may have "turned their brains," we here give a sketch of the perforating cylinders and sheet of stamps passing through them.



This is not intended as an exact representation of the machine; but it is sufficient to give the general idea.

SLIP OF DRIVING WHEELS.—In answer to C. T., query 11, page 234, I would say that practically there is no more liability to slip during the back stroke than during the fore stroke, as the maximum power of one piston is exerted at the point at which the other is at the dead center, thus equalizing all the variations through which the reciprocating parts of a steam engine pass.—J. T. N., of N. Y.

GRINDING LENSES.—To G. A. B., query 3, page 249.—Lenses, after being nipped to the circular form with a pair of pliers, are rough ground within a cast iron shell (the wooden pattern of which has been turned to the curve desired) with sand and water; they are then ground under a brass tool of the correct form with the various sizes of emery and polished with putty powder on a woolen cloth stretched over the same tool.—A. H. N., of N. Y.

POLISHING STEEL.—To E., query 4, page 249.—Steel is polished with fine emery, and finished with crocus. If the work is small, you may polish with washed crocus on a piece of pewter.—A. H. N., of N. Y.

DEXTRIN PASTE.—To H. A. H. G., query 5, page 249.—Put a drop of carbolic acid or a few drops of alcohol in your dextrin, and you will have no more trouble.—A. H. N., of N. Y.

KILLING INSECTS.—To P., query 10, page 249.—Put your insects in a box with a hole, through which you can introduce smoke or the fumes of burning sulphur.—A. H. N., of N. Y.

PRESERVING INSECTS.—To P., query 9, page 249.—Try glycerin.—A. H. N., of N. Y.

REVOLUTION OF THE EARTH.—To A. F. M., query 8, page 202.—The effect of moving matter from the equator to the poles would be to render the earth of a more cylindrical shape, with a diameter less than the present one. Hence, in order to overcome the attraction of the sun (which remains the same), it must retain its present centrifugal force, which can be done only by an increased number of revolutions. Example: Of two tops, of the same weight, that which is of the greatest equatorial diameter will retain its perpendicular with fewer revolutions per minute.—A. W. L., of Ohio.

KILLING INSECTS.—To P., query 10, page 249.—The best way to kill the small insects is to use sulphuric ether; but you can kill the beetles better by dipping them in boiling water.—H. W. U., of Wis.

DEXTRIN PASTE.—H. A. H. G., query 5, page 249, may add to his paste fifteen grains of carbolic acid, and five drops oil of cloves to each half pint, and so prevent its fermenting.—E. H. H., of Mass.

CURING BLADDERS.—J. H. T., query 7, page 249, may paint his putty bladders with a dilute solution of corrosive sublimate and carbolic acid, thickened with a little flour. This will require care, as it is poisonous.—E. H. H., of Mass.

PRESERVING INSECTS.—P., query 9, page 249, may use either of the following solutions, all of which are used for preserving various objects of entomology for the microscope: Glycerin one part, water two parts; one part wood naphtha to eight water: one part alum to sixteen water; a saturated solution of sulphate of zinc; twenty-five drops creosote in a wine glass of water: bay salt 4 ounces, alum 2 ounces, corrosive sublimate 4 grains, water 2 quarts.—E. H. H., of Mass.

KILLING INSECTS.—Query 10, page 249.—Place in chloroform, or bisulphide of carbon; neither will injure the colors.—E. H. H., of Mass.

TROUBLE WITH TOMATOES.—To P., query 13, page 249.—They have doubtless fermented.—E. H. H., of Mass.

QUARTZ GLASS.—To P., query 14, page 249.—The quartz may be so insensible to heat; but when lime, soda, or oxide of lead are added, the mixture will fuse and form another chemical compound, namely, glass.—E. H. H., of Mass.

KILLING INSECTS.—To P., query 10, page 249.—Put the insects for five seconds in common benzine; they will be killed and not be spoiled at all.—F. G. V., of Mo.

CHEAP MICROSCOPES.—I do not agree with S., of Mass., in his answer on page 250, wherein he says that nothing less than fifty dollars will buy a microscope worth having. For ten or twelve dollars a compound achromatic microscope, that performs well, can be purchased. J. W. W. can buy an achromatic object glass, French make, for five or six dollars, that gives three powers by separating the combinations, and with an eye piece, costing three and one half dollars, an instrument can be constructed giving magnifying powers all the way from about 40 to 150 diameters. I have several of the French object glasses, costing from five to ten dollars, and they are of excellent quality.—A. F. K., of R. I.

BOILER SCALE.—To E., query 10, page 217.—It is well known by engineers, and it ought to be by steam users, that the patent anti-incrustators, although very effective in some cases, are not always adapted to the peculiar character of the water used, or rather of the chemicals held in solution therein. Potatoes, bran, sal soda, tan bark, slippery elm, and various other substances are used with more or less success in different localities, and many engine men make it a point to experiment with everything they can hear of until they find some one or more articles which answer their purpose. But in the generality of cases, there is a far better and more scientific method of avoiding scale, namely: By removing its chemical constituents from the water before it is fed to the boiler. This is accomplished by passing the feed water through a lime extracting or purifying heater, in which it is raised to the boiling point and the deposit made upon removable shelves which are readily cleaned. There are several of these apparatus in the market, and I have no doubt that E.'s difficulty will entirely disappear with their use.—C. H. F., of N. Y.

MECHANICAL DRAWING.—To S. J. L., query 6, page 202.—From some years experience and observation, I can say that a first class draftsman and designer will need a good English education, including algebra and geometry, and as much knowledge of the natural sciences and laws of physics as he can acquire. His mind ought to be trained to think accurately and quickly, and this discipline is obtained partly by careful habits of study and thought, and partly by actual practice in the art. Unless one has had unusual facilities for observation and the study of machinery in the course of construction, a regular apprenticeship in some good shop is absolutely essential. A course of engineering in a polytechnic school never made a good designer, and it is an acknowledged fact that our best engineers are, or have been, practical mechanics. In this way and in no other, can they acquire an intimate knowledge of all the processes of construction and the little practical details that make perfection of design. An "artistic" draftsman does not amount to much in this matter-of-fact age, unless he adds to fineness of execution, careful and thorough working up of details. Last, but not least, he must have an unmistakable taste for his profession.—C. H. F., of N. Y.

FREAKS OF BOILERS.—Query 5, page 217.—This query cannot be answered from the data given. If the sheets mentioned were exposed directly to the fire in the furnace, either a deposit collected rapidly from the water, or the fireman did not understand his business; or perhaps the sheets were too thick. Uneven firing will often "bay" sheets directly over the hottest part of the fire. There is obviously some good reason for such a rapid destruction of the metal, which an expert ought readily to detect upon an examination.—C. H. F., of N. Y.

SAW MILL QUERIES.—To P. P. S., query 4, page 185.—In answer to your first question: 270 inches water will be required. To the second: 70 revolutions. To the third: There is a feed derrick which is what you need. Four changes of feed can be made almost instantaneously, and "gigging" back can be done without stopping the saw. All this is done by friction. But you cannot drive, successfully, a 5¼ feet saw 900 or 1,000 revolutions per minute. If you could, and had power to back it, you would be able to saw about 50,000 feet lumber in 12 hours. A 5¼ feet saw run properly, should saw some 10,000 or 12,000 feet of lumber per 12 hours. You had better change the proportion of the proposed wheel. If you do not know how much water you need, you can hardly be expected to know what proportions are best.—R. B. O., of N. Y.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

TOLL TAKER.—Wm. W. McCauley, Fancy Farm, Ky.—The invention consists in combining with the ordinary wheel attachment, provided with as many buckets as there are fractions, of which the desired toll section forms one, an intermediate ratchet that is carried by the wheel and operates the feed spout.

PILE SAWING ATTACHMENT FOR BOATS.—Henry Vogler, Baltimore, Md.—The invention consists in providing a pile saw shaft with one removable bearing and a detachable cap on the other so that it can be speedily reversed to cut off pile either at top or bottom, also in a new mode of giving adjustment to the saw shaft by means of a bearing threaded on the outside and working in a suitable female screw; and also in placing the saw between two springs that enable it to play on the shaft with the motions of the boat.

FIREPROOF FLOORS.—George H. Johnson and William Freeborn, Chicago, Ill.—The end aimed at in this case seems to be attained, namely, the maximum of strength, durability, and compactness, consistent or possible with a like degree of economy of material and labor employed in construction. The floor or ceiling is formed of hollow tiles or blocks of burnt clay, or other analogous or suitable material, which are so shaped as to fill the space between girders, of whatever width it may be. Both the top and under surfaces are flat, and hence the floor above may be laid with little difficulty, and white finish may be applied to the under side with no intermediate or primary coat. These and numerous other advantageous qualities commend, in no small degree, the invention to builders.

CHURN.—Charles Hutchins, Baldwin City, Kansas, assignor to himself and Rynear Morgan, of same place.—This invention has for its object to furnish an improved churn. The churn body is revolved, the milk is thrown by paddles and by centrifugal force against the sides of the churn body, where it encounters the perforated arms of the stationary dasher. Part of the milk passes through the holes of the arms, the form of said holes increasing the friction. The rest of the milk is thrown back into the middle part of the churn body, to be again projected against its sides. When the butter is formed the stationary dasher is removed, and a few turns of the crank back and forth will gather the butter into a solid mass. The perforated plate is then raised, taking all the butter with it, the milk flowing through the holes in the said plate into the lower part of the churn.

HEAD REST.—Felice Fabrici, New York city.—The object of this invention is to provide an adjustable head rest to be applied to the backs of railroad car seats for promoting the comfort of the passengers. The invention consists in the combination of notched standards, which are applied by spring jaws to the seat backs, with a head rest having projecting pins that are supported in the notches of the standards.

PUMP.—Robert White, Mott Haven, and David Moritz, New York city.—This invention relates to a new arrangement of valve chamber, frame, and piston rod guide for a reciprocating pump, and more particularly to such mode of fastening the valve chamber that it can be freely turned to convert the pump into a vertical or horizontal one as may be desired. The invention consists, first, in so arranging the ports, in and to a cylindrical valve chamber, that the same will operate equally well when turned in either direction on the face plate of the pump cylinder. This enables the same to connect at the bottom or at the side with the suction pipe, and on the top or side with the discharge pipe, and thus to convert the pump into one drawing and discharging water in vertical or horizontal direction, as may be desired. The invention consists, also, in fastening the pump cylinder to its frame by means of the suction pipe and a nut thereon; also, in the arrangement of concave guides for the cross head on the piston rod; and in swiveling the guide frame to the end of the cylinder, so that the operating handle or lever can be turned to either side or into any desired position.

PRUNING SHEARS.—Owen L. Samson and James R. Dill, Crawfordsville, Iowa.—This invention belongs to the class of shears for pruning purposes, wherein a double edged cutter is arranged to operate in conjunction with a fixed cutter on either side; and it consists, mainly, in the arrangement of a guide and brace bar with an oscillating or movable cutter.

REMEDY FOR HOG CHOLERA.—Robt. A. Gettings, Marion, Ky.—This invention has for its object to furnish a compound which shall be an infallible remedy for the cure of hog cholera, and it consists in the combination of various ingredients in proportions which are detailed in the specification.

BEE HIVE.—Solomon Rogers and Albert J. Mason, Butler, Ind.—The invention consists in constructing and arranging relatively to each other the bee box, comb frames, and means of detachably applying the latter within the former, whereby the comb frames can be more conveniently examined, removed, or exchanged, without disturbing the bees. It is proposed to have a dividing board in the place of one of the comb frames, by which the hive may be separated into two compartments, or cut off a portion to limit the size of the hive when required to adapt it to the capacity of the swarm of bees, the passages to the part cut off being closed so they cannot enter it.

DEVICE FOR FASTENING NUTS.—Daniel Sawyer, Topeka, Kansas.—This invention consists of a flange on the nut with a series of holes and a spring paw', with a pin in the free end to enter said holes of the flange, and lock the nut against turning, the pawl being pivoted to another washer fastened to the timber, or to the timber and to a metal plate fastener thereon.

CURTAIN FIXTURE.—Isaac B. Werner, Rossville, Ill.—This invention has for its object to furnish an improved apparatus for rolling up a window shade and lowering it from the top of a window. To the upper end of the shade is attached a roller in the ordinary manner. The ends of the roller are pivoted to blocks of some material; the winding or rolling cord passes down through a guide eye attached to the block, and its lower end is connected with a reel. A cord, the ends of which are attached to the ends of the blocks, passes up along the inner sides of the window casing, and then over knobs or pulleys attached to the corners of the casing, one of the cords passing across the top of the casing. Both cords pass down together along one side of the casing, and are connected with a single cord and serve to support the shade horizontally. The single cord, to which both are attached, extends down along the side of the window casing and is attached to the reel. The reel consists of two spools moving on a shaft. The adjacent ends of the spools are formed to receive a clutch, so that by moving the shaft longitudinally the clutch may be thrown into gear with either of said spools, so as to revolve it, while the other spool stands still. Two diagonal spring bars, the outer ends of which are secured to the case that supports the reel, and the inner ends of which rest upon the outer or ratchet flanges of the spools, hold said spools securely in place. By raising either of said spring bar from its spool, the latter is allowed to run back. To the outer end of the shaft in the reel is attached a crank, for convenience in operating it.

SCUFFLE HOE.—Thomas R. Peck, Waterloo, N. Y.—This invention has for its object to improve the construction of scuffle hoes. The hoe plate is made in two parts, the inner end of each part being turned upward at right angles to form upwardly projecting wings. The forward edges are made with a salient angle. By loosening a screw, the parts of the hoe plate may be adjusted at any desired distance apart, so that the said parts may work, one upon each side of the row of plants, to clean both sides of the said row at the same time, the wings enabling the hoe to work close up to the plants, the ends of said wings projecting above the surface of the ground, so that the operator can see exactly where the inner ends of the parts of the plate may be.

CAR COUPLING.—James Pearson, Sacramento, Cal.—The invention relates to the class of automatic car couplings. When two cars, provided with this improved coupling, come together, the link will enter the drawheads and raise the heads of the coupling bars and then drop into a position so as to couple the cars. To release the coupling link the locking pin is first withdrawn, and then a hooked bar is elevated at its front end, which causes a stirrup to raise the end of the link, when it may be readily drawn out.

RATCHET DRILL.—Francis Stein, New York city, assignor to himself and Frederick Breivogel, of same place.—This invention has for its object to furnish an improved ratchet drill, which shall be so constructed as to drive the drill always in the same direction by the reciprocating movement of the handle. A drill socket shaft works in holes in the frame, and upon it, within said frame, is placed a ratchet wheel. The ratchet wheel is keyed or otherwise secured to a second shaft, so as to carry the said shaft with it in its revolution. A block is placed within the frame, and upon the forward end of it is formed a segmental ratchet wheel, the teeth of which are similar to the teeth of the ratchet wheel into which they mesh. By this construction, as the handle is moved in one direction, the teeth of the ratchet block take hold of the teeth of the ratchet wheel and turn it. As the handle reaches the end of its sweep, a projection of the ratchet block strikes against a projection formed upon the frame and throws the teeth of the ratchet block out of the teeth of the ratchet wheel, allowing the handle to easily begin its return movement. As the handle moves in the other direction, the teeth of a pawl take hold of the teeth of the ratchet wheel and turn it in the same direction as it was turned by the ratchet pawl. As the teeth of either pawl are working, the teeth of the other pawl are sliding over the teeth of the said ratchet wheel. To the frame is attached a second handle, by which the said frame is held stationary while the handle is being operated.

SAW GUMMER.—Robert W. Thompson, Pittsburgh, Pa., assignor to J. Fulton Thompson, of same place.—This invention relates to a new saw gumming apparatus for circular saws; and it consists in the combination of a rotary cutting tool with a tubular feed screw in such manner that by means of the screw the tool can be let down more or less to cut through the entire blades, even as its points become shorter. By the screw the pressure of the cutting tool upon the saw blade can also be increased at will.

SKATE.—John Simeon Armstrong, St. John, Canada.—This invention relates to improvements in that class of skates which are constructed to be fastened to the shoe by stationary and movable heel clamps and movable clamps at the ball of the foot, the latter and the movable heel clamp being operated by a screw rod extending from the ball plate to the heel plate and connected to them.

FLY TRAP.—William De Puy, Polk Station, Pa.—This invention consists of a shallow vessel, preferably round, in which the bait is to be placed for attracting the flies, which said vessel has several entrance holes through the side a little above the bottom, so as to make it more difficult for the flies to find the way out than if placed at the bottom. Ear-shaped pieces are attached to the outside of the vessel converging at the entrance holes to guide the flies to the holes. An oval cover, partly made of wire gauze with several large holes to allow the flies to escape through it, is fitted on the pan, and over this cover is a dome of wire gauze, affording a large high space into which the flies will naturally find their way from below after feeding, and from which they cannot escape.

SHEET METAL VESSEL.—Charles B. Cooper, of Nashville, Tenn.—The object of this invention is to provide means for preventing the wear of sheet metal vessels, especially the common tin pail; and it consists in a wooden hoop or rim attached to the bottom of the pail in an ingenious manner.

PRUNING SHEAR.—Samuel J. Beigh and Eli F. Beard, of Republic, Ohio.—This invention relates to a new and useful improvement in shears for pruning trees, shrubbery, etc. The cutting is effected by pulling on a knob, thereby sliding the shank in the staff and operating the shears. By a combination of levers, great power is brought to bear upon the cutting blades, which makes it a very effective implement. The blade has a compound motion, and gives a drawing stroke when applied to the limb or twig to be cut.

HOOP LOCK CUTTER.—Walter Tripp and Henry A. Tripp, of Williamson, N. Y.—This invention is an improvement on the hoop lock cutter for which letters patent were granted to Theodore Conklin, April 5, 1870, No. 101,436. To the bed plate is pivoted a lever, carrying a V cutter at one and a handle at the other end. Another lever, pivoted to the plate, is provided with a slotted arm, through the slot of which a pin projects from the lever first mentioned. The free end of the second lever carries a knife, the first lever carries the two knives toward a small elevated platform, which is rigidly connected with the plate, and on which the hoop to be cut is supported. The upright blade of the knife first enters the hoop and cuts the transverse shoulder. The horizontal blade of the same knife meanwhile cuts the bevel on the under side, the knife being set inclined and swinging on an inclined pivot, in order to produce this bevel. The V knife cuts the curved inner and outer bevels until it reaches the shoulder. The hoop while being cut rests against a gage or back, which can be set in or out to accommodate wider or narrower hoops. The knives are also slotted for the same purpose, and to enable the wear to be taken up.

STEAM WASH BOILER.—George S. Wright, of Racine, Wis., and Elias W. Harrington, of Geneva, N. Y.—This invention has for its object to furnish an improved machine for washing and bleaching clothes and other cloths by steam, which shall be simple in construction, convenient in use, and effective in operation, washing the clothes quickly and thoroughly, and without injuring even the most delicate fabric. It consists in the corrugated false bottom, provided with a downwardly projecting rim and one or more upwardly projecting steam conductors; in the steam conductors, made with their upper ends in the form of inverted cones; in the top steamer; and in the combination of a steam escape valve with the cover.

ELEVATOR.—Patrick Byrne, of Nashville, Tenn.—This invention has for its object to furnish an improved elevator for warehouses and other places. The hoisting rope passes over a pulley, pivoted to cross bars attached to the upper parts of the posts or frame. From the pulley the rope passes around another pulley pivoted to a post beside the well and makes two or more turns around the drum. It then returns, passes around another pulley pivoted to a post at the other side of the well, and to its end is attached a balance weight. The inner end of the drum is geared to the journal of the large wheel. The face of the wheel has a groove formed in it near one edge to receive the endless rope so as to leave a smooth part of said face for the brake shoe to operate upon. The rope passes down to and around a large wheel, pivoted to a frame-work near the bottom of the well or hoistway. The wheel is attached to a short shaft, upon which are placed two loose pulleys and a fast pulley, the fast pulley being placed between the loose pulleys. The loose pulleys are designed to receive, the one a straight and the other a crossed belt, so that the platform may be raised or lowered by shipping one or the other of said belts upon the fast pulley. By means of a belt shipper one of said belts may be slipped from and the other upon the fast pulley to reverse the motion of the elevator. To the belt shipper is attached the end of the cord, which passes through an eye attached to the platform frame and has knots or other stops, formed upon it in proper position above and below the eye, against which the said eye strikes at or near the limit of its movement to reverse the direction of motion of the elevator automatically. The direction of motion may be changed at any part of ascent or descent by operating the cord by hand. The brake shoe is so formed as to drop away from the wheel by its own weight. A screw passes through a stationary nut so that, when the screw is turned forward, its forward end may strike against a downwardly projecting arm of the brake and force the brake shoe against the wheel. To the outer end of the screw is attached a small grooved pulley, around which passes an endless cord, so that the brake may be applied to or removed from the brake shoe by operating the rope. The rope or cord is kept taut by a weight, suspended from a pulley around which passes the said endless cord. By this construction, by slipping both belts upon the loose pulleys, the elevator may be operated by hand by means of the rope.

COOKING RANGE.—Henry Martin, of Duncan, Penn.—This invention relates to a new construction of cooking range, and has for its object to reduce the combustion of fuel to the greatest practicable extent without impairing the heating capacity of the range. The invention consists in arranging the fire-place between the oven and boiler, in making the oven removable, and in the arrangement of a judicious draft system in connection therewith.

[OFFICIAL.]

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FOR THE WEEK ENDING OCTOBER 8, 1872, AND EACH BEARING THAT DATE.

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On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
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On granting the Extension	$50
On filing a Disclaimer	$10
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

22,489.—COOKING RANGE.—G. Chilson. December 18, 1872.

22,491.—BILLIARD CUE TIP.—H. W. Collender. December 18, 1872.

22,532.—CORSETS AND BUSTLES.—D. Lamoureux. December 18, 1872.

22,572.—SPECTACLE FRAME.—T. Noel. December 26, 1872.

22,606.—EMERY WHEELS AND STICKS.—T. J. Mayall. December 30, 1872.

22,631.—RAILROAD CHAIRS.—W. M. C. Cushman. January 2, 1873.

22,664.—LAMP HOLDER.—C. Monson. January 2, 1873.

22,668.—CURING TOBACCO.—J. Payne. January 2, 1873.

22,674.—TRUSS SPRINGS.—J. W. Riggs. January 2, 1873.

22,539.—WRINGING MACHINE.—J. Allender. December 26, 1872.

EXTENSIONS GRANTED.

21,734.—WATER CLOSET.—F. H. Bartholomew.

21,745.—SEWING MACHINE.—C. ❶. Crosby.

21,749.—SEAMING SHEET METAL.—L. Fay.

21,756.—CENTRIFUGAL PUMP.—W. C. Hibbard.

21,799.—SPELLING BLOCKS.—S. L. Hill,
21,762.—KNITTING MACHINE.—J. K. and E. E. Kilbourn.
21,846.—PLOW.—W. Reaney.
21,864.—SCREW CUTTING LATHE.—G. W. Daniels.
21,782.—PLANING CUTTER.—J. Sperry.
21,856.—STAVE CUTTING MACHINE.—W. Steele.

DISCLAIMER.

21,734.—WATER CLOSET.—F. H. Bartholomew.
1,782.—PLANING CUTTER.—J. Sperry.

DESIGNS PATENTED.

6,158.—MUCILAGE BOTTLE.—H. S. Adams, B. Fay, Cleveland, O.
6,159.—BOTTLE.—J. L. Dawes, Pittsburgh, Pa.
6,160.—BARREL BOLT.—O. F. Fogelstrand, Hartford, Conn.
6,161 & 6,162.—DRAWER PULL.—A. Wunder, New Haven, Conn.
6,163.—COAT AND HAT HOOK.—O. F. Fogelstrand, Kensington, Conn.
6,164 to 6,169.—CARPETS.—O. Heinigke, New York city.
6,170 to 6,175.—CARPETS.—H. Horan, Newark, N. J.
6,176 & 6,177.—CARPETS.—A. M. King, Kidderminster, England.
6,178 to 6,181.—CARPETS.—L. G. Malkin, New York city.
6,182 to 6,189.—CARPETS.—E. J. Ney, New York city.
6,190.—CARPET.—J. H. Smith, Enfield, Conn.
6,171.—BOX PLAITED RUFFLES.—E. W. Taylor, Jr., Brooklyn, N. Y.
6,192.—PENCIL POINT PROTECTOR.—E. Faber, New York city.
6,193.—SHOVEL AND TONGS STAND.—O. F. Fogelstrand, Kensington, Conn.
6,194.—BLOWER STAND.—O. F. Fogelstrand, Kensington, Conn.
6,195.—COMB AND BRUSH POCKET.—A. H. Forstner, Newport, Ky.
6,196.—BADGE.—W. B. Hamm, Philadelphia, Pa.
6,197.—HEAD REST.—J. J. Hayes, Green Point, N. Y.
6,198.—MATCH RECEIVER.—W. F. Müller, New York city.
6,199.—TOY BANK.—D. A. Stiles, Durham, Conn.
6,200.—LETTER CLIP.—A. Wunder, New Haven, Conn.

