SCIENTIFIC AMERICAN

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

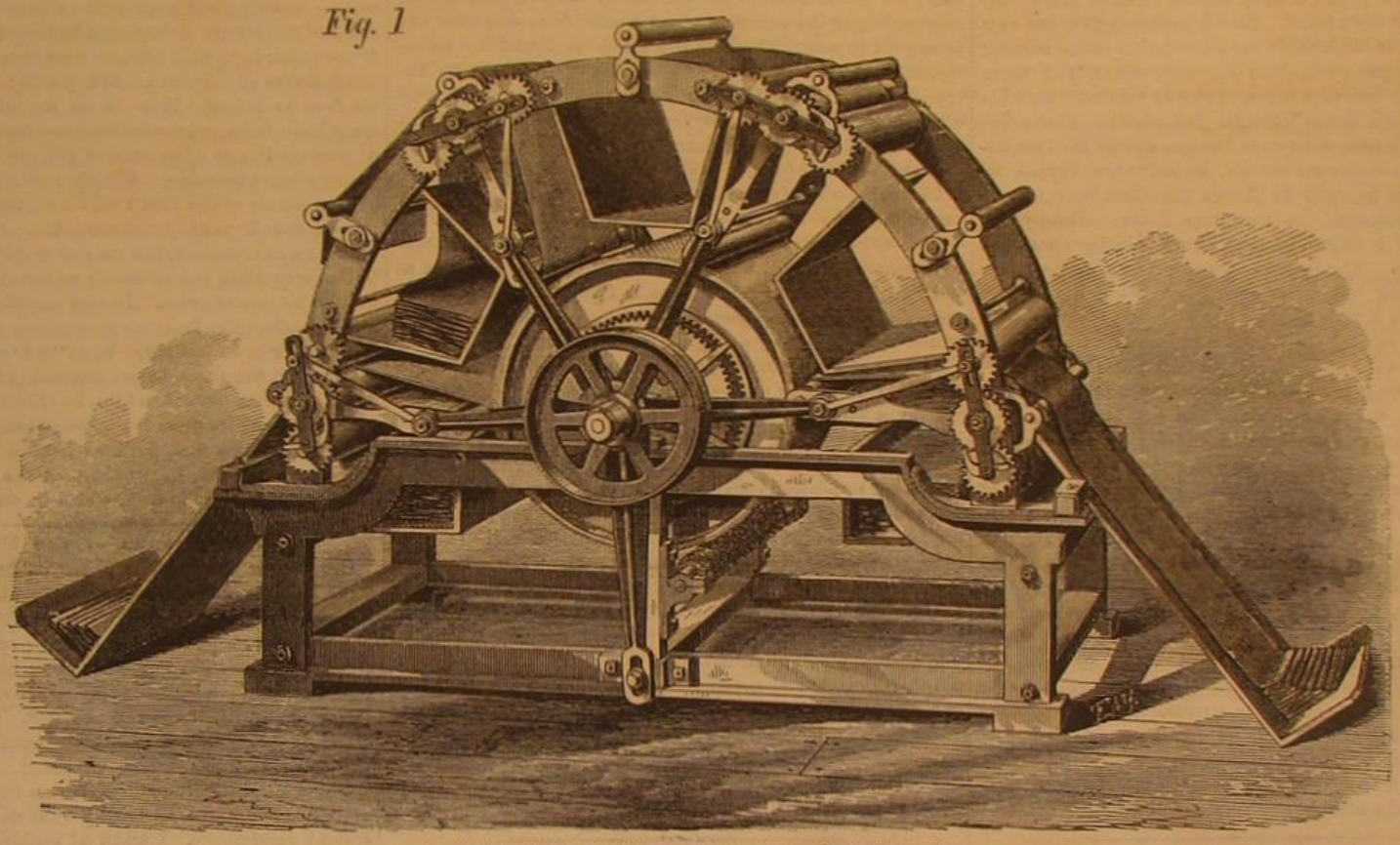
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IMPROVED NAPPING MACHINE.

Our engravings illustrate an improved machine for raising the pile or nap on woolen and cotton fabrics. It appears to be well calculated for the intended purpose, and is undoubtedly a very ingenious invention.

In Fig 1 is given a perspective view of the machine, which is intended to be run by steam or other power. It will be seen to consist essentially of a central cylinder and four systems of rollers, all of which are operated by the one driving shaft. The central, or napping cylinder, carries on its periphery the cards or teasles by means of which the pile is raised. Each system of rollers performs the duties of carrying in the cloth, presenting it to the operation of the napping cylinder, and carrying it away again to a fitting receptacle, as shown in the engraving. It follows, therefore, that as many pieces of cloth may be napped as there are systems of rollers; and their number may of course be increased or diminished according to convenience As the operation of the machine is complete in each system, an explanation of one will explain the whole, and the reader will now, therefore, please refer to Fig. 2, in which one system of rollers and the driving mechanism of the machine are shown in detail.

Fig. 1



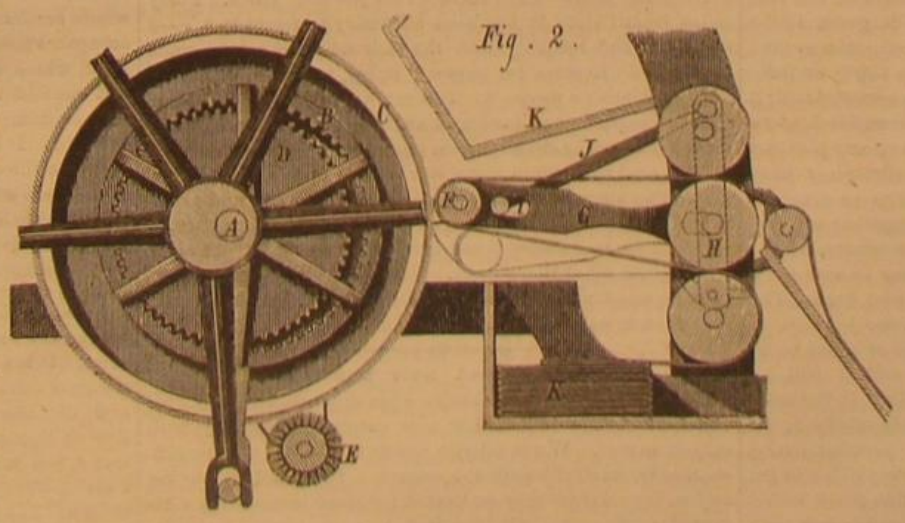
LADDS IMPROVED NAPPING MACHINE.

A is the driving shaft. To it is attached the eccentric shown, by means of which the four arms which operate the four systems of rollers are actuated and made to oscillate and to advance and recede alternately; their motion is circumscribed by a fifth arm, which slides on a fixed bearing at the lower part of the machine, as delineated. On the shaft, A, behind the eccentric shown is placed a second eccentric, by which the gear wheel, B, is worked. This wheel, B, is limited to an upward and downward and oscillating movement, by a contrivance similar to that by which the movement of the arms is circumscribed. To the napping cylinder, C, is attached the inner gear, D. They both run loose on the shaft, A, and an intermittent revolving movement is produced in them by the action of the gear, B. The roll, E, which is run by a band and pulley on the further end of the shaft, A is arranged for keeping the napping cards, etc., clear. We will now examine the system of rollers The roller, F, is carried by the arm, G, the further end of which is slotted and engages with the shaft of the roller, H, in the manner indicated by the dotted lines. The driving arm of this system (which is broken off in the engraving) has a rod, as shown, which passes through the slot, I, in the arm, G. The outer end of this rod is provided with a pivoted arm, J, which is adjustably attached to a lever, the other end of which carries a spring pawl, which latter actuates a ratchet wheel attached to the shaft of the roller, H. This ratchet actuating mechanism which is partly shown and indicated by dotted lines in Fig 2, is so fully shown in Fig. 1 as to require no further explanation, and it will readily be seen, on inspection thereof, how the outward movement of the rod results in a partial revolution of the roller, H. The two rollers geared to H, of course, make corresponding movements in the opposite direction. At K is the cloth to be napped; it passes from the recess in which it lies round the lower roller, between that and the roller, H, round the roller, F, and thence between the roller, H, and the one above it, whence it passes over a small outside guiding roller into a suitable receptacle.

In the operation of the machine, on each revolution of the driving shaft, the napping cylinder is moved forward slightly in its revolution and brought again to a stand, while the roller, F, which presents the cloth to the napping cards, is moved eccentrically away from and then towards the cards; at the same time the action of the ratchet device causes a partial revolution of the roller, H, and the cloth is consequently fed in by the lower pair of rolls, and withdrawn by the upper to the same extent. In this way every portion of the surface of the cloth is presented to the nappers, and the operation is performed in a highly effective manner.

By adjusting the ratchet mechanism suitably, the roller, F, can be made to approach the napping cylinder more or less, as may be desired, and by this means the thickness of the layer of fabric raised into pile can be precisely determined, which makes the machine of peculiar value in the manufacture of canton flannels, where the strength of the flannel is frequently jeopardized by the depth of the nap.

Fig. 2.



Among the advantages claimed for this machine are the small space it occupies, the non-liability to get out of order, and the facilities it gives for inspecting the work as it is performed. Should the fabric not be sufficiently napped on passing one set of rolls, it may readily be subjected to the action of another set before leaving the machine; and if it is designed to nap both sides of the cloth at one operation, the object is easily accomplished by passing it through a second set of rolls in reversed order. Piece after piece of cloth may be carried through the machine by simply sewing the end of one piece to that of the next.

The device is patented, and further information in regard to it may be obtained by addressing the inventor, Mr. Calvin P. Ladd, of the Ridgewood Works, Bloomfield, N. J.

A New Molding Material.

Colonel Muratori, an Italian inventor, has recently discovered a new composition corresponding to the *gesso duro, stucco duro* (hard plaster of Paris, hard stucco), which was used by the Cinque Centisti in the 16th century, and was subsequently unfortunately lost.

Like plaster of Paris, it may be used for casts. It hardens slowly, and the artist thereby has all the time he requires. Dry, it becomes very hard, and no longer receives stains. Even oil dropped on it then does not discolor it. And it can be cleaned and washed without in any way injuring the most minute and delicate details.

Its color is transparent snow white, dull, or lustrous, if so wanted; for any part of the surface is susceptible, by simple friction, of assuming a kind of crystalline enamel. Mixed with ordinary colors it retains all the properties above detailed, and most beautiful imitations can thus be made. The price of this new material is not likely to surpass the price of fine plaster of Paris.

The process of manipulation remains the same; no novelty of apparatus or handling requires to be introduced, whether the material be worked by an artist, by a skilled or common workman, and it is all these qualities combined which render it of such very great importance as a substitute for plaster of Paris for all artistic works.

Another application of the same kind deserves mention, for it also possesses a high importance. Any object whatsoever of plaster of Paris dipped into a bath of the composition comes out covered with a kind of enamel, the most minute details remaining uninjured. The solution in the bath, which is called liquid enamel, has the following properties:

It preserves and cleans plaster of Paris objects without altering, affecting, or injuring their minutest details; it gives them a beautiful transparency, and they may be left dull or made lustrous at will. It has no smell, and is not affected by exposure to great heat.

An Engineering Triumph.

There is a German printing office in this city where the employees have adopted an ingenious method to gratify their Teutonic prochivity for good lager. The composing room is situated a good way up in the skies, far above sublunary things, indicating a corresponding intellectual elevation. It might be supposed that under these circumstances the love of lager might receive a check. The reverse is the case. The back door of a saloon and bar room opens into a yard near the printing office. A good stout telegraph wire has been stretched from a post in the yard to a window of the room where the intellectual "comps" perform their arduous labors. When a supply of the stimulant is required, the tinkling of a bell arrests the attention of the bar keeper, and a set of tins or buckets, filled with the sparkling beverage, are drawn along the wire, and safely landed at the window

It has been well said that necessity is the mother of invention, and this is an apt illustration of the saying.—*St. Louis Republican.*

The Manufacture of Textile Fabrics at Pompeii.

Some interesting particulars of the ancient method of cleansing and finishing woven fabrics, as revealed by the ruins of Pompeii, are given by M. Beulé, who inspected the remains of a fulling and bleaching establishment in the buried city. The house in question was unearthed some time back, but the descriptions of its contents seem to have been confined to the pictures.

The largest and best executed paintings representative of the art were discovered in 1820, in the house of a fuller, opening on one side on the street of Mercury, and on the other on a street called, after him, Fullonica. In the court, a pillar covered with pictures was standing alongside a fountain. This pillar has been removed and deposited in the Naples Museum. In the lowest division, a woman, sitting, hands a piece of cloth to a little female slave. A workman, whose tunic is closely tied around the body, is looking at them, while at the same time carding a white cloak with a purple border, suspended from a stick. Another workman is in the act of sitting down alongside a crate of wicker work on which the cloth is to be spread out; in one hand he holds a vase on which sulphur thrown on burning charcoal will develop a gas capable of bleaching the cloth. This is the same method, says M. Beulé, which is used to-day. On another face of the pillar, arched niches contain large vats where the goods are soaked. Slaves standing in those vats trample the fabric with their bare feet in the same manner as Arabian women wash their linen by trampling them against the rocky bed of a stream; this is what the ancients called "the fuller's dance" (*saltus fullonicus*). The artist has painted with the same care the press with its two uprights, its two enormous screws, which were turned by means of cranks in order to flatten the cloth beneath the planks which imparted the necessary finish. Finally, the drying chamber is shown by long sticks hanging on chains from the ceiling. The linen is spread out on them; a slave hands to a young woman an open fabric, while the wife of the fuller makes a note of it on her tablets. I have visited with particular curiosity the houses in Pompeii where these pictures had been gathered. I counted there in a court twenty-two tanks constructed of stone, and at different levels, so that the water could run from one into the other. Little benches in front of them served for the reception of the goods. At the other end of the court, seven smaller tanks served for fulling. The store room, with traces of the planks, which were laid like rays radiating from a center, the hearths, the drying chamber, may still be recognized. In other fullers' establishments, I have seen very thick sheet lead lining the interior of vats made of cement. Sometimes, also, we find jars full of greasy earth, which must be the fuller's earth of which Pliny speaks, and which contributed as much to the whiteness of the goods as the fumigation with sulphur or the urine which was collected in vases placed at the corners of the streets. Thus, despite the differences of time and processes, it has been established, to our surprise, that moderns are but little inventive, or, rather, that the ancients had already discovered all that was essential, rational, and suited to the requirements of the art.

Hints for the Country.

In preparing grounds, it should be remembered, says the *Gardener's Monthly*, that grass and trees are not only required to grow therein, but that they must grow well. The top soil of the lot is often covered by the soil from the excavations, trusting to heavy manuring to promote fertility. But this is a too slow and expensive process. The top surface soil should, in all cases, be saved, and replaced over the baser soil. Also, where it is necessary to lower a piece of ground, the top soil should be saved to place over again. The depth of the soil is an important matter, both for the trees and the lawn. It should be at least eighteen inches deep. In shallow soils, grass will burn out under a few days of hot sun. In a soil eighteen inches deep, a lawn will be green in the driest weather. For the sake of the trees, also, the ground should be not only deep, but rich. If from thirty to forty loads of stable manure to the acre could be appropriated, it would be money well spent. Life is too short for it to be an object to wait too long for trees to grow, and planting large ones is an expensive as well as unsatisfactory business. A tree in a rich and deep soil will grow as much in one year as in five in a poor one. So in preparing a lawn, it is fortunate that, while aiming at the best effects, we are helping our trees also. It is generally better to sow for a lawn than to sod, where much of it has to be done. The edges of the road must, of course, be sodded, and the balance neatly raked over and sown. The best kind of grass to be employed in seeding is a disputed point, and it will, no doubt, depend in a great measure on the locality. In Philadelphia and northward, the perennial rye grass is excellent. It commences to grow very early, and has a peculiar lively, shining green. South of Philadelphia, it is very liable to get burned out in summer, and the Kentucky blue grass would be much better. It is much the best to have but one kind of grass for a lawn, provided it is suited to the locality. A mixture of kinds is apt to give a spotted and variegated character, not at all pleasing. Some people like to see white clover growing thickly in a lawn and others object to anything but green. However, if a good grass rake is employed freely in summer time, the heads of these flowers may be kept from expanding. Where there is a prospect of a month of growing weather, lawns may still be sown with grass seed, the clover, where used, to be kept for sowing in April or March next. A small quantity of rye should be thinly sown with the grass, which, by the shade it affords, will prevent the grass from being thrown out by the frost. The rye must, of course, be closely cut in the spring, to allow the grass to get ahead of it.

Hilgard's Magnetic Survey.

It is a fact well understood by the unlearned as well as the learned that, in determining the true north line, surveyors and civil engineers are accustomed to make certain allowances for what is called "the variation of the magnetic needle," or in other words, it is well known that the magnetic needle does not point due north. The extent of this variation differs with different periods of time, and also in different localities on the earth's surface.

Another well known fact connected with the operation of the magnetic needle is that, when suspended upon a pivot, instead of assuming an exact horizontal position, it has a slight dip toward the north, and that the extent of this dip likewise varies with the time and place. In view of these well known facts, it becomes a subject of great practical importance, as well as a matter of great interest to science, to determine the true north line of different points of the earth's surface, in order to know to what extent the needle varies from the true north course, and also to see to what extent the needle dips at different localities.

When the true north line is once established at different points, it will then be an easy matter to note, from time to time, the slightest difference, either by way of increase or diminution, of the variation of the needle from this true line from year to year. The true north line is found by an astronomic observation, and the process of ascertaining the true meridian line and measuring the intensity of the magnetic force which controls the variation and dip of the needle is called a magnetic survey.

Such a survey of the United States, says the St. Louis *Republican*, is now being made by Dr. I. C. Hilgard, under the auspices of the American Academy of Science. Dr. H. has established a station at Compton Hill, St. Louis, and is locating stations in other parts of the country. The variation as well as intensity of the magnetic force is determined by means of a tabular magnet, horizontally poised on a stirrup, which is suspended by a single cocoon fibre in line with the optic axis of the theodolite, to which a magnetometer box is clamped; the optic arrangement on a position sideways is perceived on the scale of the magnet. This is effected by having a microscopic scale at one end, placed in the focus of a lens at the other end of the magnet, causing all the rays of a mark to proceed parallel, but at an angle with the parallel rays of every one respectively. The angle or "dip" of inclination is found by placing the axles of a delicate magnetic needle upon polished agate supporters, approximately in the center of the graduated vertical or "dip" circle, and in the magnetic merician. In order to remove eccentricities of axis, imperfections and irregularities in the distribution of magnetism, etc., two different needles are used, and both read with direct and reversed magnetism, and with reversed axles as well as reversed circle, making sixty-four readings on record in all. This gives a very precise means, by eliminating all the inevitable inequalities or instrumental imperfections. The Smithsonian Institute will publish the results of these surveys for the general benefit of the community.

Lima and Oroya Railway in Peru.

This road, which is to master the altitudes of the Andean chain, is building for 27,000,000 reals, by Henry L. Meiggs. Commencing at Callao, on the coast, it will cross an altitude of over 15,000 feet, and terminate at Oroya, 12,200 feet above the ocean. The center of supplies is at Yauli, at 14,000 feet altitude. Grading has been finished 18 miles, and the work of tunneling the crest of the Andes has begun from both ends, with 1,400 Inca Indians engaged on it. The tunnel will be 3,000 feet long, and elevated higher than the summit of Mont Blanc. It is distant from the western terminus on the Pacific only 60 miles. The gradient for the railroad is 211 feet per mile—called there a four per cent grade. Forty miles from Callao, it has been necessary to resort to a V—a turntable and switch, where the railroad takes an up grade in reverse direction for several miles, and again returns, forming almost a figure 8. The mule trail, by which materials are carried over, passes an altitude of 16,500 feet, amid a cluster of peaks covered with perpetual snow. It is hoped by this road to develop the silver wealth of the Cordilleras. With the exception of some coal, rudely taken out and transported on the backs of llamas, at $25 per ton, nothing can be obtained for fuel except dried turf, "buffalo chips," (25 cents a sack), and dried llama dung. Such items will enable those unacquainted with the country to appreciate the fact that this work is one of the greatest events of the age.

Nitro-Ethan—A New Substance.

By the action of ethylic iodide upon argentic nitrite, Meyer and Stuber have obtained a new substance isomeric with ethylic nitrite. When ethylic iodide is poured upon argentic nitrite, violent ebullition ensues. To complete the reaction, the mixture may be heated for some hours with a reversed condenser. On distillation, a mixture of ethylic iodide and nitrite passes over at first; afterward the new substance, which boils at 111° or 113° C. The authors give this body the name of nitro-ethan. It is a perfectly colorless clear liquid of a peculiar agreeable, ethereal odor. Its density at 13° C. is 1·0583 (taken with reference to water at the same temperature;) it is insoluble in water, does not explode on heating, and burns with a pale flame. When nitro-ethan is heated with iron filings and acetic acid, a violent reaction ensues, which must be moderated by plunging the flask into cold water so that the liquid does not boil. On subsequent distillation with caustic potash, ethylamin passes over, in large quantity and in a state of great purity. Hence it appears that nitro-ethan corresponds to the aromatic nitro-compounds. A solution of caustic potash dissolves nitro-ethan which appears to possess weak acid properties. Sodium attacks it with evolution of gas and formation of a white powder, which explodes on heating.

Intelligent Monkeys.

Professor Cope describes a monkey in his possession. He is an admirable catcher, seldom missing anything, from a large brush to a grain, using two hands or one. His cage door is fastened by two hooks, and these are kept in their places by nails driven in behind them. He generally finds means sooner or later to draw out the nails, unhook the hooks and get free. He then occupies himself in breaking up various objects and examining their interior appearances, no doubt in search of food. To prevent his escape, Professor Cope fastened him by a strap to the side of the cage, but he soon untied the knot, and then relieved himself of the strap by cutting and drawing out the threads that held the flap for the buckle. He then used the strap in a novel way. He was accustomed to catch his food (bread, potatoes, fruit, etc.,) with his hands, when thrown to him. Sometimes the pieces fell short three or four feet. One day he seized his strap and began to throw it at the food, retaining his hold of one end. He took pretty correct aim, and finally drew the pieces to within reach of his hand. This performance he constantly repeats, hooking and pulling the articles to him in turns and loops of the strap. Sometimes he loses his hold of the strap. If the poker is handed him, he uses that with some skill, for the recovery of the strap. When this is drawn in, he secures his food as before. Here is an act of intelligence which must have been originated by some monkey, since no lower or ancestral type of mammals possess the hands necessary for its accomplishment. Whether originated by Jack, or by some ancestor of the forest who used vines for the same purpose, cannot be readily ascertained.

After a punishment, the animal would only exert himself in this way when not watched; as soon as a eye was directed to him, he would cease. In this he displayed distrust. He also usually exhibited the disposition to accumulate to be quite superior to hunger. Thus he always appropriated all the food within reach before beginning to eat. When different pieces were offered to him, he transferred the first to his hind feet to make room for more; then filled his mouth and hands, and concealed portions behind him. With a large piece in his hands, he would pick the hand of his master clean before using his own, which he was sure of.

Photographs of the Freckled.

Concerning the photographing of freckled or discolored faces, so as to hide such blemishes: while bromised collodion may be a very excellent thing, there is something else that ought to have a place in the dressing room attached to every studio. I allude not to the puff box, but to a kind of white liquid cosmetic much used by the fair sex when dressing for the opera, a ball, or an evening party. I was on one occasion asked by a lady friend to examine some of this cosmetic in order to say how it could be prepared. I made a mixture of a very similar kind by rubbing up a little oxide of zinc with glycerin, and thinning it with rose water until it was of a creamy consistency. I know of nothing better that this for applying to a lady's face previous to photographing her; for, when properly applied by means of a bit of sponge, it leaves the face of a delicate white color, and masks the freckles and other discolorations. Its value will be properly appreciated if a portrait of a lady with well developed freckles be taken first with the face in its natural state, and again after the sponge, moistened with the above cosmetic, has been passed all over it.—*British Journal of Photography.*

Snuff Dipping Factory Girls.

The Lowell (Mass.) *Courier* says: "There is a good deal of snuff dipping going on in Lowell, especially among one class of our mill operatives. A woman, who called at a house where several of these girls lived the other night, found the occupants sitting around the room with rags saturated with snuff, which were occasionally rubbed on the teeth and gums, and seemed to produce a kind of exhilaration or subdued intoxication. The visitor was socially offered a rag, but she declined. It is said that the 'dipping' may be seen at some places in the mills, and snuff selling is an important branch of business with some traders." This practice has long been known to exist in the large manufacturing cities in England, and in Lawrence, Lowell, and Fall River, it has been introduced principally by the foreign hands.

ALDOL.—Wurtz has obtained a new polymer of aldehyde having the formula $C_4 H_8 O_2$, to which he gives the name of aldol. It is a perfectly colorless liquid, which after cooling becomes thick like a pure solution of sugar. It is so viscid at 0° that the tube containing it may be inverted without any flow of liquid. When gently heated, it becomes as fluid as water, but it regains its viscid character only some hours after cooling. Its density at 0° is 1·1208: it has a strong aromatic and bitter taste, and mixes in all proportions with water and alcohol. When heated to 135°, aldol is resolved into crotonic aldehyde and water.

THE Panama *Star and Herald* records the first arrival, on April 2, at Panama, on its annual eastern migration, of the beautiful sphinx moth (*Urania leilus*). The immense flights of this moth, and the extreme regularity of their recurrence year by year, have repeatedly been dwelt upon by the *Star*, and much interest has been excited as to its starting place and ultimate destination.

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.

A NEW HYGROMETER made by G. Smith, in Paris, consists of strips of paper dipped in a cobalt salt solution containing common salt and gum arabic. In dry weather, it is blue, and in wet, rose red.

NONINFLAMMABLE FABRICS.—Carteron and Rimmel have taken out a patent in England for the use of acetate of lime and chloride of calcium for rendering goods non combustible. Equal weights of each are dissolved in twice their weight of hot water.

AN ECONOMICAL FIRE KINDLING is made in Paris by dipping corn cobs in a mixture of melted resin and tar, and drying at 100° C.

PURE AMMONIA GAS is obtained by adding 2 parts caustic potassa to one part liquid caustic ammonia.

A PROTECTIVE VARNISH for zincography is made by melting together equal parts of asphalt, wax and resin, and dissolving the mass in hot oil of turpentine.

TO PREVENT GLUE BECOMING SOUR AND MOLDY.—The addition of a quantity of carbolate of soda, just sufficient to give a strong smell to the glue, will accomplish the desired result.

LIQUID INDIA INK.—Dissolve the powdered ink in hot water and, when deep black, add one tenth its volume of glycerin, and shake well together.

ANTIDOTES TO CARBOLIC ACID.—Fatty oil, wood oil and almond oil are recommended by Dr. G. Calvert. Dr. Husemann advises the use of saccharate of lime, made by dissolving 16 parts of loaf sugar in 40 parts of water, adding to this 5 parts good slaked lime, digesting the mixture with frequent stirring for three days, filtering and evaporating the filtrate to dryness at 100° C.

TO CLEAN GOLD CHAINS.—Put the chain in a small glass bottle, with warm water, a little tooth powder, and some soap. Cork the bottle, and shake it for a minute violently. The friction against the glass polishes the gold, and the soap and chalk extract every particle of grease and dirt from the interstices of a chain of the most intricate pattern; rinse it in clear cold water, wipe with a towel, and the polish will surprise you.

A USEFUL HINT.—By rubbing chalk on the side of a carpenter's square, the figures may be more readily seen. Near sighted persons will do well to remember this.

ELECTRICITY is developed in metallic wires by merely bending them, and the development appears to be independent of any thermic action.

TO MEND RUBBER OR OTHER HOSE.—Cut the hose apart where it is defective; obtain a piece of iron pipe, ten or twelve inches long; twist the hose over it until the ends meet, and wrap with strong twine, well waxed.

BORAX.—One half a pound will drive the cockroaches out of any house. A large handful of the powder to ten gallons of water will effect a saving of fifty per cent in soap. It is an excellent dentifrice and the best material for cleansing the scalp.

TO MAKE OLD BUTTER FRESH.—Knead with lime water or a very diluted solution of washing soda. Simply washing in water is often perfectly efficacious.

TO BRONZE BRASS OBJECTS.—First warm them, and then wash over with a hot solution of ammonium chloride (sal ammoniac), then place over night in a diluted solution of two parts verdigris and one part ammonium chloride in six parts of vinegar. In the morning, remove and wash.

TO EMPTY LARGE BOTTLES OF LIQUID.—By imparting a motion of rotation to the contents of an inverted bottle, the water or other liquid will issue in the form of a tube, the air entering up the center without impeding its passage. The bottle can thus be emptied in one half the usual time.

ARTIFICIAL PARCHMENT.—The Germans are applying the paper tissue known as artificial parchment for the manufacture of artificial sausage skins—a novel but highly characteristic idea. This membrane is rather indigestible.

LACING FOR SEWING MACHINE BELTS.—An old kid glove makes excellent lacing for securing small belts on sewing and other machines. Cut the gloves into strips half an inch wide, and roll them up tight.

TO JAPAN OLD TEA TRAYS.—First clean them thoroughly with soap and water and a little rottenstone; then dry them by wiping and exposure at the fire. Now get some good copal varnish, mix with it some bronze powder, and apply with a brush to the denuded parts. After which, set the tea tray in an oven at a heat of from 212° to 300° until the varnish is dry. Two coats will make it equal to new.

ALLOY FOR JOURNAL BOXES.—24 pounds of copper, 24 pounds of tin and 8 pounds of antimony. Melt the copper first, then add the tin and lastly the antimony. It should be first run into ingots, then melted and cast in the form required for the boxes.

THE Academy of Sciences in Bologna has announced that a prize of 1,200 *lire* ($240), the "Aldini Prize," will be awarded to the author of the best scientific experimental essay on galvanism or dynamic electricity. Essays intended for the competition must be sent in between July 1, 1872, and June 30, 1874, and must be written in Italian, Latin, or French. They must be either written or printed; but, in the latter case, must not have been published previously to the two years above mentioned. Each essay is to bear a motto, and to be accompanied with an envelope stating the name of the author. They must be addressed to the Perpetual Secretary of the Academy of Sciences of the Bologna Institution.

Service upon Atlantic Cable Business.

If there is one thing more surprising than the fact that it is possible to transmit intelligence beneath the waters of the broad Atlantic, it is the celerity with which that business is performed. In the average time upon each message transmitted between New York and London, the service is barely equaled by the best managed circuits wholly upon the land. For the seven days ending July 30, 1872, the actual time averaged upon messages exchanged between New York and London was 13 minutes and 59½ seconds. That is to say that a telegram addressed to London, leaving New York at 9 A. M., New York time, reached its destination at a fraction less than 9:14 of same time. When the distance is considered, the fact that the message has to be rewritten four times—at Plaister Cove, Heart's Content, Valentia, and London, and that this is the average upon the whole business for the week, and not the time upon any one message—it speaks volumes for the business management and the skill of the operators engaged.

That the average time of this week was not exceptional, we have ample proof upon the examination of the record.

An exact record is kept of every message by each of the companies engaged in its transmission, the precise time of its reception at each office is taken, and from this a daily and a weekly average is made. In this average, press and government despatches are included, which from their much greater length than ordinary business messages, serve to place the average time somewhat greater than is really occupied in the transmission of business for the general public.

Messages between New York and London pass over the wires of four Companies—the Western Union, to Plaister Cove; the New York, Newfoundland and London, from Plaister Cove to Heart's Content; the Anglo American from Heart's Content to Valentia, and from Valentia to London, by the British lines.

On one of the seven days given above, the average time of transmission between New York and London was actually only six minutes and thirty-five seconds; and the shortest average time for messages for the entire day over one of the four lines was one minute and four seconds.

It is difficult to see wherein this service can be improved, and yet efforts are being made to that end. Mr. H. H. Ward, Superintendent of the New York, Newfoundland and London Telegraph Company, and Mr. Stearns, the inventor of the improved duplex instrument, have left for Plaister Cove and Heart's Content to introduce the double transmitter upon the wires between those points, and the Western Union Company have under consideration the advisability of placing them upon the circuits between New York and Plaister Cove, and also to place Heart's Content in direct communication with New York, thus avoiding one rewriting. When these improvements take place, the average time of transmission between New York and London will be reduced to a minimum. —*Journal of the Telegraph.*

The Cloud Burst.

Many persons confound the waterspout with what is commonly known as the cloud burst, yet a moment's consideration will show them the difference. Waterspouts are frequently seen on the ocean or upon the broad lakes, and proceed from a whirlwind gathering the water and whirling it upward in a heavy column to clouds. These can be seen at a long distance, clearly defined, carried in the direction traveled by the wind, and are decidedly dangerous customers to come in contact with. Many a good ship, missing and never more heard from, doubtless has fallen victim to some overwhelming waterspout. It is said that they can be broken at a distance by a lucky cannon shot, but if the spout is broken by the ship itself, sure and speedy destruction must follow. Whirlwinds produce a similar effect on land, and out on the deserts to the east of here are frequently to be seen huge columns of sand thus whirled upward, reaching from the plain to the clouds above. Cloud bursts occur in the summer season during heavy thunderstorms, and are simply rain showers of sudden and extraordinary violence.

Some over-laden cloud sailing over a mountainous locality merely turns its watery contents loose, and it comes streaming down, flooding the hillsides, from whence the water flows in sheets into the ravines. So sudden is the flood that, where not a drop of water has been seen for weeks or months a large turbulent, overwhelming torrent comes pouring down carrying away trees, rocks, and everything else before it, washing away railroads, bridges, toll roads, houses; in fact everything in its way. One of these floods, thus pouring down a steep, dry mountain cañon, frequently shows an advancing front of logs, bushes, huge boulders, and similar *debris*, twelve or fifteen feet high. Woe to any unlucky teamster who happens to be passing with his loaded wagon along the bed of the cañon! Those who understand matters are able to guard against the impending calamity by getting their wagons out of the ravine and up on the hillside as far as possible; or, if they have no time for that, they will unhitch their animals and give them a chance to escape. Instances are known where one of these cloud bursts has occurred on some broad slope where, having no ravine to carry off the water, it has plowed and torn a channel for itself of great depth and extent. This is the proper season of the year for cloud bursts, and as one of greater or lesser magnitude visits Gold Hill or Virginia nearly every season, one may be expected before long.—*Gold Hill (Nevada) News.*

Among the patented contrivances for stopping runaway horses, one consists of a pair of nose stoppers, attached to a bit, and which are closed over the nasal openings of the animal by means of a cord, which the driver pulls if the horse attempts to run. Another consists of a pair of blinders, by which the driver, on pulling a cord, instantly blindfolds the pony.

Hardness of Minerals and Metals.

We say in general that one body is harder than another if it can scratch it. In mineralogy, hardness is an important property, and a scale was established by Mohs, running from one to ten, which is adopted by all writers of the present day. It is as follows:

Talc	1	Felspar	6
Gypsum	2	Quartz	7
Carbonate of lime	3	Topaz	8
Fluor spar	4	Corundum	9
Opatite	5	Diamond	10

We constantly see it said, in scientific works, "the hardness is 6, 7 or 8," and by reference to the above table we at once comprehend the expression. The following list may serve to impress the subject on the mind:

Diamond	10	Turquoise	6
Ruby	9	Lapis lazuli	6
Cymophane	8.5	Felspar	6
Topaz	8	Amphibole	5.5
Spinell	8	Phosphorite	5
Emerald	8	Fluorspar	4
Garnet	7.5	Celestine	3.5
Dicroite	7.5	Barytes	3.5
Zircon	7	Carbonate of lime	3
Peridote	7	Mica	2.5
Quartz	7	Gypsum	2
Tourmaline	7	Chlorite	1.5
Opal		Talc	1

The hardness of metals is usually estimated by the resistance offered by wires of equal diameter and same temperature when drawn through a hole of given size. The following is the order in which a few of the metals are ranged:

Steel	100	Iron	43
Iron	88	Platinum	38
Brass	77	Copper	38
Gold	73	Zinc	34
Copper	58	Tin	11
Silver	58	Lead	4

According to Thomson, the order of hardness of metals is as follows: steel, iron, platinum, copper, silver, gold, tin, antimony, lead.—*Journal of Applied Chemistry.*

Auguste Krantz.

We regret, says the *Journal of Applied Chemistry*, to have to record the death of Dr. Auguste Krantz, of Bonn on the Rhine, which took place from an attack of erysipelas, during a visit to Berlin, on the 6th of April last. Dr. Krantz was a scientific merchant in rocks, fossils and minerals, one who not only knew accurately the commercial value of his collections, but was intimately acquainted with the scientific worth of every specimen which passed through his hands. His agents explored every mineral locality in the world; and, by a system of exchanges and the establishment of correspondents, he was able to obtain the choicest specimens from the most remote regions. It has often been remarked by scientific men that in order to obtain a complete suite of the minerals of the United States, it would be necessary to send to Dr. Krantz, in Bonn. There is probably not a museum of any size, in any part of the globe, that is not enriched from his collections. He was, if not the oldest, by far the most extensive, dealer in minerals in the world, and he leaves an immense and valuable collection, both of minerals and fossils, the results of the labors of a long life devoted to their accumulation. No scientific man ever passed through Bonn without going to visit the museum of Dr. Krantz, and every stranger was received with polite attention, although he was often imposed upon by tourists who really had no claims upon his time. He was truly a scientific merchant, and his death will be severely felt at every institution of learning in all parts of the world. We believe it is the intention of Madame Krantz to carry on her husband's business, with which she is well acquainted.

What is Dirt?

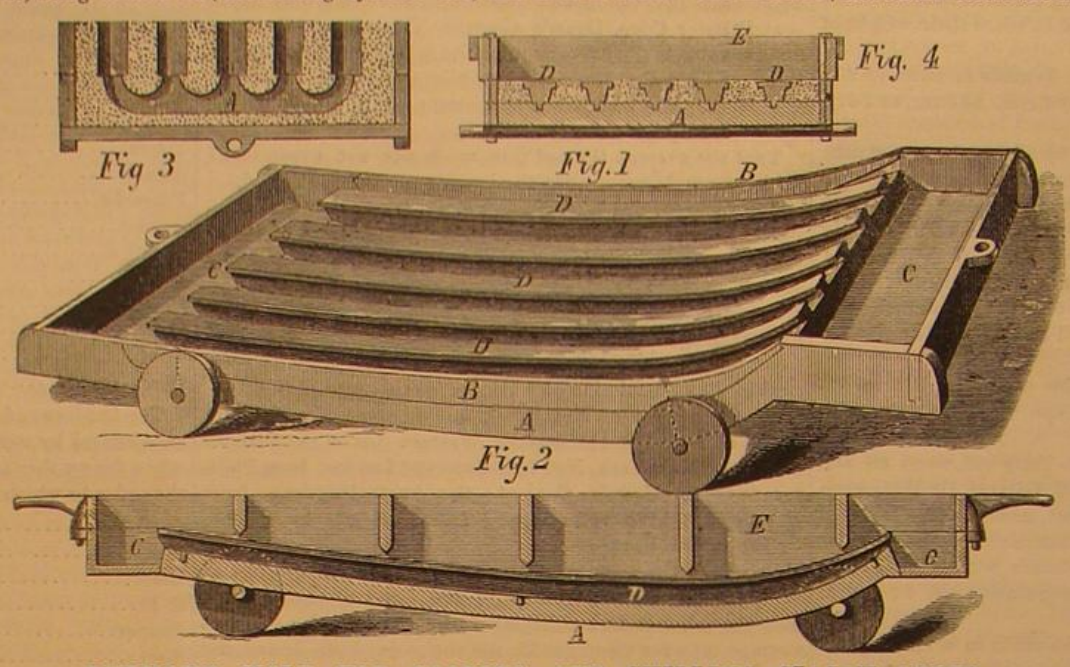
Old Dr. Cooper, of South Carolina, used to say to his students: "Don't be afraid of dirt, young gentlemen. What is dirt? Why, nothing at all offensive, when chemically viewed. Rub a little alkali upon the dirty grease spot on your coat, and it undergoes a chemical change and becomes soap; now rub it with a little water and it disappears. It is neither grease, soap, water nor dirt. That is not a very odorous pile of dirt you see yonder; well, scatter a little gypsum over it and it is no longer dirty. Everything like dirt is worthy our notice as students of chemistry. Analyze it; it will separate into very clean elements. Dirt makes corn, corn makes bread and meat, and that makes a very sweet young lady, that I saw one of you kissing last night. So after all, you were kissing dirt, particularly if she whitened her face with chalk or fuller's earth; though I may say that rubbing such stuff upon the beautiful skin of a young lady is a dirty practice. Pearl powder I think is made of bismuth, nothing but dirt. Lord Palmerston's fine definition of dirt is 'matter in the wrong place.' Put it in the right place and we cease to think of it as dirt."

TANNING WITH GLYCERIN.—The property of glycerin to preserve leather has been known for a long time; it is now proposed to employ it in tanning, to increase the elasticity and resistance of the leather. This system of tanning is particularly adapted to straps and belts of machinery, as it keeps them from drying and cracking. It is only necessary to immerse the leather, tanned in the usual manner, in a bath of glycerin, and to leave it for several weeks, when the pores will be impregnated with the greasy substance, and the leather will be found to be much more elastic and tenacious.

MOLD FOR CASTING AND CHILLING SLEIGH SHOES.

The improvement now illustrated is designed to save the time and expense involved in grinding and polishing sleigh shoes, by giving them smooth and hard faces in the casting, without, at the same time, materially injuring their strength or incurring liability to loss in the process.

A, in the figures, is the lower part or nowel of the flask, the bed of which is cast in one piece and of a shape to conform to the face of the shoe intended to be cast. The sides, B, are cast separate and are fastened to the bed by means of bolts. The ends, C, are made detachable, being hooked on to the bed casting in the manner shown in Fig. 1. This is done to preserve the flasks, as, if they are made in one piece with the bed, they are apt to crack off. At D are shown the patterns, which are placed upon the bed of the nowel and kept in place by dowels. The latter serve also the purpose of core prints. When sand has been placed in the nowel, as seen in cross section in Fig. 4, and the patterns have been withdrawn, a connecting chamber is formed at one end thereof, in the manner shown in the plan view, Fig. 3. The cope, E, which is a wooden frame with transverse ribs, and which is provided with handles at its ends, is then applied to the top of the nowel, as shown in section in Fig. 2, and the process of casting is carried out. The metal is chilled as it comes in contact with the smooth surface of the bed, and the shoes are withdrawn from the mold ready for service. The nowel is mounted on wheels for convenience in moving it.



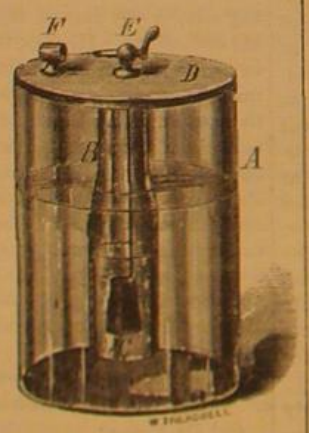
BUTMAN'S MOLD FOR CASTING AND CHILLING SLEIGH SHOES.

It is claimed that shoes produced in this way are superior to the old ones and command a higher price, while there is a saving attending the use of the new mold.

Patented through the Scientific American Patent Agency for Volney A. Butman, of Ironton, Wis. June 11, 1872. Further information may be had by addressing V. L. Benjamin, Fond du Lac, Wis.

HOW TO MAKE A CHEAP HYDROGEN LAMP.

The principle on which the hydrogen lamp is based is the property of platinum sponge to absorb large quantities of oxygen, so that, when a jet of hydrogen is directed upon it, a rapid combination of the gases ensues, attended by the evolution of intense heat and faint light. The lamp is useful not as a means of illumination but for supplying the place of matches, or other means of obtaining fire whenever a quick light is required.



Our figure represents the ordinary form of construction. A is a glass vase, B a bottomless glass vessel attached to the metal cover D, C is a cylindrical piece of zinc suspended by a wire from the cover, E is a stop cock kept closed by a spring and readily opened by the pressure of the finger. F is a metal capsule, in which is placed a small portion of platinum sponge. To set the instrument in operation, a weak solution of sulphuric acid and water is poured into A. This attacks the zinc causing hydrogen gas to be evolved, which fills the space in B and forces out the water. The stop cock should be kept open until the atmospheric air is entirely out of the receptacle. As soon as the pure hydrogen issues, the jet should be directed upon the platinum sponge, which will immediately become incandescent and ignite the hydrogen which will burn with a pale blue flame. When the hydrogen in B is exhausted, the light will be extinguished, the solution in the outer jar will again enter to its proper level, again attacking the zinc, when the same process will be repeated. Such a lamp will remain in working order until the power of the acid is exhausted or the zinc destroyed. It generally stays in good condition, giving fire immediately, for from two to three weeks.

As we have lately received several queries of how to construct this lamp cheaply, we add the following method, the materials being the least expensive and the easiest attainable that we can suggest. The outer vase may be made from a good sized preserve jar by cutting off the upper portion by means of a woolen string moistened with turpentine. For the inner tube, B, an ordinary lamp chimney will answer. The cover, D, can be made from sheet brass and the chimney attached to it by some good cement. The stop cock can be turned by a metal worker, from whom also the piece of zinc may be obtained; or the pewter cock from the top of a seltzer or mineral water flask, that can be readily bought from any druggist, may be employed, bending the tube, used for the exit of the water, straight and reducing its orifice to a very small hole. An empty metallic cartridge case will do for F. The platinum sponge can be purchased from any dealer in chemicals at a small cost. The proportions of water and acid used are about one ounce of the acid to a pint of water.

New Sugar Dryer.

C. H. Hersey, of South Boston, Mass., is the inventor of a new machine for drying sugar and other substances, which is said to be simple and effective. The machine consists of an outer cylinder from five to six feet in diameter and twenty-five feet long, inside of which is a steam cylinder about three feet in diameter and twenty feet long. The sugar is carried around in the outer cylinder by ledges on the inside of the cylinder, and is dropped in a continuous shower upon the outside of the steam cylinder, both cylinders being connected together and revolving at the same time; the sugar slides off the heating cylinder hot, and is thus dried. The machine stands inclined slightly, so that the sugar going in at one end is gradually worked forward to the other, where it falls into a revolving screen, which separates it into the various grades of coarse and fine sugar. The capacity of the machine exceeds thirty barrels per hour.

LAW'S SHUTTLE BINDER.

The invention we illustrate in the annexed engravings consists in an improved method of actuating the mechanism by which shuttle binders are operated.

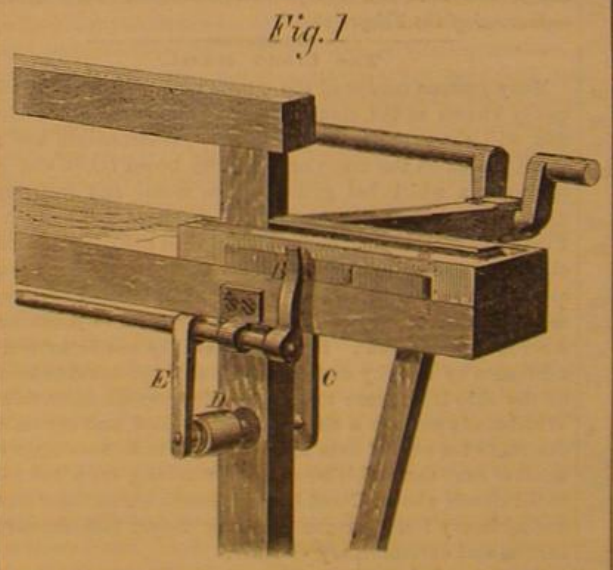
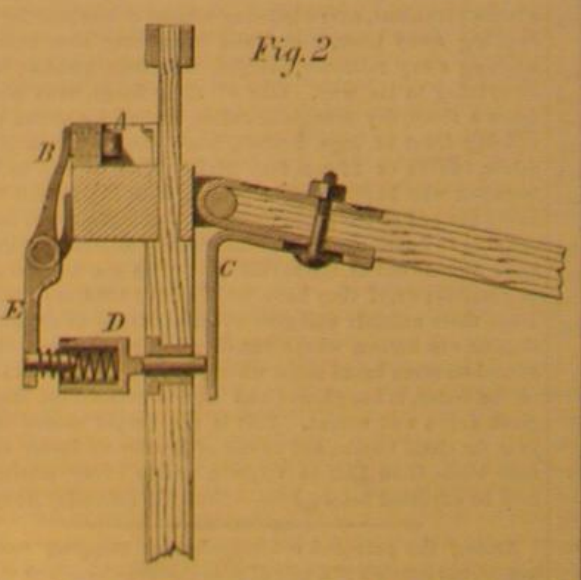


Fig. 1 represents a portion of the lathe of a loom, showing part of one sword, one rod connecting the lathe with the crank, and the device attached. Fig. 2 is a detail sectional view of the same.



The shuttle boxes are situated at the ends of the lathe beam and the shuttle binding levers, A, are pivoted in the sides of the boxes in the ordinary way. The protecting rod is provided with arms for operating the levers, shown at B, as in other looms. For producing the proper motion in this rod, the inventor provides the following simple and ingenious arrangement:

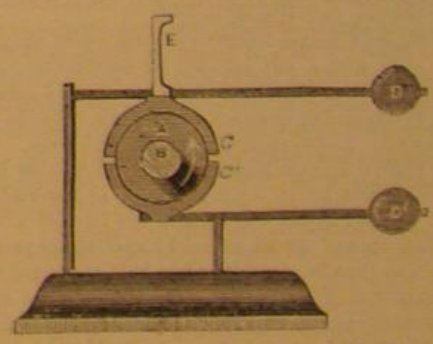
The arm, C, is attached in the manner shown in Fig. 2 to one of the rods which connect with the cranks; in a hole made through the opposite sword is placed the pusher, D, and to the protecting rod is affixed the arm, E. A spiral spring is connected at one end with E, and the other end is carried by the socket of the pusher, D, as delineated in Fig. 2. The device is brought into action by the downward movement of the crank, which takes place at the same time that the shuttle is driven into one of the boxes. This downward movement forces the arm, C, against the pusher, D, which presses outward, with a yielding pressure, the arm, E; the effect of which is to force the upper arms of the rod, B, against the binding levers, A, and thereby retain the shuttle in whichever of the boxes it may happen to be in, until the crank rises enough to carry the arm, C, away from the pusher. As soon as this occurs, the device ceases to operate, and the rod is turned by a spring (which may be seen in Fig. 2) so as to throw the arms, B, away from the levers, A, and release the shuttle just in time for it to be thrown.

The inventor claims that with this binder the shuttle is prevented flying out of, or turning in, the box and the cops do not break on the shuttle spindle. It renders needless the usual springs on the binding levers, and effects saving in power and supplies, while its own first cost is a mere trifle.

Patented through the Scientific American Patent Agency, June 11, 1872, by Mr. Henry H. Law, of Gloucester, Camden Co., N. J. of whom further information may be obtained.

Apparatus for Testing Lubricators.

A is a friction drum or pulley of cast iron, about 3 inches diameter, keyed on a shaft B. C and C' are two clips or saddles of brass, each extending nearly half round the circumference of the drum, and pressed to it with a constant pressure by means of the two weighted levers, D D'. E is a thermometer fixed on the top saddle or clip C, and serves to indicate the heat caused by the friction of the drum revolving between the two saddles C C'. The method of using is as follows: The shaft, B, and pulley, A, are made to revolve at a speed of 1,800 or 2,000 revolutions per minute, the number of revolutions being shown by a counting machine indicating up to one million, but which is not shown on the sketch to avoid complication. It will be evident that this velocity, continued several minutes, will generate considerable heat, and that this heat is raised by a less number of revolutions when a bad oil is used than when an oil of superior lubricating power is used. For instance, if it requires 50 revolutions to raise 1 degree of heat in one oil, and 100 revolutions



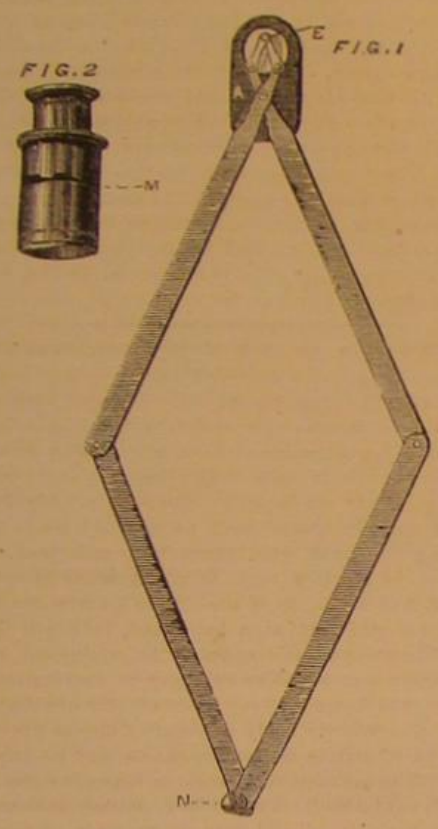
in another, it is evident that the quality of the first will only be half as good as the second. Before starting the machine, the temperature at which the thermometer stands is noted; this, of course, will be the temperature of the room or workshop. A portion of the oil or grease to be tested is poured or smeared on the friction pulley, and the saddles, with their weighted levers, allowed to press on the drum. The machine is then started and allowed to run till the thermometer indicates a temperature of 200° Fah. When it is stopped, and the number of revolutions it has made is taken from the "counter," then the number of revolutions, divided by the number of degrees of heat that the thermometer has been raised, will show its lubricating power. After the first trial, the machine is allowed to rest twenty four hours, and then it is started again without adding any more oil, and without breaking the contact of the saddles with the drum. The number of revolutions of the drum is again taken, and divided by the number of degrees of heat raised in this second trial; and if the result is not more than from 10 to 20 per cent less than the first trial, the oil may be considered good. In very bad oils, the saddles are found to be so fast glued to the drum that the machine cannot be started a second time, and in some cases it requires considerable force to break the contact or adhesion between the drum and the brass saddles.

This apparatus is the design of Jno. Bailey & Co., of England, and is said to operate extremely well.

At the recent exhibition of the Royal Agricultural Society, England, some of the portable farm steam engines were fitted with the electrical indicator which shows upon a dial the temperature of the water contained in the boiler.

Copying from the Microscope.

One of the latest inventions for rendering the copying of an object as seen in the microscope both accurate and easy was recently described, by Mr. Isaac Roberts, F. G. S., to the Royal Microscopical Society, and an illustration was published in their *Journal*. The instrument consists essentially of two parallelograms, having their major and minor sides and angles respectively proportioned in all positions in which the instrument can be placed. The major and minor sides rotate freely about the common center or fulcrum, which is fixed to the eyepiece of the microscope in the focus of the eye-lens. A pencil is attached to the major end joint of the instrument, and a small glass disk, ruled with a micrometer-lined cross, is attached to the minor, or eyepiece, end joint, in the position where pointers are placed. To see both cross and object at the same time, similar focussing is necessary to that which is employed to see an object and a pointer. When drawing, the hand merely moves a pencil over the paper, and at the same time and by the same action guides the micrometer cross lines over the field where the object appears in the microscope. The drawing paper



should, of course, be laid on an inclined table capable of adjustment to the hight of the microscope employed, the top being also made movable to suit the angle at which the micro cope is being used. In the illustration Fig. 1 represents the micro-pantograph, and Fig. 2 the form and approximate position of the slit into which the minor end of the micropantograph and its support, shown at the top of Fig. 1, are inserted. In Fig. 1, E is a glass disk with micrometer cross lines ruled upon it. It is cemented over a small hole drilled through the center of the rivet forming the joint of the minor extremity. A is a center, or fulcrum, around which the parts of the instrument freely move. N is a holder for a drawing pencil, placed over a hole drilled through the rivet forming the joint of the major end of the instrument. In Fig. 2, M s a slit for the insertion of the minor end of the micro-pantogra h, with its support shown behind E A in Fig 1. The instrument being firmly fixed in position in the eyepiece to draw any object, it is only necessary to place the eyepiece in the microscope, adjust the drawing table to the hight and inclination of the plane of the pantograph, and with the right hand forefinger and thumb guide the pencil with slight pressure over the paper, at the same time looking through the eyepiece at the object and guiding the center of the micrometer cross lines over the respective parts of it; an accurate drawing of the object will thus be traced upon the paper. For those, however, who may desire to make for themselves, it is only necessary to say that the the length of the minor sides of the parallelogram within the eyepiece is ½ inch; of the major sides 5¼ inches, the instrument when extended to the full length measuring 12½ inches

Fool's Gold and How we may Know It.

The following story is going the rounds of the papers, and would be decidedly rich if it were only true:

A verdant looking Vermonter appeared at the office of a chemist with a large bundle in a yellow bandanna, and opening it exclaimed: "There, doctor, look at that." "Well," said the doctor, "I see it." "What do you call that, doctor?" "I call it iron pyrites." "What, isn't that gold?" "No," said the doctor, and putting some over the fire, it evaporated up the chimney. "Well," said the poor fellow with a woebegone look, "there's a widder woman up in our town has a whole hill of that, and I've been and married her!"

That the poor fellow had married the widow for the sake of the hill of pyrites is very probably true, but that the pyrites evaporated up the chimney is simply impossible, and such a statement is to be regretted because the inexperienced may be led to believe that, if a bright, yellow metallic looking mineral does not evaporate when strongly heated, it must be gold. There are several minerals which are sometimes mistaken for gold, but the two which are most apt to give rise to deception in this matter are pyrites and mica, and hence they are sometimes called fool's gold. The method of distinguishing between them and gold is very simple, and requires no complicated apparatus. Gold is malleable, that is, it can be beaten out into thin leaves under the hammer, while the others crumble to powder. Moreover, gold is easily cut with a knife, while if we attempt to cut pyrites it breaks up, and mica separates into thin flakes. It is when mica is in fine powder, however, that it most resembles gold, and in such cases, its weight betrays its character. Gold is nearly twice as heavy as lead, and, even by poising it in the hand, we can tell that lead is much heavier than mica.

Estimation of Sulphur in Organic Compounds.

Chemists have always experienced more or less difficulty in ascertaining, with exactitude, the amount of sulphur contained in organic compounds, the usual methods and agents employed for that purpose being slow and uncertain in results. W. S. Mixter, of the Yale Scientific School, has devised an effective apparatus by which he burns the sulphurous substances in oxygen and condenses the sulphur in the form of sulphuric acid. This method presents an easy method of effecting the separation and permits the estimation of the sulphur with much exactness.

The following results, obtained by the author, in the order they are given, shows the applicability of the method, while some of the details mentioned may help to explain the use of the apparatus.

	Weight taken.	Per cent found.
1. Iron pyrites (mixed with carbon)	0·0658	51·20
2. " "	0·0597	51·26
3 Sulphur	0·2070	99·76
4. "	0·2807	99 92
5. "	0 4951	99·93
6. "	0·5882	100 02
7. Carbon disulphide	0·7725	84·12
8. " "	0 4598	84 16
9. Bituminous coal	0 6640	2·97
10. " "	0·7860	2 99
11. Wool	0·4640	3 44
12. "	0·4675	3·46
13. Tobacco	2 0720	0 37
14. "	2 1370	0·36

Manufacture of Envelopes.

One of the most interesting mechanical novelties to be seen at the International Exhibition in London, is the envelope machine of Fenner and Co. of that city. All the manual labor, that is required in attending to the machine, is limited to the supply from time to time of a pile of envelope blanks, and the occasional removal and banding of the finished envelopes. Thus the entire and various processes, of feeding, gumming, stamping, folding, delivery, and collection, are performed automatically by a series of mechanical operations devised with the utmost ingenuity and carried out in perfection; the machine withal being excessively compact and well arranged.

The pile of envelope blanks being placed in position on a plate at one end of the machine, which may be done either at rest or in motion, the feeding process is effected by the simple aid of intermittent suction. An elastic tube has a trumpet-shaped brass mouthpiece which descends on the uppermost blank, and at the moment of contact the air is exhausted by a stroke of the air pump, when the mouthpiece rises with the blank attached, the suction being maintained just sufficiently long to enable the arm and grippers, rapidly projected from the other side of the machine, to seize the blank, when the attachment to the mouthpiece ceases and the arm shoots back, drawing the blank into position over the folding box and there rapidly releasing it. At this moment, the stamping is effected by the action of a hammer and die, and the gum is applied in due place on the edges of the side flaps, whereupon a plunger head, of the rectangular form and size of the envelope, descends, carrying the blank down into the folding box; the flaps, thus raised into a vertical position, are then enclosed and folded down in proper sequence by slides working in the thickness of the folding box; and finally the bottom of the box rises and completes the operation by pressing the whole against the slides, so that the edges are made sharp and the adhesion is effected and secured. The slides are then withdrawn, and the bottom of the folding box drops, allowing the envelope to drop in a vertical position into the delivery trough underneath, running across the machine, wherein, by a simple contrivance and combination of guides, holders, and pressers, the envelopes as they drop from the folding box are successively, uniformly, and regularly arranged, and worked along the trough ready for removal and banding by the attendant.

These manifold operations are successively and successfully wrought with such speed, and almost simultaneity, that the finished envelopes are turned out complete at the rate of 50 per minute or 3 000 per hour.

A New Quicksilver Ore.

Professor J. D. Whitney has discovered a new ore of mercury in California, which, according to an analysis made by G E Moore, consists of sulphide of mercury 98 93 per cent, sulphide of iron 0 83 and quartz 0·25; its color is black, streak black, specific gravity 7·70, and no trace of crystallization. It appears to be identical with the amorphous modifications of sulphide of mercury. It is proposed to call it *meta-cinnabar*. The associated minerals are usually copper and iron pyrites, and a few crystals of cinnabar. The occurrence of the cinnabar has hitherto escaped notice, as it has been mistaken for black cinnabar, from which it differs, however, in the absence of crystalline form, in its black streak and lighter specific gravity. It promises to become an important ore in the quicksilver mines of California and some of the other Western States.

Correspondence.

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

Force of Falling Bodies.

To the Editor of the Scientific American:

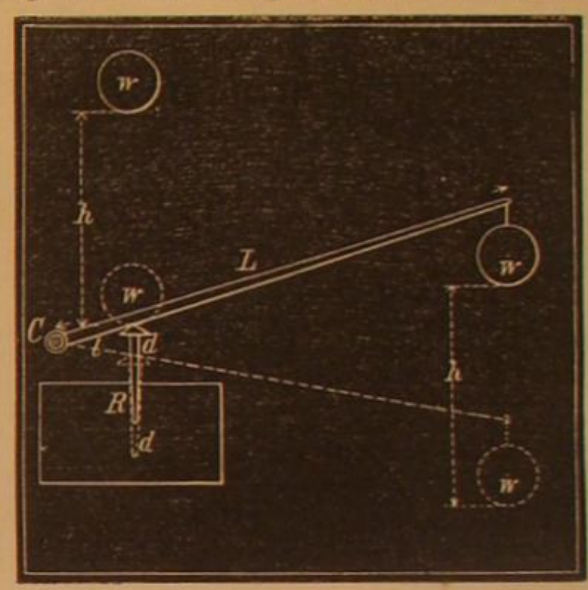
The question "With what force does a falling body strike?" has been frequently repeated in the SCIENTIFIC AMERICAN for the last 25 years, and has generally been answered by the batch of dynamical terms used in colleges and styled "scientific." The answers have invariably made the problem more obscure. Each one generally says that "the problem is very simple," and he pretends to understand the subject perfectly. I am one of those pretenders, and propose to answer the question in my own way, reference being made to the accompanying figure.

Let us assume the case of driving a nail into a piece of wood by the aid of a lever whose fulcrum is at *C*. The applied force is represented by the weight, *w*, acting on the lever, L. Let R denote the force of resistance in the wood, expressed by the same unit of weight as that of *w*, say pounds.

The weight, *w*, acts on the long lever, *L*, and the resistance, *R*, on the short lever, *l*. Then

$$R : w = L : l, \text{ and } R = \frac{wL}{l}$$

That is to say, the force of resistance in the wood is to the weight or force, *w*, as the long lever, L, is to the short lever, *l*.



Let *h* represent the vertical hight which the weight, *w*, moved, and *d* the distance which the nail was driven into the wood. Then

$$R : w = h : d, \text{ and } R = \frac{wh}{d}$$

That is to say: the force of resistance in the wood is to the force or weight, *w*, as the hight, *h*, is to the distance *d*.

Now let the same weight, *w*, fall from an equal hight, *h*, directly upon the head of the nail, and the latter will be driven into the wood the same distance as by the aid of the lever. Therefore: the force with which the falling body acted upon the nail is to the weight of the falling body as the hight of fall is to the distance the nail is driven into the wood. The force of the falling body is equal to its weight multiplied by its hight of fall, and the product divided by the distance which the nail is driven into the wood.

JOHN W. NYSTROM.

Philadelphia, Pa.

Fast Small Side Wheel Steamers.

To the Editor of the Scientific American:

I have read J. A. G.'s communication entitled "Small Fast Steam Propellers Again," in your issue of August 10, 1872, with much interest, for the reason that J. A. G.'s first communication was shown to a gentleman of our city, who wished just such a boat to solicit his various customers living on the many navigable waters of the West. After giving the subject some attention, he arrived at the conclusion that a propeller would not answer his purpose, as he desired an extraordinarily fast and light steamer; hence he contracted with the well known hull builder, Mr. D. S. Barmore, of Jeffersonville, Ind., for a hull of the following dimensions: Length 70 feet, beam 15 feet, depth of hold, 3 feet; of an easy model, but with displacing lines very full just above light water line, so that, in going very fast, she would not bury.

This hull is propelled by two side wheels placed amidships, with outer ends of shaft inclined aft ten degrees on a parallel line with keel. The wheels are 12 feet in diameter and with 6 feet buckets, the bucket blades or paddles being corrugated, and a right angled face riveted on to make them have an additional hold on the water, as the angle plate will prevent a splash of water to the center of the wheel. Each wheel is driven by a separate engine, each 10 inches × 36 inches. Balanced oscillating slide valves are used. The boiler is my own patent, and as I have "boiler on the brain," I do not want a very large gratuitous advertisement, but would modestly say: It is a wrought iron sectional safety boiler, the firebox enclosed with tubes filled with water, the same as used on my portable and traction engines; in some respects, it resembles a Root boiler.

The machinery of the steamer is now being made by Messrs. F. Warren & Co., Louisville, Ky., and the boat will be ready on September 1st. The owner has had from various builders and mechanics an estimate of the speed that she will develop; and these estimates have been from 4 to 20 miles per hour. We wish you would give us an opinion of the result that should be obtained when using 120 lb. steam, with engines wide open; you have a fair chance to be a prophet, as many expert mechanics and prominent men have been invited to accompany her on her trial trip, which will be made during the Louisville exposition. Should she perform well, a second trial may be made to Cincinnati.

Her builders contract to make but 9 miles against the current of the Ohio river, and she will trim up upon 16 inches with water in the boilers. MIRCLEAN N. LYNN.

New Albany, Ind.

Steam Engineering in the Mahoning and Shenango Valleys.

To the Editor of the Scientific American:

The valleys of Mahoning and Shenango are situated about 15 miles apart, the former being in the county of the same name in the State of Ohio, and the latter in Lawrence county, Pennsylvania. Both valleys are largely occupied by iron works and coal mines, there being 40 blast furnaces and rolling mills in operation, and coal mines large in number and extent. In the iron works, engines from 10 to 500 horse power are in use, all on the high pressure principle, the poppet valve system being in great repute. This form is much used on steam boats on the Ohio and Mississippi rivers. The boilers generally approved in these districts are cylindrical in shape, of the double return flue design; the diameters range from 30 to 42 inches, and the lengths from 22 to over 40 feet. The thickness of the plates generally used is three sixteenths or one quarter of an inch, the heads of the boilers being five eighths thick. The boilers are generally set up from two to six in a battery, enclosed in a reverberatory furnace; and they are worked at a pressure ranging from 60 to 110 pounds on the inch.

These works, however, are generally in anything but a thriving condition, and the cause is the scarcity of educated engineers, posted in the theory as well as the practice of their profession. But who is to blame for the incompetence of the botches and inexperts? Both the employers and the engineers themselves. The former employ incapable men because of the somewhat higher wages which a properly instructed mechanic rightly demands, although the ultimate expense of this cheaper labor is three times that of doing the work well and efficiently at first. I propose to give an illustration or two of the losses and waste caused by incompetent men, employed under a mistaken notion of economy.

The most obvious loss is in running the engines and machinery. The former soon become out of order; the pistons get to be loose and leaky, the valves are improperly set, so that there is no lead on the exhaust side of the poppet valve engine. The latter fault causes a waste of power which an experienced engineer only can rightly appreciate. Further losses are occasioned by loose pins, journals and bearings, and by the engines being out of line; the slide valves are sometimes very badly fitted at first, and then get more out of shape for want of an occasional facing. External corrosion on boilers is caused by leaky joints, and steam is conveyed long distances in pipes not covered with any non-conducting material. There are many other faults, which are probably in the recollections of such of your readers as have been in an ill-managed engine and boiler house.

I have already stated that the incompetence of the engineers is the cause of this state of things, and I know no other reason for the employment of such men but the before mentioned one of economy. But as a general thing, our employers do not have much to say to us. I cannot account for this, unless it is owing to an idea that we might not continue to recognize their authority, or that we might ask for higher remuneration if our positions were improved and our knowledge appreciated. But I admit that many of us are such as to justify the indifference of their employers, which, however, leads to the degrading of the man of ability and knowledge to the level of the botch and the inexpert.