TRADE MARKS REGISTERED.

1,010.—TONIC BEER.—B. Bates, Baltimore, Md.
1,011.—LABELS, ETC.—S. Crump, New York city.
1,012.—WHISKY.—Fechheimer & Workum, Detroit, Mich.
1,013.—MEDICINE.—G. H. Fish & Son, Saratoga Springs, N. Y.
1,014.—AGUE MIXTURE.—D. M. Myer, Baltimore, Md.
1,015.—STEAM PUMP.—Norwalk Iron Works, South Norwalk, Conn.
1,016.—CIGARS.—T. Russell, Washington city, D. C.
1,017.—AGRICULTURAL IMPLEMENTS.—Soule, Kretzinger & Co., Fort Madison, Iowa.
1,018.—BAKING POWDER.—Trentman, Manning & Son, Fort Wayne, Ind.
1,019.—SEWING MACHINE.—Grover & Baker Co., Boston, Mass.
1,020 & 1,021.—CHEWING TOBACCO.—Myers & Drummond, Alton, Ill.
1,022.—WHISKY.—E. H. Taylor, Jr., Frankfort, Ky.
1,023 & 1,024.—SPECTACLES, ETC.—Spencer Manufacturing Co., New Haven, Conn.
1,025 & 1,026.—PERFUMERY, ETC.—Thomson, Langdon & Co., New York city.
1,027.—SEALING WAX.—G. Watterson & Son, Edinburgh, Scotland.

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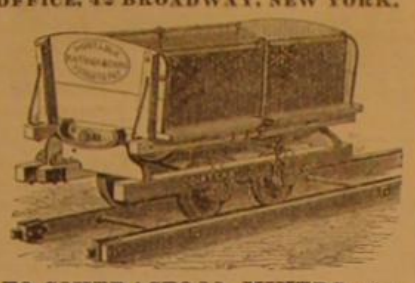

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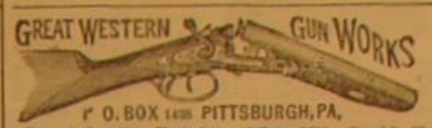

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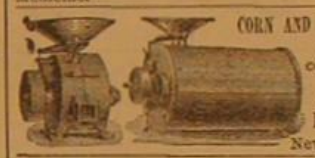

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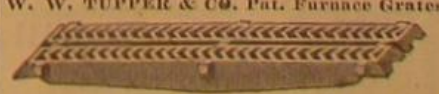

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1 Cash Gift,	8,000	35 Cash Gifts,	600 each
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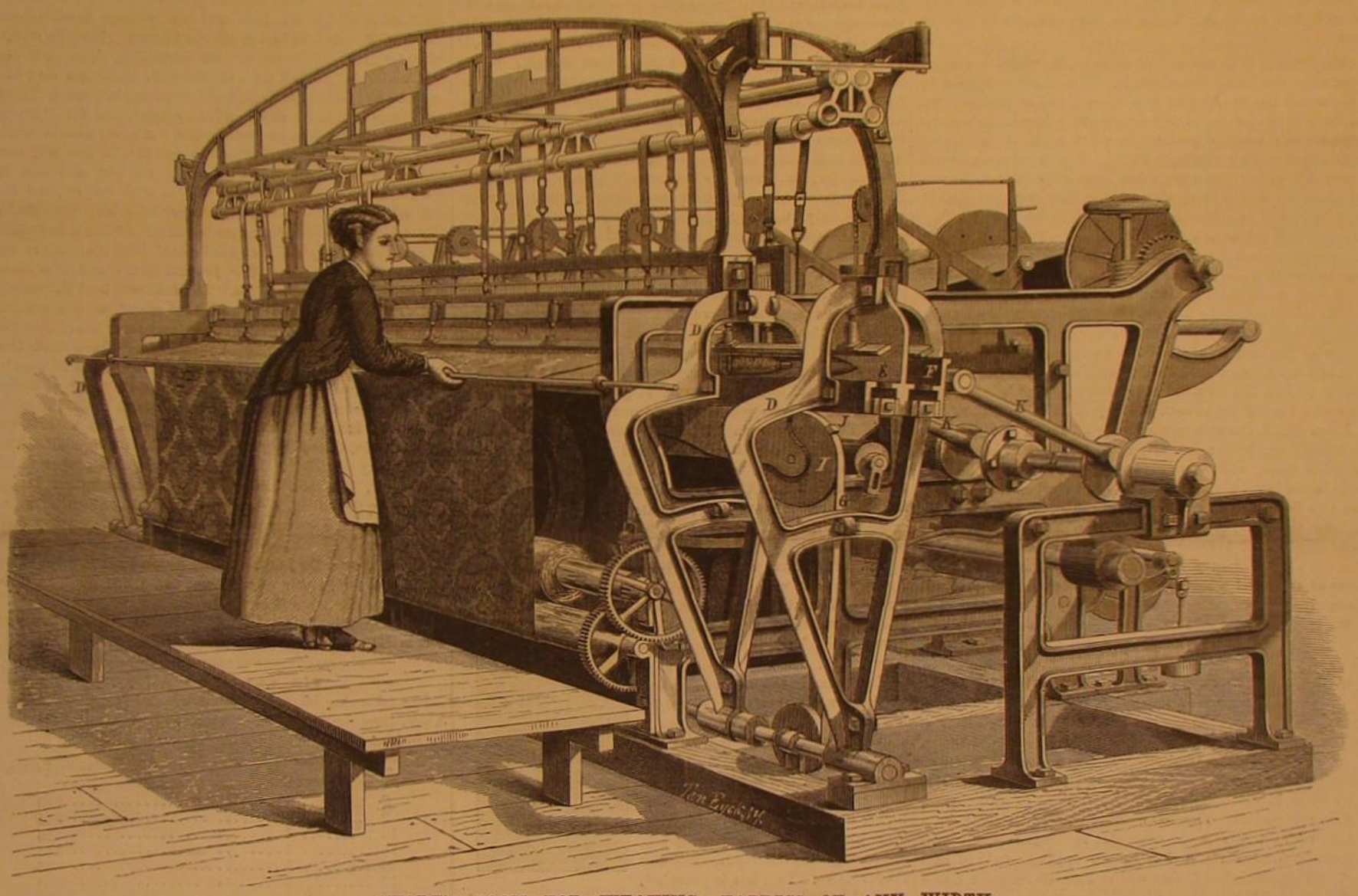
Vol. XXVII.—No. 20. NEW SERIES.] NEW YORK, NOVEMBER 16, 1872. [$3 per Annum. (IN ADVANCE.)

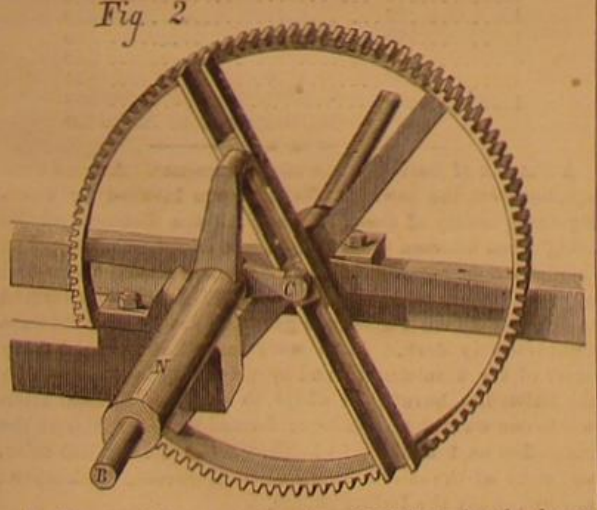
LOOM FOR WEAVING FABRICS OF ANY WIDTH.

We take pleasure in laying before our readers a device which, for ingenuity of construction, for excellence of design, and for the highly valuable results obtained by its use, may justly take rank among the remarkable inventions of modern times. Though its many parts, at first inspection appearing complex, in the end prove of admirable simplicity, it is nevertheless almost impossible to render full justice to the merits of the machine by the ordinary means. Words of description, though accompanied by never so good illustrations, fail to convey the ideas to which a few moment's study of the actual device, in its almost life-like motion, will give rise.



SHORT'S LOOM FOR WEAVING FABRICS OF ANY WIDTH.

Fig. 2

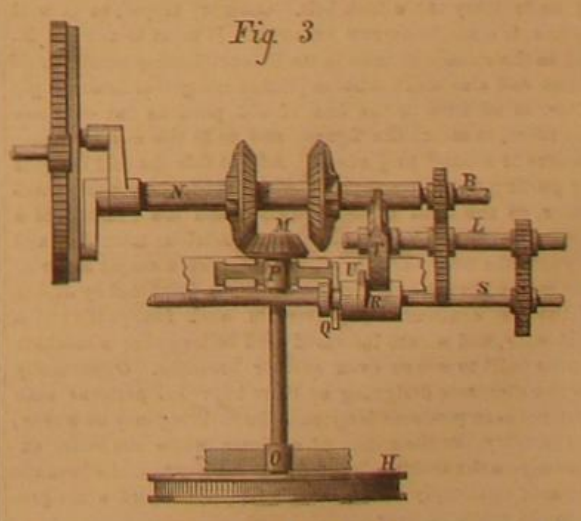


A glance at the engravings has doubtless already shown that the invention is a loom, and from the same source the observing reader has probably divined its capabilities. In brief, it will weave carpets, shawls, cloth, or any coarse fabric of any style, pattern, or device, and of any width; to exemplify, it will produce the floor covering of an entire room, large or small, in a single piece and without a seam, as readily, as cheaply, and far more expeditiously than if the carpet were made in ordinary breadth to be fitted to the apartment. Such is its work; it remains for us to convey to the reader how it is performed.

The large and, we may with truth add, excellent engraving conveys a correct idea of the general appearance of the machine, which somewhat resembles a well known positive loom already in the market; more especially as its motion is essentially positive. As is necessary for a clear explanation, we enter upon the description of the various parts in detail, beginning with the motion of the shuttle race, A, which is so vibrated forward and back as to serve the purpose of a lay or batten. The shaft causing this motion is, by the interposition of suitable mechanism, connected to the revolving shaft, B, in Fig. 2, at the outer end of which is a crank, C, which has its wristpin fitted in a slot or groove of the large gear wheel, to which motion is imparted by the main pulley. The center of this gear wheel is so far eccentric to the axis of the shaft, B, that the crank, C, may nearly, but not quite, reach the center of the wheel, the slot or groove, as shown, extending diametrically across the face of the latter. The motion thus imparted to the revolving shaft, B, is not uniform, as the crank, C, when in the outer part of the slot, turns much quicker than when in the inner part or center of the same. Consequently the shaft, B, performs part of its revolution very rapidly, and the outer portion so slowly as to be almost stationary. By this arrangement, the interposing mechanism is so actuated that the batten, A, is first moved quickly forward, then back to lay the thread, then to return, and finally to remain at rest to allow of the motion of the shuttle.

The most prominent portions of the large engraving are the triangular shaped frames, D D, which are pivoted, as shown, at their lower ends and at either extremity of the loom. These frames contain, in their upper portion, two channels, E and F, of the same form in cross section as the shuttle guide in the batten. It is plain that by moving the frames, D D, either of these channels may be placed at the extremity of the batten, A, so as to form a continuation or elongation of the same. Before proceeding further into the mechanism of the frames, D D, it is necessary to understand the movement of the shuttle belt, a portion of which is shown at G, in the engraving. This band serves to convey the shuttles and carriers over, or rather through, the raceway, within which it is supported on small friction rollers, and moves with the raceway when the latter is swung, as before described, as a batten. Motion is communicated to the belt by passing it over an operating drum, H, Fig. 3, situated under the front middle portion of the loom, and not shown in Fig. 1. At I, Fig. 1, is represented one of the rollers situated underneath the channels of the frames, D D, over which the belt passes downward. The number of shuttles and carriers used at any one period is one less than the combined number of channels in the frames. Thus if each end frame has two channels, as shown in the engraving, as there are four in all, three shuttle carriers and shuttles can be used. The connection between the shuttle belt, G, and the shuttle carrier is

Fig. 3



effected by means of a lug, J, Fig. 1, on the upper part of the former, which fits into a corresponding mortise in the under side of the carrier. After being transported the length of its race, the shuttle is left in one of the channels of the frames, D D, when the lug, J, leaves the mortise in the carrier, the belt passing down over the roller, as before stated. Meanwhile another lug on the shuttle band engages another car

rier at the other end of the loom, and the belt, continuing to move in the same direction, conveys the carrier across the race in a similar manner as above described. The two shuttles and their carriers, therefore, follow each other from the same end of the machine. Now if, after the first carrier has been conveyed across, the motion of the belt be reversed, it is evident that the carrier would be transported back to its starting point, unless, before the return movement begins, the frames, D D, are vibrated so as to bring another channel, holding another carrier and shuttle, in line with the race-way; in which case, such other shuttle would be engaged by the lug and carried back. No further explanation is necessary to make it clear that, by suitable movement of the frames, D D, so as to bring any one of their four channels in alignment with the race, either of the three shuttles may be connected with the belt and transported through the warp. It is also evident that the shifting of said frames may be so arranged as to change one carrier for another or leave the same shuttle in action, according to the requirement of the design to be produced. Consequently the further elucidation of the mechanism reduces itself to two questions: first, by what appliances are the frames, D D, so governed as to cause their vibration at the proper moment; and, second, how is the shuttle belt actuated in order that motion may be imparted to it, direct or reverse, in accordance with the other workings of the loom. These we shall consider in their order.

The frames, D D, are moved by rods, K, which communicate with cranks on the shaft, L. This shaft is turned by gear wheels, at the further or left hand end of the machine, as shown in the engraving—in which said wheels are not represented, being concealed by other portions—connected with the revolving shaft, B, Fig. 2. It will be remembered that the motion of this shaft has been explained to be one of alternate rapidity and slowness, so that each frame, D D, will be moved to shift the shuttles while the batten is laying the weft and then will remain at rest. The gear wheels, transmitting motion from shaft B to shaft L, are arranged as one to two in the relative diameters, in order to let shaft, L, turn once while shaft B revolves twice. This by a suitable arrangement of cranks has the effect of throwing the frames, D D, forward, allowing them to remain at rest during one throw of the batten, and then of swinging them backward and again leaving them motionless during the subsequent throw, so that the two boxes or channels are alternately in line with the batten at each journey of the shuttle.

From Fig. 3, the arrangements for actuating the belt will be readily comprehended. H, as before stated, is the belt wheel or drum, and is mounted, as shown, on a shaft which ends in the bevel pinion, M. The latter receives motion from the two bevel wheels on the rotating tube, N, which loosely incloses the shaft, B. At O the shaft of the drum wheel is hung on a swivel bearing, and at P in a sliding bearing, so that the pinion, M, may be carried into contact with one or other of the bevel wheels, thereby turning the drum, H, alternately in one direction or the other.

We may here add that the mechanism for shifting the motion may be materially varied, the bevel wheels being movable, and the bevel pinion remaining stationary.

On the sliding bearing, P, is a projection, Q, which enters, as shown, in a groove on the sleeve, R, which loosely embraces the shaft, S. On the shaft, L, is a cam disk, T, which, as the shaft revolves, alternately presses against the wings, U (only one of which is shown), on the sleeve, R. The latter is thereby moved, and with it the slide, P, so as to shift the pinion, M, alternately into gear with one or the other of the bevel wheels. The loose tube, N, is terminated by a crank, which works in the same slot in the gear wheel with the crank, C, of shaft, B, but in the opposite half of said slot. This mechanical device will at once be recognized as a novel and striking method of obtaining motion, which has never heretofore been accomplished. The tube, N, must, like the shaft, B, move alternately fast and slow, but its motion is so far different from that of the shaft, B, that when the batten is at rest the shuttle belt will be moved, and *vice versâ*.

It is perhaps almost superfluous to recapitulate the various obvious advantages of this machine; which, though appearing of large proportions and heavily built, is readily worked by an ordinary three inch belt. Ordinary carpet, as is well known, is made in narrow breadths. It must be cut and fitted to the room, a process in itself necessitating considerable waste and also much labor in joining it together into a single piece, in addition to the loss of odd portions cut out here and there, to match the figures and to fit the covering into corners or around projections. Add to this the cost of labor for putting down, the rapidity with which the carpet deteriorates, on the hard lines of sewing, and the chances of a handsome pattern being ruined by injudicious matching, and compare the total expense with the cost of a carpet made by this method in a single piece. The loom inspected by us, one of the first constructed, weaves its work four yards and a half wide, and we are informed and believe that a machine can be built to weave even greater breadths. Opportunity for the elaborate designing of more beautiful patterns than have yet been produced is opened; the covering may be woven, if necessary, for the rooms of a house while the latter exists only on the architect's plans, and yet a carpet can be made and sold as cheaply as that now in use, and afford a fair profit to the manufacturer.

To Mr. James Short, superintendent of the New Brunswick Carpet Company, at New Brunswick, N. J., is due the credit of this invention, which was patented through the Scientific American Patent Agency, July 16, 1872. From this gentleman, at the above address, any further particulars or information may be obtained. Mr. Short has also obtained patents in several foreign countries. He contemplates visiting England in a few weeks, to practically introduce his loom to the great carpet manufacturers of Manchester and other cities.

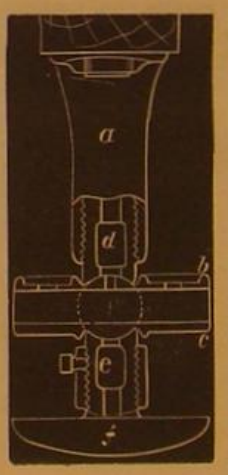
[From Journal of the Franklin Institute.]

TRANSMISSION OF MOTION.

A Lecture delivered by Coleman Sellers, at the Stevens Institute of Technology, Hoboken, N. J., February 19th, 1872.]

NUMBER II.

Next to the proper means of uniting the shafts, come the devices to sustain the shafts and permit them to revolve freely on their axes. When shafting is to be suspended under the ceiling of a room, it is provided with what are called hangers. When it passes over the top of beams or near to the floor, it is carried on what are called pillow blocks. When near to posts, the hangers are changed in form and are called post hangers. All the devices have certain parts in common. They have, in the first place, a journal box or bearing, to receive the shaft; then some form of frame to carry the box. A good many years ago—I think, perhaps, thirty years at least—a Mr. Edward Bancroft, then engaged in the machine business in Providence, R. I., invented what was called the swivel hanger. He saw that it was of the utmost importance that the bearing provided should receive the weight of the shaft over its entire length. He also saw that a long bearing would last longer than a short one, if the pressure was uniform over the whole surface. So he made the box in such a manner that it should be carried by a kind of universal joint; he hung it on pivots, and made the axis of vibration coincide with the center of the box. This swivel hanger was afterwards superseded by what is called the ball and socket hanger, now in almost universal use in this country, and which I will presently explain to you. Before the introduction of the swivel hanger, rigid bearings were the only kind used—I mean bearings which could not adjust themselves to the positions of the shafts—and such rigid bearings are still used in Europe. I have found an example of a rigid bearing in Professor Thurston's room, among models received from Europe as examples of devices in common use. I may have occasion to refer to this later. When Mr. Bancroft had demonstrated the great advantages of the swivel or self adjusting hanger bearing, he showed it to most of the prominent machine builders in the New England States, and tried to introduce it generally; but not one could be found who was willing to undertake its manufacture. They characterized it as a needless piece of refinement and far too costly to be generally used. Mr. Bancroft afterwards, in connection with Mr. William Sellers, under the firm name of Bancroft and Sellers, manufactured this hanger, and introduced it extensively. In its modified form, but the same in principle, it is now come into universal use. Time will not permit me to show you the various forms through which this hanger passed. What is known as the ball and socket hanger is what it has grown into. Various circumstances have, from time to time, caused modifications in the form of the supporting frame, but the principle has remained unchanged. Fig. 8 shows a section of the modern hanger. The part marked a is the frame or hanger, b, the top box, and c, the bottom box, the two halves united forming what is called the "box," that is, the journal box or bearing—the bearing in which the shaft rotates. This box is provided, top and bottom, with spherical surfaces, so placed as to be in reality, portions of a sphere which has its center in the center of the axis of the box; d and e are what are called the plungers. These are screwed into the frame, and are provided with cup shaped ends to clasp the spherical parts of the box. The box can rock to a limited extent in every direction in these cup shaped ends. The plungers serve a double purpose; 1st, of providing the socket for the sphere to roll in; 2d, to permit of a vertical adjustment of the entire box to bring them in line one with another. At f is an oil dish to catch the drippings from the box. It is quite evident that a shaft placed in such a bearing will control the positions of the box, and will press uniformly over the entire length of the box. This is a very important feature, and I solicit your earnest attention to its advantages as compared to a rigid bearing. Imagine, if you please, a hanger in all respects like the one I have shown you, but with its box made in one piece with its frame. These hangers are to be attached to beams, some distance from each other, and they must be bolted securely to the beams in such positions as will insure all the boxes in the entire series being in line one with another, so that a shaft placed in the boxes will rotate freely without binding. You can readily see that to do this the foot of the hanger must be carefully fitted to the beam, so that a line stretched through the various boxes will touch all parts of each. This involves greater skill and much time in putting up. This skill and time is at the cost of the purchaser and user of the hanger. Then when they are in place, the warping or twisting or sinking down of any one beam will throw the bearing out of line, and thus tend to cramp the shaft on its bearings. With the ball and socket hanger, care is only required to bring the hangers in line side ways; the plungers admit of adjustment vertically, and the shafts twist the box into line with itself. Thus all skilled labor is dispensed with in putting up, and possible adjustment is at all times practicable.



But the most important feature of this hanger is the possibility of using longer bearings or boxes than with the rigid hanger. With the latter, the longer the box the more difficult to line, and the more useless friction if out of line. With the swiveling principle, the box adjusts itself, and thus takes a uniform bearing over its entire length. This is of the greatest importance, and influences the material forming the box. With a pressure not exceeding fifty pounds per square inch, and oil well distributed over the surface of box, the metal of the shaft will not touch the surface of the box; it will run on the oil used as a lubricator. The oil under this pressure is not squeezed out, and maintains its lubricating properties for a long time. Hence, if the shaft does not touch the box, it matters little what metal is used in making the box. Cast iron is the cheapest and most readily worked into shape. It is, in reality, the most durable of the metals for the purpose if kept well oiled, but the poorest if allowed to run dry. Brass or bronze has been used to a great extent, and lately a metal called Babbitt's metal has met with favor as a lining metal for boxes, but I may mention that a cast iron nut on a lead screw of a lathe will outwear a brass nut two to one, and cast iron gear wheels are much more durable than brass under limited pressure. I mean if the pressure on two pairs of wheels, one pair iron and one pair brass, be the same, and the pressure on both be within the limit at which cast iron will run without breaking, the cast iron wheels will last much the longest. Brass is resorted to for great toughness, not for durability. The soft metals, under the general term of Babbitt's metal, are cast into recesses in journal bearings, and are extensively used. There are places where its use is advantageous, but for shafting purposes its use is to be discouraged. All soft metals, while they do not cut when permitted to run dry, in the way cast iron is sure to do, yet serve to catch the grit and dirt in the atmosphere which finds its way in with the oil, and the soft metal holds these little sharp particles, and thus gradually grinds down the shaft running in it. When it is desired to grind down a cylinder of hard metal, lead clamps are applied to its surface very like journal boxes, and into these clamps oil and emery are fed. The lead will hold the emery, and thus reduce the size of the hard metal without serious wear on its own part. Many of you may have heard that the use of soft metal is cheap. You will have been told that boxes cast with a recess to hold the soft metal can be used as they come from the foundery, and thus all labor of boring and fitting be dispensed with; the shaft can be laid in place on the cast iron shell, and soft metal, melted in a ladle, can be poured in, thus filling the recess and insuring a fit. This sounds very plausible. Let us analyze it, as is proper in all such cases. The box with its recess must be rather larger, to be of equal strength, with one cast without such recess. Babbitt's metal costs much more than cast iron; we may safely say it costs ten times as much. The melting and pouring and fussing over the job take time, which costs money. Now in point of fact, a pair of cast iron boxes can be planed on their faces, then bored to fit the shaft, and grooved for oil passages, for less than half of what the least quantity of soft metal would cost that can be used in such a box.

Tin and Lead Alloys.

The following alloys are prepared according to Professor Abel's formulæ, their constituents and melting points being as follows:

Constituents. Tin. Parts.	Lead. Parts.	Melting point. Deg. Fahr.
2	1	340
9	4	344
10	4	348
11	4	352
12	4	356
13	4	360
17	4	370
22	4	380
4	5	390
4	6	412
4	7	420
4	9	460
4	12	482
4	15	494
4	17	502
4	20	512
4	25	520
4	30	530
4	38	540
4	48	550
4	70	558
	Melting point of lead=620	

A PLAGUE of butterflies is a rare occurrence. A short time ago, however, the town of Florence was invaded by a prodigious quantity of these insects. All the distance of the Lung' Arno between the Piazza Manin and the Barriera, and in all the adjacent streets, the passage was almost obstructed by an extraordinary quantity of butterflies that had swarmed in such thick clouds under the gaslights that the streets were comparatively dark. Fires were immediately lighted by order of the municipality and by private citizens, in which the butterflies burnt their wings, so that half an hour afterwards one walked upon a layer formed by the bodies of the butterflies an inch thick ! ! ! They were of a whitish color, and some of the streets appeared as if covered with snow; at least, so say the Italian papers.

THE only persons left at the Tip-Top House on Mount Washington are three signal officers, who are equipped with a large stock of coal, four barrels of onions, about forty hams, twenty bushels of potatoes, a good supply of canned goods, and all manner of groceries in profusion, a violin, harmonicon, a good-sized library and quantities of newspapers, and other tip-top material to enable them to spend a pleasant winter.

THE USE OF WATER GLASS IN BUILDING.

The application of water glass in the building trade depends chiefly upon its forming a chemical combination with the carbonate of lime and quicklime of the wall dressing by converting both into silicate of lime, which is then in a condition to resist the influences of air and damp in a far higher degree than was the case before. But it also imparts an extraordinary solidity to all articles of burnt clay, as floor tiles, bricks, roofing tiles, etc., as well as to the most porous crumbling sandstones, which imbibe the water glass with great avidity. Instances are known in which very soft tiles, after being saturated with water glass, when laid upon the fireplace of an evaporating stove, in which frequently acid vapors are evolved, have remained quite unaltered after twelve years. Hence, in the construction of new buildings which are not to be dressed, whether of bricks or stones, it is advisable always to use a coating of water glass.

On this subject H. Wagner, of Pfiffligheim, remarks, in the *Hesse Trade Circular*, that four kinds of water glass are used —potash water glass, soda water glass, the double water glass (a combination of equal parts of potash and soda with silica), and fixing water glass. For the technical application of double water glass, it is sufficient to mix 3 parts of concentrated potash water glass with 2 parts of concentrated soda water glass. The fixing water glass is a potash water glass completely saturated with silica, to which a portion of soluble soda silicate is added, that is, to 3 parts of concentrated potash water glass, 1 part of soluble soda silicate. The latter is prepared by fusing together 3 parts of pure anhydrous carbonate of soda with 2 parts of powdered quartz, and making a concentrated solution of it. The fixing water glass has the great advantage of producing no efflorescence of carbonate of soda, and the coating is clean and free from spots, on which account it is preferred for ornament and internal decoration. In coating with water glass, it is important to consider the degree of dilution, and the proportions given here should be modified according to circumstances. Whatever be the kind of water glass, that of 33°, diluted with twice its weight of rain or river water, should be used for the first coat, but with equal weight of water for the second and third coat. Water glass of 66° is diluted for the first coat with 5, for the second and third with 2½, parts by weight. These proportions are retained for sandstones and bricks. Upon a surface of 100 square meters, the following proportions are required:

For first coat, 4 lbs. of water glass of 33°, and 12 lbs. water.
" second " 4 lbs. " 33°, " 8 lbs. "
" third " 3 lbs. " 33°, " 6 lbs. "

To produce a fine and durable coat of water glass upon a wall, special regard must be had to the dressing. The problem is to give it a stonelike solidity, and to fuse it evenly with the wall, taking care, at the same time, that the water glass shall soak uniformly into every part. In order to obtain this, the mortar should be more thin than fat; the water glass would penetrate with difficulty into limy mortar, and cause also cracks, which should be avoided.

This must be well dried and exposed for a longer time to the air, to be converted into a subcarbonate of lime, because otherwise the quicklime would partially decompose the water glass. The wall thus prepared is saturated with soda or double water glass of 33°, using the same process of dilution for each coat as above given. With larger surfaces small rain spouts are used, from which the jet is distributed like fine rain by being forced through a strainer provided for the purpose. This operation may be repeated two or three times taking care, however, that the pores of the wall are not closed by a too frequent charge, or too concentrated solutions, and thus become unfit to receive the colors.

In order to secure a good uniform ground, a water glass mortar should be prepared in the following manner: 10 parts of sharp dried sand, and 3 parts of quick lime, slaked in the air (by sprinkling fresh burnt lime with water, and frequent stirring till it is reduced to a fine powder), are mixed with 2 parts of chalk, or limestone, powdered quite dry and passed through a moderately fine sieve; then this mixture is worked into a plastic dough with a solution of soda water glass of 33°, diluted with 2 parts of water, so that it can be applied like ordinary mortar for dressing. This mortar does good service also in the joints of brick walls, and wherever it is important to guard against air and damp. It will differ from this according as more sand or chalk is added, and in many cases also the water glass solution employed is more concentrated. After drying, which takes a few days, it becomes stone hard, and should be saturated repeatedly in the manner described with a solution of soda water glass (which is cheaper than potash water glass, and for this purpose quite sufficient).

When the foundation is laid in one way or the other, after drying, the coating with color may be proceeded with. The colors to be applied, before they are brought in contact with the water glass, are moistened with sufficient rain, or river water, without rendering them liquid. The more plastic and uniform this color paste is, the better it mixes afterwards with the water glass, and the less fear there is that the color will curdle.

Even when the different coats are laid on as prescribed, the double water glass should be used. After twenty-four hours a fresh coat may be applied, and to prevent an efflorescence of carbonate of soda, it is advisable to give the last coat with fixing water glass. In order to impart a certain gloss like oil paint, the last coat, when dry, is gone over with a very dilute solution of fixing water glass, taking care that those parts which imbibe slowly present a uniform appearance. The choice of the various colors is by no means indifferent, as many have so close an affinity to water glass that they are no sooner in contact than they curdle at once to a useless mass, as often happens with the commercial oxide of iron, when, after its preparation, it still contains free sulphuric acid. Other colors are materially changed in their tints; for this reason, none of those colors derived from the organic kingdom should be used, as they fade sooner or later.

HAS OUR CLIMATE CHANGED?

There has been much apprehension, in the city of New York and throughout its suburbs, lest the supply of Croton water should fail to meet the requirements of the rapidly growing population. At times during the past year, it was even believed that the supposed deficiency would be so great as to render delay in providing other resources dangerous to the public health. It was freely asserted that the scarcity was due to the amount of rainfall, which theorists claimed had materially diminished in the United States in proportion as the surface of the country had been cleared of forests and built up or placed under cultivation. With a view to determining the question with accuracy and to setting all doubts on the subject at rest, Mr. Daniel Draper, Director of the Meteorological Observatory in Central Park in this city, has caused to be made, during every day of the past three years, reliable observations from self-registering rain gages. The results obtained, as well as other valuable information regarding the climate of this section of the country, he has embodied in the annual report, of the department under his charge, for the year 1870.

During 1869, the total rainfall was 46·82 inches: 1870, 43·32 inches, and 1871, 52·06 inches: so that it is evident that, instead of there being a decrease as has been so strongly urged, the last year shows a considerable increase of either of the years preceding. To render the fact still more striking, the results of observations made during the past thirty-six years are added, from which it is proved that from 1835 to 1846 the rainfall was 39·5 inches, from 1845 to 1856, 47 inches, from 1855 to 1866 and from 1865 to 1872, 52 inches, showing a large and steady augmentation. During the above period, although great changes on the face of the country between the Mississippi and the Atlantic Ocean have been made, no corresponding diminution can be traced in the mean amount of water that has fallen, so that it is considered as concluded that over large tracts there is perfect compensation, the decrease at one place being compensated by the increase at another.

But the actual supply of water does not depend upon the rainfall alone. It is diminished by evaporation caused by heat and consequent dry winds, by the condition of the surface which, if hard or frozen, prevents percolation, and also, in combination with the latter, by the rapidity of the descent of the rain, in which event the quantity of water that belongs to a whole month may fall in the course of a few hours, and, rushing over the surface, may be lost. Agricultural conditions also, though not affecting rainfall, have a powerful influence in causing rain-waste. Thus a growing plant vaporizes from its leaves an immense amount of water which its roots have abstracted from the soil. A sunflower, it is stated, will remove twenty ounces of water in a *single* day.

From the consideration of the amount of rainfall, it is a natural transition to that of the problem: Is the climate of New York and the Atlantic States undergoing modification? In this connection, we may cite certain interesting facts which are doubtless generally familiar to the inhabitants of this city. Thus there are no longer the deep snows which characterized the winters of years gone by; the cold weather seems to begin later, and probably all have remarked the absence of the huge sleighs which were substituted for horse cars and stages in our streets. Indeed, so far as appearances go, the winters have become milder, and, on the other hand, the summers have become cooler; for, in spite of the vagaries of the thermometer during last summer, when at times the mercury seemed to have taken a permanent abode among the nineties, it will be remembered that the intense heat rarely exceeded a few weeks in duration and did not extend through months of unbearable sultriness. In a rapidly growing city like New York, several local causes may be assigned in explanation of these changes of temperature. The quantity of fuel consumed has necessarily increased in proportion to the number of buildings erected, and, moreover the reflection and radiation of the sun's warmth from the vertical sides, or its absorption by the dark colored metal roofs of the houses, must tend to elevate the temperature and aid in producing a thaw in winter. The facts, therefore, as observed in cities, are by no means complete guides to general climatic changes.

Resort has, however, been had to data of a more extended topographical nature, for instance, the opening and closing of the Hudson River, which, flowing for 150 miles through varied localities, affords information regarding the quantity of heat over a long line. Records, nevertheless, of the past fifty years show that there has been no important change in the number of days the river has been frozen. The same is true of the Baltic rivers of Europe for the past three centuries. Again, the average hight of the thermometer for the months of January, February and March for the past half century is 33·06°, which, taken in connection with the fact above given concerning the river, plainly shows that our winter climate has not changed.

The thermometer records of Philadelphia extend back to 1767; taking, as before, the first three months of the year, the average for fifty-six years is 35·56°, for different periods distributed along 89 years, 35·23°, so that the mean temperature of Philadelphia during the winter is some 2·66 degrees above that of New York. Similar records of Boston, over 86 years, show 29·66 degrees as the average, or about 3·27 degrees lower than New York. Moreover, no sensible change in this locality is apparent. At Charleston, S. C., for five periods between 1750 and 1854, the total average is 53·93°, and although the individual averages of the separate intervals differ sometimes widely the general climate has undergone no modification. Considerations such as these may satisfy us that the surface alterations, which the Atlantic States have undergone since their first settlement, as was predicted by Humboldt, have produced no meteorological effects, and that the rainfalls and winters probably remain the same as they were many years ago. While such is our final conclusion, we must bear in mind that these mean or average results exhibit only one phase of the problem. They do not show the fact that there are brief cycles of heat and cold, of moisture and dryness, under the operation of some unknown law, a law which is perhaps not of meteorological but of astronomical origin; and, moreover, they make no allowance for the imperfections in the instruments or tables used in days gone by.

Mr. Draper concludes his report with a valuable series of meteorological tables for the year 1870, from which we obtain the following data of interest: The mean hight of the barometer for the year was 29·935 inches; its difference of range 1·346 inches, mean of thermometer, 51·12°, maximum, 92°, minimum, 2°. The total depth of rain and snow water which fell for 138 days was 52·06 inches. The prevailing wind was northwest, and the total distance travelled by all winds, 6,3571 miles.

A Gigantic Pie Bakery.

Pie baking may be called a new industry and, at the same time, one essentially American. For the benefit of our foreign readers, we explain that in the United States a "pie" is the synonymous term for the English "tart" or French "tourte," meaning a compound, generally suggestive of dire misery to dyspeptics, composed of fruit and two crusts of paste. The thick deep pasty of the venison or beef of England and *foie gras* of France have their counterparts among us as pot pies, of which the principal contents are chicken. Their *habitat*, if we may be allowed to use a scientific term in the connection, is New England, where, with the traditional pork and beans, they form a staple exercise for the ostrich-like digestive organs of our Yankee brethren.

Four great firms have united their forces in this city and have formed the New York Pie Baking Company. Fifty thousand pies are daily manufactured, and we are informed that, in event of a strong demand, as many as 65,000 can be supplied. The capital stock of the company is $300,000. The buildings are constructed of brick, and are admirably arranged for the purpose intended. They are three stories high, with basement, forming the letter L, occupying four full lots twenty-five by one hundred feet, making a total of one hundred and fifty feet either way. The office is located on the second floor of No. 82 Sullivan street. The first or ground floor is used as a retail department. In the rear are located the bakery, storerooms, ice house, wagon sheds, etc. In the basement are affixed the ovens, ten in number, measuring ten by twelve feet, where also is in operation a new rotary device, which alone will bake nine hundred pies per hour. The first floor above is apportioned to the engine, boiler and delivery rooms. The second floor is the pastry department, where the mixing of the dough is done, and the third floor is given to the preparation of fruit, etc. On this floor is stationed a huge range, capable of cooking ten barrels of fruit at once, also two huge copper steam kettles with a capacity of two barrels each. An Otis elevator is brought into service here, to hoist and lower the pies and material of which they are composed.

The weekly consumption of material is 140 barrels of flour, 42,000 pounds of sugar, 5,000 pounds of lard, 500 barrels apples, 60,000 pounds pumpkins and squashes, 60,000 eggs, 500 bushels berries in their season, 800 pounds beef for mince, 1,500 pounds cocoanut, 100 boxes lemons, and spices accordingly. They also have in constant use about 150,000 pie plates, and give employment to 100 workmen, running 35 wagons.

Dr. HECTOR'S report on the coal deposits, as laid before the New Zealand Parliament which met on the 16th of July, is eminently satisfactory, and the value of some fields may be gathered from the following extracts. The Gray River district: The coal seam is 16 feet thick, and has been proved by underground working to be of uniform quality without admixture of slack, throughout an area of 30 acres. The quantity of coal obtainable without sinking is at least 4,000,000 tuns. The area of undisturbed coal above the water is more than half a square mile. A much larger quantity of coal can of course be obtained by sinking. Malvern Hills, Canterbury: The quantity of coal that can be obtained here, level free, is about 3,000,000 tuns. Dr. Hector, however, adds that neither mines can be worked to advantage (especially the former) till a railway is constructed from the mines to the sea, and considers the amount of coal discovered sufficient to warrant the expenditure required for this purpose.

PROFESSOR WATERHOUSE, in a recent paper on the resources of Missouri, gives the following description of the iron mountains, for which the State is famous: "Shepherd Mountain is 600 feet high. The ore contains a large percentage of iron. The hight of Pilot Knob above the Mississippi river is 1,114 feet. Its base, 581 feet from the summit, is 300 acres. The upper section of 141 feet is judged to contain 14,000,000 tuns of ore. The elevation of Iron Mountain is 228 feet, and the area of its base 500 acres. The solid contents of the cone are 230,000,000 tuns. It is thought that every foot beneath the surface will yield 3,000,000 tuns. At the depth of 159 feet, the artesian auger was still penetrating solid ore. These mountains contain enough ore above the surface to afford, for 200 years, an annual supply of 1,000,000 tuns. The iron is strong, tough and fibrous."

The Railroad Conductors' Association.

A convention of the members of the Railroad Conductors' Life Insurance Company was recently held in Louisville, Ky. The association, founded four years ago, has granted 5,260 certificates of membership. Of these, 1,020 holders have for various causes forfeited their places in the society, 519 have been permitted to withdraw, 40 have been killed at their posts, 71 have died of disease, and 17 have been disabled for life. The plan of the association is the levying of an assessment of one dollar on each member whenever a brother is killed, dies by disease, or is incapacitated from working. During the past four years, the Company has paid to families of deceased members the sum of $395,989, being a yearly tax on each survivor of $33.50.

During the year closing August 1, 1872, sixteen conductors met with death at their posts, of whom eleven were on freight trains and five with passenger trains. Two conductors had each an arm amputated and one lost a leg by accident; one died of sunstroke on the New Jersey Southern, three died of spine disease, and the astonishing number of twelve died of consumption, every one of whom were passenger conductors. It is a matter of grave consideration for conductors generally that this disease claims such a large percentage of their number, but it is presumable that the eating of hurried meals, keeping irregular hours and exposure to all weathers is the cause of it. One more reason may be added: the confined and vitiated atmosphere of the railway cars, in which conductors spend so much of the irtime. This of itself is enough to bringon fevers and consumption.

A New Theory of Volcanoes.

Mr. Mallet has propounded a new theory respecting volcanic energy, which, in principle, is exceedingly simple:

It is recognized by physicists that our earth is gradually parting with its heat. As it cools, it contracts. Now if this process of contraction took place uniformly, no subterranean action would result. But if the interior contracts more quickly than the crust, the latter must in some way or other force its way down to the retreating nucleus. Mr. Mallet, says the London *Spectator*, shows that the hotter internal portion must contract faster than the relatively cool crust; and then he shows that the shrinking of the crust is competent to occasion all the known phenomena of volcanic action. In the distant ages when the earth was still fashioning, the shrinkage produced the irregularities of level which we recognize in the elevation of the land and the depression of the ocean bed. Then came the period when, as the crust shrank it formed into corrugations; in other words, the foldings and elevations of the somewhat thickened crust gave rise to the mountain ranges of the earth. Lastly, as the globe gradually lost its extremely high temperature, the continuance of the same process of shrinkage led no longer to the formation of ridges and table lands, but to local crushing down and dislocation. This process is still going on, and Mr. Mallet not only recognizes here the origin of earthquakes, and of the changes of level now in progress, but the true cause of volcanic heat. The modern theory of heat, as a form of motion, here comes into play. As the solid crust closes in upon the shrinking nucleus, the work expended in crushing down and dislocating the parts of the crust is transformed into heat, by which, at the places where the process goes on with greatest energy, "the material of the rock so crushed and of that adjacent to it are heated even to fusion. The access of water to such points determines volcanic eruption."

Mr. Mallet has confirmed his speculations by observation and experiment; and he is able *to show* by indisputable calculation that less than one fourth of the heat at present annually lost by the earth is sufficient to account for the total annual volcanic action, according to the best data at present in our possession.

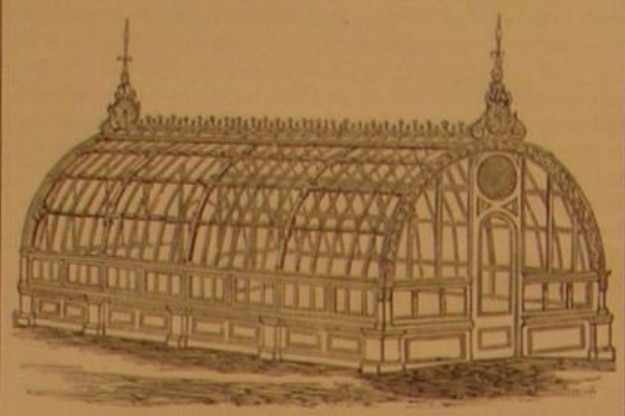
In brief, Mr. Mallet's theory tends to show that the volcanic energy of the earth is a declining force. Its chief action had already been exerted when mountains began to be formed what remains now is but the minutest fraction of the volcanic energy of the mountain forming era; and each year, as the earth parts with more and more of her internal heat, the sources of her *subterranean* energy are more and more exhausted.

THE London *Times* states that the attention of Professor Pepper, during his visit to the United States, will be directed to the "great recent development of mechanical and inventive ingenuity among their citizens, a development which has its gage in the extraordinary number of American patents which have been taken out during the last few years. A succinct history of the inventions of a given period would doubtless throw much light upon the other aspects of its civilization; and something like this is contemplated by Professor Pepper, as the ultimate result of his travels."

IMPROVED CONSERVATORY.

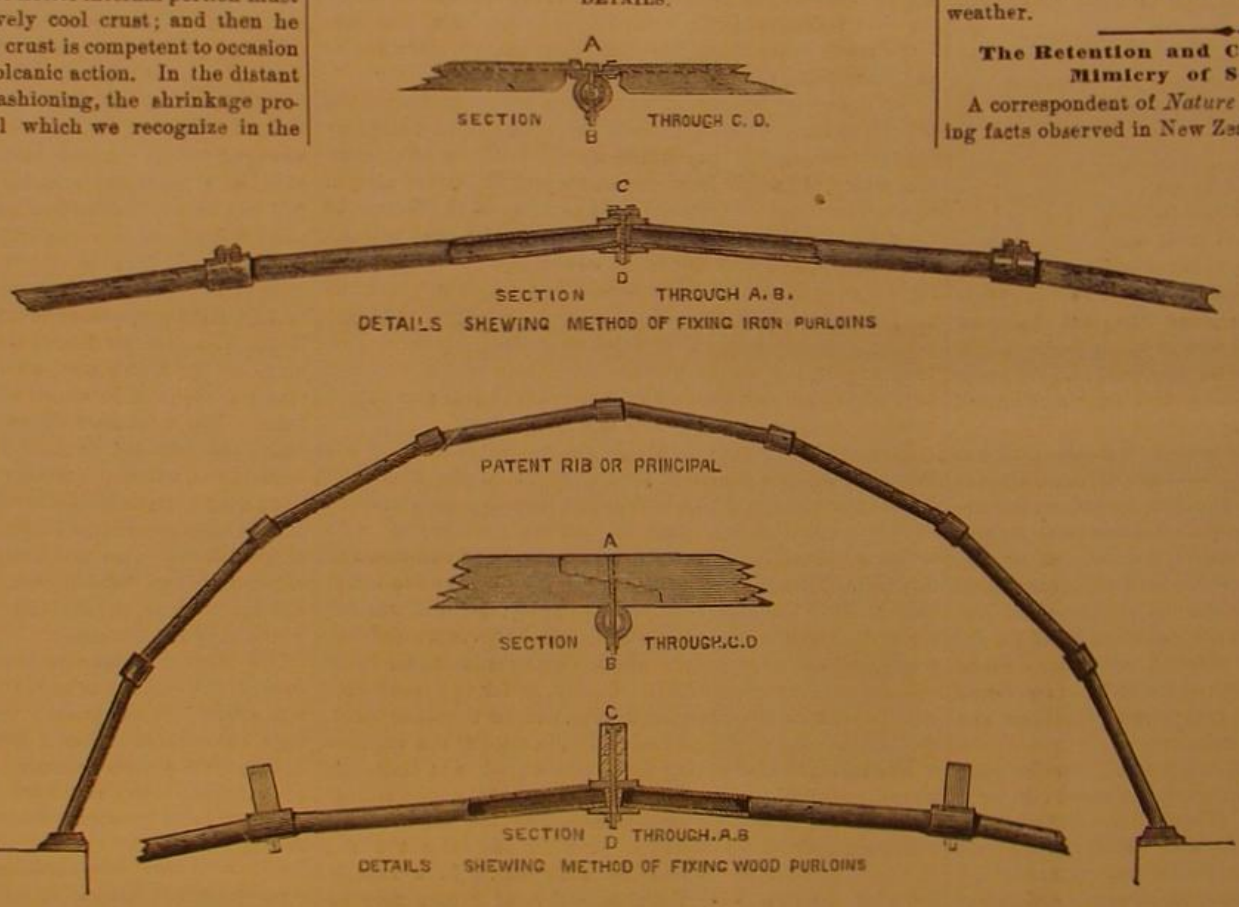
At the recent Exhibition, at Birmingham, England, of the Royal Horticultural Society, the gold medal was awarded to the elegant structure put up and exhibited by Messrs. Howitt & Co., of Westminster, London, of which we now give an illustration, for which we are indebted to the *Mechanics' Magazine*.