It frequently happens that we have to replace an old engine by a new one, and the owner will go to a machine shop and order an engine in some such words as these: "I want you to build us an engine complete, twenty inch cylinder and four feet stroke, with a balanced slide valve," or perhaps, "an engine with a thirty inch cylinder and a six feet stroke with poppet valves." For some shops, an order given in this way might suffice, but generally the shops here in the West cannot properly fill an order on such instructions as these; and the result is a badly built misproportioned engine, of which, however, the owner is seldom competent to detect the faults. I maintain that when an engine is wanted, it should be designed by a competent builder, and drawings should be given to the maker when it is ordered. As good an engine as I ever saw was built on this system in a second class shop in Pittsburgh; and I am sure that every engineer who has charge of engines and machinery should be a draftsman. But this, probably, would not suit some employers whose only notion of an engine is something with a balanced slide valve, as big as a barn door. Another point in which employers do not recognize the value of a capable engineer is in the economical use of steam.

As ironmasters and workers of iron, many capitalists in this district deserve great credit. Many of them have secured valuable patents for improved processes. But so long as the ability of some engineers is not recognized by them, and the workmen themselves are hardly recognized as mechanics, what use is it for any youth to study for a period of ten or twelve years? The consequence is that the men, who should be readers of scientific books and should have the means to purchase them, are generally wanting in instruction and become idle, and in some cases, intemperate and immoral.

Gentlemen employers, have you ever once given it a thought that your wealth and property are in the hands of these careless ignorant men? If you paid more attention to these subjects, you would find out what you lose in cost of running and deterioration of machinery; and you would learn to value the services of a competent engineer as you ought. ENGINEER.

Youngstown, Ohio.

To Detect Sulphuric Acid in Vinegar.

To the Editor of the Scientific American:

The method to detect the sulphuric acid cheat in vinegar, given by the *American Journal of Pharmacy* and republished in your paper on page 120, is the most glaring piece of stupidity which I have had the misfortune to encounter for a long time, and the editors of the *American Journal of Pharmacy* should know better than to publish such nonsense. You are perfectly right in wishing that some of your readers might suggest an easier method for this purpose.

The addition of the alcohol is not made in order to take up "the free sulphuric acid to the exclusion of the sulphates," as the druggist's circular states, but to destroy the acetic acid by changing it into acetic ether; the mixture of acetic acid, alcohol, and sulphuric acid, and afterwards evaporating or distilling the same, is exactly the regular method for making the volatile acetic ether, which will be the vapor or the product of the distillation; in this way the acetic acid is disposed of with the alcohol, and the free sulphuric acid and the sulphates are left; pure vinegar must neither contain the one nor the other, and if adulterated with sulphuric acid, it will mostly contain traces of sulphates also. The addition of a solution of chloride of barium will, in any vinegar, without previous unnecessary preparation, at once demonstrate their existence by a white heavy precipitate, which is sulphate of barytes or heavy spar; while pure vinegar will not show this precipitate, simply because acetate of baryta is soluble in water, and not insoluble, as the sulphate. The advice of preparatory treatment, therefore, with alcohol, heating, etc., is absolutely unnecessary, and simply a specimen of as gross an ignorance as is the attempt at exolanation.

The sole purpose of my dilating upon this matter is for the amount of chemical instruction it conveys.

Now the simple test of detecting sulphuric acid in vinegar is this: Make a solution of chloride of barium, pour a little in the suspected vinegar; if it remains clear, there is no adulteration with sulphuric acid; if a white cloud shows itself, there is adulteration.

Even the quantity of the adulteration may be determined in this way; when gradually so much chloride of barium has been added to, say, one pint of vinegar till no more precipitate is formed, and this precipitate is then collected by filtration and dried, every three parts of the precipitate will indicate very nearly one part of sulphuric acid adulteration.

P. H. VANDER WEYDE, M.D.

New York city.

Strikes.

To the Editor of the Scientific American:

Perhaps, after the recent disastrous failure, the laboring men will listen to a few words from a brother laborer. I will start with the proposition that all strikes, whatever their termination, are injurious to the working man. Take, for example, the so called success of the shoemakers and coal miners during the late war. The former, according to their letter writers, obtained an average rise of five per cent, and we will concede as much to the latter. The strike lasted some six weeks, more or less, at an average expense of about one hundred dollars per man; how long did it take them to make up this loss? The price of coal nearly doubled in a few months, and foot gear took some very long strides upward; and who reaped the profits? Why, speculators and holders of stocks, of course.

Now, brother workmen, as you do not seem to see it, I will tell you where the laugh comes in. It is when the Crispin pays a double price for his winter's coal, and the miner pays the same increased rate for his boots and shoes; and although the currency had something to do with the rise of the two commodities in question, I venture to say that the strike, so far as it affected the rise, put forty-five cents into the pockets of speculators where it put five into those of miners or shoemakers. J. E. S

Portland, Me.

The New Type Writer.

To the Editor of the Scientific American:

As the original projector and one of the inventors and patentees of the type writer, which you have so well illustrated on the first page of your issue of August 10th, I must take exception to and protest against any inference, therein conveyed, that Mr. C. L. Sholes, of Milwaukee, Wis., is the sole inventor thereof. CARLOS GLIDDEN.

Milwaukee, Wis.

THE COHOES RAILROAD BRIDGE.—The new railroad bridge spanning the Mohawk river at Cohoes N. Y., is to be 704 feet long and 18 feet wide, and is to consist of four spans of 140 feet each and one of 135 feet. Two spans are already finished, the ordinary combination truss (wood and iron) being employed. The progress of this work has been seriously retarded by the throwing down of one of the piers by the powerful current in the river. A force of workmen is now engaged in repairing the damage. The structure is being built under the supervision of the State engineers.

A Shower of Aerolites.

On the 9th of June, 1866, a remarkable fall of aerolites took place in the County Unghvár, in Hungary, which was witnessed by a large number of persons. A violent detonation was first heard, like the discharge of a cannon, making the glass rattle; this was followed by several more feeble sounds, accompanied by a noise like that of a heavy wagon rolling along the pavements. Attention having been attracted by the noise, a small cloud was seen in the distant heavens, which moved rapidly, having about ten times the apparent magnitude of the sun, and which emitted rays of smoke. Persons at a considerable distance off saw a red, incandescent, pear-shaped body, surrounded by a blue light, and which approached the earth at an angle of thirty to thirty-five degrees with great velocity, leaving behind it a train of vapor. One of the observers affirmed that this red body continually emitted incandescent particles, and separated into two parts in its course, and that the two globes of fire fell separately upon the earth. The phenomenon is said to have lasted four or five minutes, while the smoke emitted by the bolide remained visible for ten minutes afterwards. Some persons even professed that they perceived a decided smell of burning sulphur; and one of those who picked up a fragment a little time after its fall said that it was not free from the odor for three days after. The number of stones that fell on this occasion was quite considerable, two of them being much larger than others, one weighing nearly 600 pounds and the other about 80 pounds. At least a thousand fragments were picked up, being scattered over a surface of about 6,600 feet in length by 2,500 feet in width. The largest mass penetrated the earth to a depth of 11 feet, and the smaller to that of about two feet.

Nicholson or Alkali Blue on Wool.

This dye differs from all other aniline colors in the fact that it is not, like magenta, aniline violet, etc., the soluble salt of a base insoluble in water, but a base soluble in water of itself, yet capable of forming, in union with acids, colored and insoluble salts. The base is in itself colorless, or very pale. To obtain a dye, the base already fixed on the fiber must be united with an acid. This is effected by passing the dyed wool through an acid bath. Thus for 10 lbs. of wool, a very dilute solution is prepared by boiling 1 to 1½ ounce of the dye in pure water; a color bath is next prepared at a hand heat, in which 1½ to 2 ounces of borax must be dissolved. An equivalent quantity of the carbonate of potash or soda may be used instead. The borax serves to neutralize any trace of acid existing in the water or the wool to be dyed (possibly also to prevent the working on of certain impurities which may be present in the dye). The solution of Nicholson blue, previously well filtered, is next added. The goods, previously saturated with water, are next entered and kept constantly in motion, while the temperature of the bath is very gradually raised to the boiling point. They are then taken out, worked well in water at a hand heat, and passed into the acid bath, which, for 10 lbs. of wool, should contain 10 ounces of sulphuric acid. Here they are worked till the color is fully developed. The Nicholson, or alkali, blue is the most permanent of all the aniline colors hitherto obtained.

Dispersion of Electricity in Gases.

The gradual loss of electricity by charged conductors, supported by solid insulators and surrounded by air, is due, according to Coulomb, to two causes: first, the imperfect insulating power of the supports, and second, the action of the atmosphere, inasmuch as the small particles that are in contact with the conductor are electrified and driven away, giving place to fresh unelectrified particles, which are influenced in their turn similarly.

Coulomb found that charges which did not exceed a certain limit of electric density were perfectly insulated by the better insulators; this limit varied according to the insulating power of the substance used. For lower densities, the loss of electricity took place only by the atmosphere; and he found that the time in which the charge was reduced to an aliquot part of its amount has a constant value.

The dispersion is found to be nearly the same in dry carbonic acid and atmospheric air; in hydrogen, only about half as great as in these gases.

Moist air does not give a much greater dispersion than dry air.

The dispersion of positive and that of negative electricity take place at the same rate.

PNEUMATIC COAL MINING MACHINERY.—Pneumatic coal mining machines are now employed with much success in several of the British coal mines. The machines are provided with cutting wheels 3 feet 6 inches in diameter, which cut their way into the coal seams with great facility. A face of 120 yards in length has been cut in one night. The cutters are operated by air, which is compressed by means of suitable pumps located upon the surface of the ground, and conducted in iron pipes down the shaft, along the roadway, and by rubber hose pipes into the machines.

BY a recent amendment to the general railway law in Massachusetts, all railways connected with Boston are required to run a six o'clock morning and evening train, and issue tickets therefore at a rate not exceeding three dollars per mile per year, for distances not exceeding fifteen miles. The object of the law is to provide cheap transportation for working people. The rate of fare just established appears to be less than the actual cost. The Legislature ought to have gone a step further and ordered the companies to run a free train. As it is, the amount allowed is hardly worth collecting, so some of the companies think.

Steam on the Canals.---The Reward of One Hundred Thousand Dollars Offered by the State of New York.---Modification of the Preliminary Tests Required.

At a meeting of the commission appointed by chapter 868 of the laws of 1871, held at the office of the State Engineer and Surveyor, at Albany, N. Y., on the 6th and 7th days of August, 1872, the following members were present: Van R. Richmond, chairman, George Geddes, Erastus S. Prosser, George W. Chapman, John D. Fay, Willis S. Nelson, Wm W. Wright.

Various persons were heard by the commissioners in regard to the preliminary tests heretofore required, and certain modifications were made, as will appear by the following preamble and resolution, that were passed and ordered to be published:

WHEREAS, It is the opinion of the commission that the intent of the law, in regard to the speed required of competing boats, is that the same shall be determined by the rate of movement through the levels of the canal, not including lockages or the navigation of the Hudson river, and that the objects of the preliminary tests required will be secured by not requiring over 100 tuns of cargo to be carried west; therefore, it is

Resolved, That the first and second resolutions, adopted by this board July 10, 1871, relating to preliminary tests, which were as follows:

Resolved, That for the purpose of carrying out the intent of the law, this commission will require, among the tests to be made, that the several competitors shall make not less than three round trips, from New York to Buffalo or Oswego; each boat to be loaded with not less than 200 tuns of cargo each way; the trips to be commenced as soon as any party is ready, and all completed in the least practicable time. For the purpose of determining the time consumed by each and all the trips, the clearance must show the day of the month and the time of day that the boat passes each collector's office; certified copies thereof to be furnished to the commission. In order to obtain information in regard to the practical working of the several devices in competition, as soon as practicable, the engineer of the commission, Mr. David M. Greene, of Troy, will inspect the same from time to time, as in his judgment may be necessary, and report the facts obtained to this commission.

Resolved, That competitors are hereby notified that for the purpose of carrying out the intent of the law, though it is desirable that the three consecutive round trips from Buffalo or Oswego to New York be made at the earliest time practicable, the whole of the year 1872 will be allowed to such persons as may desire so much time, and the awards will not be made until the close of navigation in that year," —be and the same are hereby modified by the passage of the following resolution:

Resolved, That boats making the three round trips from Buffalo or Oswego to the Hudson river and return, as heretofore required by this commission for the purpose of determining the rate of speed of said boats, will not be required to continue the trips to New York city, nor to carry more than one hundred tuns of cargo going west, and that deductions from the time consumed in navigating the canals will be made for passing the locks, equal to twenty hours for each round trip from Buffalo, and proportional allowance will be made if the trial is from Oswego. In case of delays growing out of obstructions to navigation, that are caused by breaks in the canals or injuries to the structures or sunken boats, or such as detain boats drawn by horses, the time lost will also be allowed for in computing speed.

The commission adjourned to meet at the office of the canal commissioners, in the city of Syracuse, Tuesday, October 1st, 1872, at 3 o'clock, P. M.

Recent Patent Decisions.

United States Circuit Court—Southern District of Louisiana.

A suit at law upon letters patent for an improvement in metallic ties for cotton bales, granted to Frederic Cook, March 2, 1858. Mary Frances McComb and James Jennings McComb, plaintiffs; and George Brodie, defendant.

THE LAW OF INFRINGEMENT—THE LAW OF DAMAGES.

WOODS, Circuit Judge.

There may be a claim for two inventions in the same patent if they both relate to the same machine or structure; and an action can be sustained for the infringement of either one of these separate inventions when claimed as separate and distinct in their character.

Where plaintiff's patent covered three different features of invention, but suit was brought on one claim only, the jury were instructed to consider the case precisely as if the patent covered that claim alone.

The third claim of Cook's patent of March, 1858, for cotton bale tie, construed to be for the right to use an open slot cut in a buckle, which without the cut would be a closed buckle, so as to allow the end of the tie or hoop to be slipped sidewise underneath the bar through which the slot is cut.

If a party uses the open slot for passing the end of a cotton tie sidewise under the slotted bar, it makes no difference whether such end is in the form of a loop or not, if the result attained is that the end of the tie has been "slipped sidewise through the slot underneath the bar, so as to effect the fastening with greater rapidity than by passing the tie through endwise."

A man cannot have two patents for the same process because for different purposes.

When the means, devices, and organization are patented, the patentee is entitled to the exclusive use of this mechanical organization, device, or means, for all the uses and purposes to which it can be applied, without regard to the purposes to which he supposed, originally, it was most applicable.

To constitute infringement the contrivances must be substantially identical, and that is substantial identity which comprehends the application of the principle of the invention.

If a party adopts a different mode of carrying the same principle into effect, and the principle admits of different forms, there is an identity of principle though not of mode; and it makes no difference what additions to or modifications of a patentee's invention a defendant may have made; if he has taken what belongs to the patentee, he has infringed, although with his improvement the original machine or device may be much more useful.

All modes, however changed in form, but which act on the same principle and effect the same end, are within the patent; otherwise a patent might be avoided by any one who possessed of ordinary mechanical skill.

The rule of damages at law is not what the defendant has made, or what he might have made, but it is the loss sustained by the plaintiff by reason of the infringement.

If plaintiff was ready to supply the market with his patented goods, and his business was hindered or interfered with by the competition of defendant, plaintiff's damage will be the amount of profit which he has lost by reason of such interference.

If a plaintiff neglects to prove that his patented article was stamped, or that he gave to the infringer the notice required by section 58 of the patent act of 1870, a jury cannot award him more than nominal damages.

W. M. Randolph, C. Roselius, J. A. Campbell, and S. S Fisher, for plaintiffs; Semmes and Mott, for defendant.

United States Circuit Court, District of Massachusetts.

WOODWARD *vs.* MORRISON *et al.*

This was a suit in equity, brought against Louis P. Morrison and George G. Noah by Joseph Woodward, for an alleged infringement of letters patent granted the complainant, February 20, 1866, for an improved prepared paste for book binders.

INFRINGEMENT UPON ARTICLES OF MANUFACTURE—INFRINGEMENT OF CHEMICAL PROCESSES—CHEMICAL EQUIVALENTS—CONSTRUCTION OF PATENTS.

SHEPLEY, Circuit Judge.

The invention patented to Joseph Woodward, February 20, 1866, for an improved paste, consisted in the discovery that the use of a very minute quantity of corrosive sublimate would arrest the tendency to fermentation in the paste, without imparting to it any poisonous properties; also, that an improved result was effected by the addition of chloride of sodium, or an equivalent salt, soluble in the aqueous solution of corrosive sublimate.

A paste in which corrosive sublimate is used in proper quantity to prevent decomposition without making the compound poisonous and unsafe to handle, held not to be anticipated by a paste in which the same ingredient is purposely used in such quantity as to make the compound poisonous and destructive of animal life.

Semble, that where the patented invention is an entirely new article of manufacture it might be sufficient to find that the defendant makes substantially the same thing, whether by the same or a different process.

Patents are infringed by the substitution of chemical equivalents as well as of mechanical equivalents.

The use of chemical equivalents may infringe a patent even if in some respects they are improvements on the original process patented.

To constitute an infringement of a chemical process, it is not necessary that the substituted ingredient be the equivalent in every respect and for every purpose of that in place of which it is used; it must only be an equivalent in the particular process, contributing to produce the same composition of matter by substantially the same chemical action.

Where the patentee of an improved paste used the chloride of sodium mainly for increasing the solubility of the antiseptic agent employed and assisting in its diffusion through the mass of the paste: *Held*, that the use of the chloride of zinc, which in the particular process produced practically the same result, was an infringement.

Every specification is to be read as if by persons acquainted with the general facts of the mechanical or chemical science involved in the invention; and the specification of the parts is a specification to ordinary skillful mechanics or chemists of the well known mechanical or chemical equivalents.

If there are equivalents, mechanical or chemical, existing, but previously unknown to ordinarily skillful mechanics or chemists, these are not included in the specification of a patent unless specially stated therein. They are new discoveries in themselves, and may be used by all without infringing the patent.

The ingredients and the proportions thereof in their respective formulas of manufacture, as stated in the respective patents, are as follows:

Complainants.	*Defendants.*
Flour, 2 pounds.	Flour, 100 pounds.
Common salt, (chloride of sodium, Na. Cl.) 1 ounce.	Chloride of zinc, 5 pounds.
Alum, ¼ ounce.	Alum, 3 pounds.
Corrosive sublimate, (bichloride of mercury, Hg. Cl.) 8 grains.	Bichloride of mercury, 1 ounce.
	Oil of cloves, ½ ounce.

JAMES B. ROBB, for complainant.

H. G. PARKER and B. C. MOULTON, for defendants.

ELECTRIC ILLUMINATION OF LIGHTHOUSES.—The following is a list of the electric lights in England and France with the dates at which they were erected: Dungeness, January, 1862; Cape La Heve, France, South Light, December, 1863, North Light, November, 1866; Cape Grisnez, France February, 1869; Souter Point, England, January, 1871; South Foreland, England two lights, January, 1872. It is interesting to see, says *Nature*, that England took the lead in this matter of the adaptation of electric illumination to lighthouse purposes, and it must also be remembered that although the first electric light was only erected in 1862, yet in 1859 experiments were made, under the supervision of the late Professor Faraday, which were very successful.

[We believe that in the United States there is no lighthouse in which the electric light is employed.—EDS.]

A SPROUTING SNAKE.—Professor Cope states that he had for sometime a specimen of *Cyclophis æstivus*, received from Fort Macon, N. C. The slender form of this snake and its beautiful green and yellow colors, show that it is of arboreal or bush-loving habits. It never exhibited such in confinement, however; and instead of climbing over the caladia, ferns, etc., it lived mostly under ground. It had a curious habit of projecting its head and two or three inches of its body above the ground, and holding them for hours rigidly in a fixed attitude. In this position it resembled very closely a sprout or shoot of some green succulent plant, and might readily be mistaken for such by small animals.

AN acorn suspended by a piece of thread within half an inch of the surface of water in a hyacinth glass, will, in a few months, burst and throw a root down into the water, and shoot upwards its straight and tapering stem, with beautiful little green leaves. A young oak tree, growing in this way on the mantelshelf of a room, is a very elegant and interesting object.

MANUFACTURE OF PINS.

A recent visit to the works of the Empire Pin Company, situated in Cohoes, N. Y., afforded us an opportunity to witness the entire process of pin making. The wire for this purpose is received in large coils, and the first proceeding is to render it straight and free from kinks and turns. Entering a long room filled with numberless little machines, which united to make an almost deafening clatter, our attention was directed to a coil of wire which had just been placed on a revolving spindle. The end was passed through an apparatus containing several small rollers, and then allowed to wind around a large wheel some two feet in diameter. From this wheel the coil is cut off in sufficient lengths. We now pass to the pin making apparatus proper, that is, the numerous small machines which spitefully seize the wire, drag it along under cutters, bite off small pieces, then supply each of the several bits with a head and sharp point, and finally throw them into a receptacle as nearly finished pins at the rate of hundreds per minute. We say "nearly finished," because, to all appearances, a handful of pins in their present condition appear to be all ready for use. But they are rough, they are still of yellow brass, and their points are far from smooth. We are now shown two revolving barrels into which, with a quantity of sawdust, the pins are thrown. Here they are rolled until perfectly smooth, when they are removed and treated to a boiling for four hours in a solution of cream of tartar and water, from which bath they emerge literally as "clean as a new pin," and, besides, thoroughly whitened.

Next they must be sorted. Pins of every size, some short, others long, must be separated, and each length placed in distinct boxes. To effect this, they are thrown on an inclined tray; down they slide, ranging themselves side by side. Now they pass over a piece of steel, in the edges of which indentations are cut of varying depths. Each pin keeps on its journey until it reaches a point at which one of the indentations makes a passage sufficiently wide for it to pass through lengthwise when it falls into its proper box.

The pins being now sorted, the next process is to place them in their papers. Being heaped upon a horizontal tray, they are sent, by a sweep of the attendant's hand, traveling down an inclined plane of steel, in which slots have been cut. Each slot is made of such a width as to allow the body of the pin to pass through but not the head. There are as many of these slots as there are to be pins in a row. The pins sliding down range themselves in an even line at the foot of the plane. Meanwhile a continuous roll of paper has been attached to the machine from underneath. This, as each row of pins is ready for insertion, is pressed and held into a die, which forms crosswise creases in it. The pins are then forced down through these creases, the paper leaves the die, and is rolled along; another row of pins falls into place, and the operation is repeated. The paper, when filled, is cut off into proper lengths, and sent to girls to supply missing pins. As each paper is completed, it is folded and then packed in bundles of a dozen each, marked, labeled, and sent to the market.

There is another auxiliary machine connected with this manufacture by which the pins which are crooked and which fall through the last described apparatus are separated from the straight pins which become mixed with them. This is done by causing the pins to fall upon a number of endless leather belts. The crooked ones remain steady, and are carried along the belts and dropped into a receptacle at the end of the machine. The straight pins, however, in falling upon the belts do not rest upon them, but, receiving by this means a vibratory motion, roll off between the belts and are caught in a box underneath. The great rapidity of this work can be judged from the fact that some 650 packages of pins, each package containing a dozen papers, are daily turned out at the works of the Empire Company.

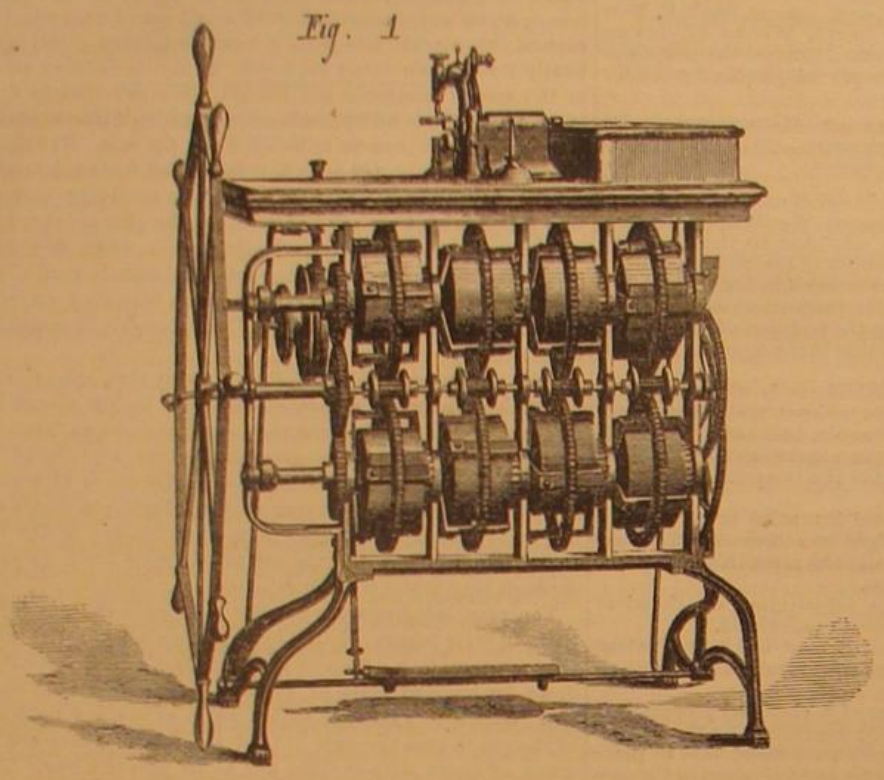
CARBONIC ACID FROM THE LUNGS.—It is customary to show the presence of carbonic acid from the lungs by breathing into lime water, and as the experiment is usually performed, it is necessary to blow through the water for a considerable time. Dr. Krebs recommends the simple device of holding the nostrils when making the expiration; it is then possible, by drawing a long breath, to obtain a considerable precipitate in lime water in one expiration. The difficulty has been that nearly all of the carbonic acid escaped through the nostrils, and hence the erroneous impression that only a small quantity was given off from the lungs.

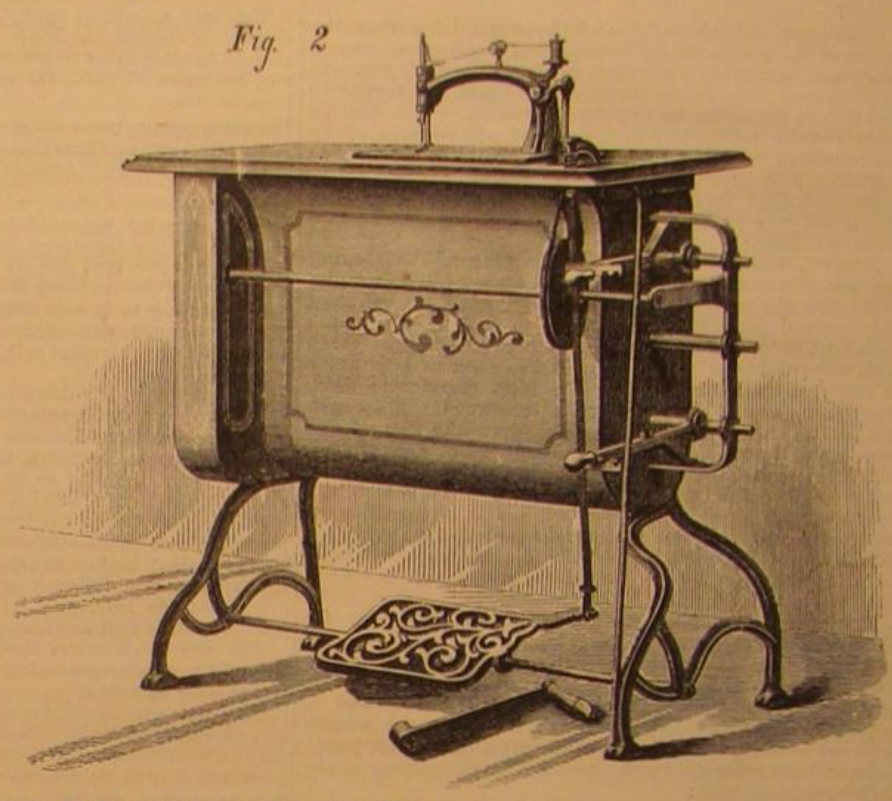
VALUE OF POULTRY MANURE.—From actual experiment it has been found that the droppings from four Brahmas for one night weighed in one case exactly 1 lb., and in another more than ¾ lb., an average of nearly 4 ounces each bird. By drying, this was reduced to not quite 1½ ounce. Other breeds make less; but, allowing only 1 ounce per bird daily of dry dung, fifty fowls will make, in their roosting house alone, 10 cwt. per annum of the best manure in the world. Hence ¼ an acre of poultry will make more than enough manure for 1 acre of land, 7 cwt. of guano being the usual quantity applied per acre, and poultry manure being even richer than guano in ammonia and fertilizing salts. No other stock will give an equal return in this way; and these figures demand careful attention from the large farmer. The manure, before using, should be mixed with twice its bulk of earth, and then allowed to stand in a heap, covered with a few inches of earth till decomposed throughout, when it makes the very best manure which can be had.

The Union Mill Company, of Fall River, Mass., make print cloth, and they pay dividends of 140 per cent annually on the stock of the corporation.

SPRING POWER FOR SEWING MACHINES.

On page 247 of the previous volume, we laid before our readers the results of the investigations made by the Massachusetts State Board of Health into the injurious effects upon the health of women employed in running sewing machines by foot power. The facts were established that among such operatives certain diseases exist in a greater proportion than with other females, and that they result from excessive work in propelling the machine by the feet. It was shown, further, that what proved excessive labor in one form might be far from excessive in another, and that the number of hours these operatives work daily would not injure them if the machines were run by steam or other power.


Fig. 1


Fig. 2

CAYCE'S SPRING POWER FOR SEWING MACHINES.

The invention we now illustrate appears to meet the requirements of the case by furnishing a simple and economic motor which can conveniently be applied to any form of the sewing machine. It consists of a spring power, mounted in a neat frame, to the top of which the table of the machine is attached.

Fig. 1 shows the apparatus, uncovered so that the driving mechanism may be seen; and Fig. 2 shows the same applied to a machine of a different manufacture, and cased. The motive power consists of eight coiled springs which are mounted on sleeves on parallel shafts, four on each shaft, as shown in Fig. 1. Each of these shafts is grooved longitudinally so as to carry a sliding key which is worked by a sliding collar on the outer end of the shaft. By means of this key, the sleeve of either of the springs can be locked with its shaft so as to allow of its being wound up by the rotation of the same. Both shafts are connected by gearing with a central one, and the winding up is done by means of a detachable hand wheel or windlass placed on the latter, as in Fig. 1, or by means of a crank handle such as is seen at foot of Fig. 2. In winding up, one spring on each shaft, upper and lower, may be locked and wound simultaneously. The power developed by the recoil of the springs is communicated through gears to a central shaft, as in Fig. 1, from which it is transmitted by appropriate gearing and a pulley and belt to the driving shaft of the sewing machine. A brake, represented in both figures, is attached to the apparatus, and by its means the machine is started or stopped, and its speed regulated. The treadle shown in the engravings is employed solely to operate this brake while at work; and by its use the speed may be slackened or allowed to start up again, etc., with great nicety and ease. The brake is also further adjustable by means of a spring lever and thumb screw, which are connected therewith and are placed for operation on the top of the machine table, as represented. A still further adjustment of the apparatus is provided for in the shape of an attachment by means of which two or four of the springs, as desired, may be locked off and prevented operating on the central shaft. We may remark, also, that the winding up can, by the construction, be done while the machine is running, if required.

Two sizes of the spring power are at present manufactured, the larger of which is calculated to run for one hour and the smaller for half an hour, the speed in each case being one third faster than that obtained in working a sewing machine by foot power. We are informed that a man can wind up the whole eight springs of the larger size in one minute, using the crank handle; and that a lady, using the hand wheel of large diameter, would accomplish the same in less than five minutes. Thus, in a day of ten hours, less than an hour would be occupied in winding up springs, and over nine hours would remain for mere sewing, unaccompanied by hurtful exertion; while the work accomplished would be more than could be done in the ordinary manner on account of the extra speed. It is stated that a boy of fourteen can do all the winding up necessary to keep twenty machines going.

Mr. John M. Cayce, of Franklin, Tenn., is the inventor of this power, which is patented in this country and in Europe through the Scientific American Patent Agency. Further information may be obtained of the United States Combination Spring Power Company, 97 Spring street, New York.

Chinese Wheelbarrows.

Crossing some uncultivated chalky downs in the province of Honan, where the roads were good, Mr. Oxenham came upon large numbers of wheelbarrows; and in one place where the country was unusually high and open, and where a strong wind was blowing in their favor, all of them set up a sail to assist them in their journey. The men who use these cumbrous and loud shrieking vehicles contrive to make about 20 miles a day, and in the event of a favorable wind, often 30. One man generally manages the wheelbarrow, though he sometimes avails himself of the services of his son, his wife, or his donkey. No laborer in the United States or Europe probably undergoes an equal physical strain to the Chinese barrowman, who seldom reaches the age of 40 years.

GOODRIDGE'S AUTOMATIC LAMP EXTINGUISHER.

The accompanying engraving represents a neat and ingenious device for attachment to kerosene lamp burners, by the automatic operation of which the extinguishment of the light is immediately effected in the event of the accidental falling or tilting of the lamp.