The conservatory in question was 30 feet long by 17 feet wide by 12 feet high, and the peculiarity of mode of construction consists in the roof principals being untrussed, and



IMPROVED CONSERVATORY.

in dispensing with the tie rods, so that a clear headway is obtained, although the roof springs within two feet of the ground. Though apparently in the form of a circular segment, the roof is polygonal, whereby the strains upon the straight tubular sections forming the sides of the polygon, being entirely in the direction of their length, are disposed in the direction of maximum of resisting power, and the sections are relieved from all transverse strain, so that their dimensions and materials may be minimized. The strains, concentrated at the joints, are there sustained and counteracted by the strength of the sockets, suitably proportioned,



which are bored to receive the tubular sections, at angles calculated to give the requisite curvature for the span of roof.

This rib or principal especially combines the extremes of strength and lightness, as far as practicable. The tubular sections of roof being socketed and not screwed together, and all the other parts fastened together by screws and bolts, houses constructed upon this principle may readily be taken to pieces and re-erected by unskilled labor. Although curved roofs have always been considered by the first authorities as the form best adapted for the propagation and healthy growth of plants, still the first heavy outlay for bent glass, added to the great expense, trouble, and annoyance of replacing it when broken, have, until Messrs. Howitt & Co. produced their polygonal roof, prevented the general adoption of curvilinear roofs. By Messrs. Howitt & Co.'s system, all the glazing is with straight panes, from purlein to purlein, which are bolted upon each socket of the ribs; and by a special arrangement the condensed moisture in the house passes from the inner surface of the upper panes on to the exterior surface of the next adjoining inferior, and so on to the bottom, so that all drip from condensation is avoided.

When the span of the roof exceeds a certain limit, an arrangement of braces is provided—in lieu of an undue and unwieldy strengthening of the sockets—so as to tie the alternate joints or sockets together, and thus give greater strength and rigidity to the rib or principal; but the depth of the truss thus formed is very moderate, and such as not to interfere with the headway.

THE city of Glasgow, Scotland, is supplied with water drawn from a highland lake, 34 miles distant. The cost of the works was $4,500,000.

Boracic Acid as a Preservative for Milk and Beer.

Boracic acid has lately come largely into use in Sweden for the preservation of milk, and a mixture of equal parts of this acid and alum has been applied for the preservation of meat, as well as for improving its appearance when discolored by packing in oaken barrels. The former is being sold under the name of aseptin, the latter as double aseptin. Hirschberg has lately made experiments in order to ascertain the precise value of the acid for the purposes described. In June, 1871, he dissolved fifteen grains and a half pulverized boracic acid in two pounds fresh milk, and kept it at a temperature of 54° F.; and for purposes of comparison, he left some pure milk in the same room. This was tested at intervals of six hours; after 96 hours, a very slight acid reaction was noticed; this did not become plainly visible till 120 hours had passed. The milk containing no boracic acid indicated a slight acid reaction after only 36 hours, and a strong acidity after 48 hours. The cream separated completely from the latter in 48 hours, while, on the former, only very little was found even after 120 hours. From these experiments it seems that boracic acid may be considered a very effective preservative of milk. A similar experiment was made with beer. On October 7, 1871, fifteen and one half grains of this substance were dissolved in a bottle of lager beer, brewed on August 30, and the same quantity was dissolved in beer brewed on October 2; both bottles were left loosely corked in a temperature of 56° F. Both kinds indicated a slight acidity, owing to carbonic acid, which was present before the boracic acid had been dissolved in them. This reaction remained, after the addition, without increase for a week. From October 14 to November 14, the beer was left at a temperature varying from 35° to 63·5° F., whereupon it became opalescent; but still no increase in acidity could be perceived (although, as has been stated, the bottles had been only loosely corked), but it was no longer fresh. The opalescence disappeared again after the bottles had been allowed to stand in a room with a constant temperature of 63·5° F., but the beer was not spoiled till the end of the month. It remains to be seen whether boracic acid is similarly useful in the hot summer weather.

The Retention and Coloring of Eggs and the Mimicry of Sound by Birds.

A correspondent of *Nature* forwards the following interesting facts observed in New Zealand: Regarding the length of time during which a bird can retain its egg, the case is mentioned of a kingfisher that began six nests, abandoning all in turn and depositing her egg in the seventh, after working for over six weeks in a condition analogous to pregnancy. The labor was incessant, three of the homes that were excavated in a turf chimney and abandoned being so far furnished that a deposit of eggs must have been imminent on three occasions during the above period.

In answer to the question: Can a bird influence the color of its eggs protectively? the writer says that a female bittern, when kept in a grassy enclosure, laid an egg of a pale bluish green color, precisely like that of a heron. The egg of the bittern naturally is of an olivaceous buff tint which harmonizes well with the half faded leaves of aquatic plants, of which the nest is often built. It is doubtless probable that the egg thus became tinged to secure for it the protection of the verdure of the grass in which it was deposited. Another and more curious instance is that of the whistler, or small cuckoo placing its egg in the nest of the blight bird. The latter is a bird foreign to New Zealand and builds a suspended nest; the eggs are clear blue green in color. The egg of the cuckoo is greenish dun, but in order to place it in the hanging nest where it will be free from reptilian invaders, the writer has found cases where it has manifestly changed the color to one closely resembling that of the eggs of its dupe, so that the latter would fail to distinguish the addition to its deposit.

Referring to the mimicry of sounds, it is stated that, in camping for some days on a river bed, the author frequently heard what he took to be one of the notes of the *hæmatopus* but that wader was nowhere to be seen; at length he traced the call to the piopio, a bird with feeble powers of flight, yet one that delights in the open glades of river beds. The mimic cry was always given when near to a stream just where the redbill (*hæmatopus*) would be likely to be found. A pair of redbills can drive away a hawk; now a hawk, "from his place on high" perceiving something near the water, might forego its swoop on hearing the mimicked note of the wary yet bold redbill. The common gray warbler, it is also stated, gives an exact imitation of the cry of the common tern, one of the boldest birds in defence of its young.

THE fact that the atmosphere at and near the sea shore is richer in ozone than it is in inland places has been explained by M. Gorup Besanez, who finds by experiment that ozone is formed by the evaporation of water. Ozone is oxygen in a most active condition.

ROLLING SHUTTERS.

The invention represented in our engravings consists of a number of peculiarly formed wooden slats, so attached together as to form a rolling shutter. Fig. 1 is a sectional and also a front view of the device, which is shown in its full size. The lower edge of each slat has a curved groove, A, and a heel, B, which corresponds with the tongue, C, and groove, D, of the upper edge of the slat next below. The heel, B, forms the fulcrum upon which the lower slat turns when the shutter is wound upon the roller. When unrolled, the tongue, C, falls into the groove, A, with absolute certainty. The slats are connected together by means of leather straps screwed to the backs, as is shown in the section in Fig. 1 and in the rear view in Fig. 2, so that a flexible shutter, that cannot fail to joint even when warped, is obtained. In Fig. 3, the invention is represented as applied to a store window, a portion of the right hand shutter being broken away to exhibit the mode of construction which, from the fact of there being no concealed hinges or other mechanism except the simple appliances above described, is both inexpensive and efficient.

For further information, regarding the manufacture of the device, or for state rights, address Hardy & Voorhees, foot of North First street, Brooklyn (E. D.), N. Y. Patented through the Scientific American Patent Agency, May 7, 1872, by Alois Kohler.


Fig 3

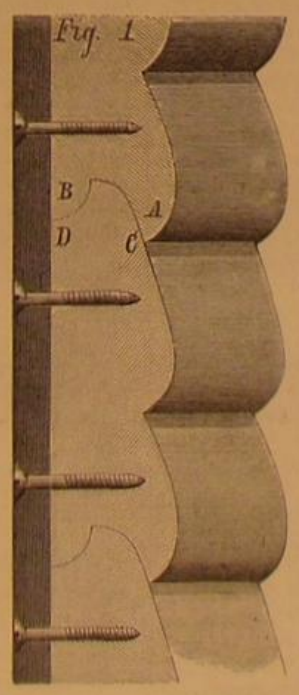


Fig. 1

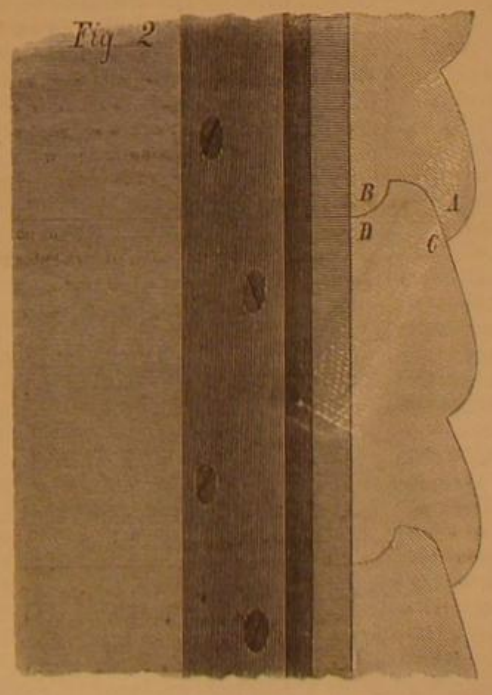


Fig. 2

Lavender Oil.

In England large tracts of land are devoted to the cultivation of the lavender plant. Only a moderate application of manure is necessary at the outset in the autumn, when the planting takes place; and after the first year's harvesting, the plants have grown to such dimensions that every other row has to be taken out, and every other plant in the row that remains. The three years' growths are the first to come to maturity, and then the second, and then the third. The harvest takes place in August. The cutting, which is done by the sickle, appears an art of itself, which affects the crop in the future year. The laborers are followed by women and girls, who immediately pack and tie the lavender up in mats, to protect it from the rays of the sun, or otherwise the quantity of oil to be extracted would be reduced before it could be taken in hand at the distillery. Small quantities have been previously cut before they are fully ripe, for Covent Garden market, or for sale about the towns and villages in the neighborhood. The distillery process is carried on upon the spot, as the volumes of smoke from several chimneys and the strong odor of herbs around the buildings sufficiently testify to some very odoriferous process within; for it must be remembered that peppermint, rosemary, dill, camomile, as well as lavender, have to find their way to the same crucial test. Beneath a brick-built shed stands a row of stills, with what are called worm tubs attached to each still. Upon the ground floor, the furnaces are being attended and the percolator watched, as a trickling noise indicates that the oil is being extracted by the process going on. Above the furnaces are the stills, of dimensions sufficient either to contain half a tun or a tun weight of herb, and the building is spacious enough to admit of carts being driven in for the purpose of unloading. The still is filled thrice in four and twenty hours, namely, eight hours to a run. The men get upon the upper floor, remove the still head by a lever, then take the lavender from the mats and tread the stalks down with their feet until the copper is tightly filled to the brim. Liquor at boiling heat is then taken from the top surface of the worm tub, although at the bottom and lower surface the water is quite cold, and the furnaces are set to work. The worm consists of piping attached to the head of the still, and passes round and round the tub which contains the cold water. The men watch the bringing over of the still, that is, the moment when the liquor begins to flow over the head into the worm. Directly it does so, they know that the oil is running, and immediately damp down the furnaces. The boiling liquor from the herbs, by passing through the tubing immersed in cold water, becomes condensed, and the oil separates from the water and runs into the percolator at the foot of the worm tub. This bringing over is the most critical point in the whole operation; then great attention and experience are needed, otherwise the herbs, both stalk and flower, might be taken into the worm, and the oil be spoiled. So well practised, however, are the men employed that what is called a "run foul" is scarcely known during the whole of the distilling season. From thence it is taken and placed in dark glass bottles with short necks, containing 4 lbs. to 7 lbs. each, ready for merchandising. When one lot has been distilled, the still top is removed by the lever, and the charge taken out with long forks. The steam and vapor that arise are very great, for the uninitiated quite overpowering; and what is termed the "walk" being very heavy, the men themselves have to labor hard to get out the refuse, which is thrown just at the back of the building for manure. The coppers are filled up again with herbs, fresh water is pumped into the worm tub to supply what has been taken off the surface for the still, and to replace what has passed off in the evaporation that has been always going on, and the process again proceeds. The quantity of oil extracted from a tun of lavender varies according to the influence of the season; from 15 lbs. to 16 lbs. is considered a fair average; very seldom it reaches 21 lbs., sometimes not more than 10 lbs. The distilling lasts about two months, from the first week in August to the second week in October, according to the abundance or otherwise of the surrounding crop. This business is separate from the growing; the small growers as well as the large take their crops to the distillery, and pay a certain agreed upon rate per tun.

THOSE who have lately become conscious of the existence of certain facts are invariably apt to suppose that those facts have only lately arisen. After a changed state of mind has made us observant of common occurrences which we were before indifferent to, there often results the belief that such occurrences have become more common. It happens so even with accidents and diseases. Having lamed himself a man is surprised to find how many lame people there are; and, becoming dyspeptic, he discovers that dyspepsia is much more frequent than he supposed when he was young. For a kindred reason, he is prone to think that servants do not behave nearly so well as they did during his boyhood—not remembering that in Shakespeare's day the service obtainable was similarly reprobated in comparison with the "constant service of the antique world." Similarly, now that he has sons to establish in life, he fancies that the difficulty of getting places is much greater than it used to be.—*Herbert Spencer.*

PLATING AND COATING METALS.

A new process for coating metals has been recently patented by M. De Lobstein, of Paris. The improvements in the method of plating are made with a view to obtain such an adhesion of the covering metal as will subsequently permit of a metallic deposition upon the underlying metal by the application of heat. In order to get an electro-chemical covering deposit of such thickness and crystaline structure as to answer to this purpose, the inventor employs very dilute alkaline and acid baths, which are used cold. The tin bath consists of 1000 parts of water, 22½ parts of caustic soda, ½ part of cyanide of potassium, and ½ part of tin salt. The copper bath consists of 1000 parts of water, 25 parts of cyanide of potassium, and 12½ parts of carbonate of copper. The zinc bath consists of 1000 parts of the liquid supplied by the renewal of the batteries, or of 1000 parts of water and 30 parts of sulphate of zinc produced from the batteries. The lead bath consists of 1000 parts of water, 22½ parts of caustic soda, and 2½ parts of the residuum of the batteries. For the rare or precious metals—silver, gold, nickel, bismuth, and cobalt—the well known cold solutions are used. The battery for a 500 gallon bath is composed, first, of a lead trough, second, a brass sheet with three wooden cross pieces placed on it, a zinc sheet being placed on these wooden pieces. Afterwards the trough is filled with 60 liters of water. This pile works at three different stages of power of the electrical current, according to the effect to be produced. For the first stage it suffices to pour into the water of the trough 400 grammes of sulphuric acid per day. For the second stage or combination, one kilogramme acetate of lead mixed with three kilogrammes of sea salt is put under the zinc sheet, and care is taken that the liquid of the pile covers the zinc sheet. This cell gives a very regular current during eight consecutive days, without any other ingredient. For the third stage, to the action of the acetate of lead is added that of the sulphuric acid, as it is said, for the first stage. Metallic lead is the residue of the acetate, and the zinc consumed in proportion of work done is used for the zinc baths. In order to set the cell to work, only trifling quantities of acetate of lead, of sea salt, and sulphuric acid are wanted. The articles to be put in the bath are cleaned, according to the nature of their metal, either by immersing them in potash solution or solutions of sulphuric or muriatic acid. The baths are supplied with anodes of the same metal as the covering to be obtained. As soon as the articles put in the bath are sufficiently covered, they are withdrawn, washed with fresh water, and carried to a stove, where they remain submitted to the degree of heat which is required for the melting of their electro-chemical cover, which occupies from five to thirty minutes. By these means, in consequence of the melting together of the crystaline particles which form the electro-chemical cover in its whole depth, a cover like to that of a melted metal is obtained. If it is desired to cause the soldering of the cover with the metal underneath, the heat is raised; the metal under the cover, dilating and evolving metallic vapor, becomes superficially combined with the electro-chemical covering and effects the soldering. If it is desired to obtain an alloy of two metals or more, the article is covered with different electro-chemical layers; afterward it is submitted to the action of the heat, and the melting of the layers gives either various alloys or new metals adhering and soldered to the under metal. The products of this process acquire all the qualities of a melted metal, namely, malleability, ductility, cohesiveness, etc., and can be softened, polished, rolled, and worked, in the same manner as if they really had been covered with a melting metal. It has already been stated that this system makes use of heat to alter the former constitution of the electro-chemical metal, which is formed with crystaline deposits, and add to the same the very properties of melted metal, namely, tenacity, ductility, malleability. To attain the required end, namely, the formation of a very small and uniform crystaline coating, cold baths very slightly concentrated are used, with batteries having large surface, giving great power, and continuous and especially regular in working. The chemical formula of the constitution of the baths is therefore of an exceptional importance, as it would be impossible to go materially below that formula, and also to go beyond its small degree of concentration, without obtaining bad metallic deposits that would be injurious to the whole system. Another part of the invention relates to the production of ornamented metallic articles by means of electricity and heat. The object, coated with a sufficient coating of metal, is placed in the stove and submitted to a temperature more or less inferior to the melting degree of the coating metal. The coated metal, which is called "subjacent

metal," and the coating one, which is called the "electro chemical metal," oxidize when thus connected in a different manner from that in which they would had each been separately submitted to the same degree of heat.

Correspondence

The Unequal Expansion of Metals.

To the Editor of the Scientific American:

A description of a fire alarm was published two or three years ago, taken from *L' Union Medicale*, a French journal; it described an arrangement, contrived by M. Robert Houdin, which consisted of steel and copper blades, soldered together and fixed on a board, like a knife blade standing with its edge or back up, only touching the board at one end of the blade where it was fastened and connected with one pole of an electric battery; the other end was near a button connected with the other pole of the battery. Owing to the unequal expansion of the metals, when heat was applied the strip would bend and touch the button, and a bell connected with the battery would ring as long as contact continued.

About the time of said publication, a fire detector was for sale at 80 Cedar street, New York. I do not remember the name of the proprietor of it, but it was dependent on the same principle as Mr. Houdin's invention; but instead of being connected with the bell by electricity, it acted like a hair trigger, releasing a spring which was connected by a wire with a bell rung by mechanism; this alarm could be set to ring at any degree of heat, even by breathing upon it, which I saw done. Copper and iron were the materials used. I thought this an excellent safeguard, and one that no house should be without. It should be placed in the basement, where a fire may make such progress at night as to cut off the retreat of the family above, before they were awakened by it; but I have since heard no more of the device.

Having one of Holmes' burglar alarms in my house, I was desirous of having a fire alarm connected with it, and finding by Molesworth's tables that expansibility of zinc over iron was nearly three times greater than copper, I soldered a ribbon of tin and of zinc together; I made it fourteen inches long, and rolled it in a spiral form. One end was fixed in my basement, and one of the battery wires connected with it; the other end was free, and near to it the end of a wire, attached to the other battery wire. I have thus a very good fire alarm, large quantities of which might be made to cost not over two or three cents each.

I have read of a plan of distributing, throughout a store or factory, water pipes, perforated with many holes, so that the whole building or sections of it might be sprinkled in case of fire; I wish to suggest that, by using the Cedar street trigger arrangement, only the part where the fire was need be sprinkled. The supply pipe should run the whole length of the building or ceiling, with pipes leading from it across the room at moderate distances from each other, and each of them should be supplied with a detector or alarm to let the water into the one that had unusual heat under it, and at the same time ring a bell; but as all machinery is liable to get out of order, a night watch should not be dispensed with.

I do not know how long the use of the principle of the unequal expansion of metals, to show heat, has been known; but 30 or 40 years ago, Mr. Baure, a very skillful watchmaker in William street near Maiden Lane, New York city, showed me a thermometer which he had made, inclosed in a watch case, in which the degrees of heat were indicated by a hand moved by a small spiral ribbon of two metals, which he had soldered together. H. M. S.

Yonkers, N. Y.

Canal Boat Propulsion.

To the Editor of the Scientific American:

On page 259 of your current volume, a correspondent signing himself J. A. D. states that "Voyageur's" method of propelling canal boats is simply a reproduction of something old and, he furthermore make a suggestion which has the lack of originality which he attributes to "Voyageur." His proposition to use false sides running from the bow to astern of the boat to destroy the swell has been acted upon some time ago. The appliances, substantially the same as those which he mentions, were practically tested at Chicago over a year since, though not on a scale to warrant the assertion that the attempt would be as successful, in ordinary canal navigation, as in the experimental trial.

The sides extended along the length of the boat and a few feet astern, and were so constructed as to admit of their being raised to facilitate a free passage of the locks. The great width of such a boat necessitated an arrangement to adjust the false sides, and this feature alone was the only one that met with condemnation, as the awkwardness of the sides in working proved the impracticability of making them serviceable except when in position in the water. L. M. H.

Boston, Mass.

The August Meteors.

To the Editor of the Scientific American:

The August meteors amounted to but little at this point. I saw probably 50 or 60 up to 11 at night on the 9th, and somewhere about half as many up to the same hour on the 10th. On the 9th, nearly all made their appearance in a northeasterly direction and, apparently rising as they approached, vanished near the zenith. On the 10th, several passed from east to west and two or three from south to north, but the most had the same general direction as on the 9th.

Only two or three gave a red light with a small rocket like trail; all the others gave white or yellow light and were apparently small, and all seemed to have a uniform rate of speed. A very few others were seen in other portions of the sky, moving in various directions, similar to those usually seen on summer nights.

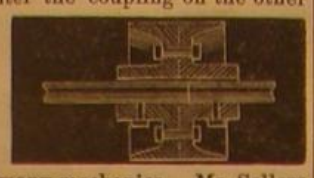
Louisville, Ky. W. L. DAVIS.

Transmission of Motion.

To the Editor of the Scientific American:

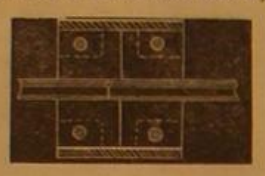
The lecture on the above subject by Mr. Coleman Sellers, as reported by you in your issue of October 19, is very interesting, as is everything that Mr. Coleman Sellers says on mechanical subjects, for it is always worthy the earnest consideration of mechanics. Anybody who knows the Sellers coupling knows that it is as near perfection in its way as anything can be, while at the same time the common plate coupling that he speaks of is not quite so bad as he believes, if it be only properly made.

Now the plate coupling can be made anywhere, and at any time, and is sometimes most convenient, as it does not require very nice fitting to make a comparatively good job, as Mr. Coleman Sellers thinks. He shows that, in order to keep the coupled ends of the shafts in line, the bolt holes in the plates must be reamed together and the bolts turned to fit. But that is not the way that good mechanics make the joint; they simply drill the holes large enough to take rough bolts, and let the end of one shaft enter the coupling on the other about ⅛ of an inch, thus:



which keeps the ends in line; and there are also ways and means of tightening the couplings on the ends of the shafts not spoken of by Mr. Coleman Sellers, but well known to many mechanics. Mr. Sellers says that it is considered good practice even now in England to make the ends of shafting larger than the body parts, and to put the pulleys on in halves.

Now I have good reason to think that I know better what is good practice in England than our friend Mr. Coleman Sellers does, and his information in that respect is new to me. I could tell him what I saw as practised there 15 years ago, and that was a coupling made in four pieces, with an outer shell to cover the whole, thus:



Bricksbury, N. J. JAS. GARLAND.

Reckless Engineering.