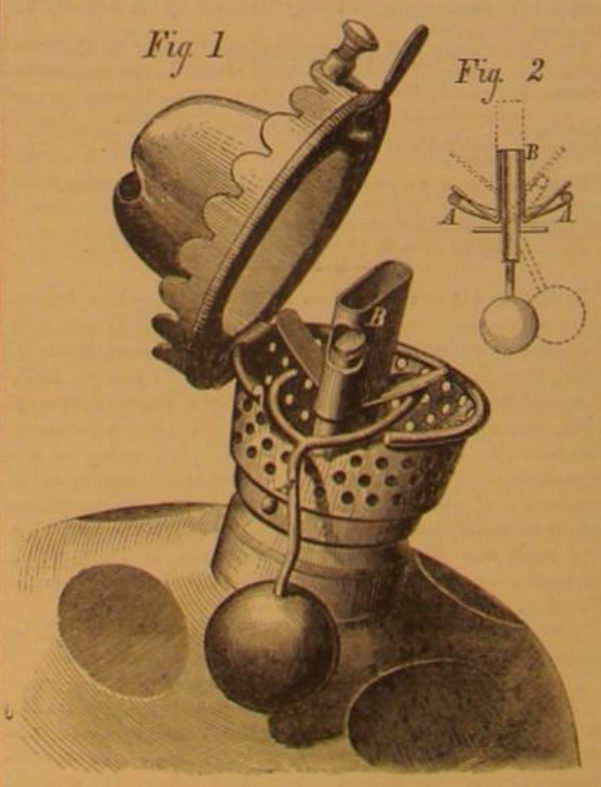


Fig. 1 gives a perspective view of a burner with the extinguisher attached. Part of the outward shell of the burner is broken out to show the ring and bent wire, A. The ring which, it will be observed, entirely surrounds the wick tube is pivoted to the shell, on the further side, by a pin which enters one of its perforations; on the nearer side, the bent wire, which passes through another perforation, also acts on a pivot. On the lower end of the wire hangs a leaden weight, the tendency of which is always to keep the wire in a vertical, and the ring, consequently, in a horizontal, position. At B is shown the extinguisher proper, which consists of a short piece of tube which is placed on the end of the wick tube and slides easily thereon. It is provided with the two projecting arms seen in the engraving, where it is represented with a hole in one side to show the tube and wick within. When the lamp is in an upright position, the extinguisher is supported by the ring, on which its arms rest, and is placed sufficiently far down on the wick tube for the latter to be on a level with or project slightly above it. Under these conditions, which are represented in the sectional view Fig. 2, the light is free to burn, but upon the weight being swung, or the lamp being caused to deviate from its vertical position, one or other of the sides of the ring is thrown upward and carries with it one of the arms of the extinguisher; by which means the latter is thrust beyond the wick tube and over the wick, and the light is extinguished. The latter conditions are shown in Fig 1, and indicated by the dotted lines in Fig. 2. By bending upward the sides of the ring, the parts may be adjusted so that a very slight tilting of the lamp suffices to put the light out.

In the provision thus made for extinguishing the lights before the oil in the lamp has time to escape and become ignited, appears to lie a safeguard against many of the disastrous results hitherto attending lamp accidents.

Patented March 12, 1872, by John M. Goodridge, of Norfolk, Va., of whom further information can be obtained.

Instrument for Measuring the Transparency of the Sea.

A correspondent of the New York *Herald*, accompanying Professor Agassiz' expedition on the coast survey steamer *Hassler*, gives a brief but interesting account of an apparatus for determining the relative transparency of the sea at different places, which has already been employed by the expedition at Barbadoes and about the Galapagos Islands. A strip of board, about four inches wide and four feet long, divided into a scale of ten equal intervals, is painted a dark lead color at one end, fading into white at the other. A large white board having been fastened parallel to it, and at a measured distance below it, the whole arrangement is lowered horizontally into the sea. At the dark end, the upper board appears the darker, but at the white end, the lower board, being seen through a greater depth of water, gives the darker appearance, and, of course, at some intermediate division, the two boards appear to be of the same shade. At that division the relative whiteness of the boards is evidently a measure of the percentage of light absorbed while going down and up again through the distance by which the boards are separated. This relative whiteness is readily estimated at night in the cabin by placing the boards at unequal distances from a candle so as to make them of the same apparent shade at the given division of the scale.

The illuminating powers are to each other as the squares of the distances of the boards from the light. Having once ascertained what percentage of light goes through a fathom, the proportion of daylight which reaches any given depth in the sea can be readily calculated. Suppose, for example, that one half the light penetrates one fathom; then one quarter goes down two fathoms, one eighth, three fathoms, and so on indefinitely.

This apparatus is the invention of Dr. Hill, who regards it as still in a crude form, and capable of much improvement.

PROFESSOR PALMIERI records a singular observation on the recent remarkable eruption of Mount Vesuvius. The vaporous emanations alone were observed to be charged with positive electricity, while the ashes alone were charged with negative electricity. Hence electric effects resulted from the collision of the clouds of ashes with those of vapor, thunder and lightning being produced as in an ordinary storm.

THE brewers in this country are considerably exercised by an attempt, on the part of the holders of William Marr's patent of 1867, to collect damages for the use of bisulphite of lime, which is employed to arrest the fermentation during the brewing operation. The grant of this patent appears to have been a blunder on the part of the Patent Office, as bisulphite of lime has been so employed for many years.

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TERRESTRIAL MAGNETISM.

The old notion that the earth possessed, near its north pole or in its interior, strong magnets which attracted the poles of the compass needle has long ago given place to the theory that our whole planet must be considered as a large magnet, and to the later hypothesis that this magnetism is caused by electric currents running east and west through its crust, and in regard to which the compass needle behaves as it does to all electric currents, namely: it places itself at right angles to the same, according to the law discovered by Oersted in 1829. By this theory the declination of the compass needle from the geographical north is simply explained by the fact that there is no cause which should compel these currents to run exactly east and west; on the contrary, by the irregular formation of the earth's crust, it cannot be expected otherwise than that these currents, which always follow the path of least resistance, should not coincide with the geographic parallels, and that consequently the direction of the compass needle, which must be at right angles to these currents, cannot coincide with the geographic meridians. This being the case, it is evident that the magnetic pole cannot coincide with the geographic pole, and in fact observations in high northern latitudes on this hemisphere have decided that, at present, the magnetic north pole, that is the point towards which the compass needle points, is situated in the arctic archipelago north of the American continent, in longitude of very near 100° west of Greenwich, and a latitude of 73° N. The magnetic south pole, in regard to latitude, is very near to the antipodes of this point, being in 74° S., but in regard to longitude, this is not the case; the antipodal point of 100° W. longitude lays in the meridian of 80° east of Greenwich; but the fact is that the magnetic south pole is at present at 140° east of Greenwich.

We can, of course, draw lines on the globe through those places where the compass needle points to the magnetic pole; in other words, when we travel from any place on earth and follow the direction of the compass needle till we reach the magnetic pole, and draw the line traveled over on the globe, we shall have a magnetic meridian. Those magnetic meridians can, of course, nowhere coincide with the geographical meridians, but must intersect them continuelly. Other systems of magnetic curves have been drawn; for instance, those of equal declination, that is, such curves as unite points where the declination of the compass needle from the geographic pole is the same. Those lines are quite irregular, much more so than the magnetic meridians, and even exhibit a great complexity. The line without declination runs from the magnetic north pole, south through Hudson's Bay and Lake Erie to Virginia, and enters the ocean in North Carolina; it skirts the Antilles and crosses the eastern point of South America. East of this line, the compass needle points north towards the west, and west of this line, it points north towards the east; and it generally deviates more in proportion as we go to greater distances from this line without declination; so while at present in Maine the declination is some 20° west, and in California, 20° east, it is in Newfoundland 40° west, and in northern Alaska, 40° east.

The reader will have noticed that we have used several times the expression "at present." This was by reason of the singular fact that all these data are continually changing. Observations made since the last three centuries and recorded on maps, for the years 1600, 1700, 1800, and 1870 prove that the magnetic poles are continually shifting their position; and this shifting is taking place regularly from east to west. Thus, in 1600, the magnetic north pole was somewhere north of Europe, and the line without declination ran through the heart of that continent, so that in the western European countries the declination was from 5° to 10° east; then it proved to be moving westward, so that the line of no declination passed over England some 100 years later, when the declination for the whole of Europe became west and was increasingly so till about 1820, when it had reached about 24°. Since this time, it is diminishing again in degree, while in the Eastern States of America it is increasing, so that in New York city, where a few years ago it was 6°, it is now more than 7° W. This points to a regular travel of the magnetic pole around the geographic pole, and, as far as we may conclude from a rather premature estimate, it will take a little over 600 years for a complete revolution, so that in the year 2200 it will again have arrived in the north of Europe.

There are two theories in explanation of this surprising phenomenon; one is that a great portion of the earth's magnetism is due to induction from celestial bodies and therefore under their influence, so that the relative position of the planets may affect the earth's polarity. The other theory, quite recently brought forward, is that the upheaval of continents and islands and in general all changes in the earth's crust, which are especially very active near the poles, modify either the magnetism or the direction of the electric currents which are the causes of the same.

In closing, we cannot forego drawing attention to two significant facts. One is that the aurora borealis appears to proceed always from the magnetic and not from the geographic pole as a center; the other is that the magnetic pole appears to coincide with the point of greatest cold, and even that the lines of equal mean temperature, or the so called isothermal lines, when drawn on the globe, show such a close relation to the magnetic pole as to give evidence that they are to a great extent governed by the same fundamental law.

THE INTERNATIONAL EXPOSITION AT VIENNA, 1873.

In reply to inquiries for the name of the United States Commissioner for the above exhibition, we would state that Thomas B. Van Buren, Esq., 51 Chambers street, New York, is the proper address. All persons who are desirous of going to the trouble and expense, of shipping their goods to Austria for this show, should communicate with the Commissioner as above. It is stated that there will be but few American exhibitors. This is not to be wondered at when we consider that under our present financial conditions—due, as the free traders allege, to our taxes and high tariff—it is not possible for Americans to compete with Europeans in filling orders for manufactured goods. It is, therefore, useless for our people to go over to Austria to exhibit the products of their skill and ingenuity. The only practical result would be that our best patterns would be copied without benefit or reward to the American maker. He could fill no orders, export no goods, simply because the continental manufacturers can do the work much cheaper and underbid his best proposals. When prices advance on the other side of the Atlantic, or become reduced here, then will be the time to talk to our people about going abroad to show their goods.

As for the exhibition of new inventions at Vienna, the Austrian patent laws offer but precious little encouragement and protection for American inventors, as we have heretofore had occasion to explain.

TUNNEL UNDER THE HARLEM RIVER, NEW YORK

The Park Commissioners of New York city contemplate the construction of a large tunnel at the upper end of the island, for the purpose of providing a carriage way under the Harlem river, from the end of the Seventh avenue drive. This is an excellent improvement and we trust will be speedily carried out. It will furnish a much needed communication between New York city and Westchester county. At the present time, the only avenues of access are the draw bridges, which occasion frequent delays, not only to the general traffic but to the railway trains.

The tunnel will be built of solid masonry, and extend 1,663 feet on the New York side, and 1,078 feet on the Westchester side of the river. It is contemplated to have the top of the arch 18 feet below high water mark, so that vessels drawing 17 feet can pass over safely. The tide falls about five feet at that point; and at low tide, vessels drawing less than 13 feet will be able to pass over in safety. It is proposed to have the tunnel about 2,759 feet long, and 16 feet in hight, to permit persons to stand on top of the highest omnibus, and 34 feet in width; this affords 20 feet of wheeling space and seven feet on each side for foot passengers. The descent will begin at 150th street, and the top of the tunnel will strike the water bed at 155th street, at a point about 200 feet south of the present Macomb's Dam bridge. The descent will not be steeper than many of the roads in the Central Park, and will not inconvenience horses drawing heavy loads. The expense is estimated to be about $1,500 000. A. W. Grant, C. E. is the engineer of this important work.

WILLIAM BRIDGES ADAMS.

We regret to have to record the decease of this distinguished civil engineer, inventor and scientific writer, whose name and works are doubtless familiar to our readers. He died recently, in England, the land of his birth, at the age of 75 years. Many of his suggestions in respect to railway improvements have been brought into common use, and among them is the so called fish joint, for uniting the ends of rails.

The employment of light steam cars and carriages is becoming every day more common. Their practicability was perhaps as completely demonstrated by the late Mr. Adams as by any other one person. We find in *Engineering* the following particulars concerning the performances of one of the early vehicles of this kind, made by Mr. Adams:

The total length of the carriage was 12 ft. 6 inches, including machinery, water tank, and seats for seven passengers, all being placed on one frame, which was hung below the axles, and carried on four wheels, 3 ft. 4 inches in diameter. The floor was within 9 inches of the level of the rails. The engine had two steam cylinders, 3½ inches in diameter, and 6 inch stroke, acting on a cranked axle. The boiler was cylindrical, placed vertically, and was 1 ft. 7 inches in diameter by 4 ft. 3 inches high. It contained a firebox, 16 inches in diameter by 14 inches high, with 38 tubes, 3 ft. 3 inches long by 1¼ inches in diameter, giving 5½ ft. of heating surface in the firebox and 38 ft. in the tubes. The water tank was placed under the seat, and had a capacity of 40 gallons.

The number of miles run during the half year, ending July 4th, 1848, was 5,526, the quantity of coke consumed being 7 tuns 9 cwt., or at the rate of 3 lb. per mile. At the date of this extract, the engine had run altogether about 15,000 miles; the greatest speed attained on the level was 41 miles an hour, the ordinary speed that might be safely calculated on for a long journey being 25 miles an hour. She had performed the journey from London to Cambridge, a distance of 57½ miles in 1¾ hours, being at a rate of nearly 33 miles an hour, with a consumption of coke of 2¼ lb per mile. This carriage was subsequently named the *Express*, and was sent down to Birmingham to be experimented with, where, to the astonishment of some of Mr. Samuel's friends—who had planned the matter—she ascended the Lickey incline of 1 in 37

SECURITY AGAINST THIEVES.

A bold bank robbery was committed not long ago at Uxbridge, Mass. The thieves surrounded the cashier's house in the dead of the night, and by means of ladders entered the open windows of the second story. They then gagged all the inmates, compelled the teller, on pain of death, to go with them to the bank and open the safe, which they immediately plundered. Loss, thirteen thousand dollars.

"The moral of the affair is," says *Appleton's Journal*, "that cashiers and tellers of banks must cease to go to bed with their chamber windows open, and that banks in the country must resort to some means of defense and protection more efficacious than the locks of a patent safe. An armed man and a stout dog in the Uxbridge bank would have prevented this robbery, and in the long run, it would be cheaper for a country bank to pay for a permanent night watchman than to be robbed, even if only once in a generation. The Uxbridge robbery is one of a series of similar outrages which have been perpetrated on the banks of New England during the last five years, and their frequency shows clearly that banks in the country cannot exist much longer in the old primitive fashion, but must fortify and arm themselves if they would keep their treasures safely."

We do not quite agree with the *Journal*. Instead of the dog and watchman, our advice to the banks is to make use of the better and surer means of protection which our ingenious inventors have provided in the shape of electrical alarms and detectors. For a tithe of the cost of maintaining a sleepy watchman, the Uxbridge bank might have had electric wires, attached to its doors and safes and also to the doors and windows of its cashier's dwelling, so arranged that any attempt of a burglar to enter would have rung an alarm bell and aroused the whole town. Entrance through open windows may be guarded by the use of a fly net to be connected with the wires. Any attempt to pass the net sounds the alarm. With the other forms of window, door, and safe alarms, our readers are familiar. We are never very sorry to hear of a bank robbery where the owners and officers have been so parsimonious as to refuse to employ the best electrical burglar alarms. Many of them turn up their ignorant noses at the idea of using such "patent gimcracks," as they call them, about their premises. But they must either use them or submit to robbery. Some of the heaviest and most astounding bank robberies have been committed upon banks that employed special watchmen at great expense, who were overpowered by the thieves, or were absent from their posts at the critical moment. But we have yet to hear of a single example of bank robbery where the electric alarm was properly applied.

THE INTERNATIONAL STATISTICAL CONGRESS.

The International Statistical Congress has opened its eighth session in St. Petersburgh, Russia. The delegates are divided into four sections, to each one of which the following subjects are assigned for consideration and report: To the first section, statistics of population, with methods of obtaining the same. Under this head, the number, sex, trades, and ages of the population of various countries will be discussed, together with the moral, intellectual, and physical condition of the people. Comparisons will also be made with reference to determining whether retrogression or progression has been made from a former state. To the physical development of man will be given considerable prominence. Investigations on this subject will include the hight, weight, volume, and development of different parts of the body, the strength, rate of walking, respiration, pulse, beating of the heart, and comparative acuteness of the senses.

To the second section, the most important part of the labor of the Congress is assigned. This is the discussion of industrial statistics. The subject is divided into five classes: Agriculture, mines and quarries, commerce and fisheries, and

manufactures. These are subdivided so that no detail, however small, will be omitted.

The third section will discuss the statistics of commerce and postal relations. Many difficulties to the accomplishment of this work are anticipated. The principal is that of fixing a uniform nomenclature for the leading articles of commerce, without which it is almost impossible to arrive at satisfactory results, and also that of obtaining the true values of merchandise for use as a basis of comparison between aggregates. The fourth section will devote itself to discussions similar to those of the Prison Congress lately held in England—the statistics of criminal justice.

The more than ordinary importance of this Congress will render its proceedings of great interest, and we look for much valuable information from the results of its deliberations.

A NEW CANAL STEAMER.

We published not long ago illustrations of Captain Goodwin's improvement in canal propulsion, and spoke of it as one of the plans most likely to prove practical and successful. We are gratified to be able to state that a pair of these canal boats have lately been constructed by the inventor, at Buffalo, and in the course of two or three weeks they are to be put on trial on the Erie canal.

The peculiar features of the plan are, first, a floating propelling wheel, extending entirely across the bow of the boat, somewhat like those employed at the sterns of the Western boats. Second, cheek pieces extending alongside of the bow wheel, so as to enclose the water in front and cause it to be driven under the bottom of the boat as the latter advances. Third, a peculiar formation of the stern of the vessel, so as to admit of the connection therewith of a train of barge boats, which when united shall form a unity, so far as propulsion is concerned.

The two boats just built are each 96 feet long by 17 feet wide, and will have a carrying capacity each of 240 tuns The engine is of 40 horse power, capable of working up to double that power if required. It is expected that the two boats when connected will be propelled with a speed of from four to six miles per hour. Of the actual performances of the vessels, we shall give a report in due time.

THE NEW RAILWAYS ACROSS THE CONTINENT.

Colonel Thomas A. Scott, the celebrated railway projector and manager, recently made a speech before the wealthy men of New Orleans, inviting them to join in the construction of a railway from New Orleans to Shreveport, for the purpose of connecting New Orleans with the Texas & Pacific Railroad, of which Colonel Scott is president. In the course of his remarks, Colonel Scott stated that the Texas and Pacific Railroad, the construction of which is now rapidly progressing, will extend from Shreveport, La., to San Diego, Cal. There will also be a parallel connecting line, beginning at Texaskana, and running westerly to Fort Worth, in Tarrant county, Texas, where it joins the trunk line. Colonel Scott stated that the entire line from Shreveport to San Diego will be finished within six years, and if the citizens of New Orleans now join in the construction of the proposed road from New Orleans to Shreveport, they will be enabled by or before the year 1878 to take the cars in their own city and ride direct to the Pacific ocean. The Texas and Pacific Company expect to have five hundred miles of their road completed within the next two years. The portion of Texas through which it passes is very rich in agricultural and other productions.

Still another new transcontinental railway enterprise is in progress, that of the Atlantic and Pacific Railroad Company, lately incorporated under the authority of the Legislature of California. The line is to be located south of the snow line, so as to avoid the detentions which so seriously interrupt the Union Pacific in the winter time. This road is intended to connect with the Atlantic and Pacific Railway of Missouri, a portion of which, over three hundred and fifty miles in length, is already in operation west of St. Louis. It is asserted that the city of San Francisco will subscribe heavily towards this new road, as the citizens have become alarmed by the efforts of the Central Pacific Company to concentrate the entire railroad system of the State in their own hands, with the terminus at Goat Island—a project which, besides establishing an immense moncpoly, is claimed to threaten the destruction of the present harbor of San Francisco, and the building of a rival city on the opposite side of the bay.

When these new highways are completed, we shall have four great railway avenues in operation across the continent, to wit, the Union Pacific, the Northern Pacific, the Texas and Pacific, and the Atlantic and Pacific.

IMPROVEMENTS THAT ARE MUCH NEEDED.

The steamboat Bristol, one of the large and magnificent vessels that navigate Long Island Sound, plying on the Boston route between New York and Fall River, lately collided at Newport, during a fog, with a ship lying at anchor. The sailing vessel, which was loaded with railroad iron, was cut down and sank, while the steamer was damaged in the bow and was run ashore to prevent sinking. As it was, her hull filled. Steam pumps were sent for, which, in a few hours, set the Bristol again afloat and she was soon repaired.

The Bristol is a noble vessel. She was built at an expense of one million of dollars, with first class boilers, engine, blowers, indicators, hose pipes, etc. Her cabins are elegantly upholstered, adorned with gilt, lighted with gas; her twelve hundred passengers are entertained, during every trip, by regularly employed bands of music, are supplied with good things from a generous larder, and served by an effective corps of the politest negro waiters. In short, the vessel is a floating palace, sailing with almost every appointment and luxury that money can supply. But in one most important requisite, namely, the means of flotation, the Bristol is sadly deficient.

The ordinary mechanic, not experienced in navigation, if asked to give his ideas as to the prime requisites for a passenger steamboat, would naturally say that the first thing to do was to provide the most ample means possible for keeping the ship afloat. But it is just here that owners disagree with him, and the Bristol is a case in point. With an operating steam force on board of nearly three thousand horse power, she was unprovided with the means of rendering her power available for pumping, and sank ignominiously into the mud.

A decent regard for the lives of passengers, to say nothing of their own property, would seem to make it the obvious duty of the owners of the Bristol to provide her with pumps, equal, at least, to an emergency like that lately encountered. Had the accident occurred on the open Sound, instead of near the bank of a river, the vessel would doubtless have gone to the bottom, with loss of many lives.

We are aware that owners are desirous of avoiding the transport of dead weight, and hence they economize in pumps and other safety apparatus. But we believe it to be poor economy. They should place on board the most effective means for safety that can be procured, calling upon ingenious people to remedy any defects that experience suggests. The invention of improved means for the flotation of vessels in case of disaster is still urgently demanded.

We trust that some of our readers will investigate this subject specially, and study out some new and effective method of rendering available for safety, in the hour of need, the immense steam force of such vessels as the Bristol. The dimensions of this boat are as follows: Length 373 feet, beam 83 feet, depth 16 feet. Measurement, 3,000 tuns. Diameter of cylinder 110 inches, stroke 12 feet, 2,800 horse power.

A NEW SUSPENSION BRIDGE.

The plans for a new suspension bridge over the Harlem river, at the high grounds in the upper part of New York city, have been prepared by the Park Commissioners. The bridge, as laid out on the drawings, will be about 1,800 feet in length, of which 734 feet will be within the jurisdiction of New York, and 1,066½ feet in Westchester county. The roadway will be about 153 feet above high water level, and extend from the Tenth avenue to the hights on the opposite shore, west of the Croton aqueduct. It will be twenty-three feet higher than the present High Bridge, and form a convenient connection between the elevated lands of both sides of the river, affording favorable ground for foundations for piers and towers, and for anchorage for cables.

THE ELECTRICAL RAILWAY ALARM.

The bell rope commonly used on our railways, while it is very serviceable for short trains, is not of much use on long freight trains, because the weight and friction of a long cord is such that the rear portion of the cord may be broken without moving the forward portion. Thus, if the coupling of the rear cars of a long freight train breaks and the train separates, no alarm will be sounded on the engine gong, because the rear portion of the cord breaks while the front portion, to which the bell is attached, is not moved. An improvement which overcomes this difficulty consists in placing a magnetic bell hammer upon the engine, together with a small electrical battery, and in providing each car with a set of wires, joined by flexible joints, so arranged that while the train remains united all is well; but should any of the car couplings or wires break, the gong on the engine will instantly commence ringing. The same device may be employed by the conductor to give any signals that he may desire to the engineer, from any part of the train.

OLD AND NEW STEAM ENGINES.

The engines of the Cunard steamer *Scotia*, a large and splendid ship which plies between New York and Liverpool, are of 5,000 horses power, 100 inch cylinders, 12 feet stroke, very massive, elegant to look at, but of old style, side levers, entirely out of date, and very expensive to run. The ship burns 160 tuns of coal a day and requires 1,900 tuns for an Atlantic voyage. The new style of compound engines, now used on most of the ocean steamers, effects a saving of more than fifty per cent in fuel. Mr. F. J. Bramwell states that, nine years ago, the average consumption of fuel of the best marine engines was 4½ pounds of coal per horse power per hour, and that the same results are now obtained with a consumption of a trifle over 2 pounds of coal per horse power per hour. This is a wonderful improvement. The owners of the *Scotia* would make money by throwing away their present engines and substituting the new patterns. They might thus save 1,000 tuns of coal per trip, and add 1,000 tuns to the cargo capacity of the vessel.

THE COOLEST PLACE IN NEW YORK.

The coolest place to be found in New York in the summer time is the Pneumatic Underground Railway Tunnel, under Broadway, opposite the City Hall Park. When the thermometer stands at 90° in the shade on the street, if you go down into the pneumatic tunnel you find a temperature of only 65°. The projectors of this tunnel enterprise, which is pretty generally admitted to be the best plan for rapid city transit that has been presented, are obliged to wait the sanction of the State Legislature before proceeding any further with the work. Meantime that portion of the tunnel which has been constructed under Broadway continues open to the public and forms a cool, clean, well lighted promenade, being withal an interesting place to visit. A narrow gage railway track is laid in the middle of the tunnel, in which a comfortable passenger car sometimes runs, being propelled on the pneumatic plan with much success. The great earth-boring machine remains motionless in the south end of the tunnel, waiting the legislative voice to give it renewed activity.

PROMOTIONS AT THE PATENT OFFICE.

W. Burke, lately first assistant examiner in class 25 "Clay and glass manufactures," has been appointed Principal Examiner in class 121, "Steam."

J. Newland, lately first assistant examiner in class 126, "Calorifics," has been appointed Principal Examiner in classes 61 and 98, "Hydraulics and Pneumatics."

Both of these appointments are the result of competitive examinations which were highly creditable to the successful candidates. Both are gentlemen of ability, and their appointment to the higher position they now occupy gives general satisfaction. They are well qualified, zealous, and industrious officers.

DIAMONDS IN ARIZONA.

Fabulous stories are told in the daily papers concerning the recent discovery of emeralds and diamonds in Arizona. Large quantities of these precious stones, found by prospecting parties, have been carried to San Francisco and put on exhibition. A great area of the territory where they are found has been secured and several joint companies formed, based on great expectations in the acquisition of diamond wealth. The richness of the new fields is alleged to surpass those of South Africa, and the famous mines of Golconda are dwarfed into insignificance. If the half that is told of the Arizonian discoveries is true, real diamonds are about to become more common than the paste article, and the occupation of the artificial manufacturers will soon be gone. One of these companies, by name the San Francisco and New York Mining and Commercial Company, announces a capital of $10,000,000, of which a large proportion has been already taken. Probably a small amount of the stock yet remains unsold, which those who greatly want it can perhaps obtain, as a special favor, if immediate application is made.

The new diamond fields are located among the foot hills of the Pinal mountains in Arizona. The whole country round about is said to be rich in mineral wealth.

WHY IT HAS BEEN SO HOT.

The present summer has been characterized by unusual heats in almost every part of the Northern world, and all classes of philosophers, the weather wise especially, have been at their wits' end to account for it. Professor Tacchini has been making direct enquiries at headquarters, and has received the most satisfactory explanation. By means of spectrum observations and other carefully conducted experiments, he has discovered that for some time past our great luminary, the sun, has been throwing off immense and unusual volumes of magnesium gas from all parts of its surface. Magnesium is one of the most inflammable and fiercely burning substances in nature, when once set a-going, and the explanations of Professor Tacchini settle the whole matter. When the thermometer falls, it may safely be concluded that the supply of magnesium in the sun's atmosphere has diminished.

THE METEORS OF AUGUST TENTH.

The expected shower of meteors, predicted by the astronomers for August 10th last, did not make its appearance in the locality of New York. We observed few if any more meteorites on that night than on ordinary occasions; nor have we received reports from any quarter indicating that the earth went through the tail of any comet. It may be, however, that the plunge of our sphere into the cometary matter took place in the day time, the resultant meteors being then invisible.

TO RENDER METALS ELECTRIC.—T. Sidot has observed this phenomenon, and found that iron, silver, and aluminium, if the friction be sufficient, will give off electric sparks. To perform this experiment, take a perfectly dry tube of thick white glass and put in 15 to 20 grammes granulated silver, and 30 to 40 grammes pure bisulphide of carbon, and seal up the tube. On warming the tube slightly and shaking it in the dark, sparks appear in the interior, their number increasing with the violence of the agitation. The sparks disappear on immersing the tube in water.

CAUSTIC SODA.—A new method of preparing caustic soda is given by M. Tessié du Motay, in *Les Mondes*. One equivalent of sulphuret of sodium is mixed and fused with one equivalent each of caustic soda, hydrate of lime, and metallic iron (cast or malleable); when these substances are heated to redness, the sulphuret of sodium is completely converted into caustic soda, and sulphuret of iron formed. M. du Motay considers that the water of the hydrate of soda or lime is decomposed by the iron, which becoming oxidized, hydrogen is set free, oxide of sodium formed, and then sulphuret of iron; the soda being separated from the last named substance by lixiviation with water. In another process, the sulphuret of sodium is first converted into a basic phosphate of soda, and then into caustic soda by means of caustic lime.

The corporation of the city of New York have ordered a portrait of the late Professor Morse to be painted, to adorn the grand parlor, or Governor's room, of the City Hall.

SCIENTIFIC AND PRACTICAL INFORMATION.

TO ENAMEL COPPER UTENSILS.

Finely pulverize 12 parts white fluor spar, 12 parts unburned gypsum, and 1 part borax, and fuse together in a crucible. When cold, mix with water to a paste, and apply to the interior of the vessel with a paint brush. When dry, the vessel should be thoroughly baked in a muffle or furnace.

MESMERISM.

Mr. J. E. E., of Pa., says: "About six months ago a mesmerizer was performing in this place for about a week. Our nearest neighbor's little daughter, a pretty bright child, became a very interesting subject: and during the stay of the professor was nightly under his influence, sometimes for two hours. Her mind seemed in a strange way the day after he left, and in two days she was taken with a severe headache with darting pains; these terminated in a stupor, and, for about six months, she has been under medical treatment. The physicians say she has no disease. The poor child is an object of pity, having pined away to a skeleton and become perfectly helpless and idiotic. She does not know her own wants; never asks for food, merely opens her mouth when it is touched, and takes it like a young bird."

FIREWEED FIBER.

In reference to this product, described on page 89, current volume, our correspondent, Mr. I. Stauffer, says:

"The plant known as fireweed, which springs up in clearings when recently made and burned over, is the *Erechthites hieracifolia, Raf.* This belongs to the natural order *compositæ*, and the numerous *achenia* in the receptacle, provided with a copious pappus of very fine and white hairs, might be compared with the boll of the cotton plant. But the writer says it is called *epilobium;* of this we have 5 species: the *epilobium angustefolium*, L. (great willow herb) attains a hight of from 4 to 7 feet, and is often very abundant in newly cleared land. This gets fine flowers in a long spike or raceme. The pod is linear, many seeded, each seed with a tuft of long hairs at the end. The epilobium belongs to the natural order *onagraceæ* (the evening primrose family). I doubt not but that the fiber of the bark would be useful for the purposes of "wicks, ropes, yarn, and even paper." I know that our common evening primrose, *œnothera biennis*, with which I have seen neglected fields completely covered, is suffered to rot as a weed, simply from ignorance of its value."

WATER FROM THE BOTTOM OF THE SEA.

A German inventor suggests the use of a vessel, lowered by a rope and provided with a wire which, by electrical action, closes the vessel when the required depth has been reached. The idea is simple and appears to be practicable; and some valuable results may be obtained by drawing up water from various depths in the sea.

APPEARANCE OF FOREIGN GRASSES IN FRANCE.

The growth, apparently spontaneous, of several foreign species of grass in middle France, especially in the communes of Cour and Cheverny, has been explained by M. Vibraye in *Les Mondes*. It appears that, wherever the cavalry horses had been supplied with forage from Algeria, numerous grasses unknown to the locality were growing, as many as twenty new kinds already having been observed. A gentleman has noticed as many as forty four unknown species in the neighborhood of Angoulême, which all appeared immediately after the presence of a cavalry camp in the suburbs. The avidity with which the new plants have taken root has induced the Academy of Sciences in Paris to authorize the preparation of a scheme for the systematic introduction of Algerian forage plants into France.

[Special Correspondence of the Scientific American.]

LETTER FROM PROFESSOR R. H. THURSTON.

A flying visit to Chicago," the Cream City," and St. Paul. The St. Louis River and its remarkable characteristics. Important railway engineering. Duluth, its astonishing growth. Houghton and the Lake copper regions.

HOUGHTON, Portage Lake, Mich., July 17, 1872.

Leaving St. Louis soon after sunset, we next morning found ourselves rapidly but smoothly riding across the level, treeless prairies of Northern Illinois, the view strongly reminding one of that obtained from a ship's deck in open ocean on a calm day—a monotonous dreary sameness bounded in every direction by an equally distant line, the apparent line of meeting between heaven and earth.

At eight o'clock A. M. we were landed in Chicago and rode across to the Northwestern depot through a portion of the "burnt district." We were thus enabled to obtain a glance at the terrible desolation which so suddenly overspread a large portion of this great city, and to see something of that phœnix like revival which the wonderful energy of the people, assisted by the substantial sympathy of every civilized country, has inaugurated. We must spend more time here on our return from the great northern lake.

MILWAUKEE.

After a substantial breakfast, we again started northward, passing through Milwaukee, one of the most interesting cities of the northwest and one which promises to become the seat of extensive manufactures in iron. "The Cream City," as it has been called, has a fair harbor at the mouth of the Milwaukee river; extensive water power is afforded by the river, and lines of steamers and railroads assist in making the city one of great importance and of promising future. It is scarcely more than twenty years since the city was founded, and, yet, in 1870, it contained 71,464 people.

From Milwaukee, our route took us through a country which, as we went northward, gradually lost the prairie character and became irregular in surface and more and more wooded; and as one pleasant scene succeeded another, and as we crossed one fine farm after another, we thought these Minnesota lands the finest we had yet seen.

ST. PAUL.

A day and a night on the rail, and we finally reached St. Paul, the capital of Minnesota, a city of about 25,000 inhabitants, standing upon a high bluff at the head of navigation of the Mississippi river. A quarter of a century ago, there were, where the city now stands, perhaps a dozen dwellings, whose inhabitants were trading with the Dakotas or the Chippeways, and hunting and fishing in the neighboring forests and in the beautiful streams flowing through them. To-day, with its 25,000 people and their well built residences and frequently imposing stores and public buildings, its four miles of water front from which steamers can take their cargoes without difficulty to New Orleans, 2,060 miles below, and with the lines of railway which radiate in all directions and connect the city with every part of the country, with its healthy climate and surrounded, as it is, with a fine farming country, St. Paul is an excellent place in which to build up a manufacturing industry, and its future should be one of exceptional prosperity.

The cities of Minneapolis and St. Anthony are a short distance above St. Paul, at the falls, and seem equally prosperous. They have an additional advantage in the possession of immense and readily utilized water power. The former has already become known as the seat of woollen manufactures; and the blankets woven there are among the very finest in our markets.

ON TO DULUTH.

We made but a short stay here and then started for Duluth *viâ* the Lake Superior and Mississippi Railroad. This road passes, for the greater part of its length, through a rather uninteresting country; but, at Thompson, we crossed the St. Louis river, and thence the road was carried along its banks nearly to Duluth.

DIFFICULT RAILWAY ENGINEERING.

It was during our ride along the banks of the St. Louis that we saw at once some of the most beautiful scenery and the most difficult engineering that we had met with since leaving home. The rails are carried on high trestles across deep ravines, and for long distances along the high bank of the river and at points, the road bed seems almost ready to slide into the stream. The work is, however, well done, and the greatest care is taken in running trains over the more dangerous portions of the road; there is really very little risk, much less than on many roads where the natural obstructions are far less formidable, but where the engineering is less skilfully done.

A GREAT WATER POWER.

The river, from Thompson to Fond du Lac, where it enters Lake Superior, presents an almost uninterrupted succession of falls and rapids.

In the last eight miles, the river falls about 400 feet and, as the rate of flow has been stated to be 290,000 cubic feet per minute, it is not improbable that this stretch of the river offers an available power of not less than 100,000 horses,—enough to drive 10,000,000 spindles, could it be applied to cotton manufacturing. It is a large cotton mill that contains 50,000 spindles; this water power is thus capable of supplying 200 large mills. The rocky bed and precipitous banks of the river are slate, and this stone, together with the excellent lumber of the adjacent forests, is quite sufficient to support a large industry for an immense length of time. The amount of capital which may be usefully and profitably employed here can hardly be imagined. The valley must at some future time support a large population, and a beginning has already been made at Thompson, where there are several saw mills, railroad shops, and other manufacturing establishments.

THE "DALLES" OF THE ST. LOUIS.

But, as the traveller rides over this eight miles along the "Dalles" of the St. Louis, even although he may be the most thoroughly utilitarian of capitalists or engineers, he can hardly, at his first visit, so far control his feelings as to be able to speculate, upon the probable available power of the stream or the value of its slate deposits and bordering forests, while in their actual presence. Nature here presents such scenery as is rarely found either at home or abroad. It has none of the grandeur of Niagara or of the Yosemite, but in its wild beauty, in its picturesqueness, and in the variety of its scenery, it can have but few rivals. The Dalles present a collection of attractions that will repay the lover of Nature for all the fatigue of a journey across a continent. Here, for miles and miles, the river rushes between precipitous banks over its rocky channel, and rapids and falls and rapids again follow each other in constant succession. Occasionally the banks recede, and the river widens and becomes a wide but shallow and brawling stream; again the banks approach each other and high precipices confine the river in a narrow bed where it roars among craggy slate dykes or rushes over a succession of cascades to a lower level; here it, perhaps, flows more quietly for a little time, but soon it resumes its wild career, and finally loses itself in the calm depths of Lake Superior.

THE NEW CITY OF DULUTH.

Duluth, where we were to take a steamer for the lake ports, is one of those typical western "cities" which frequently spring up as if at the command of the slave of Aladdin's lamp. Hardly three years old, it already contains eight churches, two hotels of moderate size, several saw mills, and a considerable number of stores. An opera house and another hotel are promised. The North Pacific Railroad is building long lines of wharf in a very good harbor. This has been rendered readily available by cutting a ship canal through Minnesota Point, which stretches out six miles across the bay toward Superior city, and makes the best possible breakwater. A capacious elevator has been erected at the landing. There are probably 4,500 people in the place. This is the terminus, on Lake Superior, of the great Northern Pacific Railroad. Its connection by rail with all parts of the country and its several lines of steamers, which keep it in regular communication with all the ports of the great lakes, are advantages that must rapidly build up the city. Still, when land sells, as it has here within a few days, at eighty dollars per front foot, we are somewhat inclined to believe that the youthful city is suffering from an inflation of prices in its real estate market that must retard its growth. The buildings are generally framed structures and of rather rough construction, as might be expected. An occasional brick building and at least one brown stone front may be seen in the upper town.

This town, springing up as it has, reminds one of those which, during the war, were occasionally built by the army, not only by the rapidity with which this peaceful army has erected its quarters, but, in some places, by the character of the buildings.

THROUGH THE LAKES TO THE COPPER REGIONS.

After waiting two days at Duluth, the steamer *Meteor* came into port and we sailed next morning. We had a clear bright day, with a warm sun but a cool air, and enjoyed the sail extremely. By the middle of the afternoon, we were steaming through that beautiful group, the Apostle Islands, and, just before sunset, touched at Bayfield, a village on the south shore of the lake. As we left the shore again and headed for Isle Royale, we witnessed a magnificent sunset; such brilliancy of color and such variety of cloud shapes no Italian sky could surpass.

We arrived, next morning, at Isle Royale, where we took on board a prospecting party returning from an exploration of the copper deposits of the island. These deposits are quite extensive and are supposed to be at some points extremely valuable. They were formerly worked by several companies; they are now nearly all held by a single corporation, and operations which have, for some time, been entirely suspended, will probably, ere long, be resumed. It is not improbable that this island may be found to contain an immense amount of mineral wealth, if we may judge by its geological structure and by the evidence afforded by explorations and workings which have already been commenced.

Once more steaming out of harbor, we again headed southward, and, at evening, by the light of the full moon, we were skilfully piloted through the long, tortuous entrance to Portage Lake, and late at night came alongside the wharf at Houghton, the principal town of the Lake Superior Copper Regions. Here we propose spending some days for the purpose of learning something of the character of these deposits, and the methods adopted in "winning" the ores.

R. H. T.

18,000 Blows a Minute

Can easily be given with our new machine for reducing

SEWING MACHINE NEEDLES.

It is universally acknowledged to be the best and most practicable machine ever invented for reducing metals; doing the work very much faster than any other machine, and it will run for years without any perceptible wear. Our machines are operated on an entirely new mechanical principle, discovered by Mr. Hendryx—a principle which produces the most perfect mechanical arrangement for a rapid motion ever yet invented; the dies can be made to strike twenty thousand positive blows a minute.

We are now prepared to furnish our machines at a reasonable price, to any or all parties who may want a very superior machine for reducing sewing machine needles, for pointing wire, for wire drawing, or for swaging any articles where a very rapid stroke is required.

Sewing machine needle makers will find it greatly to their advantage to call on us and see our machine in operation, as the introduction of our machine into the art of needle making will cause the plan of swaging needles to entirely supersede the old plan of milling, for it not only makes a great saving in the cost of making the needles, by greatly lessening the cost of reducing them, besides saving more than half of the wire used in making milled needles, but the process of swaging makes a needle which is far superior to a milled needle—for, in reducing needles by the milling process, all of the best of the wire, the outside, is cut off and wasted, the poorest part of the wire, the core, only being used; while the swaging process, by condensing the particles of metal, makes the part of the needle which is reduced far superior to the wire itself.

Our machine is fully covered by good valid patents in this and foreign countries. Communications by mail will receive prompt attention. Call on or address Webster & Hendryx, Ansonia, Conn.

Facts for the Ladies.—J. A. H. Abell, Warsaw, N. Y., bought a Wheeler & Wilson Lock-Stitch Machine in 1857; used it 9 years in stitching clothing that 8 hands prepared, and since in family sewing, with not a cent for repairs; it runs now like magic, with no signs of wear. See the new Improvements and Wood's Lock-Stitch Ripper.

Merit is its Own Success.—Superior merits and capabilities, cheapness in price, and ease of operation, have placed the New Wilson Under-Feed Sewing Machine far in advance of all other machines in the market. The public shows its approval of all that it is and does by purchasing the machines as fast as the company can possibly manufacture them. There is no test of a sewing machine ever yet inaugurated but what has been used on the Improved Wilson, and in every case it has come off ahead of every other machine in use. No pains or expense is spared in the material used in it, or the workmanship of its construction, to make the Wilson every way the best, most pleasant, and most durable sewing machine in existence. It costs but $50, and is sold on easy payments. Salesroom, 707 Broadway, New York; also for sale in all other cities in the United States.

NEW BOOKS AND PUBLICATIONS.

EASY RULES FOR THE MEASUREMENT OF EARTHWORKS by means of the Prismoidal Formula. Illustrated. By Ellwood Morris, Civil Engineer. Philadelphia: T. K. Collender & Co., Third and Walnut Streets.

This is a well arranged treatise on the subject announced in its title page; and it provides for the calculation of earthwork of all kinds by an elaborate compilation of formulæ and tables.

THE MUSICAL WORLD. Henry Litolff, 211 Fourth Avenue, New York city.

This publication contains, in each issue, a number of songs, reprinted in a clear and legible manner, the selection being judiciously made from composers of known ability.

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.

Flouring Mill near St. Louis, Mo., for Sale. See back page.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 12c. a line.

Wanted—A Situation to superintend work, by a Machinist of considerable experience. Address "Machinist," carrier 98, Philadelphia, Pa.

For Sale—Retiring Partner's interest in a Sash, Door and Moulding Mill, located at one of the best points in the Northwest, and doing a large trade. A good opening to a paying business. Address "Mill Co." care Cook, Conurn & Co., Chicago, Ill.

Baby's Carriages—Send illustrated circulars of to a purchaser. Address Lock Box 304, Pittsburgh, Pa.

Griffith & Wedge, Zanesville, Ohio, are the only Builders of the Vertical Portable Engine, and their unequalled Saw Mill. H. Fairbrother says, July 21st, 1872, "I am making the Pine dust fly at the rate of Twenty thousand feet per day."

The best Portable Engine in the World is Griffith & Wedge's "Vertical." E. Boston says, August 5th: "Engine works first rate with any kind of green wood; the trouble is to keep the Steam down to 70 pounds, which is all we need. Hard Pin Oak, 25 in. cut, does not check it."

For Best Fish Net Machines—Lewis & Ward, 73 Commercial Street, Boston, Mass.

Valuable Invention for Sale, Pat'd. Box 116, Providence, R.I.

Woodworth Surface Planers, $125. Planers and Matchers, $350. S. C. Hills, 32 Courtlandt Street, New York.

Wood Lathes, all Sizes. Wm. Scott, Binghamton, N. Y.

See Mill Spring adv. to Millers and Millwrights, back page.

Turbine Water Wheels—Two twenty-four inch Reynolds Wheels—less than one year's wear and as good as new—for sale cheap. For further information, apply to J. G. Parker & Son, Poughkeepsie, N. Y.

Patent Steel Measuring Tapes, made and sold by W. H. Paine, Greenpoint, N. Y. Send for circular.

American Boiler Powder Co, Box 797, Pittsburgh, Pa., make the only safe, sure, and cheap remedy for 'Scaly Boilers.' Orders solicited.

A foreign patent of unusual merit for sale on liberal terms or on commission. Address G. T. W., Post Office, Baltimore, Md.

A Rare Chance—Pleasure Steamboat for $275.00. Length, 16 feet; speed, 6 miles an hour. Address Geo. F. Shedd, Waltham, Mass.

Bogardus Mills—Two number 5 and five number 3, for sale cheap. Address B. G., 112 John St., New York.

Whitcher's Pat. Rotary Engine is the simplest, cheapest, and most economical. On exhibition at P. Fields & Son, North Point Foundry and Machine Works, Jersey City, N. J.

Platina Plating—Alb. Lovie, 720 N. 3d St., Philadelphia, Pa.

Wanted—A number of Rotary Engines. Dealers, please address J. D Butler, Lancaster, Mass.

Windmills: Get the best. A. P. Brown & Co., 61 Park Place, N.Y.

Sweetser's Blacking and Brush Holder—illustrated in Sci. American, May 18, 1872. Best thing for Stove or Shoe Blacking. Needed in every household. Rights for sale. E. H Sweetser, Box 317, Salem, Mass.

It is better to purchase one of the American Twist Drill Company's Celebrated Patent Emery Grinders than to wish you had.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N. J Also 3-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

New Pat. Perforated Metallic Graining Tools, do first class work, in less than half the usual time and makes every man a first class Grainer. Address J. J. Callow, Cleveland, Ohio.

Gear Wheels, for Models; also Springs, Screws, Brass Tube Sheet Brass, Steel, &c. Illustrated Price List free by mail. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company foot East 9th Street, New York—1202 N. 2d Street, St. Louis.

Brick and Mortar Elevator and Distributor—Patent for Sale. See description in Sci. American, July 20, 1872. T. Shanks, Lombard and Sharp Streets, Baltimore, Md.

The Berryman Manf. Co. make a specialty of the economical feeding and safety in working Steam Boilers. Address I. B. Davis & Co. Hartford, Conn.

The Berryman Heater and Regulator for Steam Boilers—No. one using Steam Boilers can afford to be without them. I. B. Davis & Co., Hartford, Conn.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and reset by J. Dickinson, 64 Nassau st., New York.

Wanted—Melter. Permanent situation, at good wages, to a good, experienced Iron Melter. Address C., Iron Founder, Cleveland, O.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro. 414 Water st., N. Y.

For Machinists' Tools and Supplies of every description, address Kelly, Howell & Ludwig, 917 Market Street, Philadelphia, Pa.

Machinery Paint, all shades. Will dry with a fine gloss as soon as put on. $1 to $1.50 per gal. New York City Oil Company, Sole Agents, 116 Maiden Lane.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 22 Broadway, N. Y., or Box 1809.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $4 E. M. Boynton, 80 Beekman Street, New York. Sole Proprietor.

Better than the Best—Davis' Patent Recording Steam Gauge Simple and Cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For hand fire engines, address Rumsey & Co., Seneca Falls, N.Y.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies see Manufacturing News of United States in Boston Commercial Bulletin. Terms .00 year.

The best recipes on all subjects in the National Recipe Book. Post paid, $2.00. Michigan Publishing Company, Battle Creek, Mich.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

For Marble Floor Tile, address G. Barnoy, Swanton, Vt.

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

Portable Baths. Address Portable Bath Co., Sag Harbor, N.Y.

For Steam Fire Engines, address R. J. Gould, Newark, N. J

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.—DIAMONDS.—Will some one of your readers tell me how to detect a diamond, and in what way to test its value?—C. W. P.

2.—COLORING INDIA RUBBER.—I would like to enquire if soft rubber can be colored throughout a bright and durable green, brown, yellow or other color?—C. L. P.

3.—PAPIER MACHE.—What is the process for making this substance, and what is put in the pulp to harden it?—W. R. F.

4.—SOLDERING LEAD.—Can any one tell me what is used by plumbers in joining lead?—J. C. H.

5.—CEMENT FOR IRON.—Is there any cement, in use in machine shops, for sticking iron together? If so, how is it made?—J. H. S.

6.—ROTTING STRAW.—What cheap chemical must I apply to straw in stable refuse to rot it quickly? I want something that will not affect brick or stone work.—C. DE P. F.

7.—VALUE OF PURE GOLD.—What is the value in coin of gold, 24 carats fine?—S. A. G.

8.—SMELTING LEAD, COPPER, GOLD AND SILVER.—H. S., of Ill., desires to know where good modern treatises on the subject can be obtained. There are several published, but the publishers keep them away from our advertising columns as much as possible.

9.—ELIMINATION OF MERCURY FROM TIN AMALGAM.—How can I obtain pure mercury from the coating on the backs of looking glasses?—J. H. M.

10.—CEMENT FOR MEERSCHAUM.—Can any one tell me how to prepare a cement to mend a (colored) meerschaum pipe?—E. S. T.

11.—DRILLING HOLES IN GLASS.—Can any one give me practical directions for drilling holes in glass?—W. V. B.

12.—BOILING OIL.—Can steam be used, to replace a coal or coke fire, for boiling oil or other liquids requiring a heat of from 300° to 400° Fah?—V. L.

13.—INDIA RUBBER FOR STEAM TIGHT JOINTS.—Can india rubber be exposed to the heat of steam and iron without injury, being used as a washer or in place of an ordinary valve in immediate connection with a steam boiler?—V. L.

14.—DYEING ANILINE BLACK.—How is the aniline black, the preparation of which is described on page 101, current volume of the SCIENTIFIC AMERICAN, used in dyeing?—E. T. H.

15.—WOODEN RAILWAYS.—E. O. N., of Tenn., repeats the questions asked by C. M. P., query 17, page 106. Will Mr. J. B. Hulbert give the public some light on the plan he has adopted?

16.—THE VIENNA EXPOSITION.—T. C. P., of Mass., and others enquire who is our government agent for securing space and forwarding articles for exhibition at Vienna. If any appointment or arrangement has been made, it has hitherto been kept out of the public mind.

17.—CUTTING PLATE GLASS.—I have a plate of glass three tenths of an inch thick and two and a half feet wide, which I wish to cut without risk of breakage. A light diamond cuts it, but not surely. What means shall I use?—J. P. A.

18.—PRESERVING THE EYESIGHT.—Some years since much was said in relation to preserving the sight in old age by pressing the eyeballs. If any one of your readers has received benefit from such treatment, he will do a vast amount of good by giving the particulars through your paper.—J. H. D.

19.—WATER VERMIN.—In your issue of August 10, page 84, I find a communicat on from W. Ward, Cleveland, O., on how to destroy wigglers. I am troubled with a similar pest. The cistern water is a swarming with small reddish-colored bugs or lice; they crawl, and are very lively in the water, and are about one thirty-second of an inch in size, and smaller. The cistern was cleaned about three and a half months ago, and we have only noticed them for three weeks past. What can they be, and what is the best way to get rid of them?—A. H. R.

20.—NITRO-GLYCERIN.—Will some one please give me a formula for making nitro-glycerin?—P. G. S.

21.—BRONZING.—How can I bronze small castings in a simple and effectual manner?—L. H. W.

22.—PRESERVING POLISHED STEEL SURFACES.—We have seen it stated that carbonate of soda is found to be effective in preserving polished steel surfaces from oxidation. Can you inform us what solvent is used and how applied?—F. & N.

23.—VERMIN IN DRIED FRUITS.—How can I keep worms out of dried cherries and raspberries?—M. S.

24.—CEMENT TO RESIST WATER AND ALCOHOL.—Can any of your correspondents furnish me with a recipe for a cement to resist the action of both water and alcohol, which must possess sufficient elasticity so as not to crack and peel off?—F. S.

25.—WHALES AND FISHES.—I believe the notion prevail among scientific men, as well as among sailors, that the *cetacea*, an order of animals including whales, porpoises, etc., exhibiting a high degree of animal heat and exhaling an elastic fluid resembling air, though living only in water, are not fishes, but species of mammalia that breathe air like land animals. I have had many opportunities of watching the ways of these animals, and have caught a great many porpoises of different varieties; and these questions have occurred to me: 1. How am I to account for their sudden appearance and disappearance at long intervals, often in vast numbers, sometimes beneath the surface without touching it? 2. Can any one explain the fact that they never inspire? Their breath is invariably a more or less prolonged exhalation; while the inhalation of the seal and the turtle is easily distinguished from the short, feeble puff that precedes it. 3. How is it that they cannot live out of water? In fact, they die sooner than fishes generally when they are taken out of water. And, like fishes, when deprived of the power of locomotion, they will soon die even in the water. Their anatomical structure, I believe, does not admit of that bellows-like motion so necessary to the process of respiration in air breathing animals. 4. What is meant by "warm blooded animals"? Have certain animals a constant fixed degree of animal heat, while all others are variable according to the temperature of the surrounding elements in which they live? Or are not all animals, including fishes, more or less warm blooded? 5. In catching fish, such as cod, bream, etc., in deep water, say thirty fathoms or more, they usually come to the surface in the condition that fishermen call being poke-blown, the abdomen being distended to its utmost capacity, and a portion of the viscera protruding from the mouth, the whole fish inflated with some elastic fluid. Now what is this fluid? And how does it get there? May not the explanation of this phenomenon afford a clue to answer some of the preceding questions?—G. W. G.

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.

BURSTING OF SAWS.—G. A. H. is informed that no such accident as he mentions has ever occurred within our knowledge, nor do we think it is possible to burst a saw by running it at any velocity.

TOY BALLOONS.—A one line advertisement would obtain J. F. O. S. the information he seeks. See notice at the head of this column.

GREEN WALL PAPER.—J. S. G. is informed that the deleterious effects of green wall paper are most noticeable in rooms lined with flock paper, from which particles of wool, with, of course, the green coloring matter, are constantly getting detached. Green paint is not so hurtful, and the idea of varnishing it is a very good one.

DUPLICATING DRAWINGS.—W. R. F., of Mass., is informed that the sensitized paper mentioned in M. Rénault's process is not photographic paper, but a chemically prepared material manufactured, we believe, in Paris.

APPARENT DIAMETER OF THE PLANETS.—* * *, of Mich. sends us a communication with a sketch showing the apparent diameter of the planets, "as they would appear to the naked eye were the excess of light removed so as to render their disks visible." Our correspondent appears to be unaware that it is not possible to give a drawing which shall represent the apparent diameter of any body. A drawing of the moon may just as well be 12 feet in diameter as 12 inches; neither of these measurements can give any idea of the size of the moon as it appears to the eye. In a painting of a landscape, there is a proper diameter for the sun or moon, as the question of proportion to the trees and other objects represented then comes in. But without this opportunity for comparison, it is impossible to give any idea of the size of a heavenly body.

MILDEWED SAILS.—H., of N. J., should soap the mildewy spots, and then rub in powdered chalk. The growth of the mildew fungus can be prevented by steeping the canvas in an aqueous solution of corrosive sublimate (bichloride of mercury).

THE WEIGHT OF THE ATMOSPHERE.—If an airtight chamber is able to hold 500 pounds weight above the water, will it be able to carry more in case the air be pumped out of the chamber?—S. R. Answer: Yes; the chamber will carry more if exhausted than if filled with air. Every 100 cubic inches of air, the barometer being at 30 inches and the thermometer at 59° Fah., weighs 31 grains avoirdupoise.

HAIR DYE.—To G. H. J., page 106.—Solution No. 1: Dilute solution of nitrate of silver. Solution No. 2: Solution of sulphide of ammonium or sulphide of potassium. Comb one solution through the beard carefully, and then use the other in the same way.—E. H. H., of Mass.

FRICTION MATCH COMPOSITION.—C. B., page 106.—The following I have frequently made, and know to be good. I presume you know the *modus operandi* in making or mixing. Phosphorus, 34 parts; nitrate of potash, 50 parts; chlorate of potash, 26 parts, red lead, 43 parts; best glue, 42 parts.—E. H. H., of Mass.

TEMPERATURE OF ICE HOUSE.—J. C. McC., page 106.—The radical fault with your ice house appears to have been the wet sawdust; it should have been dry sawdust, a very fair nonconductor of heat, whereas the wet would infallibly cause the unfortunate result. There should be no ventilation whatever, especially at the top. Any water from the melting ice should have a chance to get away, so as not to remain in contact with the lumps.—E. H. H., of Mass.

SPONTANEOUS COMBUSTION.—To W. F. C. S., page 106.—The cases you relate were most undoubtedly of spontaneous combustion, and the college professor must have been lamentably ignorant of common things to have made the statement he appears to have done.—E. H. H. of Mass.

PURE VINEGAR.—To J. E. H., page 106.—Most certainly vinegar can be, and is, manufactured perfectly free from the little eels, etc., you speak of. If a vinegar is properly and carefully made—no matter from what material—it will be perfectly clear, bright, and free from animalculæ. If it be thick and muddy, it is owing to careless treatment, and is almost sure, sooner or later, to breed the eels. A perfectly sound good vinegar can be made in less than forty-eight hours, and better than that generally made to take from seven to nine days in production.—E. H. H., of Mass.

EXTINCTION OF CAB LAMP ON A LOCOMOTIVE.—To W. F. C. S., page 106.—Probably it is caused by the peculiar vibration of the air resulting from a particular note produced by your whistle. If you modify the note, so as to be either considerably above or below its present pitch, very likely the lamp will not be put out. If you try the experiment, I should like to know the result. I suppose the note or sound may be modified by increasing or diminishing the aperture through which the steam escapes, or else by attaching a different cup on top, or perhaps placing something on the present one.—E. H. H., of Mass.

SETTING BOILERS.—To J. D. H., query 16, page 106.—The cause of your carbon explosions is that you do not admit air enough to burn it as fast as it accumulates. You should leave your ash pit door more open, and pack your fuel less closely, or admit air through a damper in the furnace door; if there be no damper in the door, drill a dozen half inch holes or leave it a little open. There is no harm in admitting more air under the grate unless you wish to burn your fuel in the ash pit. Keep your chimney damper wide open while running.—A. L., of Mass.

RED ANTS.—Query 23, page 90.—If J. C. W. will sprinkle finely powdered borax about freely in his cupboard, I think he will not be troubled in the future with red ants.—J. C. E., of O.

TEETH IN WHEELS FOR CHAIN BELT.—M., query 6, page 90, is correct in saying that "different wheels require different spacing for the same chain," if he spaces from one tooth to the next at one stride of the dividers, which is an incorrect method. The simplest way is to first ascertain the precise length of a link between the centers or pivots, and then set your dividers and space around on the pitch line. This being done, rub out every other point; the remaining points will be the correct centers for the teeth. This rule will be found correct, no matter how large or small the wheels may be.—G. B. D., of Ill.

Recent American and Foreign Patents.

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

LAST.—Nathan M. Rosinsky, of New York city.—This invention consists in attaching the heels of such shoes as are known in the trade as turn shoes to the soles before attaching the uppers, and in afterwards securing the uppers, either in whole or around the heel only, by headed nails driven from the side which becomes the inside of the shoe after it is turned; whereby the soles are secured very firmly, as the nails have heads at one side and are riveted at the other by being driven against a metal last; or long nails are used at the heel, so as to fasten it from both ways. Besides fastening the soles better, the nails will not hurt the feet, as they are likely to do in the ordinary method.

SPINNING WHEEL.—James Cochran, Jr. of Cornwallis, Nova Scotia.—This invention provides an improved method of support and fastening for a hand spinning machine, by which it may be adjusted on the edge of a table in positions for the operator to either stand or sit, the same clamp answering in either case.

HOPPER FOR BAG HOLDERS.—Warren Wasson and George W. Dungan, of Genoa, Nevada.—This invention consists in the construction of grain hoppers for bag fillers and other apparatus, of rawhide or leather stretched on a wire or other frame; the rawhide or leather is in one piece and formed in the shape of a common wood hopper within the frame, and is provided with a hole at the center of the bottom for the escape of the grain. The hopper is coated with waterproof paint and varnish, so as to make a smooth hard surface and protect it against moisture.

FEED CUTTER.—Samuel Holl, of Reading, Pa., assignor to himself and Jacob Holl, of same place.—This invention relates to an improvement in the class of feed cutters wherein the cutter has a compound or planetary motion. In the present arrangement the cutting is effected by a circular or disk knife, which by means of suitable gearing is not only rotated on its iron shaft but is carried round the main shaft by an arm; it is so adjusted that it passes before the feed rollers and does its work as it descends. The invention also consists in a modified arrangement of the feeding apparatus.

PEANUT PICKER.—Samuel C. Fewell and George Baars, of Bearcstown, Tenn.—The first part of this invention relates to breaking off or picking the nuts from the plants by means of two cylindrical rollers which are so arranged, in close proximity but not in actual contact, that when revolved in opposite directions they fasten upon and force between them the soft and yielding plants, but cannot so fasten upon and pass the nuts. The second part relates to the final separation of the nuts from the plants after they are picked off by means of two carrier belts, which are so arranged, one above the other, that the upper belt receives the denuded plants, as they come from the picking rollers, and carries and discharges them at a remote point, while the lower belt receives the nuts at the same time, and carries and discharges them at a point less remote in the machine. The third part relates to cleaning the nuts from dust, leaves, or broken stems by means of an inverted fan, by the action of which the nuts, in falling into the chute that discharges them from the machine, are exposed to a strong current of wind.

ELEVATOR BRAKE.—Theodore Thorn, of St. Clair, Pa.—This invention is an improvement in the class of brake attachments for elevators wherein wedges are employed, and it consists in the construction following: The brakes are connected by flat steel springs, by means of which they are also forced apart and made to operate. To the centers of the springs are attached rods which are connected with the central lifting block, as are also the brake blocks; by which construction, when the car is raised, the springs are drawn up in the centers, and the brake blocks drawn up to the car corners. Should the supporting chain break, the released springs would straighten themselves and force the brake blocks against the corners of the frame, where they would become safely wedged by the weight of the car.

BRIDGE.—John Johnson, of Mott Haven, N. Y.—This invention furnishes an improved mode of building arched bridges and other arched structures, which is simple, convenient, and effective, and enables an arch of any desired span to be formed without previously constructing a form or guide frame; it consists in supporting the arch in process of construction by two or more pairs of suspended cables, and in combining with the main arch a secondary one, the blocks of which are formed with tenons which interlock with the cross beams of the main arch.

LATH MACHINE.—Samuel M. Palmer, of Glen's Falls, N. Y.—This invention furnishes an improved lath machine, which is simple, convenient and effective. It is so constructed as to bring the machine fully under the control of the operator, so that he can easily regulate the rapidity of the feed without stopping the machine, and instantly stop the feed when desired.

TUMBLER FOR POLISHING FORKS, ETC.—Hilon Bump, of Wallingford, Vt., and Alexander H. Ritchie, of New York city.—This invention furnishes an improved tumbler for polishing forks, etc., which is so constructed as to furnish no cracks or crevices for the points of the forks to catch in and be broken, thus protecting the manufacturer against the loss from breakage in polishing in tumblers constructed in the ordinary manner; it consists in grinding the ends of the tumbler barrel and the main hole cover to their respective seats so as to form perfectly close joints.

SEED AND GUANO DISTRIBUTOR.—William J. West, Greenville, S. C.—The invention consists in providing a seeder hopper with a pendent swinging shoe, whereby the grain and guano are held until said shoe is tilted, shaken and caused to distribute it; in providing the shoe with a leather or other tube placed centrally at the conveying end so as to place the seed always in the middle of the furrow: and in a plumb, so placed as to enable the operator always to know when he has the shoe at the proper inclination. This machine is manufactured by the firm of Gower, Cox and Markley, Greenville, S. C.

BAG HOLDER.—Thomas Jefferson Trapp, Williamsport, Pa.—The invention consists in providing a bag holder with a shank tapering on the rear side so as to throw the mouth of the bag on a decline toward the front, and with an auxiliary stem guide; in providing the jointed arms with edge flanges so that one arm may slide within the other, with ratchet and pawl to hold them at different degrees of expansion; and, finally, in providing the pawl with a flanged holder that raises from and lets down the pawl into the ratchet.

MACHINE FOR PICKING AND CLEANING HAIR, WOOL, COTTON, ETC.—David M. Varney, Burlington, Vt.—The invention consists in a combination of the ordinary feeding bands of pickers, and a set of radial arms provided with movable comb pickers—said pickers being advanced and retracted by an eccentric groove so as to draw toward the center pickers at each revolution to clear themselves. It also consists in providing two perforated disks and a hood to create a current of air in the direction of rotation of the pickers, for the purpose of blowing out refuse, dust, etc.

PARLOR COOKING STOVE.—Edward M. Decy, of New York city.—This improvement consists of a modification of the base burning open fire heating stove patented by the same inventor February 21, 1871, whereby it may be converted into a parlor heating and cooking stove. The modification consists, first, in converting the principal portion of the body of the stove into ovens, and in an arrangement of flues and dampers therefor for suitably applying the heat at will; also for utilizing the ovens for air heaters. Second, in an adaptation of the magazine so that it is readily removed and its seat converted into a cooking top; third, in a pot-heating attachment to the horizontal part of the pipe behind the stove; and fourth, in the construction of the top plate for heating pots and other cooking utensils.

BLACKSMITHS' TONGS.—John Woodville, of Washington, Ind.—This invention relates in part to constructing blacksmiths' tongs with transversely notched jaws, one of which is bifurcated or grooved to receive the other, by which means they are adapted to hold rods or bars in a peculiarly efficient manner. It also consists of a sectional handle which is so contrived that, by shifting one section forward and backward on the other, the outer end taken in the hand may be adjusted, relatively to the other handle, as needed for holding thick or thin pieces between the jaws.

BRICK MACHINE.—Wm. F. O'Reilly, Starkville, Miss.—The invention consists in operating two pug mills, an intermediate press, and a mold supplier and discharger by the same operative mechanism, whereby bricks may be made in the most effective and workmanlike manner and at a reduced cost.

BEE HIVE.—Wirt F. Cunningham, of Middletown, Ky.—This invention furnishes an improved bee hive, which is so constructed as to facilitate the various operations of attending the bees, watching their condition, removing the comb, keeping out moths, etc. It consists more especially in closing and opening the front side of the base by means of a triangular roller which is pivoted within it.

COMBINED EXTENSION SKID AND LADDER.—Emanuel B. Field, of Yonkers, N. Y.—This invention furnishes an improved extension skid by means of which barrels of flour and other heavy articles are conveniently carried up a flight of stairs to an upper floor or down a flight of stairs to the basement; it may also be adjusted for use as an extension ladder for the use of firemen carpenters, masons, and others. It is made in two lengths, one of which is made to extend along and beyond the other, and is held securely in any position by means of pawls and ratchet bars. Various improvements enter into its construction, including a sliding carriage and windlass to operate it.

AXLE.—Charles Ahrenbeck, of Navasota, Texas.—This invention furnishes an improved iron axle for wagons and other vehicles which is stronger without being heavier than iron axles made in the ordinary manner; it consists in so forging a bar of the ordinary weight that the metal is upset, or forced from each end toward the point where the collar is swaged out of the same bar; by which means the weight and strength of the metal thus condensed is thrown on the points of greatest strain. The bottom edge of the journal is made oblique instead of horizontal, so as to allow the lubricating oil to flow back along it.

COMBINATION LOCK.—William A. Kerr, of Williamsport, Pa.—This invention relates to improvements in combination locks, and it consists in a novel arrangement of adjusting apparatus for setting a set of combination disks for locking and preventing the withdrawal of the bolt after it has been shot. It also consists in an application to the disks of an apparatus for returning them to the true position if they are disarranged after being turned away from the locking position and left in positions indicated by the letters of the word representing the combination on which it is locked. The readjusting apparatus is also applicable for use in changing the combination. This invention produces a lock that cannot be picked or easily blown up by powder, and which, if blown up, destroys the means of moving the bolt and leaves it unmoved.

APPARATUS FOR SINGEING HOGS.—Patrick Kenny, of Chicago, Ill.—This invention furnishes an improved mode and apparatus for singeing hogs to remove the bristles, hair, and other matters from the carcass preparatory to dressing it, and it consists in providing a number of furnaces arranged in a circle so as to leave a space between them for the carcass of the hog. In the inner sides of the furnaces are formed holes through which the flames are driven by a fan blower and made to impinge on the carcass. The carcass is introduced and removed in any convenient manner.

MEDICAL COMPOUND FOR HEALING WOUNDS, ETC.—Nicholas W. Gaddy, of Nichols, S. C.—This invention and discovery relate to a new and useful compound to be used as medicine for the cure of diseases, and to be applied externally for healing wounds and sores on man and beast; it consists in the distilled sap of pine, strained, clarified, and suitably prepared for use.