To the Editor of the Scientific American:

The Springfield, Ill., Iron Company have just started a very substantial and convenient rail mill, supplied with the Siemens gas furnaces. The motive power is furnished by seven return flue boilers 3½ feet in diameter by 24 feet length, with two 15 inch flues, giving a fire surface of about 340 square feet each. They are set, four in one nest, with a steam drum running across them, and connected with each by the usual nozzle; two are similarly placed in another nest, while the last one stands alone. All are connected to one steam pipe, but each can be shut off. The one which stands alone has a three inch safety valve, which is evidently not large enough for its fire surface by nearly half its area; the two in the next nest are provided with one three inch safety valve also, and the four others are also supplied with but one safety valve of the same size; the pressure carried is one hundred pounds. This arrangement has worked well so far, because all the boilers together do not furnish steam enough to run more than half the mill, and four more are ordered. When steam is up, the 40 inch engine carrying the rail train is started; and when, after an hour or so, it drops to 40 pounds, the engine is stopped, and word sent to the firemen to open the furnace and breeching doors, when in about five minutes the pressure runs up to 100 pounds, blowing off violently. Now is there any excuse for such engineering in this age of cheap handbooks, by which any school boy may post himself on the rudiments, at least, of the science; and should not the least spark of common sense teach a man that a safety valve which may be sufficient for one boiler is not big enough for two, to say nothing of four?

But this is not all. In this mill, one of these boilers was tested by driving a plug into the hole where the safety valve should have been, putting a brace from there to the roof; and, without a gage on the boiler, steam was got up, when a visitor, getting a little scared, screwed on a gage and turned the cock, when the hand jumped to 60 pounds.

If any body can beat this for stupid and criminal carelessness and ignorance, I should like to know of it. Thus a hundred lives are constantly imperiled in this mill, to say nothing of the large amount of money invested; the latter, however, is of little consequence, for if capitalists will place their property in the hands of ignorant numskulls, they ought to suffer. This is either a case of penny wise and pound foolish, or one of misplaced confidence. I rather think it is the latter, for the directors of the company appear desirous of securing good men, and are said to pay liberal salaries.

A DISCIPLE OF WATT.

REMARKS:—A common English rule for area of safety valves, allows one half square inch for each square foot of grate surface with natural draft. The French law requires an area of $A=\frac{22{\cdot}5}{P+8{\cdot}62}$, where A— area in square inches per square foot of grate, and P— the pressure as indicated by steam gage. This is also adopted and recommended by the Committee of the Franklin Institute*. The United States regulations, as applied to steam vessels, require 20 square inches area for each 500 square feet of effective heating surface, or $A=\frac{H(\text{eff.})}{25}$.

*Journal of the Franklin Institute, Vol. 54, p. 336.

Professor Thurston uses two formulas for general practice; one is based upon area of heating surface and the other upon the amount of coal burned per hour. They are. $A=\frac{4C}{P+10}$ and $A=\frac{5H}{2(P+10)}$. He prefers the former for all exceptional cases. In the first three formulas, A— actual area of valve in square inches, H— area of heating surface in square feet, C— coal burned per hour, and P— pressure per gage. Measured by either rule, the boilers described by our correspondent need a three inch safety valve to each, and we must agree with him that the case is one that calls for a thorough investigation and for the severest judgment upon whoever may be responsible for such professional malpractice.

The ordinary safety valve, as usually proportioned and constructed, is very defective; it rarely acts satisfactorily, and probably never rises so high as to afford an opening equal to the disk area of the valve. There are, however, a number of valves in the market which are vastly better than the common valve and not very much more expensive. Intelligent and conscientious proprietors and engineers cannot hesitate to adopt some one of them promptly, if they once realize the magnitude of the responsibility which rests upon them.

We have seen a marine engine suddenly stopped when steaming at full speed, the pressure being the maximum allowed, 25 pounds by the gage, and have seen the safety valve rise at 27 pounds and yet fail to check the increase of pressure until the gage showed 37 pounds above the inspector's test, in spite of every effort on the part of the engineer to check the formation of steam by opening doors and pumping cold water into the boiler. Can the continued use of a valve of such construction be in any way justified? The valve referred to was of the full area required by law, but, like all ordinary valves, could not be given full opening by any safe over-pressure of steam.—EDS.

The Ellis Vapor Engine.

To the Editor of the Scientific American:

I have interested Mr. Corliss and the Corliss Steam Engine Company of this place in my invention, and they are erecting a 40 horse power Corliss engine to be worked as a vapor engine on my plan, to drive the blowers for their foundery. It is to be arranged so as to give the matter a most careful test in the most economical class of engine, and is to be especially arranged so as to give the most accurate results as to amount of coal consumed and power developed, both by the steam and the vapor cylinders. All is to be done under the personal superintendence of Mr. Corliss himself, which will, I trust, make the result satisfactory to engineers throughout the world and to yourself. I will avail myself of your kind offer to publish the result of such a trial; and I will send you the original copy of the results, with diagrams, etc., verified by Mr. Corliss and his engineers, as soon as they are completed, whatever they prove to be.

Providence, R. I. JOEL A. H. ELLIS.

Explosions of Benzine.

To the Editor of the Scientific American:

You made mention some weeks since of an explosion of benzine which was being used by some men cleaning machinery, and it called to my mind a case that happened some years since. Two men were in the midst of an explosion of benzine gas; both died some days after. I visited one of them after death. The skin came off all over his body, excepting where a broad leather belt was around his loins. About two days after the explosion happened, he was lying on his back and said there was fire under him. The attendants examined and found the bed clothes on fire, and we concluded that gas was coming out of him, and that the heat of his body caused combustion.

Cleveland, Ohio. WILLIAM WARD.

Ball Lightning.

To the Editor of the Scientific American:

In your issue of September 28, on page 196 current volume, C., of Cleveland O., has a letter averring that he witnessed, from an elevated position, the phenomenon of ball lightning as it passed from one cloud to another. C.'s observation is not to be disputed, for almost every one has frequently seen essentially the same thing; but his conclusion cannot be proved so satisfactorily. A dazzling light accompanied by a loud report is not always lightning, else its exhibition was alarmingly frequent during our late unpleasantness.

A meteor coincidental with the storm has been mistaken by your correspondent for a peculiar display, or, perhaps, according to his judgment, for a peculiar kind of lightning.

Shreve, O. M. D.

[For the Scientific American].

Concerning the Nature of the Hydrogen Atoms in Benzol, and of the (SO^2OH) Group.

The object of the author in the following researches was to determine, so to say, the "sex" of the successive H atoms in the important radical benzol. Their nature, in the case of the fats, where the C atoms are little, if at all, coupled with valences with each other, has already been exhaustively investigated, experiments having shown that, upon the displacement successively of the H atoms by a negative element or molecule, the radical finally becomes so essentially "soured" as to assume the character of an acid of the hydrochloric type, its H being replaceable by a metal. For example, hydride of methyl, CH_4, may be cited, where, upon the displacement of three of the H atoms by the strongly negative group NO^2, the resulting nitroform $CH(NO^2)_3$ readily exchanges its H for a base. Now to determine whether this were equally true of the "aromatic series," I chose the sec

ond of the bromine substitution compounds of benzol ($C_6H_4Br_2$) and replaced successively the fourth and third H atom respectively by the strongly negative groups (NO^2) and (SO^2OH), giving a finely crystallizing acid of the formula ($C_6H_2Br_2(NO^2)(SO^2OH)$). Now in theory this acid should be bibasic in its nature, the second H atom of the original benzol and that of the (SO^2OH) group being both replaceable by bases. Experiment denies this, *in toto*; salts of the acid with the most powerful + elements, K, Na, Ba, Sr, Pb and Cu, presenting on analysis the formula $C_6H_2Br_2(NO^2)(SO^2OH)$ proving conclusively that the displacement of the H atoms in a compound of the aromatic series by a + element is impossible. Concerning the nature of the SO_2OH group, these investigations lead to the inference that it possesses but little negative influence, in a compound, at least, so thoroughly saturated with + C as benzol.—*Rich. Douglas Williams, Ph. D.*

[For the Scientific American.]

ON CERTAIN UNDESCRIBED PROPERTIES OF THE CONCENTRATED SOLAR RAYS.

By George Robinson, M. D., Fellow of the Royal College of Physicians of London.

Some thirty years since, I accidentally noticed that the sun's rays, concentrated by an ordinary lens and directed upon the hand immersed in water, produced immediate pain with burning heat and vesication. This experiment, varied and repeated at intervals on different living animal tissues and under different circumstances, always led to the same result. But if the concentrated rays were fixed for an instant upon the head of a small aquatic animal, death immediately resulted before vesication occurred. On dead animal matters similarly treated, no perceptible effect was produced.

The physiological action was, as I have stated, always instantaneous but when a thermometer having a bulb of black glass was immersed in water and the rays concentrated on the bulb for some time, the instrument at the end of ten minutes only indicated a rise of temperature from 60 to 80°. A few years since I happened to mention these observations to my venerated friend, the late Dr. John Davy, and at his request I prepared a short account of them which he communicated to the British Association for the Advancement of Science, at its meeting in 1867.

The rationale of the results witnessed in this simple experiment always seemed to me obscure, and to indicate the possible existence in the sun's rays of some property or force that had not hitherto been investigated. Under this impression and being myself engaged in practice, I took advantage of an opportunity to draw the attention of the illustrious Faraday to this subject some fifteen years since, in the hope that he would apply his powerful mind to its elucidation. But in a kind letter, he told me that he was then overwhelmed with work and could not undertake the inquiry.

Happening to be in New York during the recent hot summer, I have performed a few additional experiments; and so far as they go, they certainly tend to confirm my belief in the existence of a hitherto unrecognized property or force in the solar rays.

In attempting to ascertain the precise nature of this force, I could not rely on ordinary thermometers, for they are actuated gradually and slowly while the pain and sensation of heat are instantly felt. Neither would the usual thermo-electric apparatus meet the difficulty, as my observations must be made in water as well as air. I finally concluded to rely on Nature's own instrument, the nerves of sensation as they exist in exquisite perfection in the integuments of the finger. In the propriety of this course, I was confirmed by a remark of Professor Tyndall that the optic nerve is more sensitive to the heat rays present in light than any thermometer.

In experimenting, I generally placed on the end of the forefinger of my left hand the substance under observation, steadying it with the thumb, and dipping the hand when necessary into water so as to have a layer of that liquid at least an inch thick above the skin. The lens employed was of 7 inches focal distance; and in using it, I always threw the focus behind the object examined so that the rays should traverse it instead of being concentrated upon it.

Whenever in experiments in air there was the slightest appearance of singeing or other action of heat on the substance examined, the observation was rejected. Care was taken not to press the finger firmly against the substance, but merely to maintain the slightest possible contact. Under these conditions, a burning painful sensation was felt when the concentrated solar rays were transmitted through the following substances both in water and air, namely, two layers of blue glass, black leather (glazed and unglazed), green leaves, thick white card board, the same covered with blue or red paper, six layers of pink paper, earthenware, oil clot hand common brown glue a quarter of an inch thick.

Now taking only these substances into consideration, it is, not easy to explain on the views now current how rays could pass, through an opaque non-conducting substance like oil-cloth, so as to pain the finger placed beneath it even when both were immersed in water. But my observations came still more into collision with received opinions. Thus it is generally stated in scientific works that a crystal of alum is athermanous, that while allowing the rays of light to freely traverse it, those of heat are arrested. But on directing the concentrated rays through a crystal of perfectly transparent alum, I found that it produced a burning sensation in the skin both in air and water. It is evident therefore that Melloni's conclusions with reference to athermanous bodies do not apply to the concentrated solar rays, if the pain were produced by heat. Another still more curious and unexpected result was obtained. It is generally believed that metallic surfaces reflect heat rays of all degrees of refrangibility, and are consequently impenetrable to them and absolutely athermanous. But I found that a burning heat was felt in the finger when the concentrated rays were transmitted through double tin foil and thin sheet iron. The following experiment illustrates this point very clearly: I took a mirror formed of plate glass a quarter of an inch thick, silvered in the usual way with tin amalgam, on the back of which was a thick layer of red paint, well dried. I let the painted back part of the mirror rest upon my finger both in air and water; and on concentrating the rays upon the glass, throwing the focus as usual behind the mirror, the burning pain in the finger was instantly felt by myself and others. The mirror itself was in no way affected by the experiment.

Here the light rays were of course excluded and those of radiant heat were, according to the generally accepted laws of physics, prevented from penetrating to the finger by the intervening metallic coating of the mirror, to say nothing of the layer of red paint; and yet rays capable of producing pain and inflammation in the integuments of the finger undoubtedly passed through, 1, the water, 2, the thick plate glass, 3, the layer of tin amalgam, and 4, the coat of red paint.

Now what were these rays?

They were very refrangible, they possessed great penetrating power, they acted instantaneously and energetically upon the tissues of the living animal body. These are obvious and palpable conclusions, but without additional facts we cannot go much further in reasoning on the subject.

That the concentration or mere convergence of the sun's rays does really increase their penetrating power is, I think, highly probable, and this may partly explain some of the facts observed. But I still cling to the belief that the conditions present, for instance in the last mentioned experiment, rather point to the presence in the sun's rays of a force acting specially and as a powerful stimulant or irritant on living matter. It may be that the more refrangible heat rays thus exercise on vital structures a special influence analogous to the actinic or chemical power of the more refrangible rays of light. I append other experiments, which also tend to render it probable that the irritation and pain in the living tissues, observed under these circumstances, are not induced by common heat. Ordinary albumen being coagulated at a temperature of about 150 F. might, I thought, serve as a test of the presence of common or thermometric heat in the sun's rays, and so assist in determining the question whether the burning pain was really due to heat or to some other force.

Some perfectly transparent egg albumen, placed on glass or on white earthenware, was not at all changed by the concentrated sun's rays; on any dark surface, however, it was instantly coagulated, and this effect occurred both in air and water. Thus when poured on dark purple paper and the rays concentrated upon it in the slightest degree, the albumen presented at once an opaque clot.

I took some of this purple thick glazed paper, and wrapped it round my finger. On the purple surface, I placed some albumen, and on the latter, a second layer of the purple paper. I then carefully concentrated the sun's rays so as to avoid burning or injuring in any way the paper, throwing the rays through it and the albumen; I instantly felt the burning pain in the finger, and then withdrew the lens and examined the albumen placed between the two layers of purple paper. *It was not at all coagulated.*. Here the irritating rays passed through two layers of purple paper and a film of albumen without producing any effect on those substances, but instantly caused pain in the skin beneath. A little of the same albumen placed upon the same paper was at once coagulated by the same condensation of the sun's rays, so that, if any rays of heat had passed through the first layer of paper, they ought to have produced coagula in the albumen resting upon the second layer of purple paper. As they did not do so, the probability is that the pain was not occasioned by ordinary heat.

In another experiment the mirror above mentioned was placed upon the finger, a layer of egg albumen intervening between the skin and the back painted surface of the mirror. The rays were then gradually concentrated upon the upper glass front of the mirror until a burning pain was felt in the finger beneath the latter. The albumen, being then examined, was *not* coagulated.

In leaving this subject for the present, I shall merely remark that the phenomena of "sun stroke" are probably due to the peculiar rays producing the pain and other physiological and pathological effects noticed in my experiments. This inquiry may therefore not be without some practical interest to the members of the medical profession.

In the hands of more skillful investigators, aided by the refined scientific appliances of the present day, there is every reason to hope that the obscurity still surrounding this subject will be dispelled, and that we shall hereafter be enabled to recognize more fully the nature of the intimate and beneficent connection undoubtedly existing between the solar and vital forces.

New York: October, 1872.

Electrical Batteries.

Mr. E. G. Bartholomew lately read a paper on this subject before the Society of Engineers, London.

The author said he has always regarded it as an apt illustration, to draw a parallel between the electric telegraph and the steam engine. The conductor may be compared to the steam pipe; the one conveys the electricity from its source, the battery, to act upon the instrument: the other conveys the steam from its source, the boiler, to act upon the engine. Again the instrument will bear a strict comparison with the engine, for both are mere machines constructed in such a manner as to be best influenced by the power conveyed to them. There then remains, in either case, the source of power. Now, what a steam engine would be without the boiler, a mere combination of inert pieces of mechanism, the electric telegraph would be without the battery. For this reason it has been thought that the battery forms a subject worthy of a separate notice.

The progress of telegraphy may indeed be regarded as dependent in a large degree upon our knowledge of the battery.

The identity of electricity, from whatever source derived, whether from the friction of certain substances, from evaporation, from the chemical action set up under certain conditions, from magnetism, or from heat, is not doubted. It may differ in degree but not in nature. If it be true, as has been asserted, that when we eat an egg with a metal spoon we generate electricity, the electricity so evolved will be identical with the flash which rends the oak. And certain substances, and certain combinations of substances, afford greater facilities for the development of the force than others; and it has been a part of the study of the modern philosopher to ascertain by what means the greatest amount of electrical force can be obtained at the least possible cost. The well-known story of Galvani's accidental discovery of a force hitherto unsuspected requires no repetition here, nevertheless, we are bound to ascribe to him the honor of finding that certain metals when converted by a fluid would develope electricity; and when Volta subsequently produced a real battery by examining the laws of production and multiplying the combinations, he only followed in the path his predecessor had indicated.

The simplest voltaic combination is that in which two metals, as copper and zinc, having different affinities for oxygen, are immersed in a liquid capable of oxidizing one of them. Under such conditions a current of electricity is generated upon the surface of the most oxidizable, and, passing through the liquid, is given off at the other metal; and if a wire connect the two plates the current will continue to flow through it, from the receiving to the generating plate, so long as the necessary conditions are fulfilled.

It has been ascertained that those metals or substances which differ most in their affinity for oxygen will form the most powerful combination. The order of the substances is as follows:—Graphite (carbon from gas retorts), platinum, silver, copper, iron, lead, tin, zinc. Hence a combination of graphite and zinc forms a powerful battery, and, as both substances are comparatively cheap, this form of battery is of frequent occurrence. The great desiderata in a battery required for telegraphic purposes are its ability to overcome R (or resistance) and its constancy in action. The power a battery possesses of overcoming R is called electromotive force.

There are two distinct characteristics in a battery, dependent upon the order in which the same combinations are arranged; thus, if one pair of large plates, say 12 inches by 12 inches, be employed, the quantity of electricity generated will be considerable, although the electromotive force will be small. If, however, a similar pair of plates be cut up into 144 pieces 1 inch by 1 inch, and the 144 combinations be so arranged in 144 separate cells as that the —plate of the one be connected with the + plate of the next, and so on throughout the series, a battery is then obtained possessing 144 times more electromotive force. Its latter property is termed its tension, and is applied to the entire series, the electromotive force being more strictly applied to the specific energy of each combination.

Where great energy is required, the Grove battery becomes the most valuable of all combinations. In this arrangement amalgamated zinc and sheet platinum are employed, separated by a porous diaphragm. The zinc stands in a strong solution of acid sulphur, and the platinum in pure nitric acid. The action is as follows: The hydrogen element of the decomposed water, instead of passing over to the collecting plate and forming upon its surface, is entirely suppressed by the nitric acid, which becomes slowly deoxidized and converted into nitric acid, which passes off in dense red fumes. This is a serious drawback to the use of this battery.

One of the most valuable batteries for telegraphic purposes, where a constant current is not required, is the Leclanche. It consists of a zinc rod placed in a solution of common chloride of ammonia (sal ammoniac), in which stands a porous pot containing a piece of carbon surrounded by a mixture of gas carbon and a peculiar form of peroxide of manganese broken into small pieces, but separated from any powder. When the battery is in action, chloride of zinc is formed. When the sal ammoniac has become nearly removed from the liquid, it cannot dissolve the chloride of zinc, and the liquid becomes milky; more of the salt must then be added.

In a battery consisting of many plates in a series, all the plates should be of the same size, and all the cells in the same condition, as one faulty cell will not only rob the entire series of the value of itself, but will injure the action of the whole. Every cell of a battery should therefore be periodically tested separately, and, if the quantity of any one cell be less than the average of the others, it should be rejected or remedied The battery itself, although the source of power, yet possesses resistance to the passing of its own current.

It is interesting to find that the so-called silver mines of Athens, from the profits of which Pericles is said to have built the Parthenon, are now attracting special attention. The mines of Laurium are some veins of argentiferous galena running between the mica schist and limestone formations of the promontory of Laurium, stretching from Sunium to Athens From the remains of the ancient workings, there are now being obtained about 9,000 tuns of bar lead, lowered in value by being very antimonial, which contains above ten ounces of silver to the tun.

FLEXIBLE PIPE COUPLING.

In order to render the large pipes, which are employed to carry a supply of water across (or rather under) rivers or streams, flexible, so that they may rest throughout the entire length on the uneven surface of the bed, it is necessary to construct them in sections united by universal joints. The mode of coupling generally used is the ball and socket. One end of each section is turned and bored into a cup-shaped socket, into which is inserted the globular extremity of the succeeding portion, which is retained in place by lead poured into suitably arranged grooves. The metal, hardening, prevents separation of the sections and, at the same time, does not interfere with the free play of the joint. The objections urged against this method are: the leakage, due to the lead not forming an adequate packing, the necessity of machine shop work in the boring and turning of the sockets and balls, the difficulty of repair, necessitating the lifting of the pipe, and much labor in the formation of new joints and the substitution of perfect sections for those that become deteriorated.

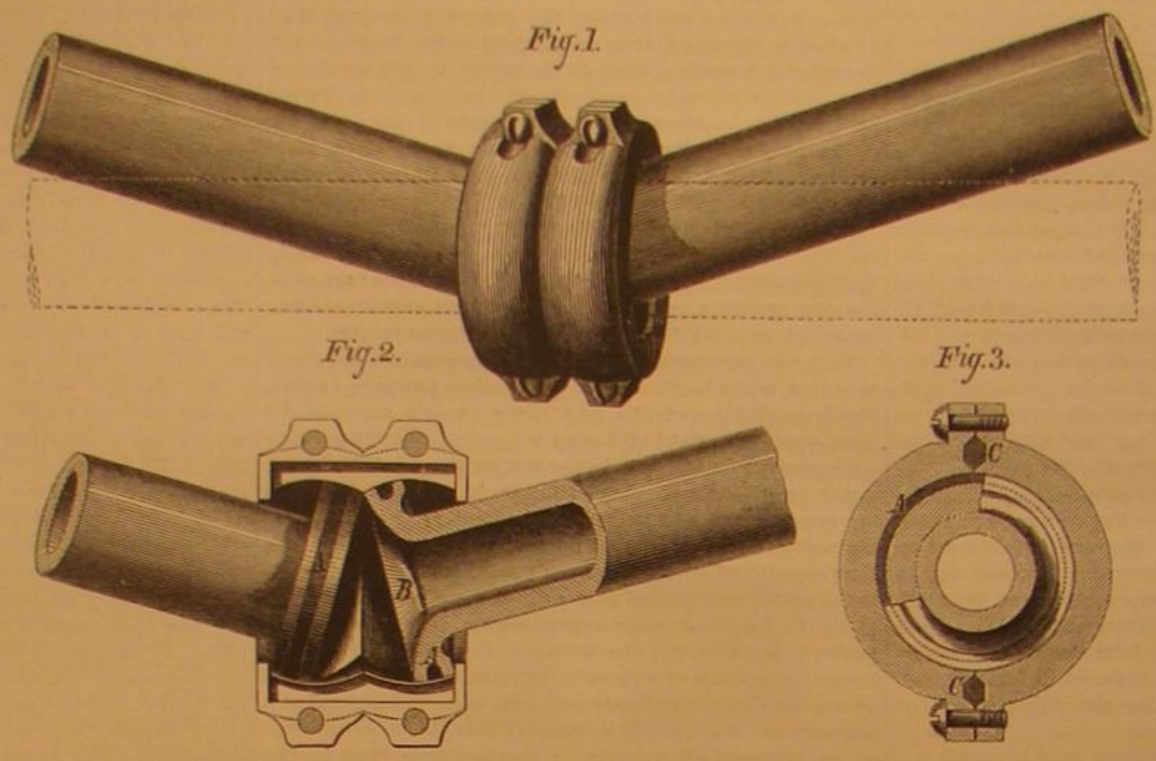
In order to avoid these disadvantages, Mr. William Kearney, who, our readers will remember, is the inventor of the excellent form of grate bar described in a recent issue of our journal, has devised a new method of coupling, which we illustrate in the annexed engravings.