ELEVATOR BELT TIGHTENER.—William Merson, of Danbury, Conn.—This invention furnishes an improved device for tightening an elevator belt and holding it until laced, and it enables the ends of the elevator belt to be drawn together and laced by a single person. To the belt, near one end, is bolted a small plate or lug, to which is attached one end of a short rope, the other end of which is attached to a short shaft which is passed through holes in the sides of the elevator case, and the ends of which project and are squared off to receive a crank. The other end of the belt is secured to the case by screws. By this arrangement, by turning the crank the cord is wound upon the shaft and the belt is tightened. The crank is then reversed so that its handle rests against the case and holds the shaft from turning back while the lacing is being done. When the lace has been secured the device is detached, and the holes in which the shaft works are closed by caps.

FURNACE GRATE BAR.—William H. Settle, of Louisville, Ky.—This invention furnishes an improved grate bar which is so constructed that the slice bar or poker cannot strike against the sides of the separations and break the bar, while at the same time provision is made to protect the bar from the injurious effects of unequal expansion and contraction; it consists in making the bar of a peculiar form by which the poker or slicer is made to glance off instead of striking the bar.

WASHING MACHINE.—John C. Chase, of Monticello, Minn.—This invention furnishes an improved washing machine which is simple, compact, and without framework to get in the way of the person using it; it consists mainly of a large corrugated roller and four small plain ones, whose journals revolve in head blocks; the journals from the large one and arms from the head block rest in notches on the upper part of the tub. The peculiarity of the construction allows the small rollers to be conveniently unshipped when desired, and also adjusted in any desired position, according to the work to be done. Some of them may be used as wringers while the others are doing the washing.

SOLDERING APPARATUS.—Jacob Gulden, of Keyport, N. J.—This invention relates to a new apparatus for soldering the bottoms of tin cans to the sides of the same, and more particularly to the application to such an apparatus of the heat from gas flames, so that the process can be rapidly carried on by hand. It consists in the application to a metallic table of inclined soldering platforms with circular recesses and made of metal, which are heated by gas from beneath.

INSTRUMENT FOR PLUGGING TEETH.—Christopher S. Longstreet, of New York city.—This invention provides an improved dentist's plugger, the details of the construction of which would not be understood from a verbal description. Among the various improvements effected are an arrangement for regulating the weight of the blow struck and a provision for lubricating the shaft journal, etc.

TRACTION ENGINE.—William H. H. Heydrick, of Chestnut Hill, Pa.—This invention relates to improvements in traction engines or the propelling mechanism for steam plows, and it consists in an arrangement of devices for connecting the front axle with the frame or platform in a simple and efficient manner so as to admit of supporting the platform on a spring placed on the axle, and for confining the axle without the use of a king bolt passing through it, while allowing it the free universal oscillation needed for traveling over uneven ground. An oscillating plate and a housing are pivoted to the under side of the platform and also, at the lower side, to two strong braces. The axle lies across and within the housing, and between it and the top wall of the same, which is immediately under the plate, an india rubber spring is placed.

SHOE FASTENING.—Charles A. Rolfe, of Utica, N. Y.—This invention provides an improved mode of securing the buttons to ladies', misses', and children's boots or gaiters, and consists in an additional strap which runs the whole length of the fastening on the inside of the boot; a metallic clasp is secured to the strap where each button is to come by bending projecting portions of it round the strap. A wire staple with the bottom attached is passed through the boot and through holes in the clasp, after which the ends are bent down into the clasp by means of suitably formed pliers.

DOOR SPRING.—James Losee, of Peekskill, N. Y., assignor to himself and Joseph L. Cook, of same place.—This invention furnishes an improvement in the class of springs which are arranged vertically or parallel to the hinges of the door and which have a torsional action; it consists in the employment of a rubber cylinder, a spindle, a notched disk, a curved connecting arm or rod, and a screw, which are so arranged that the degree of torsion and longitudinal compression of the cylinder is governed by adjusting the disk and screw. By the construction, as the door is opened the rubber cylinder is both compressed and twisted, so as, when the door is released, to close the door by the elasticity of the rubber. The upward pressure of the rubber also tends to support the door, thus relieving the hinges and preventing the door from sagging.

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 case 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. 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 on their New York correspondents.

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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.

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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.

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

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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[OFFICIAL.]

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SCHEDULE OF PATENT FEES:

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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:

7,813. HORSE HAY RAKE.—H. W. Sabin. Oct. 23, 1872.
21,496.—COUCH FOR RAILROAD CAR.—F. R Myers, F. H. Furniss. Aug. 21, 1872.
21,540.—HARVESTER.—A. Sherwood. Aug. 28, 1872.
21,541.—PIN STICKING MACHINE.—C. W. Van Vliet. Aug. 28, 1872.
21,574.—PREVENTING NUTS FROM UNSCREWING.—S. Noblet. Sept. 4, 1872.
21,719.—CROSS SEAMING SHEET METAL.—L. Fay. Sept. 25, 1872.
21,878.—FURNACE FOR TEMPERING STEEL.—P. G. Gardiner. Oct. 2, 1872.
21,879.—SELF MOUSING HOOK.—J. R. Henshaw. Oct. 9, 1872.
22,027.—PRINTING PRESS.—C. Montague. Oct. 23, 1872.
22 048.—LOCK.—L. Yale, Jr. Oct. 23, 1872.
22,049.—RAILROAD CAR WHEEL.—T. C. Ball. Oct. 23, 1872.
22,213.—RAILROAD CAR BRAKE.—A. L. Whipple. Nov. 13, 1872.

EXTENSIONS GRANTED.

20,999.—HOLDING CUTTERS IN PLANING MACHINES.—I. Gibbs.
21,059.—STEAM ENGINE.—H. and F. I. L. Blandy.
21,122.—TREATMENT OF CAOUTCHOUC.—A. G. Day.

DISCLAIMER.

20,727.—CARTRIDGE.—G. W. Morse. Filed June 29, 1872.

DESIGNS PATENTED.

6,012.—CARPET.—J. Barrett, New York city.
6,013.—BUTTON.—H. Henrich, New York city.
6,014.—SATCHEL.—J. H. Hitchings, San Francisco, Cal.
6,015.—CAMPAIGN BADGE.—J. P. Perley, Washington, D. C.
6,016.—TOY BANK.—D. A. Stiles, Middletown, Conn.

TRADE MARKS REGISTERED.

933.—TRUSSES.—Bartlett & Butman, Boston, Mass.
934.—GLOVES.—P. and F. G. Conklin, San Francisco, Cal.
935.—WHISKY.—J. R. Conway & Son, Baltimore, Md.
936.—MUSTARD.—Farrington, Campbell & Co., Detroit, Mich.
937.—WRITING PAPER.—B. & P. Lawrence, New York city.
938.—BITTERS.—W. H. Penn, Lindley's Mills, Pa.
939.—VELVET RIBBONS.—S. Trischet and J. Bondy, New York city.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
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ADMINISTERING INJECTIONS, ETC.—M. Mattson, New York city.
AXLE BOX.—W. A. Boyden, Harrisburgh, Pa.
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CONVERTING CAST IRON INTO STEEL.—T. H. Alexander, Washington, D.C.
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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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By the terms of the new patent law of Canada (taking effect September 1st 1872) patents are to be granted in Canada to American citizens on the most favorable terms.

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.

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.

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 pamphlets of instruction free.

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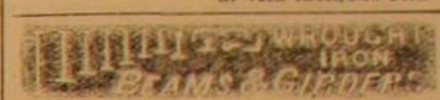
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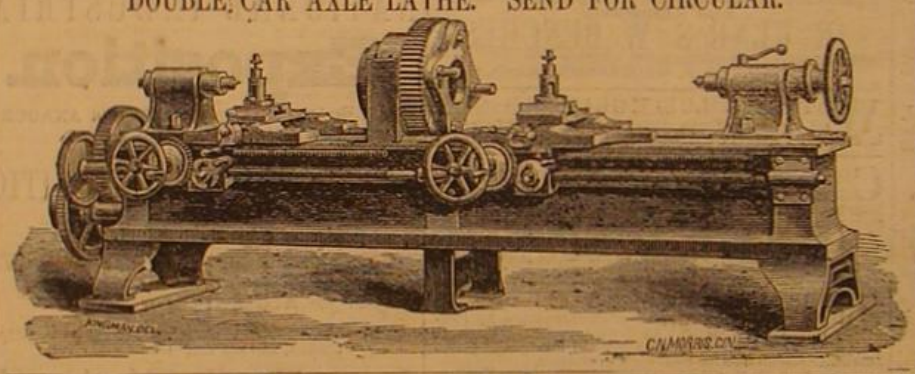
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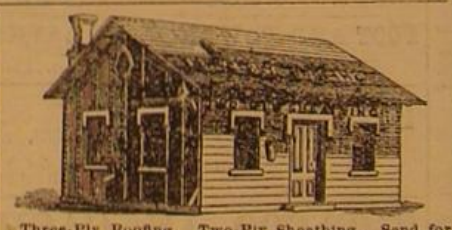
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SCIENTIFIC AMERICAN

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Vol. XXVII.—No. 10. NEW SERIES.] NEW YORK, SEPTEMBER 7, 1872. [$3 per Annum. (IN ADVANCE.)

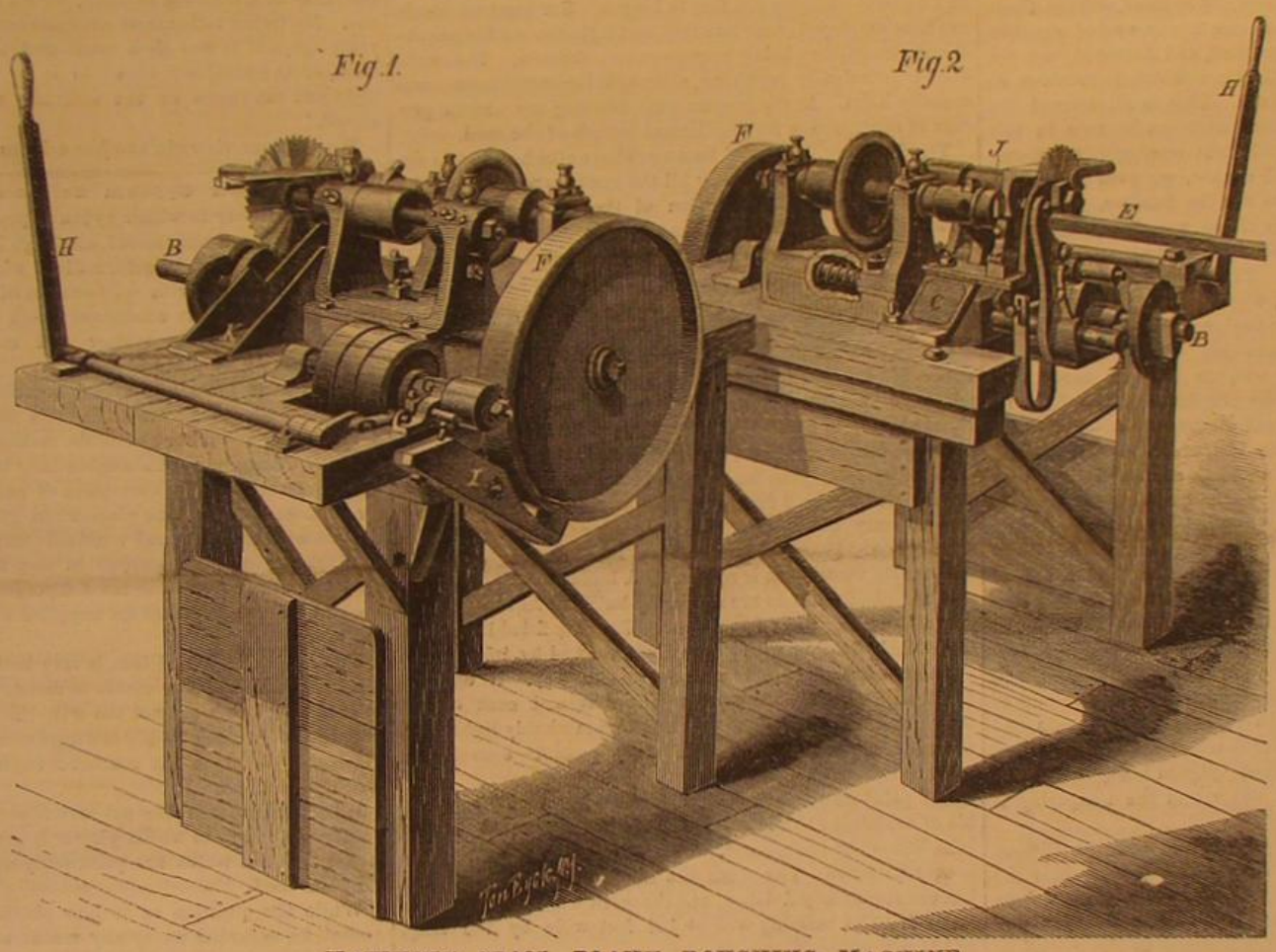
SPOOL BLANK ROUGHING MACHINE.

Our engraving illustrates a new and improved machine for making spool blanks, round wood boxes, and other similar articles. Fig. 1 is a perspective view taken from the rear of the machine, and Fig. 2 gives a front view of the same. The improvements consist in the following additions to the regular cutting and sawing apparatus which constitutes the ordinary spool blank rougher: namely, the reciprocating shaft, A, the rotating shaft, B, and the standard, C, with their various attachments.

The shaft, A, can either rotate or slide longitudinally in its bearings, and carries an upwardly projecting arm, D, to which is attached the V shaped carrier, E. In this carrier, which is adjustable to varying sizes of wood, is laid the square stick to be operated upon. A bent lever is pivoted to the arm, D, above the carrier, as shown in the engraving, and is actuated by a spring in such a manner as to firmly hold, by means of an adjustable clamp at its end, the square stick in the carrier while it is being cut, bored, turned, or sawn off. On a stud projecting horizontally from the end of the shaft, A, is placed a roller which engages with the cam seen in the end of the shaft, B; and on a stud projecting from the arm, D, is placed a roller which engages with an inner cam on the shaft, B, as shown. The effect of the first cam is to move the shaft, A, and carrier, E, inward during a portion of the revolution of B, and of the second to rotate the shaft, A, and to press back and hold in the requisite positions the arm, D, and the carrier. A helical spring surrounds the shaft, A, as shown through the part broken away in Fig. 2, and is attached by one end to the shaft, and by the other to a fixed part of the machine. It is thus made, by its recoil, to return the shaft and the carrier to their original positions after they are released by the cams.

Fig. 1.

Fig. 2



HAWKINS' SPOOL BLANK ROUGHING MACHINE.

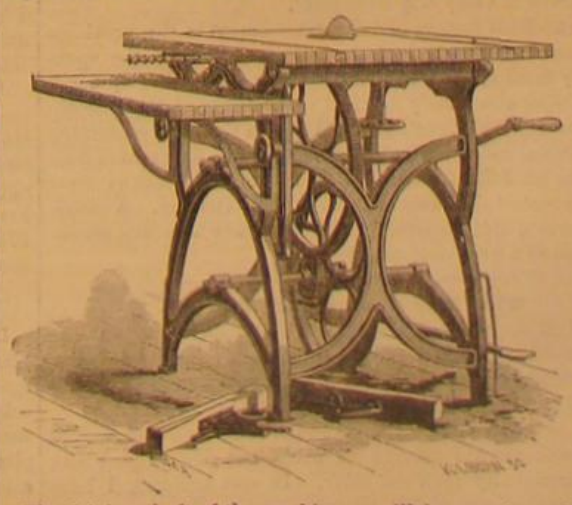
The standard, C, carries a stop, against which the bent lever of the arm, D, is made to strike by the action of the inner cam, so as to compress the spring and release the stick at the moment when it requires shifting in the carrier. The shaft, B, carries upon its rear end the friction pulley, F, and is driven by the friction pinion attached to the shaft, G. This shaft runs in movable bearings, and the friction pulleys are made to engage or disengage at the will of the operator by means of the toggle joint, shaft, and handle, H, shown distinctly in Fig. 1. At I is a friction brake, by means of which, in disengaging the friction pulleys, the pulley, F, is brought to rest at any point, and as quickly as desired.

In the operation of the machine, the outer cam of the shaft, B, moves the arm, D, inward, forces the stick into the cutter head, and afterwards releases it therefrom; at which time a depression in the inner cam allows the spring to throw the arm, D, to the right and carry the stick to the saw to have the finished piece cut off. After this is done, the further rotation of the inner cam throws the arm, D, to the left and brings its lever in contact with the stop on standard, C, as before described, and releases the stick. The stick is then advanced in the carrier by the operator, according to the nature of the work; the arm falls into its central position opposite the cutter head; the clamp again grasps the stick, and the operation goes on as before. A rest, J, the operating parts of which are not shown in the engravings, is provided to support and guide the stick to the cutter after it has become too short to lie unbalanced in the carrier. An inverted rest is attached near the saw, as shown, by which the workman cuts out imperfect parts of the lumber. K is a chute by which the finished pieces are conveyed to a receptacle below.

The mechanism described can be applied, the inventor states, to any of the ordinary spool blank roughers at a moderate expense; it saves, he estimates, not less than two thirds the cost of the old manufacture. It is adjustable in every way required to make articles of various lengths and diameters, and besides spool blanks and boxes, any cylindrical goods may be made by it which are sufficiently well finished by the saw at the ends. Among the advantages claimed for it are: the correctness with which it does its work; its ability of using up lumber of any length to within a very short distance from the end—say, one quarter inch—and also of making perfect work from crooked lumber. It can be run by a boy. The machines, as made, are geared for different speeds, and produce from 150 to 175 gross of spool blanks per day. They are in operation at the spool manufactory of Holt & Hawkins, Salisbury, Vt., who may be addressed for further information on the subject. Application for a patent is pending in the name of John T. Hawkins.

COMBINED HAND AND FOOT CIRCULAR SAWING MACHINE.

The annexed engraving represents Marston's combined hand and foot power circular sawing machine, which is an ingenious device that may be applied to a variety of uses.



The driving shaft of the machine, as will be seen from the engraving, is centrally situated, and is worked by either a crank or treadle. The driving gear attached to this shaft plays into a small gear on the saw arbor, and thus imparts the power in a most direct and simple manner to the tool. It also meshes with a pinion on a lower shaft which carries a proportionate balance wheel, by means of which the power is stored up and equalized and the easy action of the machine insured. The driving shaft is arranged to be operated with two handles, one at each end, so that two men can work, if necessary, when cutting very heavy stuff; but the treadle is stated to be sufficient for all ordinary work, as one man working an 8-inch saw by it can easily cut off 2¾ inch stuff.

The table on the top is hinged, and is raised by means of a screw and crank, so as to adapt the machine to the work of rabbeting, mitering, etc., as also for the purpose of changing the saws and wheels when required. To make these changes it is only necessary to unscrew a nut, and they can therefore be effected in very short time.

The boring attachment shown in the engraving can easily be applied to the apparatus at any time, and one man working the same by the crank can bore holes up to one inch diameter easily. To change the bits in the boring mandrel, it is simply necessary to operate a set screw, and no more time is consumed in so doing than in changing them in an ordinary bit brace. This is an especially useful attachment.

Two gages accompany the machine, one for splitting and the other for cutting off, the latter being used for mitering. Miters are also marked on the table. The saw, with gage, is said to cut perfectly square. Grooving is done by using a wabbling saw.

No belt being required in this machine, one cause of expense is avoided, while the power lost by their slipping is of course saved. It is claimed that the saw can do the work of four men, and in a more thorough manner than by the common handsaw, which makes it a valuable adjunct in the shop of any worker in wood. An emery wheel for grinding tools can be used with the machine if wished. It is a very simple and complete machine, occupying but little room, and will save its cost in a short time in any shop where the work it can be applied to is carried on.

Further particulars may be obtained by addressing Reed & Bowen, 36 Kilby street, Boston, Mass.

Light of the Vapor of Iodine.

Vapor of iodine presents a number of curious properties. The following is one that does not appear to have been previously noticed: This vapor at a high temperature gives out rays but little refrangible, furnishing a continued spectrum. Place in a tube of Bohemian glass a small crystal of iodine, and heat the tube strongly at a certain distance from the fragment; when sufficiently red, leave it to cool until almost invisible in the dark; the iodine then vaporizes rapidly. The colored vapor, on arriving at the heated part, burns red in a very nice manner. By admitting an absorbing medium, the incandescence of this vapor can be produced in a very brilliant style. Seal in the interior of a glass tube a fine platinum spiral, which can be raised to a red heat by the electric pile; then introduce pure iodine into the tube, and seal the same after having expelled the air; volatilize the iodine, and establish the electrical communication. The incandescent platinum becomes surrounded with a vacillating flame, of which the color is modified by absorption. It is a very rich red, and gives a fluted spectrum. The author expects to draw from these facts some interesting conclusions, but, before publishing them, purposes to submit them anew to experimental verification.

HOW AXES ARE MADE.

In order to withstand the severe usage to which they are put, axes are almost always made from superior qualities of metal. The bit or cutting edge is usually of the best English steel, while the head is formed from the better grades of iron.

If our reader will now imagine himself to be with us in our late visit to one of the largest ax manufactories in the country, that of Messrs. Weed, Becker & Co., in Cohoes, N. Y., we will endeavor to lead him through the many workshops of the establishment, and thus trace the making of the ax from its first reception in the shape of bar iron and steel to its final packing in finished form, and its shipping to the trade.

The iron portion of the head is cast in a mold, but its shape is far from resembling that which it will attain when finished. The eye, in which the handle is inserted, is there, but instead of the metal tapering off to an edge it is formed in two branches, so that the casting is in fact an ax, split from its edge to the eye. As we enter the foundery, a large number of these rough pieces are being removed from the flasks; beside them lie the pieces of steel which are to form the edges, so that the process we are about to witness is the welding together of these two portions and the first shaping of the tool. A smith seizes one of the iron castings with his pinchers, heats it in his fire, and, holding it under a powerful trip hammer, welds the separated edges together. He then passes it to another workman, who again heats the piece to redness and then fits to the edge the bit or piece of steel, in the side of which a groove is cut. Another heating takes place, more hammering with the trip hammer and by hand, and the shape is complete, both steel and iron being firmly welded together. The edge is now rounded, smoothed, and flattened, and the ax is placed under a swage die from which it receives its peculiar rounded or convex form. This is all termed the "cutting process" and, as nothing more can be seen in this workshop except perhaps the different manipulations necessary to form the axes of varied shapes, we pass to another smithy where the holes or eyes for the handles, which the previous hammering has nearly closed, are opened and made into proper shape, and where the head or butt end of the ax is hammered square and even. This is done by heating and pressing on flat stones, so that, when finished, the tool is perfectly true and square at all its angles.

We next pass to a room containing several large grindstones, which, kept constantly wet, are in rapid revolution. Here the ax is smoothed and the roughness and scale on its surface removed by pressing against the stones. This completed, we follow the tool to the temperer. Each workman stands before a small coal fire, which is contained in a very narrow though long grate. Above the hot coals are bars on which the axes rest while being heated. Taking each tool separately, the temperer heats it to redness, and then suddenly plunges it into a pickle of brine and then into a tub of cool water, to wash off the salt which adheres. In this condition the ax is intensely hard; the metal is crystallized and brittle, so that it would probably snap in pieces at the first blow. It is necessary, therefore, to "draw" this temper, and the process is one involving considerable skill on the part of the operative. The ax is again placed over the coals, and as we watch it we notice its color change from white to straw color, and finally to what is termed "pigeon blue," when it is suddenly plunged in the cold water, and the tempering is complete.

The ax is now ready to be ground, and in order to witness the process, we pass through a dense cloud of dust into the grinding room. Here are forty immense grindstones driven at a fearful rate of speed. Above each stone is the saddle or piece of wood, one end of which is fastened to the frame of the grindstone, while the other is held up by a strap suspended from the roof. Across this saddle sits the grinder, who inserts the ax under the end or pommel of the saddle and bears it down with his whole weight against the stone. The labor requires considerable practice and no small degree of skill, as it is absolutely necessary that every tool should be ground perfectly even at all portions. The men engaged at this work were mostly French Canadians. We were informed that all were more or less unhealthy, and that it is common for them to die of consumption after a few years' labor as grinders. The air is filled with particles of metal and grit which they constantly inhale; this irritates the lungs and eventually causes acute disease. Polishing is the next process, and is performed on wheels covered with emery and oil. Each ax, after having gone through this operation, shines like polished silver. Inspection of the most rigid kind follows. We find a workman sitting before a small anvil, taking up the axes, one at a time, and tapping them with his hammer. Nothing passes his observation. An ax, which appears to us perfectly sound at every point, rests on his anvil. A blow or two with the hammer and his quick ear detects a difference in sound. Picking up the axe, he dashes it against the anvil, away flies a corner of its edge, proving that the temper was unequal. Another is thrown aside for a minute, almost imperceptible, crack. A third yields too readily to the file; and thus the inspection goes on, the rejected tools being, if possible, made over, or else finding their way to the scrap heap.

Now comes the painting and labeling. Passing into another apartment, we find hundreds of finished axes hanging on frames. Some are red, others black, others bronzed, in order to suit the varied tastes of the market. From a room below, we hear the whirr of lathes, and looking down, we see the great logs of hickory rapidly cut up and then placed in machines nearly resembling the lathes used for making shoe lasts; and we thus see the finished handles turned out with incredible rapidity.

Meanwhile, around us, men are engaged in branding and boxing the finished tools. Here are axes, hatchets, adzes, mattocks, turpentine tools for North Carolina, and hammers of every description. Huge Spanish axes destined for the hands of the Indians of South America to hew their way through the forests of Peru and Equador, odd shaped hatchets for the hunters and the bush rangers, marked for Australia, and dozens and dozens of other tools, all painted, labeled, and ranged in their cases, are strewn around, ready for distribution throughout the whole civilized world.

The works, our inspection of which concludes in the last mentioned apartment, cover a area of five acres of ground, and furnish employment for 250 workmen. About 150 dozen of axes and other tools are daily produced, at a yearly valuation of over $400,000.

THE CAR SHOPS OF WEST ALBANY.

The New York Central and Hudson River car shops are substantial brick buildings, covering an area of about 60 acres of ground, situated about two and a half miles from the city of Albany. The different shops range from three to five hundred feet in length. The main power of the works is derived from a centrally located building containing two low pressure engines of 200 and 125 horse power respectively. Steam is supplied by four steam boilers. An auxiliary engine of 75 horse power is located near the machine shop. The works are divided into two portions, one devoted to the construction and repair of locomotives and the other to the fitting up and building of cars. The locomotive department, under the superintendence of Master Mechanic G. B. Van Vorst, is an immense building 500 feet in length. Six hundred hands are here employed, four hundred and eighteen working in the shops, the balance being engineers and firemen. The work done is principally repairing, although locomotives are occasionally built. At the present time, two engines are in process of construction for the Central branch of the road.

The foundery, forge and hammer shops attached to this department manufacture nearly all the castings required on the line, besides a large proportion of the axles and general heavy forgings. Fifty switches are now being made to be located near Syracuse in this State. The round house is one of the largest in the country, being 278 feet in diameter, and containing 41 stalls. In the oil house adjoining, is a tank holding 115 barrels of oil.

The car shops proper are superintended by Mr. Joseph Jones, Master Car Builder. Few new cars are here constructed, the work being principally the alteration and repairing of those already in use. We noticed some old cars being fitted with the Miller platform, and our attention was directed to some 40 cars designed for the transportation of horses. These are 29 feet long by 8 feet wide, and are six inches higher than the ordinary cattle cars. The sides are sealed to within 18 inches of the top, the remaining space being slotted, so that ample ventilation is secured. A hundred new combined coal and platform cars are also being built, 29 feet length by 8 feet width being their dimensions. They are fitted in the center of their flooring with dump doors worked by iron shafts.

The blacksmith shop is a model in its way. It contains fourteen octagonal chimneys, arranged around each one of which are four fires. The building is remarkably light, airy, and spacious, and is fitted with every possible convenience and improvement.

The paint shop, which was formerly a large building capable of containing thirty cars, is now a heap of ruins, having been burned to the ground. The estimated loss by this fire is over $120,000. The plans of a new edifice to replace the lost one are already finished, and the work will shortly be commenced. The building will be 130 feet wide by 700 long, and it will accommodate 88 cars.

The storage building contains, besides a large variety of fittings, etc., a machine for cleaning old car cushions after they have become filled with dust and dirt. A large lumber yard filled with timber of every description supplies the wood working portion of the shops with material. Fire is provided against by a powerful steam fire engine and a donkey engine rigged on the top of a locomotive, the apparatus being kept constantly ready for use. A wrecking car is also kept in condition for immediate service. It is 48 feet long and contains all the necessary tools, derricks, etc., for making repairs or clearing away wrecks.

The traverse table, used for transporting cars from track to track, is a device recently introduced in the works and is one of the best pieces of mechanism in the establishment. It is the invention of Master Car Builder Jones, and its working has proved in every way successful.

An excellent feature of this establishment is the provision made for the rewarding of the most deserving of the workmen by furnishing to them commodious and admirably fitted-up cottages at a merely nominal rent. Sixty of these dwellings are now built, each 22 by 32 feet in size and containing ten finished rooms beside all conveniences. The rent is from eight to ten dollars a month, a sum barely sufficient to cover the interest of the sums laid out on their erection. A boarding house is also provided, where thirty-five men are accommodated at a very moderate price.

The Manufacture of Vinegar.

A. H. R. sends us a letter in which his troubles, labors, and expenditure as a manufacturer of vinegar are fully detailed. He certainly has gone to work in a liberal manner, as the following passage from his letter will show:

"I have been in the vinegar business for two and a half years, using in the process no acids, but cider, high wines, and occasionally malt and cider. In one building I have eleven tanks, each of 800 gallons capacity; this structure is on a sand bottom, and is floored with planks fastened to cross pieces bedded even with the sand. The walls are of stone up to the second story, and there is a hill behind the building, as high as the roof. The tanks abovementioned are of clear white pine, and were new last fall. A stove to prevent freezing was put up, and the contents of only one of the tanks was, last winter, affected by frost. The door of the building has been kept well caulked up to ensure an even temperature. Adjoining this building is a three story frame structure, having eight tanks of 1,000 gallons capacity each, on the ground floor. These tanks are filled with vinegar or cider, and are kept warm by the exhaust of our pumping engine. At this season, the average temperature on this floor is from 75° to 90°, and in winter it ranges from 50° to 60°. Going from it into the first described chamber is like stepping into an ice house.

I commenced by making strong vinegar, showing 18° or 20° (Baumé, probably. EDS.) when first made. One gallon of sirup was added to each 80 gallons of cider, and the whole fermented, settled, and run through generators 25 feet in hight, newly constructed and filled with shavings of red beech. A few days ago, the vinegar began to lose its strength, and to preserve it, I gave it more body, which only served to arrest the deterioration, and now it is all spoilt, and I find myself with only one tank of good vinegar, having this week allowed 2,000 gallons to run to waste. The generators are still running, and seem to work well.

The cold damp air has killed the vinegar, and the trouble spreads from one vat to another, like an epidemic; and nevertheless, the acidity remains unimpaired. Have you or any of your readers had similar experiences? If so, perhaps my case may be a warning to them, for my loss is a very serious one. My father tells me of a similar occurrence four or five years ago, and it was then attributed to the poverty of the cider, or to something added to it to keep it sweet. Any light you can throw on the difficulty will be thankfully received."

We give our views in another column.

How Gypsum Acts on Soils.

The exact way in which gypsum produces its fertilizing effects is not well understood, although it is known that the chemical changes or transformations which occur when it is brought in contact with soils are not of a uniform or fixed character. Upon the conditions which exist as regards the presence of vegetable matter and moisture, depend the changes that take place.

It has been proved by actual experiment that gypsum is capable of absorbing ammonia from the air, and also from decomposing animal or vegetable matter, in the form of sulphide of ammonium. This again may be changed into carbonate of ammonia, by absorption of carbonic acid from the air. These changes take place when gypsum is brought in contact with moisture and vegetable matter.

Whatever other decomposition may take place under different circumstances, this must be regarded as the most important, as from it plants are supplied with food of the highest value.

From this ascertained fact, it may be inferred that plaster must prove highly serviceable to moist, mossy hills, and also to meadows which are not too wet. Experiment has shown that the north side of a hill is sometimes greatly benefited by plaster, while upon the southern exposure it produced no perceptible effect.

It is certain that it does not matter much what may be the nature of the soil to which plaster is applied, since it is external agencies which are principally concerned in fitting it for plant food.

While the question as to how plaster acts as a fertilizer cannot be regarded as by any means settled, yet there are certain facts to guide its application. It would be manifestly absurd for a farmer to apply gypsum to a dry, silicious plain, or to a not impoverished slope; and also it would be unwise to use it upon a meadow under water some months in the year.

Plaster may be applied with confidence to pastures and fields which are strong enough and moist enough to support deciduous trees. A hill side where moss will grow so as to crowd out good grasses is usually promptly benefited by plaster, and the white clover comes in at once.

Artificial Hatching of the Sturgeon.

It seems that the sterlet (*acipenser ruthenus*), the smallest of the Russian sturgeons, spawns in the Volga early in May on rocky bottoms, the temperature of the water being at 10° R. (54½° Fah.). The eggs are readily fecundated by the artificial method. After they have been in the water a few minutes, they adhere to any object which they touch. The development of the embryo can be observed in progress at the end of one hour. On the seventh day they hatch. At first the young fish are about $\frac{2}{10}$ of an inch long. At the age of ten weeks, they are nearly two inches long. They feed on larvæ of insects, taking them from the bottom. Both in the egg and when newly hatched, the sterlet has been taken a five days' journey from the Volga to Western Russia, and in 1870 a lot of the eggs were carried to England to stock the river Leith. This species passes its whole life in fresh water

Colored Spectacles.

Dr. Stearns writes: "The photographer uses orange colored glass to exclude the actinic rays of light, and why some optician has not had the genius to see that orange is the proper color for spectacles, instead of green or blue, for persons with weak eyes is beyond my comprehension. A room in the hospital with which I am connected is lighted through orange colored windows, and is used by patients who have certain diseases of the eyes requiring the exclusion of the actinic rays of light. It has been very satisfactory. Orange is also, I believe, the proper color for bottles containing chemicals affected by light."

THE ADVANTAGES OF SCIENTIFIC EDUCATION.

This was the subject of a recent lecture before the Government telegraphers of Great Britain, by Mr. William Henry Preece, who said:

"The reasons why scientific study is so little popular are that it does not appeal directly to our senses, involves time and study, and because people do not like trouble. There is, unfortunately, no royal road to learning. Knowledge is fixed at the top of a hill which requires some stiff climbing; hence science is unpopular.

A scientific man is one who knows, and one who derives pleasure from that which he knows; hence, the chief advantage which I lay before you to be gained by the study of the scientific part of your profession is—pleasure.

What would be thought of an engine driver who stuck on a bank for the want of knowing how to use sand on the rails? Such, I am sorry to say, is the position of the great majority of those who are employed in the operating branch of our department.

Education itself is an inducement to seek scientific knowledge. The object of education is to attain precision of thought, and to possess the power of drawing correct inferences from facts—indeed, to exercise judgment and common sense. There is no better method of acquiring these valuable qualities than by a scientific training. We can find out many things without scientific training—trace faults, etc.; but we can do such things more quickly, more correctly, and with more gratification, with such training. Rule of thumb methods have always a flavor of science in them; and though it has been said that an ounce of practice is worth a tun of theory, an ounce of practice *with* theory is worth a tun of practice without theory.

Scientific knowledge and training are the parents of invention and improvement, and these are the highest order of education. I do not mean scheming, or the bringing forward of novelties for the sake of novelty, often in opposition to fixed principles, but the improvement of defects and the introduction of objects of real utility. Watt has said "It is a great thing to find out what will not do—it leads to our finding what will do." When we know where the shoe pinches, we can find a remedy.

Some of the schemes which ignorant outsiders have submitted to telegraph engineers as improvements are simply ridiculous. I can remember, when the Atlantic cable of 1858 failed, a lady writing and suggesting that cables should not be submarine but super-marine—that they should be suspended above the ocean; and she suggested that the Rock of Gibraltar, the Peak of Teneriffe, and the Andes formed conspicuous objects for this purpose! Again, when we suffered so much, a little later, from the rupture of our light cables in the North Sea, an officer of one of the scientific corps of Her Majesty's army thought that he had made the grand discovery that the world was growing, and that it was owing to the continents separating themselves further and further by the growth of the globe that our cables snapped! Many suggested that the Atlantic cable should be suspended by balloons, and even very recently a gentleman, who possesses no knowledge whatever of telegraphy, has endeavored, by the powerful aid of the press and other means, to thrust upon us an apparatus which we know to be radically wrong in principle, and which has been anticipated or tried by nearly every telegraph engineer who has exercised thought on the subject.

On the other hand, those who possess scientific training, and those who have devoted their attention to remedy defects, have done great service to their profession. Mr Fuller succeeded in replacing the defective sand batteries of twenty years ago by the ordinary sulphate battery, which still remains the form principally employed by the department. Mr. Varley, by the application of his powerful mind to the working of our wires, has brought the present state of insulation to the perfection it has now attained; and Sir Charles Wheatstone, by the constant and unremitting study of forty years has brought out that beautiful automatic apparatus without which it would have been difficult for the Postal Telegraph Department to have transacted the enormous business, thrown upon its hands by the adoption of the uniform shilling rate and the low tariff applied to the press. The two first named telegraph engineers owe their success entirely to those principles of self-education that I wish to inculcate into you: and Faraday, a purely self-educated philosopher, has instanced Sir Charles Wheatstone and his inventions as examples of the effect of the continued application of these principles.

There is plenty of room in the working of our instruments and wires for the display of your powers of invention and improvement. Real improvements are not the result of chance; they are the effects of the continued application of those methods of thought and study which education, and particularly scientific education, impart.

Geometry and algebra are essential to the skilled telegraphist, and it is difficult for any one to comprehend the higher branches of the profession until he has mastered the elementary principles of these two branches of pure mathematics. It is the application of algebra which enables the telegraph engineer to tell the distance of a fault in a submarine cable to within half a mile, and to direct the sailor, with unerring accuracy, to the spot where he must apply his apparatus. . . . It is the differential calculus which enables the electrician to obtain the greatest possible speed of working with the least consumption of materials out of his submarine cable.

Applied mathematics or dynamics considers force and its measurement. A current of electricity is only one form of force, and all our methods of electrical measurement are based primarily on the laws of dynamics. The stability of our posts, the strains upon our wires, the submersion of our cables, are applications of the laws of dynamics. A knowledge of chemistry, magnetism, and electricity, is indispensable to the telegraphist. They are so mutually dependent that a little must be acquired of each branch of physics by studying any of those enumerated."

In conclusion, the lecturer considered how this knowledge is to be obtained by those whom he addresses. Briefly, he recommended as aids to study, attending lectures, reading of scientific and practical works on electricity, telegraphy, and kindred subjects, observation, experiment, and reflection.

Something about Pickles.

Pickles, as an article of food, are to the best stomachs only appetizing, and to the weakest positively injurious. Still people will eat pickles, and whatever our physiological friends may say, we do not doubt that things so generally craved have some use in the animal economy. When soldiers have chronic diarrhœa, our army surgeons usually allow them to eat pickles and other things that, under ordinary circumstances, would be considered fatal, and to the surprise of everybody the hopeless patients often recover. So, without discussing the dietetics of the matter, we accept pickles as a fact. To look at the matter physiologically, a pickle is a mere vegetable sponge to hold vinegar. Any vegetable tissue that is not so fibrous or tough as to be unpleasant to masticate, and which has no disagreeable flavor of its own, will answer for pickling. If the article pickled has an acceptable flavor of its own, all the better. It is the possession of this that makes the cucumber the most popular of all pickles. Vegetables which have no marked taste are made flavorous by the free use of spices. It is customary to salt pickles before putting them into the vinegar. Why do we? It is not for the purpose of flavoring them with salt, for this can be added to the vinegar. This matter of salting pickles brings us to the question of *osmose*, which we cannot find space to discuss. Briefly, when a fresh vegetable is placed in salt and water, an interchange takes place between the juices contained in the tissues of the vegetable and the brine by which it is surrounded. The natural juices pass out and the brine passes into the vegetable; the brine being denser, it, according to a well known law, passes in more slowly than the juices of the vegetable pass out, and the salted things shrivel. When salted pickles are placed in water the case is reversed, their shrivelled tissues are full of brine, much heavier than the water by which they are surrounded, the brine passes out, and the water goes in and restores the plumpness. Soaked pickles with their tissues full of water, being put into vinegar, readily become penetrated by that liquid. The question of salted pickles has nothing to do with flavor, as the finest pickles are those from which the salt is most completely soaked.

One of the most frequent questions is "How can I make pickles like those put up at the makers?" It may be answered that the pickles referred to are put up in colorless vinegar. Home made pickles should be prepared with regard to flavor rather than appearance. As a general rule, vegetables to be pickled are first put into brine, then soaked to freshen them, and then placed in vinegar, which may be spiced or not, according to taste. One point is to be noticed: when freshened pickles are put into not very strong vinegar, the water with which their tissues are filled so weakens the vinegar that the pickles are not only not sour enough to the taste, but not enough so as to keep well. It is not necessary to enumerate the things that may be pickled, as there are few fruits or vegetables that may not be so treated; pickled peaches are delicious, and pickled purslane is not to be despised—a wide range surely. Some good housekeepers have, besides the regular cucumber and other standard pickles, a jar of

MIXED OR INDIAN PICKLE—The basis of this is usually sliced cabbage, and cauliflower broken into bits and put into brine. After these are ready, they are covered with spiced vinegar; and then such pickle materials, fruits, or vegetables as occur during the season are added from time to time, taking care that the newly added things are covered by the vinegar. At the close of the season, the vinegar is drained off, heated to the boiling point, and poured over the pickles; this is repeated two or three times, when the pickles are stored away for use, and are usually better in the second year than the first.

In the making of the spiced vinegar, probably no two will agree. As a suggestion we give two recipes. The various directions differ greatly; the chief object seems to be to get in enough spice. In looking them over, we are reminded of the toper's directions for making punch, "too much of lemons, sugar and whisky, and not enough water." One recipe gives: Vinegar, 6 pints; salt, ½ lb.; bruised ginger root and whole mustard seed, 2 oz. each; mace, 1 oz.; shallots, ½ lb.; cayenne pepper, a dessert spoonful, and some sliced horseradish. Simmer together for a few minutes, then put into a jar and cover close. Another, claimed to be "very superior," directs for each gallon of vinegar 6 cloves of garlic, 12 shallots, 2 sticks of sliced horseradish, 4 oz bruised ginger, 2 oz. whole black pepper, 1 oz. allspice, 12 cloves ½ oz cayenne pepper, 2 oz. mustard seed, ½ lb. mustard (ground), and 1 oz. turmeric. All the above, except the mustard and turmeric, are put into the jar with cabbage, cauliflower, and other pickle vegetables, and the vinegar boiled and poured over them. The ground mustard and turmeric are to be made into a paste, with cold vinegar added.—*London Farmer.*

THE manufacture of ice in New Orleans has been the means of reducing the price to $8 per tun.

Manufacture of Gold Leaf.

The process of gold beating is exceedingly interesting in its various details, and is one which requires the exercise of much judgment, physical force and mechanical skill. The gold must first be properly refined. The process is as follows: The coin is first reduced in thickness by being rolled through what is known as a "mill," a machine consisting of iron rollers operated by steam power. After being rolled, it is annealed by being subjected to intense heat which softens the metal. It is next cut up and placed in jars containing nitro muriatic acid, which dissolves the gold, and reduces it to a mass resembling Indian pudding, both in color and form. This solution is next placed in a jar with copperas, which separates the gold from the other components of the mass.

The next process is to properly alloy the now pure gold, after which it is placed in crucibles and melted, from which it is poured into iron molds called ingots, which measure ten inches in length, by one inch in breadth and thickness. When cooled, it is taken out in the shape of bars. These bars are then rolled into what are called a "ribbon," usually measuring about eight yards in length, of the thickness of ordinary paper, and retaining their original width. These "ribbons" are then cut into pieces an inch and a quarter square, and placed in what is called a "cutch," which consists of a pack of French paper leaves resembling parchment, each leaf three inches square, and the pack measuring from three quarters of an inch to an inch in thickness. They are then beaten for half an hour upon a granite block, with hammers weighing from twelve to fifteen pounds, after which they are taken out and placed in another pack of leaves called a "shoder." These leaves are four and a half inches square, and the gold in the "shoder" is beaten for four hours with hammers weighing about nine pounds. After being beaten in this manner, the gold leaves are taken out of the "shoders" and placed in what are called "molds." These "molds" consist of packs of leaves similar to the other packs, and made of the stomach of an ox. After being made ready in the "molds," the gold is beaten for four hours more with hammers weighing six or seven pounds each.

It will be noticed that the thinner the leaf becomes, the lighter are the hammers used, and it is also necessary in beating the gold, especially in striking the "mold," that the blow should be given with the full flat of the hammer and directly in the center of the "mold." Should the beater strike with the edge of the hammer, there is every chance that the leaf will be broken and the pack spoiled. The leaf, after being taken out of the "mold," is cut into squares of three and three eighths inches, and placed in "books" of common paper. Each "book" consists of twenty-five leaves, and there are twenty "books" in what is known as a "pack."

The same process is used in the manufacture of silver leaf, the only difference being that the metal, being softer, requires less time to manufacture.

Gold foil is made in a manner similar to gold leaf, except that the sheets are thick and are annealed separately, while the chief distinction is that it has, if a genuine article, no alloy whatever. The article known as "German gilt" is not made from gold at all. The wood upon which it is to be placed is first made exceedingly smooth, and then painted with a preparation which, being covered with silver leaf, has the property of producing a gold-like appearance.

The busiest season for selling leaf or foil is just approaching, and the present evidences are that the demand will be large. The summer business has been good, better, in fact than business generally.—*Commercial Bulletin.*

Decorative Painting on Tin.

Tinfoil is spread out upon a smooth surface, such as glass the latter having been first moistened to aid the laying out of the foil and to maintain it in its position. The painting is then executed upon it in oil. This painting on tin, when dried and varnished, can be rolled up like ordinary paper hangings, from which it essentially differs in possessing all the variety of tones and coloring that oil paintings admit of. The tin groundwork constitutes a waterproof protection, and, on account of its great flexibility, will follow the various moldings and contours of the object to be ornamented. To the latter should be applied a hydrofuge mixture, when it will be ready for the decorator. This method can replace ordinary gilding, as the gold can be applied in the workshop and the gilt tin fixed afterwards. The advantage of gilt tin over gilding on other metals is that it is inimical to oxidation; whereas it is known that gilding upon other metals, and notably upon zinc, deteriorates rapidly.—*M. C. Daniel.*

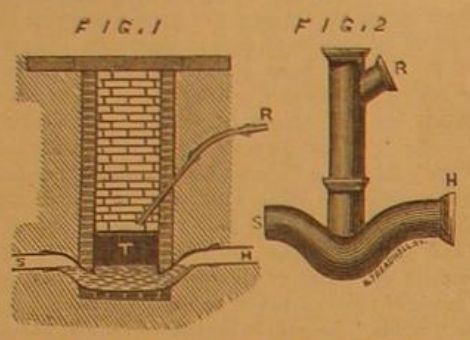
BRIDGE OVER THE NILE.—The Fives Lille Company are reported to have completed and opened for traffic a large new bridge between Kasr el Nil and Gebsireh, uniting the suburbs of Cairo with the opposite or left bank of the river Nile. This bridge is of iron, double trellis girders, and constructed in two parts, one fixed and the other movable, for the service of the navigation. Its length is about 450 yards, or a little over a quarter of a mile, and the width between the centers of the girders is not quite 40 feet. The total weight of the bridge is 1,600 tuns, and it has been built within two years.

THE Belgian government some time ago appointed a commission to inquire into the sanitary relations of factories where chemicals are made. In their report, the commission places alkali works among the most noxious of all. They also condemn tall chimneys as being more hurtful than short ones, in consequence of the greater surface over which they diffuse deleterious gases and vapors, as well as for the reason that, by increasing the draft, tall chimneys discharge gases into the air, which would be otherwise absorbed in the passage.

House Drains.

Mr. Osborne Reynolds, Professor of Engineering at Owen's College, Manchester, Eng., proposes to abolish all house traps altogether, and deal with the sewer gas outside the house. He places an ordinary siphon pipe between the house and the sewer, connecting the bend in the siphon—which practically forms the trap—with the open air. He has applied the principle to his own house, as shown in the annexed section. All the drains in the house are connected with the pipe, H, Fig. 1, which leads to a siphon trough, T, at the bottom of the man hole, the latter being constructed as near the house as may be convenient. The floor of this man hole is 2 feet above the bottom of the drain, which passes through it in the shape of an open trough, T, 2 feet and the width of the pipes deep, the sides being rendered in cement. This trough is so laid that the water stands half an inch above the orifice on the sewer side, S, and an inch on the house side, H, while, to prevent scum forming on the surface, the pipe, R, brings rain water from the roof and discharges it at the upper part of the trough, T. Of course, in most cases a much simpler arrangement than this will suffice for the sanitary requirements of the house, for a siphon trap, Fig. 2, with a pipe communicating with the surface and connected with the rain water pipe, will be found to prevent all influx of gas into the house. In this way, a trap is formed which effectually closes both the house and the sewer from the man hole, and doubly closes the house from the sewer; and

FIG. 1 FIG. 2



if care is taken to arrange the orifices of the pipes in the man hole, as recommended, it will not be possible for the water to be sucked out of the trap even should the pipe run full.

Importance of Fuel Saving Appliances.

In his recent address before the Institution of Mechanical Engineers, London, President Siemens stated that the annual coal production in Great Britain amounts at present to 120 million of tuns, which, if taken at 10s. per ton of coal delivered, represents a money value of £60,000,000. It would not be difficult to prove that, in almost all the uses of fuel, whether to the production of force, to the smelting and reheating of iron, steel, copper, and other metals, or to domestic purposes, fully one half of this enormous consumption might be saved by the general adoption of improved appliances which are within the range of our actual knowledge without entering the domain of purely theoretical speculation, which latter would lead us to the expectation of accomplishing our ends with only one eighth or one tenth part of the actual expenditure, as may readily be seen from the following figures: One pound of ordinary coal developes in its combustion 12,000 units of heat, which in their turn represent 12,000×772=9,264,000 ft. lbs., or units of force, which represents a consumption of barely ¼ lb. of coal per indicated horse power per hour, whereas few engines produce the indicated horse power with less than ten times that expenditure, or say 2½ lbs. of fuel. Again, the heat required to raise a tun of iron to the welding point of say 2,800 degrees Fahrenheit requires 2,240×2,800×0·13 (specific heat of iron) = 815,360 units of heat, which are producible by 815,360 divided by 12,000=68 lbs. of coal) whereas the ordinary heating furnace consumes more than ten times that amount. In taking credit, however, for only 50 per cent of the actual average expenditure, we arrive at an annual money saving of £30,000,000 per annum—a sum equal to nearly one half the national income! Nor does this enormous amount of waste indicate all the advantages that might be realized by strict attention to appliances for saving fuel, which are, generally speaking, appliances for improving the quality of the work produced.

Soapstone Manufacture.

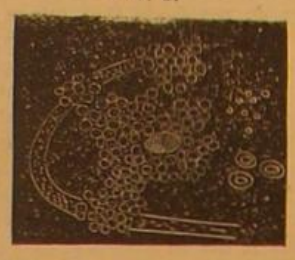
Soapstone has recently found a new application as a raw material for buttons, dominoes, and other similar objects. Chips and refuse pieces of the mineral are ground to powder, mixed with silicate of soda—water glass—and after a repose of some hours, drying on a plate, when the mixture is again pulverized. The powder is then subjected to powerful pressure in molds, and afterwards baked in airtight fireclay crucibles. The pressed objects are a second time saturated with water glass, and again heated out of contact with the air. The hardness of the products depends, in a great measure, upon the number of times the heating is repeated. The last stage of the process of manufacture consists in washing in water in a rotary tub, drying and agitating in a suitable vessel with soapstone powder, which imparts a polish to the surface.

THERE is something more than a daily ferry now between Europe and America. In fact, the rate is something like a steamer for every 12 hours from the port of Liverpool alone. During the month of May, 53 steamships left the Mersey, of which 17 belong to the Cunard company, 11 to the Inman, 5 to the National, 5 to the White Star, 10 to the Allan, and 6 to the Guion Company, respectively. When to these are added the ships of the French and the German lines, we get some idea of the prodigious increase of late in steam communication between the continents.

DETECTION OF IMPURITIES IN MILK.

A recent number of the *Lens* contains an interesting report by Professor James Law, of Cornell University, upon certain microscopic examinations, by him made, of some samples of suspected milk. The latter was supplied by one of the best farmers near Ithaca, N. Y., and the author took the usual precautions to prevent the access of foreign matter after the receipt of the liquid for examination. This milk, when delivered, looked rich and good, presenting nothing unusual in color, consistency or flavor. But after standing for twelve hours, it had become viscid, and fell in fine threads from the point of a needle dipped therein. Placed under the microscope, it showed an abnormal adhesiveness of the oil globules, which had accumulated in dense masses instead of remaining apart as in healthy milk. Intermixed with the globules were dark colored spherical bodies of a much larger size (spores) and filaments. This cryptogam, or species of plant, steadly grew, and at the end of forty-eight hours presented the form shown in Fig. 1.

FIG. 1.



The farm buildings, pastures, and water supplies, where the cows were kept, were then examined and found to be in excellent order. The water drunk by the cows issued from a couple of springs, and, to the naked eye, looked perfectly clean and pure. But, under the microscope, it was found to contain numerous diatoms and spores of some low form of vegetable life. A little of this water was placed in a portion of milk which, by previous examination, had been found to be pure. In three days the milk so treated had become viscid, and contained numerous spores and mycelium (as shown in Fig. 2) which continued to grow.

FIG. 2.



Two cows, from which the impure milk first mentioned was obtained, were then examined. The animals appeared to be in good health in every respect; but on application of the clinical thermometer, it showed a temperature of 102°, while the temperature of the other cows, giving pure milk, indicated only 100°.

A little blood was then drawn from the affected cows, and, by aid of the microscope, was found to contain ovoid bodies, double the size of the ordinary blood globules. After standing corked for a few days, this blood exhibited a luxuriant growth of mycelium, or substance from which fungus is derived. A drop of this blood was also added to a sample of pure milk, and in a few days it presented a rich fungoid growth, as shown in Fig. 3.

FIG. 3.



The farm springs were now fenced, and the cows supplied with water from another source—a well upon the premises. Dram doses of the bisulphite of soda were given, for one week, to all the stock. The impurities of the milk at once disappeared, and have not returned.

The chain of evidence now appeared complete. The water contained vegetable spores, which developed into a luxuriant growth of mycelium, when allowed to stand or when added to milk of known purity. The presence of similar germs in the blood was demonstrated by microscopical examination, by the further development of the cryptogam when the blood was allowed to stand, and by the appearance of the same product in milk to which a drop of this blood had been added. The constitutional effect of its presence was slight, being manifested by a rise of temperature not exceeding 2° Fah. The germs in question were present in the milk, and grew with great rapidity in this medium. Lastly, the disuse of the contaminated water and the administration of sulphites put an end to the affection.

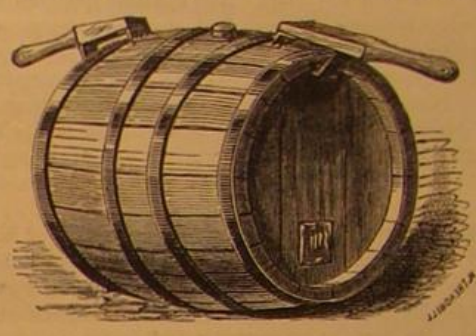
There is one more feature of the case which ought not to be passed without notice. Out of a herd of about twenty cows, only one or two were attacked at first, and after giving tainted milk for a week or more they recovered, while one, two, or three more had in the meanwhile been taken ill. At first the whole of the milk was injured by the admixture of the impure, and it was only by setting aside a little milk from each cow in a separate vessel that the owner was enabled to fix on the affected ones.

This unsusceptibility of the majority of the cows to the agent which all alike were swallowing, and the acquirement of this susceptibility by one after another at irregular intervals, demand investigation.

It may be added that Dr. Percy's report to the New York Academy of Medicine, in 1858, "On Swill Milk," shows the presence of spores in such milk when drawn and the growth of mycelium within twenty-four hours thereafter, though the liquid had stood in a well corked bottle in the interval. This report shows, further, the tendency of such milk to induce severe and even fatal disorders of the digestive organs of infants fed upon it exclusively in its fresh condition.

HANDLES FOR BARRELS AND BOXES.

This is the invention of M. S. Scofield, of Stamford



Conn. The construction and manner of using these handles can be readily understood from the engraving. To adapt them for use on boxes or other packages without chimes, the jaws are serrated or toothed, so that, by a sudden thrust of the handle, the teeth of the hook-shaped jaw will be forced into the side of the box sufficiently to give the handle a firm hold upon it. This seems a simple, useful, and practical invention.

Progress of the Telegraph.

The progress of the electric telegraph within the past six years has been very great in every quarter of the globe. Upon this continent, the electric wire extends from the Gulf of St. Lawrence to the Gulf of Mexico, and from the Atlantic to the Pacific Ocean. Three cables span the Atlantic Ocean, connecting America with Europe, and another submerged in the Gulf Stream unites us with the Queen of the Antilles. Unbroken telegraphic communication exists between all places in America and all parts of Europe; with Tripoli and Algiers in Africa, Cairo in Egypt, Teheran in Persia, Jerusalem in Syria, Bagdad and Nineveh in Asiatic Turkey, Bombay, Calcutta, and other important cities in India, with Hong Kong and Shanghai in China, Irkoutsk, the capital of Eastern Siberia, Kiakhta on the borders of China Nagasaki in Japan.

A direct line of telegraph, under one control and management, has recently been established between London and India, with extensions to Singapore, Hong Kong, Java and Australia.

Europe possesses 450,000 miles of telegraphic wire and 13,000 stations; America, 180,000 miles of wire and 6,000 stations; India, 14,000 miles of wire and 200 stations; and Australia, 10,000 miles of wire and 270 stations; and the extension throughout the world is now at the rate of 100,000 miles of wire per annum. There are, in addition, 30,000 miles of submarine telegraph wire now in successful operation, extending beneath the Atlantic and German oceans; the Baltic, North, Mediterranean, Red, Arabian, Japan and China seas; the Persian Gulf; the Bay of Biscay, the Strait of Gibraltar, and the Gulfs of Mexico and St. Lawrence.

More than twenty thousand cities and villages are now linked in one continuous chain of telegraphic stations. The mysterious wire, with its subtle and invisible influence, traverses all civilized lands, and passes beneath oceans, seas and rivers, bearing messages of business, friendship and love, and constantly, silently but powerfully, contributing to the peace, happiness and prosperity of all mankind.

RE-SENSITIZED PHOTOGRAPHIC PLATES.—After the collodionized plate has been sensitized in the nitrate bath in the usual manner, it is exposed to a weak diffused light; the picture is then taken in the ordinary way. Singular as it may appear, this exposure to diffused light increases the sensitiveness of the plate for pictorial purposes. Anthony's *Photographic Bulletin* states that Mr. H. J. Newton, of this city, has fully tried the plan, and finds that it reduces the time of exposure nearly two thirds without any photographic loss. Mr. Gutzlaff, of Bahia, Brazil, is the patentee of this new method.

M. GAUDUIN has been making experiments to supersede borax, which is generally employed in soldering, and the result is that he finds that an excellent flux for soldering iron, and brazing copper and aluminium bronze, is obtained by a mixture of equal parts of cryolite and chloride of barium Cryolite is a product and export of Greenland, and consists of a double fluoride of aluminium and sodium.

BED BOTTOM.

The improved bed bottom here illustrated is designed to present an elastic surface just where the same is needed and not elsewhere, and also to allow of the stretch of the canvas or cord employed in its construction being easily taken up. Fig. 1 gives a perspective view of the bedstead and bottom, and Fig. 2 is a detail longitudinal section of the same.

A is one of the side rails of the bedstead, which is of ordinary construction. Near the ends of the rails are attached the stops, B, and at the middle part, the stop, C, which is made with steps or shoulders as shown, is affixed. D and E are the head and foot frames. They are constructed by attaching the ends of ordinary slats to side bars, which side bars extend along the inner side of the bedstead rails, A, and rest upon the stops, B and C, as represented. In the head frame, D, enough cross slats are used to occupy about one foot of the length of the bed bottom, and in the foot frame, E, a number sufficient to extend about two feet of the length is used. Cords, as shown in Fig. 1, or a piece of strong canvas, as may be preferred, are secured to the inner slats of the two frames so as to form, with them, a complete bed bottom. This part of the bottom should, in practice, be about three feet in length. If desired, the two frames may be made with equal numbers of slats.

By this construction, the head and legs of the person lying on the bed are supported firmly by the slats of the head and foot frames, and the body, from below the hips to the neck, is supported by the cords or canvas. In this way, the bed bottom is given elasticity exactly in the place where the quality is desirable. Furthermore, should the canvas or cords stretch, the slack can be taken up by raising the outer ends of the head and foot frames, or either one of them, and dropping the inner ends of the side bars into the next notch or notches of the stop, C. By this means, the difficulty which has heretofore been found in taking up the stretch is stated to be completely overcome.

The invention was patented, through the Scientific American Patent Agency, July 16, 1872.

For further information the patentee, Mr. Frederick Wellhouse, of Leavenworth, Kansas, may be addressed.

Fig. 2.

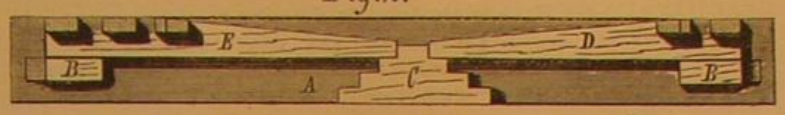
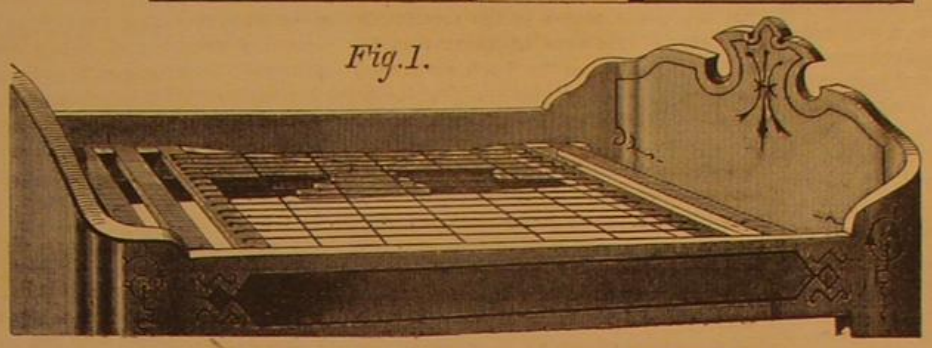


Fig. 1.



WELLHOUSE'S IMPROVED BED BOTTOM.

GIFFARD'S UNIVERSAL PISTON.

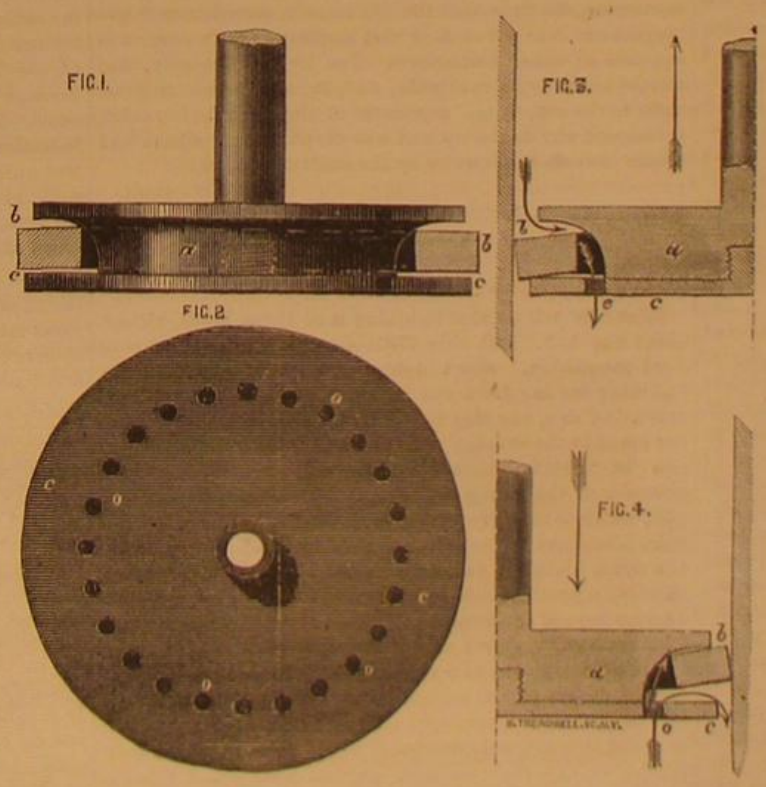
The name of Paul Giffard, civil engineer, of Paris, is by no means unknown to fame, in connection with the well known injector that goes by his name; but we are inclined to think that he will hereafter be quite as well, or even better, known as the designer and inventor of a simple and ingenious form of combined piston packing and valve, which we illustrate herewith.

From the annexed engravings, it will be seen that the body of the piston is formed somewhat like a deeply grooved pulley, in diameter smaller than the cylinder, and that a ring of suitable material, leather or india rubber, fits loosely within the groove, wherein it is adjusted to act simply as a gas or fluid tight packing, or for combined action as a packing and as a valve, in suction or in forcing action.

In the latter case, *vide* Figs. 1, 2, 3, and 4, there is not only a difference in the diameters of the cylinder and piston, and in the depth of the groove and the flexible ring, *b*, but there is also a space between the inner edge of the ring and the bottom surface of the groove, as also a difference in the diameters of the two rims forming the groove, the smaller rim having numerous perforations made so as to admit of a free communication, for the fluid or gas, between the space within the groove and the cylinder space above the piston. Thus, while moving in one direction, the fluid pressure keeps the ring tight against the larger rim and the cylinder, forming a perfect joint, whereas, when moving in the other direction, the ring will be pressed against the smaller rim, leaving free communication from one side of the piston to the other through the inner groove space and the apertures.

When, however, the ring is to be used as a piston packing only, the rims are equal, and both unperforated; and thus at each stroke in either direction the fluid presses the ring firmly against the inner surface of the cylinder and one or the other of the rims, securing perfect action in the pump. The form of the groove may be varied, but it is preferably made conical in section and polygonal in plan, as most advantageous in combination with the hollow cylindrical form of the flexible ring. The details of the construction, which is very simple, are clearly shown in the engravings: the piston, *a*, is shown in elevation in Fig. 1, and in section in Figs. 3 and 4; Fig. 2 shows the plan, *c*, of the piston and perforations, *o*; and the ring, *b*, is shown in section in Figs. 1, 3, and 4, in the former at rest; in the latter respectively as affected by the up and down stroke.

This piston is wonderfully effective, leakage and friction, or in other words, waste of power, being reduced to a minimum; and apart from its adaptation to various purposes of hydraulic and air pumps, blowing engines, gas exhausters, etc., in which it will be found of great value, there are other applications of equal or greater importance, which only await development.—*Mechanics' Magazine.*



GIFFARD'S UNIVERSAL PISTON.

Extracting Poison from the Rattlesnake.

The process of extracting the poison from the rattlesnake (*crotalus horridus*) for medicinal purposes whilst the reptiles were still living, has been successfully accomplished by Mr. J. C. Thompson and Dr. Hayward, of Liverpool. The following was the *modus operandi*, if any of our readers care to do likewise:—The reptiles were in separate compartments of a large case, fitted with a double lid for extra security. A long staff, fitted at the end, with a thick india rubber noose which could be loosened or tightened by the hand at pleasure, was inserted through the partially opened lid, and the opportunity quickly seized of slipping the loop over the snake's head, the loop being immediately drawn tight by means of the cord attached thereto. With a similar contrivance the tail was next fastened, and the snake, being thus securely held, was lifted out of the box on to the floor of the room. A pickle bottle containing chloroform was then thrust over the snake's head, and carefully held in its place by keeping time to the animal's efforts to extricate itself. As the reptile became stupefied, the noose was gradually relaxed to enable the lungs to have full play, and when it appeared powerless, the snake was laid in a long narrow box, made for the purpose, with an aperture at one end, out of which its head projected while the after operation was performed. Its jaws were then opened and fixed, and the poison glands were pressed with forceps, then with the gloved finger and thumb, while a small blown graduated phial was held to receive the drops as they slowly oozed out through the poison fangs. Twenty drops were the average quantity yielded by each snake. The venom is of a straw color, thick and gummy in consistency, and decidedly acid in its reaction on litmus paper. It is readily soluble in glycerin or water, but it is precipitated by strong alcohol, the precipitate being redissolved, with the addition of a little water. Its toxicological properties were fully tried on a variety of animals. Half a drop produced death in a linnet within three minutes after being injected under the wing.—*Hardwicke's Science Gossip.*

AMERICAN HORSES.