Fig. 1 shows the pipes connected, and also the amount of flexure of which the device admits—the dotted lines representing the tubes when straight. Fig. 2 is a longitudinal, and Fig. 3 a transverse section, showing clearly the interior arrangements. Both ends of each section are cast with flanges, a process which at once obviates the expensive operations of boring and turning. On the edges of these flanges are cut grooves, shown in section, which are filled with suitable packing, as at A, Figs. 2 and 3. The faces of the flanges are flared outwards so as to gradually widen the interior orifice, as is represented at B, Fig. 2. The extremities of two sections, being brought together, are placed in a metal box, cast in halves and of the shape shown in Fig. 1. From the interior of the box (Fig. 2), it will be seen that two annular chambers are formed, in each of which one end of either adjoining section of pipe freely moves, the joint being made water-tight by the packing on the flanges. The two halves of the box, one of which is below the tubes and the other above, when in position, are held firmly by the four screws, as shown, and their point of contact is made impervious to water by packing placed in the grooves represented at C, Fig. 3.

If the reader will now, in looking at Fig. 1, consider that he has descended to the bottom of the river as a diver, and is regarding the upper side of the coupling as it lies on the bed, it is plain that in the event of a leakage on the under side, which, as we before stated in the old mode of connection, would necessitate the raising of the entire tube, he has only to remove the screws and take off the upper half of the box, and the ends of the pipe are free to be repacked or otherwise made tight; or, by disconnecting another coupling, the entire section may be lifted out and a new one substituted. This advantage is so obvious that we think no further explanation of it necessary.

The double annular chambers in the interior of the box, in connection with the flaring of the ends of the pipes, insures a greater delivery of water, by preventing the opening between the tubes from being rendered smaller by the bending of the sections at considerable angles to each other—an unavoidable defect in the ball and socket arrangement, where the parts have square edges and necessarily come in close contact. As to the cost of this coupling, as compared with the first mentioned and older device, we are assured by the inventor that it is less. He states that the expense of the lead and the boring and turning is much greater than that of the extra metal required and the manufacture of the simple castings; while the advantages in facilities of repair and ready connection, he justly considers, turn the balance largely in favor of his invention.

Patented January 9, 1872. For further particulars address the inventor, Wm. Kearney, engineer of the Jersey City water works, Belleville, N. J.



KEARNEY'S FLEXIBLE PIPE COUPLING.

A VERY common preventive for boiler scale used in this country is ground logwood, a little of which placed in a steam boiler is very serviceable. A new preventive is announced in England, to wit: the leaves of the bearberry, a wild trailing plant common in this country and also found in England and Scotland. The leaves are said to contain gallic and tannic acid.

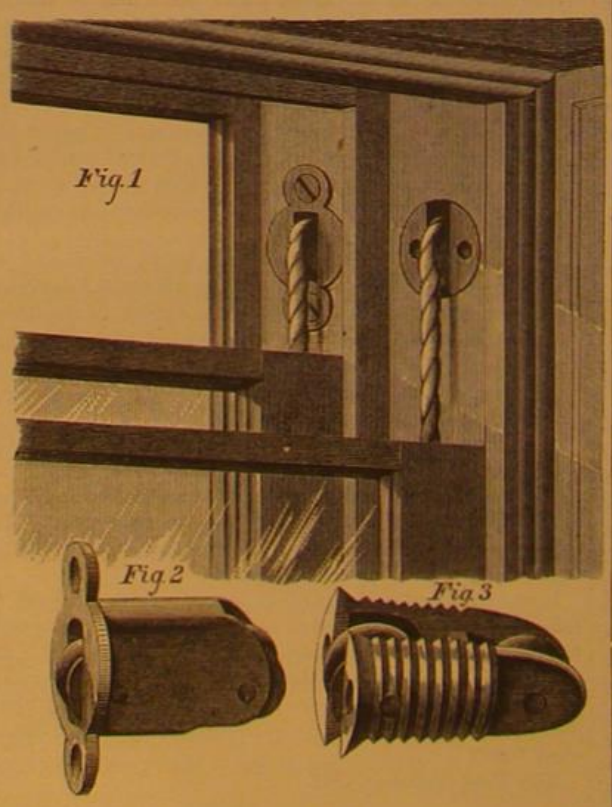
THE centenary of Linnæus's death will be celebrated at Stockholm on the 10th of January, 1873, when a statue of the great Swedish naturalist will be unveiled. He died at Upsala (in the university of which city he was for many years Professor of Botany) in the sixty-eighth year of his age.

Novel Use for a Balloon.

Mr. Samuel A. King, the well known Boston aeronaut, was recently employed upon a novel commission, that of measuring with balloons the discharge from a gas well in Ontario county, New York. The well is owned by a company of capitalists, and the gas is conveyed in pipes to Rochester, twenty-six miles distant, and there mixed with the street or illuminating gas. The flowage reached only 25,000 feet a day, when the capacity was estimated at 800,000. With two balloons, one of 20,000 cubic feet, and the other of 13,000, the exact capacity of which was previously ascertained to a nicety (says the Boston *Journal*), Mr. King measured the flow for a certain period, and the result showed that the flow was about 4,000 feet per hour. Much of the gas is thought to escape by leakage from the pipes between Bloomfield and Rochester. In accordance with Mr. King's suggestions, the Company propose to perfect the present drill hole and sink another near the first. The gas was discovered many years since, while parties were boring for oil, and when it first escaped the tools were driven out.

SASH PULLEYS.

The accompanying illustrations represent two new improved forms of sash pulley. Fig. 2 shows the device known as the "Builder's Favorite," consisting of a metal box containing two wheels, which are drilled smooth and run on wrought iron axles. The pulley is easily and firmly adjusted to the window case, as no mortise is required and the work of setting is entirely done with the bit. To the left of Fig. 1, it is shown in place and also the mode of attachment by screws through holes in the outer plate. Fig. 3, called the "Universal Sash Pulley" is an iron shell, on the outside of which a screw thread is cut. Within are two wheels arranged in a similar manner to the invention above described. A fork wrench and common brace are all the tools needed to insert the appliance into either an iron or a wooden window frame, where, being firmly screwed into place, it remains fixed. It is shown in position above the right hand or lower sash in Fig. 1. The friction of the cord over the wheels is comparatively nothing, so that it will last for years.



Both devices will be seen to be exceedingly simple and free from springs, ratchets, catches or locks. They can be inserted and permanently secured, it is claimed, in much less time than is required to place other pulleys, while their durability is ensured by their construction. Patented June 29, 1869, and December 28, 1869. For further particulars address the manufacturers, the Lakin Manufacturing Company, Westfield, Mass.

Fish Culture in the United States.

A convention of the New York State Commissioners of fish culture was recently held in this city. Professor S. F. Baird, the United States Commissioner of Fish and Fisheries, gave an account of his administration of the trust committed to him, namely, the propagation of useful food fishes in the waters of the United States. He stated that Mr. Seth Green had succeeded in planting several thousand young shad in the Alleghany at Salamanca, and a large number in the Mississippi above St. Paul. Mr. William Cleft has also placed about 400,000 fish in the first mentioned river, as many more in the White River at Indianapolis, and the balance of his stock in the Platte River, near Denver, Colorado. And Professor Baird further said that measures had been taken for stocking American waters with salmon eggs. About 600 large healthy salmon are now in an enclosure staked off in the center of a pond of 150 acres. From these fish the eggs are to be taken at the proper time and impregnated, the salmon themselves then to be again set free. It is expected that millions of eggs will be thus secured.

Through the influence of the Deutsche Fischerei Verein, in Germany, the German government has offered to present to the United States a quarter of a million of eggs of salmon from the Rhine, which, with as many more purchased, also in Prussia, will soon be received. The endeavors to obtain eggs from the rivers of California have been partially successful, about 15,000 eggs being collected during the season.

MANGANIFEROUS IRON.

In the Bessemer process the use of spiegeleisen plays, as is well known, an important part; on the one hand it serves for carbonizing the iron, on the other it improves the quality on account of the manganese it contains. Two properties, therefore, render spiegeleisen of special value; first, its constant large amount of carbon, and, secondly, its great percentage of manganese. It is only by adding a definite quantity of spiegeleisen to the iron to be worked that a definite carbonization and the desired degree of hardness can be obtained; while the large proportion of manganese insures an abundant formation of slag and thus purifies the pig iron subjected to the process. Of late, this last requirement has become of special importance, as coke pig iron may be now treated by the Bessemer system; and coke—made iron is, as is well known, much more impure than charcoal iron, as it often contains much silicon. In England, where coke iron is chiefly used for the making of Bessemer metal, the price of the manganiferous spiegeleisen varies according to its percentage of manganese. Where, however, it is used for the carbonization of charcoal pig iron, it is not necessary to have a larger percentage than seven or ten per cent. Formerly, spiegeleisen was produced from highly manganiferous ores, and at Siegen, on the Rhine, where this industry is concentrated, spiegeleisen with eight per cent of manganese is considered indispensable in all Bessemer works.

It has long been known that, if a mixture of iron and an oxide of manganese be melted, together with a proper reducing agent, alloys of iron and manganese of any proportion may be produced; in short, an artificial alloy renders the same service in the manufacture of manganiferous iron as the naturally occurring ores do, and such a product is even more available, as it may be brought to any quality required. Through one of our German exchanges, we learn that a company has been formed in Jauersberg, Austria, and is now actively engaged in the manufacture of these alloys. Von Hauer, in Vienna, has analyzed these samples, and found them to contain from twelve to fourteen per cent of manganese, a proportion which had been guaranteed by the company. This is a proof that the operative chemist has the proportion under perfect control. The amount of carbon averaged five per cent. As the new product exhibited a less lamellar structure than the spiegeleisen from Siegen, it was at first received with some distrust; but now it has become the object of considerable demand, since chemical analyses, as well as practical tests, have proved without doubt that it answers all reasonable expectations.

To make yellow wax into white wax, the former is boiled in water, spread out into thin layers, and exposed to the light and air. This is repeated until all the color is gone and the wax remains pure and white.

Scientific American.

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(Illustrated articles are marked with an asterisk.)

THE ANTIQUITY OF MAN.

If a hundred years ago a *savant* had expressed, in a company of his peers, the opinion that the earth was a million of years old, he would have been laughed at; and if only twenty years ago a geologist had, in a similar assembly, asserted the great antiquity of mankind and the existence of fossil men, he would have been considered to be incredulous in religious matters and over credulous in regard to geological evidences. The general opinion that the diluvial age and the modern period were characteristically distinguished by the appearance of the human race could not, 20 years ago, be shaken; but now there is scarcely any geologist left among us who doubts the existence of man during the end of the glacial period, or at least immediately after the same.

It should be kept in view that, for the geologist, when there is question concerning the nature and habits of the fossil men, neither traditions, written histories, nor pictures of ancient civilized peoples can give any information. The oldest among the traditions or writings give us scarcely any information for a period of 6,000 years; while in regard to pictorial relics, even the highest estimates allow a maximum of only 12,000 years. But what is 6,000 or 12,000 years for the geologist, who measures the period of the carboniferous era alone by millions of centuries?

Therefore, in order to obtain information in regard to the history of primitive man, we are reduced to the geological records, investigated and explained according to true philosophical methods. Such geological evidence we find, besides the somewhat rare human skeletons, especially in the tools, remnants of food, kitchen utensils, and other indestructible traces of man's presence and activity. Rude contrivances or arms to subjugate the animals surrounding them, and to procure food for themselves, were in the possession of all primitive races, in whatever savage condition they may have existed; and many important conclusions may be drawn from their appearance.

It is evident that, in all investigations in which there is question of the primitive history of our own race, we should proceed with the utmost care, so as to avoid errors; because this question is closely related to those concerning the highest spiritual interests of mankind. This praiseworthy prudence is therefore the cause that, in former years, all records of diluvial traces of man were treated with mistrust, and that there existed an inclination to consider such remains as having reached the diluvial strata by mere accident. So the report of Pastor Esper, who, in 1774, dug human bones (among those of the fossil cave bear) out of the Gailenreuther cave, was not noticed; and a similar fate befel the records of the English archæologist, John Frere, who in 1797 found, in the diluvium of Suffolk, arms made of flint. The report of Ami Boué, who in 1823 found, in the bluffs of the Rhine valley in Baden, a human skeleton, was also neglected; and no notice was given to the communications of the French archæologists and geologists Tournal, Christol, Joly, and Marcel de Serres, concerning several bones of new fossil animals (found in different caves) which had been worked and fashioned by human hands, as well as flint implements found among the bones of these now extinct animals, in the caves of Southern France. It must be acknowledged that several of the above reports could easily be objected to by reason of uncertainties in the observations and the vagueness of the conclusions drawn. But it is almost unexplainable that investigations of exemplary accuracy, such as those of the Belgian geologist Schmerling, remained so long in oblivion. This conscientious investigator had, in 1833, the caves of Engis and Engihoul, near Liège, emptied of their contents, and watched personally, with several witnesses, the labor, for many weeks and with the utmost care. He described afterward in, a large atlas, all the objects found; among them were two human skulls and many flint implements, all found mixed with the remnants of the cave bear, cave hyena, etc. At last, all doubts were resolved by the facts furnished by Boucher de Perthes, in Abbeville. High above the present valley of the Somme in Picardy, existed undisturbed layers of diluvium, with remnants among them of the mammoth, rhinoceros, cave bear, cave hyena, etc., relics in short of the whole *fauna* which inhabited Europe during the glacial period. In the middle of these primitive animal remains, De Perthes, as early as 1833, found near Abbeville the first few specimens of flint arrowheads, hatchets, knives, etc., and he afterwards discovered many hundreds of the same. Moreover, many of the fossil bones had been evidently cut and scraped by means of these flint tools. But, singularly, it was not till 1863, thirty years after the first discovery, that Moulin Quignon found a lower jaw and several other human bones at the same place.

This last discovery made some commotion. A small congress of English and French geologists assembled in order to inspect the locality which had yielded human bones from the deposits of the diluvial period. After Boucher de Perthes and Sir Charles Lyell, in his celebrated work on "The Antiquity of Man," had drawn the attention to these prehistoric human remains, similar discoveries have succeeded one another continuously. Flint tools, similar to those of Abbeville, were found in caves with the bones of the diluvial mammalia. Near Aurignac, in the Haute Garonne, the exploration of a rabbit hole by boys led to the discovery of a large grave, closed with a stone slab; inside this tomb 17 human skeletons were found, together with implements of flint and reindeer horn, and several fossil men. In front of the cave was a hearth, on which were numerous broken and half burned bones of the giant deer, reindeer, cave bear, rhinoceros and other animals; many productions of human art were also found. Unfortunately the mayor of the place had the human bones buried in a cemetery, where, some years afterwards Lartet could not find them. This was much deplored by some investigators who were very anxious for details concerning the skeletons of our most ancient ancestors.

Two skulls, one from the Neander cave near Dusseldorf and the other from a cave near Liège, appear to show an inferiority in the development of the brain; and a similar formation is the case with the recently discovered five skeletons in a railroad cutting in the department of Dordogne, France. Among these is one of a woman and one of a child; the male skeletons are, in size and power, far superior to the French now inhabiting that locality. The faces are very broad, and prominences for muscle attachments very large. In regard to the mental culture of our ancestors, these discoveries suggest very sad reflections. The male bones show traces of fractures and wounds, while the female skull has been cracked by a stone hatchet.

Our readers may be desirous to know something about the chronology of the events, the relics of which we have noticed. Lyell estimated, some 10 years ago, the antiquity of man at 150,000 years or more; but we know now that the glacial period ended more than 200,000 years ago; and that man, with the reindeer, which retreated north, was already in existence at its termination.

THE VIENNA EXPOSITION.

"The preparations for the exposition of the art and industrial products of the world at Vienna are on the largest scale. Some idea of the importance of the undertaking may be gathered from the fact that the building itself will cover six times the space of the Palais de l'Exposition at Paris. In addition to this, strenuous efforts are being made in all countries to secure a complete representation of art and industrial products. The various systems of public instruction will be contrasted, and we hope that the result will not be unfavorable to our public school system. On account of Congress having made no appropriations, the representation of American manufactures will not be so large as might be desired; but as the exhibition of goods is a form of advertisement, we see no good reason why the public should be called on to pay for the transportation of goods belonging to a wealthy corporation. Unless exhibitors believe that the exposition of their wares is likely to be sufficiently profitable to justify them in incurring the expense of transportation, we do not feel called upon to pay their advertising. At the same time we wish the exposition all success, and desire that American industry should be properly represented; but those who reap the profits ought, in justice, to pay the expenses."

The above from the *New York Herald* is sensible and meets the case. Private individuals who desire to show their goods at Vienna or any other exhibition ought to pay their own expenses; Congress did a good thing last year in refusing to appropriate the public funds for this purpose. But an attempt will probably be made, on the assembling of Congress, to revive the subject and procure money. The poor advertisers alluded to by the *Herald* want their board paid by Uncle Sam, as a matter of course; then there is General Van Buren, the United States Commissioner for this show, who will also come in for emolument. At present his office is purely honorary; he draws no pay, and knew that when he accepted its functions. But of late he has been very arduously engaged in his exhibition duties, stumping eloquently around the country to urge the election of General Grant, and the administration will, of course, be expected to provide handsomely for his trip to Europe.

We have heard it stated that some fifty thousand of our citizens annually go abroad, taking out of the country from ten to twenty millions of dollars. The Austrian show will, in any case, take an immense amount of money from the pockets of our people, and the sum *ought* not to be swelled by appropriations from the national treasury.

LIFE-SAVING INVENTIONS NEEDED.

Another terrible disaster at sea has happened, which, for loss of life and property, surpasses the Metis, Bienville, America and Nevada calamities. The Atlantic mail steam propeller Missouri; *en route* from New York to Havana, was, on the 22nd of October last, while near the Island of Abaco, one of the Bahama group, completely consumed by fire. The vessel was 1,180 tuns burden and built in 1862; her cargo was valued at 500,000 dollars. Seventy six lives, including those of the captain and entire crew, were lost, and only twelve saved. Of the six boats that were launched, three were instantly swamped, two were burned alongside the ship, and one, through the heroism of a passenger, reached the shore in safety.

It would be supposed that the awful lessons of the wrecks of the past few months would have served as warnings, to the owners of sea-going vessels, to make, by the best attainable means, adequate provision for the safety of the lives entrusted to their care. Yet from the details of this last horror, briefly given in the telegraphic despatches, it is shown that there was no preserving apparatus at hand, and that the ordinary appliances for the rapid and safe lowering of the boats were entirely absent. Moreover, the boats themselves were of the common wooden construction and in the hands of the crew who were totally uninstructed and unskilled in their management, failed, as might be expected, to live in the rough sea that was running.

It is high time that proper life-saving inventions were placed aboard our passenger steamers. Rafts, of trunks, of mattresses, of state room doors, have been devised, tried, and found wanting. The first heavy sea tosses them about so that it is impossible to cling to them, much less to maintain a footing on their surface. Boats, unless handled with consummate skill, capsize almost immediately when crowded; and the only means of any value, which is available when the vessel is stranded, is the life line and traveling casks, in which crews have often been transported ashore in safety. The records of past shipwrecks show that boats and rafts have been kept afloat for some time in heavy weather, by attaching them to a number of spars lashed together, and allowing them to ride to the latter as a sea anchor. The spars form a sort of breakwater, and in a measure reduce the force of the waves. Again, the simple cask weighted at the bottom, to keep it from rolling over, in which a person may be inclosed, has been proved of great efficiency. Now, cannot some inventor combine both casks and spars, and devise a life-saving apparatus that will sustain a number of persons and yet be practically safe? The necessity is most urgent, and it is inexplicable that, in a country where so large a portion of the population live on the seaboard and are familiar with maritime affairs, that no one has succeeded in bringing forth a really trustworthy and efficient plan. We sincerely trust that inventors will now need no further appeal to turn their best energies to this subject. It only remains to pevelope an idea which, when once proved to meet all requirements, it is the duty of the Government to compel by law, owners, to carry aboard every sea-going vessel, coupling with such enactment the severest penalties for its evasion or or non-fulfillment.

THE HORSE DISEASE AND STREET CARS.

The continued prevalence of the horse disease in New York city has resulted not only in a great inconvenience to the mercantile portion of the population, but has virtually rendered worthless the ordinary means of public transportation. The various cars and stage lines have either ceased running altogether or send out such a reduced number of vehicles that the people prefer to walk rather than endure the discomforts of crowding and bad ventilation.

Various projects are discussed in the daily journals, for affording a means of conveyance between distant points of the city. A line of cheap steamers plying on either side of the island and touching at convenient streets is suggested, the plan to be similar to that of the penny boats on the Thames at London. The question of dummy engines has been again brought to light, and the city authorities have passed an ordinance allowing of their use on certain roads for a limited period; and under this authority, the Remington steam street car, from Ilion, N. Y., is soon to be put to work on the Bleecker street line. As to grades, curves, etc., the route of this road is one of the most difficult, and the powers of the steamer will be well tested.

It remains to be seen whether steam can be successfully used on street cars in lieu of horses. There is an abundance of genius in this country which, if it can only be brought to bear, will readily discover a solution for this problem. Cannot some of the great army of inventors with whom we come in daily contact confer a lasting benefit on their fellow beings by finding a way of relieving this necessity?

BINARY ENGINES.

We publish elsewhere a letter from Mr. Ellis, the inventor of the improved Binary or Bisulphide of Carbon engine, heretofore illustrated in the SCIENTIFIC AMERICAN. From this, it appears that Mr. Corliss, the famous engine builder of Providence, R. I., has become so far interested in the matter, that he is about to undertake a comparative test of the new invention on a large scale, for the express purpose of determining its economy, if any, over the best forms of the steam engine. We shall look for the reports of the result with great interest.

SUNDAY RAILWAY TRAINS.

The Brotherhood of Locomotive Engineers, recently in session at St. Louis, adopted a resolution favoring the abolishment of all Sunday trains, and appointed a committee to confer with railway officials in all parts of the country. This movement cannot succeed. It smacks of the old "blue laws" of Connecticut, which made it a criminal offence for a man to travel on the highway on Sunday, and subjected him to grave suspicion if he was even seen to walk in his private garden.

We are earnestly in favor of securing to railway engineers the full enjoyment of at least one day's rest out of seven, and they may always count upon our hearty coöperation to that end. But we think they make fools of themselves when they resolve that nobody shall ride on Sunday, which practically is what the St. Louis convention has done. If it is right and proper for people to travel on any sort of a road on Sunday, on errands of necessity, mercy or personal benefit, it is equally right for them to travel on railroads; as such roads are expressly designed for the public service, it is the duty of railway companies to provide reasonable facilities for Sunday travel. For large communities more especially, we believe it to be morally advantageous to have special railway facilities provided on Sunday, whereby the popu'ation may be quickly carried out to the adjoining country towns, there to enjoy rest, fresh air, social interchange, and Divine service if it be desired. The best of engineers, the best of cars, and plenty of them, should be provided, and the trains should be run morning and evening, so as to afford a generous accommodation. If our friends of the Brotherhood were to resolve that all engineers who work on Sunday should rest for two days during the week, we would heartily second the motion, and believe the plan might be realized.

The public necessities require that Sunday trains shall be run, and mails and passengers carried. It remains for such organizations as the Brotherhood to regulate the matter, in some manner reasonable and satisfactory to all concerned.

AN IMPROVEMENT WANTED.

The Board of Health of New York city recently passed an ordinance which, so far as we can learn, gives, to a corporation known as the Manhattan Odorless Excavating Company, a monopoly of the vault-cleaning and sink-emptying business of the entire city. The invention controlled by the company is an air-tight apparatus which consists of a force pump to which are attached lengths of india rubber hose, through which the contents of the vault are drawn by the action of the pump into large barrel tanks, on wheels. From the upper portion of each tank projects a pipe, leading to a furnace in which a charcoal fire is lighted. The end of the hose being placed in the vault, the pump is set working by manual labor, and a stream is drawn through the hose into the tank. The noxious gases, escaping through the pipe, are conducted through the charcoal fire where, it is claimed, they are consumed. This device appears to be covered by the patent of Louis Strauss, dated January 28, 1868, of which the claims are as follows; 1. The combination of the reservoir or receiving tank and deodorizer with a forcing engine; 2, the sliding valves of the engine constructed with cutting edges; 3, the apparatus for emptying privies as above described. The idea of cutting the soil is also embodied in another patent (dated November 2, 1869, granted to J. G. Berger, a native of Bavaria), which covers a special apparatus for the purpose, composed of steel rollers and other suitable mechanism.

It is asserted by the opponents of the system that the machine withdraws only the liquid matter, while the solid substance has to be removed by tin cans in the ordinary way. If such be the case, it is evident that, so far as it is a means of avoiding disagreeable odor, the apparatus is of no advantage. This fact has been set forth in a petition, signed by a large number of property owners, which document also remonstrates against the exorbitant rates charged by the company for work. On the other hand, the night scavengers complain bitterly against the injustice done them, as not only their business is taken away from them by the action of the authorities, but they are unable to purchase rights either to manufacture or use the above described machine.

The gist of the whole matter is that some new invention is needed: a device which shall be capable of cheaply and effectively removing the whole of the soil without creating nuisance. Such an invention would be valuable in every large community.

THE CONTRADICTIONS OF SCIENCE.

Professor Pepper, of London, recently made his first appearance in public in the United States, before the Polytechnic Section of the American Institute. The "Contradictions of Science" formed the subject of a pleasant and, at times, witty conversation—we can hardly term it a lecture—which the Professor illustrated by a few well chosen though simple experiments. Some of the "contradictions" explained were the sinking of an egg in pure water and its floating in brine; the bleaching action of chloride of lime on a solution of indigo, causing letters written in the latter to disappear, while it rendered visible some characters painted in a colorless mixture of iodide of potassium and starch; the boiling of water by certain chemicals and its freezing by others; the reaction of a solution of iodide of potassium on a solution of corrosive sublimate, both clear liquids which, when combined in certain proportions, throw down a scarlet precipitate of biniodide of mercury, which is caused to disappear and the mixture again made limpid by the addition of an excess of the iodide of potassium, and the well known conjuring trick of the magic bottle, which is filled with weak sulphuric acid and water. The mixture being poured into wine glasses, previously rinsed out with solutions of salts of iron, lead, etc., changes its color so as to resemble different wines, milk ink, etc.

In connection with the corrosive sublimate experiment the Professor animadverted quite strongly on the insecurity of modern chemical testimony in courts of law. He spoke of the extreme care and accuracy required in the tests on which a man's life might depend, and instanced how a chemist might be led, in applying the iodide of potassium test for the deadly corrosive sublimate, to declare that the latter was not present in his analysis, by simply adding a drop of the reagent in excess. The testimony of neither one nor of two men, however expert, should be regarded as convincing. A public officer should be appointed, whose duty it should be to select three well known chemists and require each to make separate analyses. This done, they should meet and prepare a judges' report, which should be received in evidence, and the experts themselves should be subjected to severe examination and cross examination apart from each other. Such testimony should be in favor of neither side of the case, but a simple calm exposition of the truth.

The Professor gave quite an entertaining account of the so called fire eaters. Fire, he said, might be handled with impunity if various conditions be complied with, and, as he repeatedly remarked, "if you know how." Sometimes the skin is naturally hard, thick, and callous, so that highly heated substances may be held for some time without danger; or non-conductors might be interposed—a fact which he illustrated by covering his hand with charcoal and placing thereon a lump of red hot iron. Certain chemical substances, being applied to the skin, will, when in contact with other substances of high temperature, vaporize, forming a cushion of vapor which protects the part from injury. To prove the fact, the speaker, first dipping his hand into turpentine to cleanse the skin, and then into ether, coolly plunged it into a tank of boiling water and removed an egg. Then, as a concluding experiment, he moistened his hand with strong ammonia and dipped his fingers into molten lead, hot enough to inflame paper, and finally poured the molten metal on his palm, scattering it about as if it were quicksilver.

It would be hardly proper to criticise the entertainment as a scientific lecture, as it evidently was not intended as such, being nothing more than a pleasant chat, delivered in an off hand easy manner, which succeeded in amusing the audience for a couple of hours. Professor Pepper's *forte* is popular science, and, as he says, his main object is to awaken an interest in its study in the minds of the young by presenting the subject in its simplest and most attractive light. We noticed Professors Barnard and Morton and several other eminent scientific gentlemen in the room, all of whom seemed to enjoy Professor Pepper's gravely humorous way, of telling them the commonest truths, as much as if he had devoted the evening to the profoundest of researches and investigations.

Since the above was written, Professor Pepper has delivered two of his lectures on the subject of "Persistence of Vision," at Steinway Hall. The lectures were, perhaps, suited for general audiences, but fall below the standard which the public had expected and are accustomed to in this city. We hope, at some future period, to hear Professor Pepper under more favorable auspices, as his entertainments would have undoubtedly been much more satisfactory had he not been obliged to struggle against inexperience on the part of his assistants.

THE SAXBY AND FARMER RAILWAY SIGNALS.

The oft-repeated railway disaster due to the "open switch" is again exemplified in the Seabrook casualty on the Eastern road, which has resulted in a large loss of life and is traceable to a more than usual amount of culpable negligence. If that Utopian period ever arrives when coroners' juries will find some other verdict than "no one to blame," at such time it will probably dawn upon the railway companies that it is better economy—leaving out the question of humanity—to provide the roads with improved machinery and appliances, which will reduce the danger incurred by the negligence of employees to a minimum, than to be heavily mulcted in damages and loss of property.

We published, some time since, an article on the Saxby and Farmer Safety Switch and Signal—an apparatus devised and much used in England, being employed, in fact, on many of the leading railways. This invention, for an improved form of which two patents have lately been secured in this country, is now being introduced by the agent of the manufacturers, Mr. Joseph Dixon, of No. 260 Broadway, in this city. The device consists of a suitable lever, which not only moves the switch, but also, by a very ingenious arrangement, actuates wedge blocks which firmly and immovably lock the switch rails in position.

To the absence of this apparatus, the London *Times* editorially imputes a disastrous collision which recently took place at Kirtle Bridge, England. In practice, the switches and signals are connected in such a manner that both are actuated by a single lever, and neither can be moved alone. The above mentioned journal, quoting an official report on the accident, says: "If this system had been in operation at Kirtle Bridge, the consequence would have been that the signal man, when he saw the down line clear and set his signal at safety, would, by the same act, have locked all the points leading from cross over roads and sidings on to this line. The station master, if he wished to continue the shunting and to use the down line for the purpose, instead of pulling a lever that was ready to his hand, would have been compelled to send an order to the signal man, who, by obeying it and by the act of turning the points, would have raised his signal to danger, and would thus have stopped the coming train."

The report also states that in England, in 1871, 53 accidents out of 159, and in 1870, 60 out of 122, were caused by want of locking switches or by defective signal arrangements. In the United States, 3 casualties from misplaced switches alone occurred in the past month of September.

The railway companies cannot plead ignorance of inventions of this kind, as, both in our own columns and in those of other journals, their attention has been repeatedly called to the superior and almost absolute safety of such systems. Collisions at stations and sidings take place, in greater or less numbers, yearly, on almost every line in the country; and we confess to but little hope of seeing them cease until railway corporations see fit to introduce well tried and efficient apparatus.

CORUNDUM IN PENNSYLVANIA.

At a meeting of the Academy of Natural Sciences of Philadelphia, on October 1st, 1872, Professor Leidy remarked that he had inspected a deposit of corundum recently discovered on land owned by Mr. George Ball and others, in the vicinity of Unionville, Chester Co., Pa. The deposit promises to be one of the most extraordinary accumulations of the mineral ever discovered. Detached crystals of corundum have often been found on the surface of the ground about the locality; and, in some instances, boulders of the same material, up to several tuns in weight, have been found in the superficial drift. A company, several years since, was led to seek for the corundum in place, and for this purpose sunk a shaft in a neighboring hill of albite, but met with no success.

Mr. John Smedley, an intelligent farmer employed by the proprietors of the corundum mine, was led to its discovery in place by noticing the course of the boulders of corundum in the surface drift. Tracing these to the top of a hill, he found the important material about five feet below the surface of the ground.

The corundum deposit yet remains undisturbed; and, as now exposed to view at the bottom of a trench, it appears as the crest of a large body or vein lying between a decomposing gneiss and a white talcose schist. The vein extends west, and towards the east bends at an obtuse angle to the north east. The portion exposed is twenty or more feet in length, and averages about six feet in depth and five feet in thickness at bottom, and is estimated to contain fifty tuns. How much further the bed extends, in breadth, depth, and thickness, can only be determined by future mining. The rock on the south side of the vein is the white talcose schist above mentioned, which, on the declivity of the hill, passes into steatite and serpentine. In immediate contact with the corundum, the talcose schist assumes the appearance of the mineral recently described by Mr. I. Lea, under the name of "Lesleyite."

The corundum is not of the character of emery, but is the pure material. The masses are composed of a close aggregation of bluish gray crystals, with the intervals occupied with margarite. Some of the crystals appear to have undergone partial metamorphosis into the latter material. Some of the fissures and surfaces of the masses of corundum exhibit large and beautiful crystaline plates of margarite and, rarely, unusually fine crystals of diaspore. The corundum is of more compact texture and not so readily cleavable as the North Carolina material. The discovery of this large accumulation of corundum will prove of great service to the arts in which an exceedingly hard material is required for cutting grinding, and polishing.

PETROLEUM IN MASSACHUSETTS.

For several weeks past the town of Lee, Mass., has been agitated by the alleged discovery of an oil well in that vicinity, and from the latest accounts the good news seems to be confirmed. The Pittsfield *Sun* says that the oil excitement at South Lee still continues, together with the flow of oil from the springs near there.

Mr. Wheeler, a mineralogist, claims that this and other springs in the neighborhood that show oil are only leaks from large supplies of oil, and that coal can be found in the region. In proof of his faith in the latter statement, he is sinking a shaft on the south slope of Monument Mountain, having made 60 feet in twelve days, and has discovered an excellent quality of fire clay, suitable for the manufacture of the white fire brick which are now brought from Bennington, Vt., for use in smelting furnaces, fire places, grates, etc., although no coal has been found as yet, nor has he "struck ile."

DEATH OF HON. JOHN A. GRISWOLD.

John A. Griswold, one of the first in the ranks of American manufacturers, recently died at his residence in Troy, New York. Though for some time closely identified with both national and state politics, having been three times elected to Congress and once nominated as Governor, Mr. Griswold is perhaps better known to our readers as the owner of the great iron works of Troy. In this business he embarked in 1857, subsequently purchasing and first introducing the well known Bessemer steel process in this country. Under his managment, the business of the mills became so great as to warrant their large extension, and within the past few years to render their proprietor one of the richest iron masters in the Union.

During the war, Mr. Griswold's record passes into history as one of unswerving loyalty. Many will remember the difficulties encountered by Ericsson in the building of the first and famous Monitor. Condemned as a quite impracticable scheme by naval constructors and engineers generally, the enterprise bid fair to be abandoned for want of means to carry it to completion. Mr. Griswold, however, firmly believing in the feasibility of Ericsson's idea, supplied the necessary funds, and constructed the vessel at his own expense, taking the risk of being repaid in the event of the

ship proving successful. The result of the conflict in Hampton Roads, and the immense loss to the country averted by the timely arrival and magnificent performances of the Monitor, are too well known to need repetition. To Mr. Griswold's liberality and patriotism, as well as to the genius of Ericsson, is due the introduction of the new system of warfare, which not only rendered such efficient assistance in the suppression of the rebellion, but which has since revolutionized the naval armaments of the world.

IMPORTANT IMPROVEMENT IN TEXTILE WEAVING.

On the first page of the present issue will be found, fully described and illustrated, a new and admirable invention destined, in our belief, to materially alter, if not revolutionize, a great and growing industry. We confidently recommend it to the examination of carpet manufacturers at home and abroad, as an object well worthy of their careful attention. Mr. James Short, the inventor, is the superintendent of the New Brunswick Carpet Works, and a gentleman of life-long experience in the carpet manufacture; so that this loom is not only the result of a remarkable inventive genius, but of arduous and continued study and repeated experiment. It is of such inventions as this that our country can well afford to be proud, as it is to them, or rather to the master minds to which their conception is due, that she owes her present position of industrial supremacy.

THE BURNING OF THE ESCURIAL.

The conflagration in the Palace of the Escurial, near Madrid by which the venerable pile nearly escaped total destruction is a sad example of the general neglect and indifference which exists in Spain regarding the use of the best known and commonest safeguards of civilization. To the disgrace of the authorities on whom the warning of two previous fires in the building was totally thrown away, there were but two fire engines in the place—none others nearer than Madrid, some miles distant—and these were wretched old fashioned affairs, worthless when most needed. Moreover, it has been discovered that the gigantic edifice was unprotected by a single lightning rod or similar appliance of any kind. With a child-like confidence worthy of a better object, implicit reliance was placed in the guardianship of some saint—probably San Lorenzo—who was compensated for his services by having his effigy placed in a wood some miles distant. As it is customary for the peasantry, both in Spain and Italy, to administer severe corporal punishment to their idols, when the latter abuse the confidence of their adorers by not meeting their very reasonable expectations, it is probable that the above mentioned statue no longer exists, as it was doubtless thrashed into powder immediately after if not before the fire was subdued. *"Cosas de España,"* the London *Times* sarcastically remarks; but if these be Spanish customs, Spain richly deserves the loss of her great palace and its countless treasures of art, though such a misfortune would be a calamity to the entire world.

Fortunately, however, and recent foreign papers bring us the intelligence, but little damage was done. The storm is described as one of unusual severity. The lightning struck the roofing in the *Patio de los Reyes* (court of the kings) and spread rapidly to the library. Assistance did not arrive from Madrid until the flames had raged for several hours, but, through good fortune, not a book, a manuscript, or a picture was injured. The Spanish Minister of Finance, in his report to the Cortes, states that the church and the palace are untouched. It is estimated that the building will cost some $200,000 to repair. The idea of a national subscription was started, but King Amadeus knocked it on the head by insisting on defraying the whole cost out of his own private purse.

This is liberal on the part of the charitable young ruler, but we think that he would be wiser if he would devote some more of his superfluous revenue to the importation of a few enterprising American inventors, and assist them in the introduction of their modern devices throughout his kingdom, so putting in practical operation the "ounce of prevention" in order that he may not find himself compelled to apply the "pound of cure" to similar disasters in the future.

INCRUSTATION OF BOILERS.

The *American Exchange and Review*, in a recent number, recurs to the well known trouble caused by incrustation of boilers. Almost all natural waters contain enough lime, salts, and other impurities, to create a crust, in the interior of the boilers, which not only impairs their efficiency by its non-conducting qualities, but, if neglected, is likely to result in serious consequences.

The editor of the *Review* states that he has taken the trouble to inquire into the merits of the Anti-Lamina patent of Josiah J. Allen, of Philadelphia, for preventing incrustation; and he pronounces the ingredients to be such as to render the composition harmless, having no corrosive or injurious effects upon the iron, which many other remedies involve, and thus the effect is purely mechanical; and, from the testimony of a large number of persons who have used Anti-Lamina for many years, his impressions of its merits are most favorable.

[Correspondence of the Scientific American.]

THE GEORGIA STATE FAIR

ATLANTA, Ga., Oct. 18th, 1872.

To-day our Fair closed. The exhibition was not so large and attractive as it was in 1870, but, while the articles were not so numerous, many of them were objects of considerable interest. Prominent among these was a steam road engine by Aveling and Porter. This is an English invention, protected by patents in this country, and is doubtless known to most of your readers. But it was something new in this region, and attracted the attention of large crowds, as it made its way up and down hill and over rough grounds, drawing half a dozen or so large wagons loaded with rock. The fact is that it seemed impossible to get a load sufficiently large to test the capacity of this more than Herculean monster, which was turned about and guided, with apparent ease, by a boy.

Another object of interest was the Chicago Farm Pump by I. F. Templeton and Sons. This was admired for its neatness, its cheapness, its easy action, its wide range of application and its durability. It will doubtless have a large sale. In the agricultural machinery department, the Improved Ingraham or California Wheat Cleaner excited the admiration of all by the perfection of its work in separating smut, cheat and all foreign admixtures from the grain. The only thing of this kind remaining, after passing through the machine a specimen of wheat full of impurities, was a little cockle, which could not be removed without wasting too much of the pure grain.

Another object of great interest was a full set of mechanic's tools, of the most beautiful finish, made entirely by I. W. Baum, who has a natural talent for mechanical work, never having served a day in a machine shop. His workmanship is certainly a marvel of skill, and well deserves the numerous prizes he has taken.

The Pocket Sewing Machine and Quilter, which is sold for the low price of $5, promises to be one of the most useful of modern labor-saving machines, and attracted much attention.

Messrs. Pellegrini and George exhibited beautiful specimens produced at their terra cotta works in this city.

The "Queen of Charts," patented in your office and exhibited by Mrs. Millwer of South Carolina, appears to be adapted to cutting out every style of ladies' and children's garments.

Messrs. Zimmerman and Carter exhibited very fine specimens of a variety of soaps, manufactured at their Excelsior Steam Factory in this city. Atlanta bids fair to become a formidable rival in this line of manufacture.

The exhibition of carriages, etc., from the houses of David McBride and A. T. Finney, of this city, was fully equal to the finest specimens from northern factories.

Upper Georgia was well represented in the fruit department by Cobb and Bartow counties. Mr. C Y. Shelman, of the latter county, exhibited a remarkably fine collection of apples, peaches, pears and quinces. There is perhaps no region better adapted to these fruits than Northern or Cherokee Georgia.

The ladies' department was, as usual, well represented by the handiwork of our fair women. But I cannot specify. I therefore content myself with this brief notice of some of the prominent objects of interest. W.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Inventions Patented in England by Americans.

(Compiled from the Commissioners of Patents' Journal.)
From October 9 to October 17, 1872, inclusive.

BOOK SEWING MACHINE.—D. Shedd, New York city.
BRAKE.—W. B. Chapin (of Wickford, R. I.), London, England.
CHAIR.—J. Vose, Boston, Mass.
COMPRESSING BLOOMS.—S. Danks (of Cincinnati, Ohio), London, England.
ELECTROMAGNETIC CLOCK.—W. M. Davis, Cincinnati, Ohio.
MUFF.—T. A. Dodge, Boston, Mass.
RAILWAY CARS, ETC.—W. D'A. Mann, Mobile, Ala.
REAMER AND COUNTERBORE.—A. Shedlock, New York city.
STEAM GENERATOR.—E. Weston, Buffalo, N. Y.
TELEGRAPH.—H. J. Rogers, New York city.
TRUSS.—C. G. Patterson, J. L. Rowe, New York city.

COPIES OF PATENTS.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a reasonable cost, the price depending upon the extent of drawings and length of specification.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent.

Address Munn & Co., Patent Solicitors, 37 Park Row, New York city.

Facts for the Ladies.—Helen Launceford, Lowell, Mass., reads by the hour while she is doing ordinary sewing with her Wheeler & Wilson Lock-Stitch Machine, and recommends it for simplicity, durability, rapidity and beauty of work. See the new Improvements and Woods' Lock-Stitch Ripper.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.

1.—What is the best solder for gun ribs and thimbles?—J. M.

2.—Can any one tell me how to make a flexible varnish for rubber, so as to give it a gloss?—W. S. T.

3.—Can any one tell me of a practical book on pruning fruit trees and shrubs?—E. E., of R., India.

4.—How is Bachhoffner's paraffin lamp constructed?—E. E., of R., India.

5.—Does any one know of a handy machine for cutting up green leaves of plants?—E. E., of R., India.

6.—Can any one give me a cheap and simple recipe for making aerated bread?—A. T. M.

7.—Can any one give me a description of a cheap ice machine, described in the English *Lancet* a few years ago?—E. E., of R., India.

8.—How can I purify salt obtained from sea water by evaporation by the heat of the sun, and what apparatus is required?—G. W. D.

9.—Will some one please describe the preparation of senna, from the plucking of the leaves to the packing for sale?—E. E., of R., India.

10.—Is there any kind of mortar or wash which will render the brickwork of flues and hot air passages non-absorbent of heat?—A. T. M.

11.—How can I make ozone papers and how are they used?—O. S.

12.—Are Liebig's and Petitjean's processes of silvering glass for mirrors, etc., dangerous?—D. R. W.

13.—What material is generally used for bolting cloths, and what is the best for the purpose?—J. W. S.

14.—Can any one recommend any mixture more durable than linseed oil and coloring stuff for painting the floor of a room?—W. W.

15.—I am using veneers of wood, a twenty-fifth of an inch thick. How can I deprive them of taste and smell?—H. P. A.

16.—What is the best form of a light, compact, and portable dark tent or room, available either for wet or dry photo processes?—E. E., of R., India.

17.—Will some one tell me how to transfer pictures to glass, wood, china, etc., by the process called decalcomanie? Is there any publication descriptive of this process?—F. A. S.

18.—When malleable cast iron is broken, is there any way of welding (or otherwise mending it by heat), in a common blacksmith's fire, so that it will be as good and sound as it was before it was broken?—T. D.

19.—I wish to know how many square feet of pipe surface it will require, per horse power, to condense steam at sixty pounds per square inch, the pipes in the condenser being kept cool by passing sea water through them at its ordinary temperature.—J. S. B.

20.—How are engravings, etc., transferred to glass, so as not to leave anything but the printer's ink on the glass? I know the old-fashioned way of rubbing the paper on the back of the picture, but I want another and better process.—S. L. D.

21.—I am now erecting four large vats for fermenting ale, and I wish to know if there is any chemical I can apply externally to prevent them rotting. I have had great trouble with my vats, having to renew them every five years owing to the dampness of my cellar.—O. S.

22.—In the rotary engine known as Murdoch's and the several modifications of it (consisting substantially of two toothed wheels working into each other inside an elliptical case, the outer teeth working against the sides of the case and forming the pistons), is there not twice the amount of steam used that would be necessary to do the same work with an ordinary piston and cylinder having the same area of piston surface, disregarding friction, etc?—A. H.

23.—Does a point on the top of a locomotive wheel travel faster than the point of contact with the rail? I say that all points in the periphery travel at the same speed; but my friend claims that the ground is a fulcrum, and the top travels faster than the bottom, the wheel being practically a lever.—A. P. C.

24.—Will some good sawyer, who has tried all the different modes of setting the teeth of large circular saws, tell us which one will cut the most lumber the smoothest and with least power? I am using a gullet tooth saw and I swage and file square, keeping up the points of the the teeth on both sides. It does tolerably well, but I wish to know if there is a better way.—B. F. W.

25.—Will some one explain the nature of the chemical change effected by fulling raw deer skins with Straits or Labrador cod oil, by which they are converted into what is commonly known as buckskin? After the hair and grain have been removed, the skins are alternately sprinkled with the oil, fulled in a fulling stock, and aired or partially dried until the lime water in which they have been previously manipulated has entirely evaporated, and then the oil is extracted and they are ready for use.—V. E., Jr.

26.—How can I bleach broom corn so as to make it almost white?—T. J. S.

27.—Is there any way of composting leather chips and similar offal, to convert the same into manure?—T. J. S.

28.—I am a grower of tea and wish to know how to test my daily manufacture for strength, flavor, pungency and briskness when good, and for sourness, flatness, and mustiness when bad. If a chemical test is suggested, I should like to know what apparatus is required, and how it is used. Can any instrument such as an hydrometer be used? Can an extract of tea, similar to the well known extract of coffee, be made? How is it done, and what apparatus is required? What principles does tea contain, and how are they acted upon in the treatment of the leaves? Can the infusion of tea be analyzed and its constituents separated?—E. E., of R., India.

29.—Can any one tell me how blue and red litmus test papers, for acids and alkalies, are prepared?—J. F. S.

30.—I am in a bad predicament and want advice. I built a cottage in the Swiss style last winter. The roofs are steep, irregular, and many-sided. Being a novice in building, I left the matter, except paying the bills, entirely to the architect. The tenant has complained from the first that the roof leaked badly all over. I find on examination that the shingles (cedar) are nailed to narrow lath-like strips instead of to boards. I interviewed a carpenter the other day, and sought his advice as to the best mode of stopping these leaks. I was dismayed when he told me the only way was to take off the shingles and slats, fasten boards to the rafters, and nail the shingles to the boards. My attention was called to rays of light streaming through the roof in all directions; and, to render me still more unhappy, my carpenter tells me that, at the first winter's storm we have, the chambers will be filled with snow, blown through these cracks and under the warped shingles. Now I do not wish to incur the expense of taking off the shingles or disfiguring the roof, by covering it with painted canvas, which some one has suggested. Is there any coating that can be supplied, which will sufficiently cover the cracks and fill the space under the shingles, to prevent the snow entering: or what can I do?—M. D. O., of N. J.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

Young Engineer, who wants to know about the dimensions of safety valves, rods, lap, etc., may study Bourne's "Catechism of the Steam Engine," or consult back volumes of the SCIENTIFIC AMERICAN. We cannot spare the space to go over the A. B. C.'s of the subject with him. If he is in real earnest to supply himself with a knowledge of the steam engine, he should, in addition to study, make himself an operating wooden model of valves, piston, and cylinder. By observing the motions of the parts, in connection with his studies, he will reach an understanding of the matter.

J. H. L. asks:—What preparation is used by painters to cover the glass in doors, to prevent people looking in, which does not materially obstruct the light? Answer: A strong solution, in water, of sulphate of zinc is frequently employed. It gives a white frosting. After drying, it should be protected by a coat of varnish.

G. A. F., of Texas, says:—I have in my house a reservoir, in the garret, for supplying the house with water. This reservoir is of wood lined with galvanized iron; pipes of galvanized iron lead from it to the washstands, etc., in the different rooms. The water is discharged from the washstands through iron pipes into a sewer under the house, leading into an open ditch some fifty yards off. The water is pumped into the reservoir from a (drive) well some thirty feet from the house and some forty feet deep. The pump is at the well; and the water is forced from it to the reservoir through galvanized iron pipes laid underground to the house, then up between the weatherboarding and ceiling to the reservoir. The water is good but, I think, has some lime and sulphur in it. Will the galvanized iron in any way affect the water and make it unwholesome to use, or is the arrangement safe? Again, is it safe on account of lightning? The iron and water are good conductors; and the reservoir being at the top of the house all the pipes lead from it to the different rooms, as well as to the pump (which is all, even the handle, of iron), and into the ground. Is it dangerous or is it a protection? Answer: The use of galvanized iron pipes for conducting water for household purposes is unsafe, as the zinc is likely to become slowly dissolved in the water and result in poisoning. Several distressing examples of such poisoning, in families, have occurred, accounts of which we have published. Your arrangement of pipes and water tank is good as a protection against lightning. All house pipes should be connected with underground pipes in the way you have them.

H. M. asks whether the heating of impure air purifies it; or, in other words, is a vitiated air, such as is generally found in ordinary cellars, rendered fit for breathing by being heated in the ordinary hot air furnaces at present in use? My reason for asking this question (which possibly may be a very absurd one) is that, being engaged in fitting up various kinds of heating furnaces, I have frequently hesitated about drawing my supply of cold air from the cellar, although it is a very prevalent custom. Answer: It does not purify foul air to warm it. It is the worst possible plan to send the air from the cellar through the heater, thence into the apartments of the house. Cellar air is apt to be charged with carbonic acid gas and other impurities. You should always arrange air pipes in connection with the heater so as to take the supply from outdoors.

H. W. S. asks:—Can you give me any method for filtering sperm oil that has become mixed with other substances? Answer: Bone black is a good material for an oil filter.

A. C. G. asks:—Is there any process by which charred paper can be restored so as to take from it its peculiar brittleness and make it bear handling? I have a valuable work, parts of which have become brittle by fire, so that it will not bear handling without breaking. The authorities at Chicago used, I believe, some method for restoring currency, etc.; can you tell what it was? Perhaps some of your correspondents may be able to enlighten me. What colored glass for lamp chimneys or shades is most beneficial for weak eyes? They are made in various tints of blue, green, red, etc.; which of them is the best, or would an occasional change from one to the other be desirable? Answer: We call to mind no method of rendering charred paper pliable, as you suggest. Use pale blue glass for the lamp chimney. It corrects the yellow glare of the ordinary lamp flame.

J. C. says:—I wish to know if there is any chemical process for getting gold out of quartz rock besides the use of quicksilver. Answer: Yes. The quartz may be dissolved in hydrochloric acid. But this is a rather expensive process.

G. R. E., of Miss., says:—I have found a pearl growing in this part of our country. Enclosed you will find a specimen; please inform me what you think of its value. Answer: The specimen is not pearl but quartz. Will G. R. E. state where he found it, that is, whether in a river bed or in dry earth; and state also the original shape of the specimen? This specimen appears to have been artificially rounded when found.

P. H. A. asks:—Is there any danger of bursting the barrel of a rifle in case the ball is not rammed down to the powder? Answer: The fact that the ball is not rammed down does not increase the liability of bursting the barrel.

D. G. N., of Ark., says:—I have a 12 horse power engine and wish to run a circular mill. Please to give me your opinion as to the best mode of obtaining full effect, also probable amount of work that will be done. If with a 20 horse power and 52 inch saw and good head blocks 9,000 feet could be cut, can I cut 3,000 or 4,000 feet? I also send a sample of scale from boiler, and sediment deposited from water. Would like to know if it is injurious. My engine is a Wood, Faber & Morse portable. Answer:—Our correspondent should probably run his saw at a velocity of periphery something under 9,000 feet per minute, taking as coarse a feed as his power will allow. He will probably be able to cut between 4,000 and 5,000 feet with careful management. If he can belt direct to the saw, without countershaft, he will probably economize power to some extent. The scale sent is injurious, as is every kind of deposit, as an obstruction to the passage of heat from the furnace gases into the boiler. That which seems almost an impalpable powder greatly resembles a form which has caused more than one explosion by the great non-conducting power which it possesses. He should clean his boilers frequently, if it is deposited in any considerable amount.

J. M., Jr., of Sydney, New South Wales, asks:—What is the best method of making lubricating oil from crude petroleum, and also from the heavy oil obtained from crude petroleum, after extraction of the paraffin scales? Answer: In some of the Pennsylvania refineries, about 50 per cent of the oil is distilled off for illuminating purposes, and lubricating oil is made by refining the residue. This is done by heating (preferably by immersed steam pipes) to 212° Fah., which drives off the lighter inflammable portions. There is left in many oils a species of grit, said to be rottenstone in solution, and there are processes for getting rid of this ingredient, but they are generally kept secret by their proprietors.

E. A., of New Mexico, sends us a mineral specimen and says:—Will you please inform me what the specimen is, and if of any value? Answer: It is oxide of manganese, an ore of considerable value in the arts.

S. asks if the rays of the moon, falling upon drops of rain, would produce a rainbow. Answer: Yes. The lunar rainbow has been frequently observed.

To J. S. J., page 217. According to experiments with hollow side stays one fiftieth of the grate area, 190 feet of air were passed through firebox for each pound of coal consumed.—C. M. H., of Iowa.

J. M. can temper his millstone picks by using the following pickle: One ounce corrosive sublimate and two handfuls common salt to six quarts water. Heat the picks to a cherry red only, and put them in the pickle, and do not draw any temper. Always work mill picks at as low a heat as possible.—J. T. N., of N. Y.

W. W. can fix pencil marks on paper as follows: Make a size of isinglass dissolved in a saturated solution of alum, boil it after cooling, and add an equal quantity of alcohol. Put the liquid in a dish, and gently immerse the drawing therein, face downwards.—J. T. N., of N. Y.

To P., query 10, page 249.—Take a wide-mouthed fruit jar (a self-sealer, whose top screws on, is the handiest) and in the bottom put an ounce of cyanide of potassium in chunks, and over it place some cotton or wool. Cut a piece of pasteboard to the right size to fit closely the inside of the jar; punch it full of pin holes, and place it in the jar over the cotton and press it down level. Never leave the jar open long at a time as the fumes of cyanide are poisonous; and when opened, let it be done in the open air, or, if in a room, near an open window. In a jar so fixed, any insect may be killed without injuring it in the least.—L. Q. B., of O.

IRON RUST STAINS.—I have enjoyed a laugh at R. O. W.'s witticism, and would ask him if he has tried my mode for removing iron rust stains? I venture to say he has not; he therefore exposes his own ignorance, for the plan will not destroy the cloth; and if he will work cloth in one part sulphuric acid and two parts water for half an hour, he will find it uninjured by the acid. Does he know that such a solution is in daily use in a certain manufacture of cotton? I will enlighten R. O. W. further: sulphuric acid is much better than oxalic.—E. H. H., of Mass.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

ROAD SCRAPER.—Michael M. Brunner, of Orange, N. J.—The object of this invention is to provide a convenient machine for scraping and leveling roads, more especially designed for carriage roads in cemeteries and private grounds, but applicable to all roadways; and it consists in a series of adjustable bars with triangular scrapers thereon. The scraping teeth may be made separate and be attached to the bars by means of screws or otherwise, if desired. When the machine is in use these ends rest upon the ground, and as the machine is drawn along, they scrape the ground and tear up the grass and weeds. When they meet an obstruction (a fast stone for instance), their angle, in regard to the surface of the ground, is such that an obstructed bar will be raised by the contact and will pass over the obstruction and instantly drop by its own gravity to the surface of the road. The scrapers are so spread at the bottom that, although the bars are separated, the scraping teeth cover the entire surface, and leave the ground level and clean when they are not obstructed by roots or stones. Weights on the rear ends of the bars may be adjusted as desired. Each bar may have a weight, and, as they are moved from or toward the scrapers, the effect will be increased or diminished. The machine is in use in the grounds of the cemetery at Orange, N. J. and is spoken of as working in the most satisfactory manner.

BOTTLE.—Benjamin C. Odell, of Kingston, assignor to himself and Robert McNaught, of Albany, N. Y.—This invention relates to a new style of bottle for use in the dispensing of medicaments and other articles; and has for its object to separate within the same bottle two or more kinds of liquid which can be separately removed to be mixed or not, as may be found most agreeable or proper. The invention consists in arranging one or more partitions within the bottle, thus dividing it into two or more separate vessels or receptacles, each of which has its own discharge neck or spout. This enables the putting up of several ingredients whose mixture in the same bottle may not be required, but which, nevertheless, it is desirable to have at hand together.

DEVICE FOR CUTTING SCREWS.—William W. P. Clement, of Canoe Station Ala.—This invention relates to a new implement for cutting screw threads on bolts or pins, being especially intended for use on the ends of bolts that project from cylinder heads or other surfaces, from which it is not desired to detach the bolts. The invention consists in the use of dies, held by hinged jaws and by a clamping nut in the end of a tubular shank, which can be connected with a brace or wrench whereby to be turned. This instrument can be applied without inconvenience in places which are inaccessible to the ordinary screw plate.

GLOVE.—George Chandt, of Port Jervis, N. Y.—This invention consists in the form of the pattern or shape for the thumb piece, whereby a smooth fit in the angle between the hand and thumb is produced, and the seam is removed from the part most subject to wear; and second, it consists of a flap attachment to one of the parts at the opening in the wrist, adapted to wrap around and button at the front of the wrist.

MODE OF ATTACHING PULLEYS AND WHEELS TO SHAFTING.—Charles L. Smith, of Rahway, N. J.—This invention has for its object to furnish an improved device for attaching pulleys and wheels to shafts securely, and at the same time detachably. In the hub of the pulley is formed a groove, which does not extend the whole length of said hub, and which is designed to receive a key rigidly attached to the shaft upon which the pulley is placed. In the end of the hub of the pulley, at the end of the groove, is formed a dovetailed notch, into which is fitted a dovetailed piece. Upon the outer surface of the end of the pulley hub and of the piece is formed a screw thread, into which fits the screw thread of the nut or band. By this construction the dovetailed piece prevents the tongue from coming out of the groove, and the band or nut prevents the piece from coming out of the notch, so that the pulley is rigidly and at the same time detachably connected with its shaft.

HORSE POWER.—Thomas S. Johnson, of Winona, Miss.—This invention relates to a new manner of connecting the driving wheel of a horse power with the sweeps to which the animals are attached, and has for its object by the new connection, to increase the convenience of construction and gain or economize power. Sweeps secured in a socketed hub on a shaft so as to project from the diametrically opposite sides thereof, and connected by inclined braces with the driving wheel, constitute the claims allowed in the patent.

WASHING MACHINE.—Joseph H. Jenkins, of Smithville, Mo., assignor to himself and Elijah W. Jenkins, of same place.—This invention has for its object to furnish an improved washing machine, and it consists in the box

which is made rectangular in form and contains a large cylinder, to the face of which are attached, at a little distance from each other, longitudinal ribs, which are turned into alternate concavities and convexities, and which should be so arranged that the convexities of one rib may be opposite the concavities of the adjacent ribs, so as to more effectively operate upon the clothes and so as to allow buttons to pass the said ribs without being broken off. The operator, by operating the treadle with his foot, can bring a concave board against the ribbed cylinder and hold it there with any desired force. A flexible pad of cloth, or other suitable material, may be placed upon the concave board to form a yielding bed for the clothes while being operated upon by the ribbed cylinder.

ROTARY WRENCH.—Almon Pitcher, Freedom, Minn., assignor of one half his right to Lester D. Pitcher, Dixon, Ill.—This invention consists in an improved mode of opening and closing the two pawls which are used in turning the jaws of a rotary wrench. The disengaged pawl is held by a dog, while a spiral spring holds the other pawl to its work.

LOOM FOR WEAVING HAIR CLOTH.—William Samuel Laycock, Sheffield, England.—This invention is applicable to those looms in which the weft is of horse hair, or other material in short lengths; and it consists in the application of certain parts to the shuttle, which parts catch hold of the weft and deposit it in the shed. When the shuttle, in transversing, brings one of the rollers near the selected horse hair, it is guided into the groove of the roller by the guard and curved wire, and as the traverse of the shuttle continues while the end of the selected horse hair is held in the nippers, it is evident that the shuttle draws the horse hair out of its bunch in the tube and deposits it in the shed, the nippers of the right hand selector being opened as soon as the shuttle has arrived near the left hand selector to release the horse hair. A left hand selector, as soon as the shuttle has passed, is raised to lift the end of a horse hair, and to hold it while the shuttle returns.

MANUFACTURE OF INDIA RUBBER HOSE.—Isaac B. Harris, Newtown, Conn.—This invention relates to that description of ply-hose called suction hose, heretofore manufactured of india rubber, or india rubber compounds, in combination with cotton, flax, linen, canvas, or cloth, and consists in protecting from displacement the coils of metallic wire or coils of metallic hoop iron or loose rings employed in keeping the flexible canvas and india rubber materials of such hose or tubes distended against atmospheric or other external pressure. The inventor forms the outside coverings and applies them outside of the bare or uncoated wires, hoops, or rings first, and presses them inward so as to effect the cementation thereof as heretofore, and he afterward introduces an inside covering for the metallic spirals or rings. This inside covering is formed of a plastic or yielding rubber tube, and inside of this tube, when introduced into the hose, he applies hydraulic, gaseous, or steam pressure. By this means, the inner tube is forced outward against the wires, hoops, or rings, and also against the surface of their immediate outside covering, there being no filling inserted as heretofore (in the making of ply-hose) between the coils of wire.

FIREPLACE DAMPER.—James Bradford, Charlotte, N. C.—This invention has for its object to furnish an improved device for regulating the draft of fireplaces, which shall be so constructed and arranged as to supply the fireplace with air to support combustion from outside the room. In the foundation is formed a transverse flue, open at both ends, and from which small flues lead up to an air chamber, placed directly beneath the hearth, and which should occupy the space of about two bricks, more or less. The air chamber is covered with a metallic plate, which should be so formed as to rise a little above the level of the hearth, and in its vertical forward side, near the top, is formed an opening through which the air may be allowed to escape. Another plate fits upon the top of the forward part of the plate above mentioned, and the forward edge, which is bent downward, is so arranged as to allow the air to escape through the opening to the fireplace to support combustion, and thus prevent air from being drawn from the room for that purpose. Cold air may be prevented from being drawn in through the cracks and openings around the doors and windows of the room. This construction of the device prevents any puff of air from passing through the flues and air chamber to the fireplace, and prevents any cinders or ashes from falling into the air chamber or flues.

BOAT-DETACHING APPARATUS.—Edward J. Hill, Pimlico, England.—This invention relates to improved means of automatically detaching a ship's boat immediately it is lowered into the water. In carrying out the invention, a peculiar contrivance, which may be divided into two parts, termed the slip hook and the slip ring, respectively, is employed. This contrivance the chief means whereby the automatic detachment of the boat is insured. It is combined with the boat and boat-lowering tackle. The boat-lowering tackle may be of any suitable description. The boat is suspended from the block tackle by means of an arrangement of ropes or chains, termed a sling, the purpose of the said sling being to connect the slip rings together. The slip hooks and the slip rings are employed, one toward either end of the boat. Each slip ring is made double—that is to say, it is forged in two loops at right angles to one another. The smaller loop is attached to the nearest block of the tackle, and the large loop is sometimes made heavier on one side, for the purpose of insuring the disconnection of the boat under certain circumstances. The sling consists of a wire rope, by which the two lower blocks of the falls are connected together, and two short chains, which may commonly be of the length of two feet, by which the slip rings are attached to their respective blocks. The length of the horizontal rope is less than the distance between the slip hooks fixed in the boat, so that when the slip rings are engaged in the slip hooks, and the boat is suspended, the chains each stretch out at an angle with the rope. The ends of rope are merely hooked to the blocks by hooks formed on the under side of the first link or shackle of chains, a loop being made at each end of rope around a thimble fitting loosely on hooks, so that, when the slip rings disconnect from the slip hooks, the rope will be detached from the blocks and fall into the boat, thereby avoiding any chance of the rope dragging a man overboard. The slip hooks are pivoted in a shackle or link, and are free to incline themselves to the direction of the strain. The slip hook consists of a curved or hook shaped part, in which the slip ring engages, and an upright guard, over which the slip ring is passed. The guard serves to render it impossible for the slip ring to again engage itself with the hook, when once, by the slackening of the chains, it has become detached. Thus, immediately the boat is fairly floated and the sling chains are released from its weight, they slacken and allow the slip rings to fall, whereby the boat is instantaneously and automatically detached by the act of lowering the boat into the water.

NEW BOOKS AND PUBLICATIONS.

COOLEY'S CYCLOPÆDIA OF PRACTICAL RECEIPTS, and Collateral Information in the Arts, Manufactures, Professions and Trades. Fifth Edition. Revised and partly rewritten by Richard V. Tuson, F. C. S. Philadelphia: Lindsay & Blakiston.

This new edition of a well known work contains information, on all the subjects on which it treats, of the latest date, and describes the most recent improvements in all branches of domestic and commercial economy.

TABLES, for the Rapid and Exact Computation of the Number of Gallons contained in any Given Weight of Oil, etc., arranged with Special Reference to the Wants of the Petroleum Trade. By S. A. Lattimore, A.M., Professor of Chemistry in the University of Rochester, N. Y.

This book is a handy volume of comparative weights and measures of oils of all specific gravities. It will be found useful to the trade, as it is complete and trustworthy.

SMALL POX; the Predisposing Conditions and their Preventives, with a Scientific Exposition of Vaccination. By Dr. Carl Both. Boston: Alexander Moore. Boston and New York: Lee and Shepard.

Dr. Both gives, in this book, a lucid and, no doubt, a correct explanation of the condition of the body and blood which renders man especially accessible to the attacks of the terrible scourge, small pox; but he attacks the system of vaccination in its entirety, without attempting to explain away the fact that the ravages of the disease have been largely reduced wherever the practice of vaccination has been thoroughly enforced by law. Many writers on this subject have shown that cleanliness, temperate living, and proper care of the health will, in theory, prevent the spread of the disease; but we have to deal with society as it is, with dirt, squalor, intemperance and neglect of decency all around us; and the efficacy and necessity of vaccination are demonstrated more and more forcibly every day.

EVENINGS AT HOME: A Collection of Indoor Games. Milton Bradley & Co., Springfield, Mass.

Messrs. Milton Bradley & Co. are largely engaged in the manufacture of games for children, calculated to form pleasant and useful amusement during the long winter evenings. We notice that, in this collection, the excellent kindergarten system of object teaching has been followed as a principle, while the various playthings are admirably devised to combine both instruction and entertainment. Each game (and a large selection, through the courtesy of the manufacturers, has been laid before us) has some useful object. Thus, for children of two or three years of age, there are bits of gaily tinted paper, to weave into fanciful designs, thus impressing their minds with the first ideas of color and form. Then there are games which teach the names of numbers; others, more advanced, that require some arithmetical knowledge to perform the mental computation; others, again, such as the "dissected locomotive," give a good general idea of the parts of machinery. Even literature is pressed into service, for a game of cards is published by which the juveniles are rendered familiar with the prominent characters of Dickens' novels. History is taught in a somewhat similar manner; while even the alphabet is presented in such an attractive form that the most perverse of youngsters would, of his own free will, take the first steps in the thorny path of learning. Nothing is published by the above firm that will offend the most fastidious. Every thing is either innocently amusing or directly instructive, while the sole aim is to provide healthy and profitable recreation. From our examination of the samples forwarded we can cordially recommend the games to the notice of our readers as excellent gifts for the little ones during the coming holidays.

UNDERGROUND TREASURES: How and Where to Find Them. By James Orton, A.M., Professor of Natural History in Vassar College, N. Y. Worthington, Dustin & Co., Publishers, Hartford, Conn. Price $1.50.

This is the title of a valuable little work on minerals, etc., by Professor James Orton, of Vassar College. It is intended as a guide for the most unscientific, enabling them to determine the nature of the majority of mineral specimens themselves. By an artificial key, prepared by the author, the use of the plain language of common sense, and the omission of any thing and every thing which will not aid in distinguishing the various minerals, the necessary knowledge has been condensed into a very small compass. With this little book in hand, any one may detect the useful minerals without trouble or expense. It will prove of great value to many, especially in remote districts of our country, and lead to the development of the vast but now hidden mineral resources of the United States. It is thoroughly scientific, without appearing so. It is not meant for the mineralogist, but for the artisan, the farmer, the laborer, the miner, and the like. It will be welcomed by the majority of our readers, being just what is needed to place in the hands of the people; and its use, we think, will result in many discoveries.

[OFFICIAL.]

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SCHEDULE OF PATENT FEES:

On each Caveat	$10
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

22,635.—TOOL HOLDER.—W. W. Draper. January 2, 1873.
22,681.—COOKING STOVE.—P. P. Stewart. January 2, 1873.
22,723.—LANTERN.—C. Gersten. January 8, 1873.
22,742.—BED BOTTOM.—B. F. S. Monroe. January 8, 1873.
22,753.—BREECH LOADING FIRE ARMS.—C. Sharps. January 8, 1873.
22,812.—ROLLING HORSESHOE IRON.—W. W. Lewis. January 15, 1873.
22,853.—SEWING MACHINE.—W. W. Wade. January 15, 1873.

EXTENSIONS GRANTED.

1,829.—PHOTOGRAPHIC SHIELD.—E. Gordon.
21,879.—SELF MOUSING HOOK.—J. R. Henshaw.

DESIGNS PATENTED.

6,201.—WATCH CASE.—C. K. Colby, New York city.
,202.—STOVE PLATFORM OR SUPPORT.—W. M. Conger, Newark, N. J.
6,203.—TOY BOAT.—J. M. Dodge, Newark, N. J.
6,204.—STAIR ROD.—W. T. Mersereau, Orange, N. J.
6,205.—HANDLES OF SPOONS, ETC.—E. C. Moore, Yonkers, N. Y.
6,206.—SUGAR TONGS.—G. Pashley, E. Davies, New York city.
6,207.—GROUP OF STATUARY.—J. Rogers, New York city.
6,208.—JARS FOR FISH, ETC.—J. R. Thompson, New York city.
6,209.—LADY'S HOOD.—C. E. White, Baltimore, Md.

TRADE MARKS REGISTERED.

1,028.—BITTERS.—C. Frank & Co., Cincinnati, O.
1,029.—CORSETS.—T. F. Hamilton, New Haven, Conn.
1,030.—SHELL GOODS.—S. F. Knight, Providence, R. I.
1,031.—RYE WHISKY.—W. T. Pitt, C. McCann, Baltimore, Md.
1,032.—MEDICINES.—William R. Reud, Brooklyn, N. Y.
1,033.—BOOTS AND SHOES.—P. Ware, Jr., Boston, Mass.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants or their New York correspondents.

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A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co. 37 Park Row, for full particulars.

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