Vermont has long been celebrated for its trotting horses, and the Morgan breed is so identified with that State that the name is almost a synonym for horses raised there. In New York, however, the greatest attention is paid to this business. The single county of Orange has over one hundred breeding establishments, some of which are very extensive. Charles Backman's, for instance, includes six hundred acres, where are collected upward of one hundred and fifty horses, of all ages, many of which are of the finest trotting lineage. In the rear of the immense stables of this equine village are yards, exercising grounds, and a mile track for training the young animals. The whole business is as completely equipped as a commercial establishment in a large city, and the owner calculates with almost equal certainty upon the profits of his enterprise. Millions of dollars are also invested on stock farms all along the Hudson river in the breeding of trotting horses. There are similar breeding establishments in Iowa and other western States. For the last thirty to forty years, the value of trotting horses has increased even faster than their numbers and speed, the rate being at least 100 per cent every decade. In 1858, Flora Temple was sold for $8,000; in 1862, the California Damsel for $11,000; in 1866, Young Pocahontas for $25,000; and in 1867, Dexter, which in that year surpassed all previous speed—trotting a mile in 2 minutes 17¼ seconds—sold for $33,000. It is now no unusual thing for fast trotting horses and fine stock horses of the best trotting blood to sell for from ten to twenty thousand dollars. This shows the immense popularity of the American breed of trotting horses, and the amount of wealth they represent. The founder of this breed seems to have been Messenger, whose lineage is traceable back to some of the finest Arabian blood in England. He was imported into New York in 1788, and was of superb form and extraordinary power and spirit. His form, with the remarkable vitality and endurance of his race, has endowed his progeny—which has been persistently used and trained to trotting—with extraordinary courage and endurance. So great has been the impress of his wonderful stamina and splendid form upon American horses that his value to the country may be estimated at millions of dollars. His stock has been bred in-and-in to an unprecedented degree, without any of the disastrous effects generally feared from inbreeding. This success has led many to think that where sire and dam are affected with no disease, inbreeding may be resorted to with safety, the only effect being to intensify in the progeny the charcteristics common to both parents.

In this connection, a few words in reference to a very remarkable auction sale of horses which took place in July last at Tattersall's, London, will not be out of place. The animals offered belonged to the stock of the late Mr. Blenkiron, of Middle Park, near London, who was one of the most scientific and successful stock raisers in the world. Many of the nobility and the most noted horse breeders and fanciers of Europe were present.

At the appearance of Blair Athol, the finest stallion in the world, the cry of "Hats off" was raised, and the whole assemblage uncovered in honor of a horse.

The sale of this stallion was the great event of the entire auction, and the bidding was of nation against nation. Started at 4,000 guineas, the offers rose, amidst intense excitement, until, on the bid of the New Stud Company, Blair Athol was knocked down at 12,500 guineas, or the monstrous sum, in American currency, of $65,625. This was the largest sum ever paid for a horse, and by the side of it the prices paid here in America for such horses as Dexter, however much criticised, sink into insignificance. The famous Gladiateur, the triumph of the French turf, was sold to a private buyer at $35,000. Mandrake, who brought $10,500, comes to America. The twelve stallions realized altogether $182,280, an average of $15,190 each, while the entire stud, comprising, besides these, 198 mares with foals and 63 colts, brought the astounding and unprecedented sum of 102,370 guineas, or $536,440—over half a million dollars in a four days' sale.

The enormous prices which these animals brought are simply an index, says the *Evening Mail*, of the importance which is being put upon horse breeding as a branch of national industry. There was much criticism on the price paid for Blair Athol, but it was stated, in defence of that extreme valuation, that he has earned during his career as a stallion the immense sum of 32,000 guineas all told, or at the rate of $16,000 a year. It is of the utmost importance to a country, from the purely industrial point of view, that its horseflesh should be of the highest quality, and experience seems to have shown that this result is obtained by the breeding of these fancy horses, in themselves so absurdly valued, as sires. How much is owed in this country to the Morgan breed, or that of half a dozen other noted progenitors, it would be difficult to estimate justly. No matter what may be the increase of other means of transportation by the extension of railroad lines, there must be more and more demand for horseflesh, and that of the best quality; and perhaps, in this light, the high prices paid for the English stallions we have named, are not, after all, as extravagant as might at first sight be thought, even from the rigidly economic point of view.

ANCIENT manuscripts were written without accents, stops, or separation between the words; nor was it until after the ninth century that copyists began to leave spaces between the words.

ABOUT 25,000 steel shuttles for sewing machines, embracing twenty patterns, are turned out monthly by the Billings and Spencer Manufacturing Company, of Hartford, Conn.

Correspondence.

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

Rubber and Leather Belts.

To the Editor of the Scientific American:

I have had considerable experience with belts for fifteen years, a good deal of it under varying circumstances, in dry and hot places, in damp and wet places, and exposed to rain, snow, and ice, with portable saw mills, grist mills and other machinery; and my experience has been the very opposite, in nearly every particular, to the statements in your journal. I began almost exclusively with leather belting, but, occasionally trying gum belting, I liked it so much better that I do not think I will ever buy another foot of leather belting; and indeed, in half the situations or uses of belting, I would buy gum in preference to using leather if furnished without cost The severest test, that ever I put belts to in actual use, was a two inch belt on a quarter twist for driving sawdust elevators. The best leather I could get lasted only from 6 to 10 days, double lasting but little longer than single. Running two single belts, one on top of the other, however, increased their durability about fifty per cent. After wearing out several leather ones, I got a three ply gum one which lasted two months before it finally failed; and it required less than a fourth the time to tighten and repair that the leather did. With larger belts my experience has been somewhat similar, though I have never yet worn out a gum belt where it was not overstrained for want of width or sufficient pulley surface. I once had a seven inch leather belt run off a drum, draw tight across the corner of it, and while I could run down two pair of stairs and stop the engine, the belt was cut and burnt about half off, so that it had to be repaired before it could be further used; afterwards a gum belt ran off and caught in the same way, remained the same time and only had the surface gum rubbed off for a few square inches; it was hot, but sustained no substantial damage and needed no repairs. The writer further asserts that it is next to impossible to repair rubber belts; while wide ones cannot be cut up into narrow ones like leather. Now I have never found it any more nor any less difficult to repair gum than leather belts, and I do it in precisely the same way; and I have cut up pieces of wide gum belts and riveted them together into narrow belts and, when properly run, I find no difficulty with the cut edges. "A rubber band, costing hundreds of dollars, may be spoiled in a few moments by the lacing giving out, and the band being run off into the gearing, or by being caught in any manner so as to damage the edges, or by stopping of either driving (!) or driven pulley." Exactly so with a leather belt; they can be repaired alike. I once tore a new eleven inch belt in two, because it had not adhesiveness enough to do the work, and flew off and caught fast. If it had been only a nine inch gum belt, it would have done the work without slipping off; or if it had torn in two, I should have mended it in precisely the same way, namely, laid the two ends together, and put a patch of leather or gum on the outside to lap on each end and riveted through with copper rivets, a job taking ten minutes when tools and material are kept ready as they always should be. Speaking of tearing a gum belt, the writer says "if the rent strikes a seam, it is most certain to follow it, even the entire length, if the machinery is not stopped." Is he so ignorant of the subject whereof he writes as to suppose there are seams in gum belts running lengthwise? This shows how much practical knowledge he has, and how much he would impart to us. Every person, I presume, who has any practical or even correct theoretical knowledge of this subject knows that the webbing in gum belts is in long seamless bags placed one within another when over "three ply," while the three, or five, etc., ply consists of one or more bags with a flat selvaged edge strip in the center, with the gum placed around and between all parts cementing it together, making it waterproof, and giving it 30 to 50 per cent more adhesiveness than leather, as long as the gum is on it; and, if worn off, still as much as leather. Gum belts do sometimes though rarely, tear lengthwise, not because of seams, however. I have seen but one torn in that way to any length, and that was about ten feet, but was repaired without much difficulty. Animal oils spoil the gum on a belt; there is no demand nor expence for oil on them as for leather, and no intelligent person allows any put on them, though I have seen ignorant men pour oil on when the trouble was in not setting the pulleys right. A gum belt will stretch the first day or two as much as leather till it gets a certain length, or set, then it stretches very little and will run frequently for years without having to be altered, while leather continues to stretch as long as there is anything left of it; and leather stretches every dry warm day, stretches more on getting damp, then again on drying, and so on; while dampness or dryness has no effect on gum. I have never known moisture and water to soak into a gum belt, much less have I had water freeze in a belt and burst it; I never knew the gum to pull off the belt when frozen to the pulley, though I have very often started them when frozen to pulleys and sheeted with ice between pulleys; but one round scales off all ice by bending over the pulley, while a leather belt must be taken off and folded away in the dry, or you have trouble. I have used gum belts eased and quarter twist, and with sliding friction for hoisting and stopping loads, where they would heat too hot to bear my hand upon them, and they were not damaged when used with discretion at the start till they get a polish and a good solid working surface, after which there is little danger. A gum belt requires more care while new than afterwards, as the gum is more sticky and softer; but it may be heated to over 300 degrees any time without injury, if not done by harp, cutting or scratching points or edges, while leather is crisped and ruined for all purposes at about 200 degrees, less than the boiling point of water. I lately put two seven inch leather belts on a machine for hoisting coal, because, as there was some sliding of belts, I thought they might do better than gum, but they utterly refused to lift the load required; so I laid them away to sell to the shoemakers, and got three ply gum ones, and the coal comes up easy enough now. The worst objection I have to gum belts is the disagreeable smell of the sulphur on their surface while new, which is hard to keep off one's clothes. But the advantage is that they always do their work well, without trouble, always run to their places true and straight as long as they last; while even the best factory leather belts will draw crooked by use, and the longer they run, the worse they get.

THOMAS HOGE.

Waynesbury, Pa.

How is Erratic Motion Caused?

To the Editor of the Scientific American:

I read, in an excellent and very interesting article, published in your journal of August 10th, that the results of Professor Agassiz's geological researches in Patagonia, prove that the grand march of the erratics, in that country, was *northward*. He says of them that the "grand general movement, was from the South, northward;" and that "their direction is such that glaciers from the adjoining mountains cannot be supposed to have caused the abrasions and furrows of the rocks." Does not this scientific discovery, this mass of facts, go a great way in establishing the theory I propounded and published in your valuable journal, Vol. XVIII, page 37, 1868, nearly five years ago? I said, in that article, that all the glacial epochs that ever the earth saw were caused, and would be caused, by the poles of the earth laying in the ecliptic plane; and that through the combined attraction of the sun and ice, the grand movement of the vast fields and mountains of ice, which would be formed alternately at the poles, would be toward the equator, with an eastward or westward tendency, according to the position of the sun to the earth at the time. I venture to say that all geological research made, from Patagonia to the most northern boundaries of Brazil, will show that the grand march of the erratic family has been northwestward; and that all such research will as surely prove that all erratic motion from the north pole, has been in a southern direction.

I have merely thrown out these few remarks to, as it were, stimulate scientists, geologists and astronomers, to give the theory and the subjects it involves more candid consideration, and more thorough investigation. The earth has, undoubtedly, seen many glacial periods in its time, at least one undeniably; and to find out what is the cause of that one, or of the many, must surely be, to studious and scientific minds, of vast interest and importance. If the ice had grown and and accumulated for many ages together, as some scientists think, then it seems to me that the tops of a great many mountains, and especially hills, would be worn off and furrowed, but such phenomena are very rare indeed; whereas striations on the rocky coasts of lower lands and of mountain sides show that the ice formed, though massy and magnificent, was not of such vast magnitude as to cover hill and dale of either hemisphere. The ice, undoubtedly, was formed annually, at each pole; and, in being presented gradually to the sun, by the movement of the earth in her orbit, it loosened and broke up, and was drawn in vast sheets and blocks towards the equator by the sun's attraction.

JOHN HEPBURN.

Gloucester, N J.

Lightning.

To the Editor of the Scientific American:

Scientists tell us that lightning is of three kinds, zigzag, sheet and ball. But this distinction, I think, is without good foundation. Sheet lightning is nothing but zigzag lightning darting from one cloud or part of a cloud to another. Of this, one may satisfy himself by observing a thunder cloud in the evening which is manifesting the phenomenon of "sheet lightning" He will occasionally catch glimpses of the zigzag and be able to trace its general direction, which is most frequently horizontal, but sometimes upward into space. The streak is sometimes seen to divide into a dozen branches, radiating in all directions, and when shooting upwards, these branches occasionally extend several degrees beyond the outline of the cloud. This phenomenon I have witnessed scores of times. The reason why the zigzag is so rarely seen is because it is in the interior or upper part of the cloud, and seldom comes near enough to the surface to be caught by the eye. As to ball lightning, the evidence of it is not satisfactory. The witnesses of this phenomenon are, for the most part, ignorant peasants of Europe, living during the last century. I have yet to learn of a single instance of ball lightning of recent date being seen in this country by a person whose testimony is worthy of credit.

Franklin, N. Y. J. H. P.

Sulphuric Acid in Vinegar.

To the Editor of the Scientific American:

The simplest way of detecting sulphuric acid in vinegar is to add a few drops of baryta water, when the liquor, if sulphuric acid be present, will become cloudy, sulphate of baryta being formed, which is insoluble. As baryta is poisonous, the experiment should be made with a small quantity.

Every druggist keeps or ought to keep baryta water.

New York city. E. W.

TO REMOVE iron rust from linen, apply lemon juice and salt, and put it in the sun. Use two applications if necessary.

MISCELLANEOUS ITEMS.

An improvement "for imaginary horseback riding" is the designation given in a recent patent granted to C E. S. Scripture, for a combination of see-saw levers, which are made to canter or trot the rider, to suit his taste. It is intended as a sort of mechanical gymnastic machine.

William M. Welling's patent for the manufacture of artificial ivory, has lately been extended by the Commissioner of Patents for seven years. The article is composed of 10 ounces of white shellac, 4½ ounces acetate of lead, 8 ounces of ivory dust, and 5 ounces of camphor. The ingredients are reduced to powder, heated, and mixed, then pressed in heated molds into sheets or other desired forms.

A PATENT BREAKFAST.—The Commissioner of Patents has lately issued a patent to John R. Weed for a hash of dried fish and potatoes, as an article of food. Boarding house keepers will now have to discontinue the practice of letting their fish balls stand over.

The tornados, it appears, are not all confined to the western parts of our country. On the 15th of August, Massachusetts experienced a touch of one of these peculiar visitors. A tornado swept from East Longmeadow to Wilbraham, and levelled everything in its path for a distance of five miles, its course being northeasterly. Stone walls and fences were strewn in every direction. A strip from five to fifteen rods in width was cut clean through a forest of large trees, and several buildings were thrown down, but no dwellings. Total loss, about $15,000.

The prospects for business this fall are excellent. The crops in nearly all parts of the country are good, and the merchants generally predict a large fall trade. Increasing activity is manifest in all departments of industry.

Dr. Robertson, in *Dental Cosmos*, gives an account of the destruction of a considerable portion of the jaw bone of a patient who had been poisoned by the fumes of zinc. The man was a brass founder, and in pouring the alloy of copper and zinc, the fumes of the latter were abundantly thrown off The action of zinc fumes upon the bones of the human system appears to be analogous to that of phosphorus.

The Erie Railway is not likely to be very profitable to its shareholders for a long time to come, if we may judge from a recent report of its new directors, who succeeded the notorious Fisk & Co. in the management. According to this report, the Company own or have under lease 1,547 miles of track, on one of the best routes in the country. But the stock was so heavily watered by Fisk, the increase having been from $16,000,000 to $80,000,000 since 1867, that it will take a considerable augmentation in the receipts before the stockholders will receive so much as a one per cent dividend.

We recently alluded to the subject of bank robberies, and suggested that the managers of such institutions ought to furnish their premises with the improved electrical alarms as the most reliable means of protection. We further stated that some of the most daring bank robberies had been perpetrated even when special watchmen were employed to guard the safes. Another remarkable example of these bold depredations was lately committed in Baltimore, Md. The safes of the Third National Bank were opened, by cuts made through the walls of the adjoining building, and completely rifled. From five hundred thousand to one million of dollars in bank notes and securities were stolen. The bank building was guarded by watchmen, who knew nothing of the matter until after the thieves had fled. This robbery might have been prevented and the thieves captured had a suitable electrical alarm been attached to the walls of the safes.

Some of the glass tanks of the new aquarium at Brighton (Eng.) are 100 feet in length. Of smaller sizes, there are a great many. We hope that one of these days the Commissioners of this city will erect aquaria of large size at the Central Park.

MOSCOW INDUSTRIAL EXPOSITION.—A large and extensive industrial exposition is now open in Moscow (Russia), and attracts great attention. We find here, as in other European countries, that the inventions of citizens of the United States, such as firearms, sewing machines, reapers, and woodworking devices, occupy the prominent places and receive the highest patronage. But in a material point of view, this is of little benefit to our people. In the first place, our tariff and tax laws have brought up the costs of manufacturing goods in this country to such a high figure that we cannot fill orders for our own goods half so cheaply as can the foreign imitator. Specimens of our improvements are eagerly sought for from abroad, simply that they may be copied; but we get comparatively few important orders. In the second place, many of the continental patent laws are so framed as to discourage American inventors from undertaking the introduction of their improvements. For example, in Russia the expenses of securing a patent are very heavy, and the grant only lasts for ten years. The formation of companies, the inauguration of new enterprises, the movement of individuals, are all burdened and discouraged by governmental surveillance and official interference. At the present Moscow exhibition, the best specimens of Russian cotton are those raised from American Sea Island seed. The display of American sewing machines is quite large; although few, if any, of the machines came from this country. They were mostly made in Germany, and are copies of our patterns.

The celebrated American yacht Sappho is now in England, and Mr. Douglas, her owner, has challenged all the British schooner yachts to race with him across the channel and back. It is believed that the Sappho can beat anything there is afloat of equal size in European waters.

Recent Patent Decisions.

APPEAL FROM THE BOARD OF EXAMINERS-IN-CHIEF IN THE MATTER OF THE APPLICATION OF PHILIP C. SCHUYLER FOR LETTERS PATENT FOR IMPROVEMENT IN FLOUR SACKS.—DECIDED JULY 31, 1872.

Leggett, Commissioner.

The alleged invention in this case is a flour sack, made of a fabric consisting of cloth and paper attached to each other; to be made in such a manner that the cloth shall be on the outside.

The applicant is rejected upon an application made by Charles E. Howland, who invented a bag made of precisely the same fabric, except that he describes it as having the cloth on the inside and the paper out; in other words, Howland's bag is made of a fabric with one side out, and applicant's of exactly the same fabric with the other side out.

It seems to me ridiculous to talk of the difference between these two bags constituting an invention. The reference I regard as well made and as fully answering the claim of the applicant; but even in the absence of any reference I would not regard a bag made of such a fabric as being patentable.

Bags have long been made of cloth, and also of paper. The fabric consisting of paper and cloth, or a fabric having one surface composed of paper and the other of cloth, is old, and has been used for a variety of analogous purposes for many years. To say that a person entitled to the use of this fabric should not have the right to make it into so common an article as bags, with either side out that he might prefer, would be placing a restriction upon the use of the article which is not justified by the patent laws nor by common justice.

The decision of the Board is affirmed.

HENRY AND F. J. L. BLANDY.—EXTENSION OF LETTERS PATENT NO. 21,059, FOR IMPROVEMENT IN STEAM ENGINES.—DECIDED JULY 27, 1872.

Novelty.—Diligence.—Remuneration.

Where the validity of the patent has been sustained in court, and no new references are brought to the attention of the Office, the novelty of the invention patented must be regarded as unimpeachable.

Where the inventors have manufactured their improvements, but their reasonable profits have been reduced by inferior machines put upon the market by infringers, and where active and persistent efforts have been made to bring such infringers to justice: *Held*, that it cannot be charged upon the inventors that it is through neglect or fault of their own that they have failed to secure reasonable remuneration for their invention.

The invention having been proved of great practical utility in its application to portable steam engines: *Held*, that a net profit of $9,000 is an insufficient remuneration for the time, ingenuity, and expense bestowed upon the invention.

Thacher, Acting Commissioner.

United States Circuit Court, Western District of Pennsylvania.—Smith *et al. vs.* Frazer *et al.*—*In Equity.*

PATENT OF J. R. SMITH, AUGUST 27, 1867, FOR STONE CRUSHER—MECHANICAL MODIFICATIONS WITHOUT INVENTION—NOTICE OF PRIOR KNOWLEDGE AND USE.

McKENNAN, Circuit Judge.

A claim for introducing water into the pan of a stone crushing machine to aid in disintegrating the rock and to cleanse and discharge the pulverized sand, the auxiliary and dependent relations of the water to the mechanism and its cooperative agency being fully set forth in the specification, held to embody patentable subject matter.

The patent of John R. Smith pronounced invalid in view of the Chilianmills previously used in crushing and washing ores.

Where the gate in a machine for crushing and cleansing gold ores had been placed in the side of the pan, above the bottom, with view to discharging the water and lighter impurities, but retaining the gold: *Held*, that if it were desired to discharge the entire contents of the pan, this could so obviously be effected by extending the aperture to the bottom that the change would fall far below the rank of an invention. To conceive and make it would require but a small amount of mechanical knowledge.

If, in the notice of special matter relating to the novelty of the patented invention, the sources of defendants' proofs are indicated with such distinctness that the complainant can identify and resort to them, the purpose of that provision of the law which requires the defendant to give "names and residences of those whom he intends to prove to have possessed a prior knowledge of the thing, and where the thing had been used" is answered.

Where the defendants gave the name of certain mining establishments in a specified county as the places where the prior use of the invention had taken place: *Held*, that they had fairly supplied the complainants with the means of verifying their proofs, and had filled the measure of their legal duty.

Complainants, John R. Smith, William H. Denniston, and Christian Snyder; defendants, William E. Frazer, Harvey Fry, George H. Holtzman, and David L. Furnier, treading as *Fry, Frazer & Co.*

The claims of the patent were as follows:

1. The introduction of a stream or flow of water into the crushing pan of a revolving sand, sand rock, or sandstone crusher, to aid the crusher or crushers in disintegrating the rock, and to cleanse and discharge the pulverized sand, substantially in the manner and for the purposes hereinbefore set forth.

2. The rotating and revolving crushing wheels, *b*, in a sand rock crusher, in combination with a crushing pan, *a*, provided with a discharge gate, *s*, and a water supply pipe, *h*, or its equivalent, all constructed and operated substantially as and for the purposes above set forth.

Bakewell and Christy, for complainants; John Mellon and John H. Bailey, for defendants.

THE AMERICAN INSTITUTE OF INSTRUCTION held its forty-third annual meeting in August last at Lewiston, Me. Several of our prominent and indefatigable workers in the cause of improved education were present, and quite a number of valuable papers were read. Mr. Nathaniel T. Allen, who, as an agent for the United States Government, has visited Prussia and examined the educationary system there in vogue, stated that he found the Prussian system to be far ahead of the American system, and urged a course of united action among educators which shall bring ours up to a level with theirs. He, however, considered the Prussian system to be defective in the following particulars, namely: 1. It is autocratic; 2. It is unjust to girls; 3. It is thoroughly undemocratic in its teachings; 4. It is sectarian.

Glass Lined Iron Pipes.

This is a new and valuable manufacture now carried on in this city by the Glass Lined Pipe and Tube Company of New York. Through these pipes the water comes in contact with nothing but glass, and cannot become impregnated with any oxide, as in all metallic pipes; there being no oxidation or corrosion, their purity and durability cannot be questioned. The inner surface of the pipes being perfectly smooth, there is no friction, and the flow of water is greater, and can be carried up in houses with less pressure than through any other pipe of the same diameter. The lining between the iron pipe and the glass tube inside consists of plaster of Paris, a nonconductor of heat; this prevents the water therein from freezing in winter and keeps it cooler in summer, thus saving these pipes from bursting. The lining in the pipes is protected against any moisture by a layer of hydraulic cement, which is put on the end of each length of pipe, thus preventing the plaster of Paris from being affected. The resisting power of the glass lined pipe is five times greater than lead, and the difference in the expansion and contraction between iron and glass is overcome by the compressible plastic substance between the two materials. The glass lined pipes are invaluable for conveying chemicals or any other liquids that are to be kept free from impurities, and also for ale and beer pumps, condensing of salt water on steamers, purifying gas, and for numerous other purposes. It is a fact well known that quite a percentage of gas escapes through the pores of the iron. When lined with glass this waste is prevented, and the pipes rendered much more durable. Great expense for continual repairs is almost entirely overcome, and the cost of this pipe is not much above lead pipe.

New Process for the Preservation of Alimentary Substances.

In a communication recently made to the French Academy, M. Sacc described his process and submitted specimens of meat and vegetables so prepared. The food to be preserved is placed in a barrel, with layers of powdered acetate of soda, in the proportion of one fourth by weight. In winter, the temperature must be raised to 20° C. After twenty-four hours, the barrels must be turned, and after forty-eight hours the process is complete, the salt having absorbed the water of the meat, which may then be headed up in the pickle, or dried in the air.

If the barrels are not full, they are to be filled up with brine of one part acetate of soda in three parts water. The pickle is evaporated down to half its bulk, crystallizing and regenerating for use one half the salt employed.

The mother liquors form an excellent extract of meat, representing three per cent of the total weight, and must be preserved and poured over the preserved meat when prepared, so as to restore the original flavor of the fresh meat, of which it is otherwise bereft by the retention of the potassic salts in the pickle.

For cooking, the preserved meat must be steeped for from twelve to twenty-four hours, according to size, in tepid water containing ten grammes of sal ammoniac per liter. This salt decomposes the acetate of soda contained in the meat, forming salt, and also ammoniacal acetate, which causes the meat to swell, and restores to it the odor and acid reactions of fresh meat.

The bones also yield an excellent and tasty soup. By adopting the precaution of simply removing the intestines, animals, etc., may thus be preserved whole. Fish, poultry, and game have been so treated, with excellent results. Meat may be dried in a stove, losing one quarter in weight thereby, in addition to one quarter lost in pickling; but, in general, fish cannot be dried at all.

Vegetables are similarly prepared, losing generally five sixths of their weight; before salting, they should be heated until they lose their rigidity. In twenty-four hours they may be pressed and dried in the air. For use they must be steeped for twelve hours in fresh water, and then boiled as if fresh. Potatoes must be steamed before salting.

Finally, all food thus prepared must be kept perfectly dry, as the salt absorbs moisture from the air.

New Galvanic Battery.

M. Gaiffe has recently introduced to notice a new electric pile, devised by him with a special view to its universal cheap production. It resembles in form Callaud's cell, which has been employed for some years on telegraph lines, but the elements are different. The poles are rods of lead and zinc, immersed in a ten per cent aqueous solution of ammoniacal chlorhydrate, contained in a suitable vessel. The zinc rod is only half the whole depth, whereas the lead rod reaches to the bottom, where there is a layer of saline oxide of lead (minium). The electro motive power of this pile is about one third of that given by a Bunsen couple; its internal resistance is small and little variable, as the chloride of zinc formed does not sensibly change the conductibility of the exciting liquid; its constancy is great; and finally the cost is merely nominal when the circuit is open.

The Medicinal Use of Carbolic Acid.

Carbolic acid is very largely employed in the treatment of wounds and festering sores of all descriptions; but hitherto few experiments have been made with it as an internal remedy. There is good ground, however, for believing that in certain cases it will be found a very valuable therapeutic agent, and under these circumstances the *Lancet* describes some experiments which have been made by two French *savants* to ascertain in what doses it may be poisonous.

MM. Paul Bert and Jolyet, of Paris, have undertaken experiments to make out this point. Between forty-five and sixty grains will kill a dog of large size; nor should it be concluded that a man could bear a dose in proportion to his weight compared to that of the dog, as thirty grains of hydrochlorate of morphia have been injected into the jugular vein of a dog without killing him. Of course one fourth of this dose would kill a man. The above mentioned authors state that carbolic acid is a powerful poison, which, very imprudently, is left in the hands of anybody, either in solution or in the solid state. The former is the most dangerous, as some weak solutions for internal use are sold, as well as very strong ones intended for external use. Thus mistakes may easily occur. MM. Bert and Jolyet find that carbolic acid acts like strychnine on the excitability of the spinal marrow. It increases its sensibility, like strychnine, at first; but it diminishes that sensibility, or completely abolishes it, when the convulsive stage has exhausted the medulla. The phenomena resulting from carbolic acid are said by our authors to be quite similar to those produced by chloroform, chloral, ether, woorara, and the section of a motor nerve.

Importance of Truth in the Cultivation of the Memory.

When we reproduce what we have seen or otherwise experienced, it must be with scrupulous fidelity. No details must be filled in by the imagination. It is one of the most difficult things in the world to speak the exact truth, or even to represent to ourselves the exact truth. If we hear an event frequently related, we soon begin to confuse it with our own recollections. In this way, honorable and conscientious persons have testified to witnessing occurrences which really took place before they were born, but which had been often repeated to them in childhood. The imagination is an active and deceitful faculty, often putting on the guise of recollection. Without the most vigilant care to distinguish the two, men may come to utter the most absurd falsehoods, without any suspicion that they are not telling the truth. Imagination is but a rearrangement of our experiences, and the faculty of taking note of this rearrangement gets untrustworthy without a persistent and conscientious exercise of it. Hence, though, as the proverb says, liars have need of good memories, they are of all men the least likely to have them. The best cultivation of the memory, therefore, forbids us even to highten the color of a narrative, or sharpen the edge of a witticism, when professing to narrate what has occurred, but to accept dulness rather than admit inaccuracy. —*American Exchange and Review.*

The Reffye Cannon.

This piece, so called the Reffye, after its inventor, is a gun recently employed in the French artillery; it is a breech-loader, and can throw a projectile weighing 7 kilogrammes (15·4 lb.) for a distance of 5,500 yards.

This gun combines the lightness and portability of field pieces with the accuracy and range of siege guns of average caliber. The grooves are numerous, in order that an equal action may be imparted to the whole surface of the lead-covered projectile. The gun is of bronze, made of 100 parts of copper to 11 of tin. The total length of the piece is 6ft. 8¾ inches, the diameter of the bore is 3 5 16 inches, and the weight of the complete weapon is 1,320 lb. The charge is divided into two parts, the cartridge and the projectile, their respective lengths not permitting of their being united. Forty-two ounces of compressed powder, arranged in disks, form the charge, which is placed in a metallic envelope, the net price of which, complete, is 1·10 francs. As to the projectile, it is cylindro conical, of cast iron, 9¼ inches long, and covered with a zinc envelope. The shells are ignited by a percussion fuse. This type of ordnance, rendered celebrated during the defence of Paris, principally on the plateau of Avron, will play an important part in the future of French artillery.

CERESINE.—Céresine is a new product destined to play an important part as a lighting material. It is obtained from ozokerit or fossil wax by the following process: Ozokerit is heated up to a temperature ranging from 250° degrees to 300° Cent. in order to separate, by volatilization and subsequent condensation, the liquid oils. The mass being cooled down to 60°, it is heated with from 10 to 20 per cent of the sulphuric acid of Nordhausen. The temperature is then raised to 100°, and care is taken to maintain this heat until the precipitation of the carbon takes place and forms a viscous residue, which is carefully separated from the supernatant oils, heated and then treated with about ten per cent of diluted sulphuric acid, afterwards neutralized by aid of an alkali. The mass is then heated to about 180°, poured upon plates and pressed through linen cloths in order to separate the greasy matters; this residue of wax can then be melted and filtered. The product is céresine, which is employed in the manufacture of candles.

LEE, THE LEARNED CARPENTER.—Samuel Lee, Professor of Hebrew at the University of Cambridge, England, was seventeen years of age before he conceived the idea of learning a foreign language. Out of the scanty pittance of his weekly earnings as a carpenter, he purchased a book, and when this was read, he exchanged it for another, and thus he advanced in knowledge. He had not even the privilege of balancing between reading and relaxation, but was obliged to pass directly from bodily fatigue to mental exertion. During the six years previous to his twenty fifth year, he omitted none of the hours usually appropriated to manual labor, and he retired to rest regularly at ten o'clock in the evening, and yet at the age of thirty-one years he had actually taught seventeen languages. This illustrates that "where there is a will, there is a way."

FANCY WEAVING LOOM.

The invention we illustrate relates to a new arrangement of mechanism for producing the harness motion in fancy looms. Mr. John Crawshaw, of Coburg, Ontario, the inventor, is a practical weaver, and has devoted years to bringing these improvements to perfection.

Fig. 1 gives a perspective view of the machinery employed, unincumbered by the harness, heddles, etc. Its more essential parts are shown in detail at Fig. 2, and their mode of operation will now be explained. At A are levers whose upper ends are connected by lines with their respective heddles in such manner that the heddles are raised when the upper ends of the levers are forced outward. B are levers connected similarly with the lower sides of the heddles, so as to pull them down, when their lower ends are forced outward. At C are elbows which operate these levers, and which are themselves worked by the chain, D (shown only in Fig. 2; its reel is seen in Fig. 1). The normal position of the elbows is that of rest against the upper part of the levers, B, under which conditions the heddles also are at rest, and the warp remains unopened. Upon the chain pressing in the ends of the elbows next to it, the other ends are raised so as to release the levers, B, and to press back the lower ends of the levers, A. The effect of this is to raise the heddles connected with the levers and to open the warp so that the shuttle may be thrown. A cam is now made to operate through levers upon the rods shown at E, in such a way as to bring the levers, A and B, all into line in a neutral position, thereby closing the warp. The inner ends of the levers are now clear of the elbows, which, being released by the chain, fall into their normal position.

Another prominent feature is the mode of driving the wheel that carries the chain. F is the driving shaft, upon which is placed the sleeve, G. This sleeve carries a cam of peculiar form, shown in the engravings, by which the reel is rotated. The shaft admits of being easily shifted in the direction of its length, and the sleeve and it are only held together by the pin and notch shown at H, which are brought together by a concealed spring. This spring is made to adjust the hold taken by the pin so nicely as to allow of the rotation of the sleeve only while the loom is working properly and smoothly. When, by reason of any accident happening, extra work in turning the reel is thrown upon the sleeve, the tension of the spring is overcome, the pin is disengaged from the notch, and the shaft continues to rotate without carrying the sleeve with it. Thus all chance of damage is effectually prevented.

The improvements described are of a very important nature. In the usual construction of fancy looms, the warp is opened by a combined up and down movement of the heddles, which is effected only by very complicated machinery governed indirectly by the Jacquard chain. In Mr. Crawshaw's loom, the warp is opened by a simple upward movement of the heddle, to effect which requires considerably less power than the usual movement. This allows of the direct use of the chain in producing the motion, and does away with a long train of intricate mechanism.

A patent for this loom was obtained through the Scientific American Patent Agency, July 23, 1872, and further information in regard to the invention can be obtained of Mr. Crawshaw, as above.

Fig. 1.

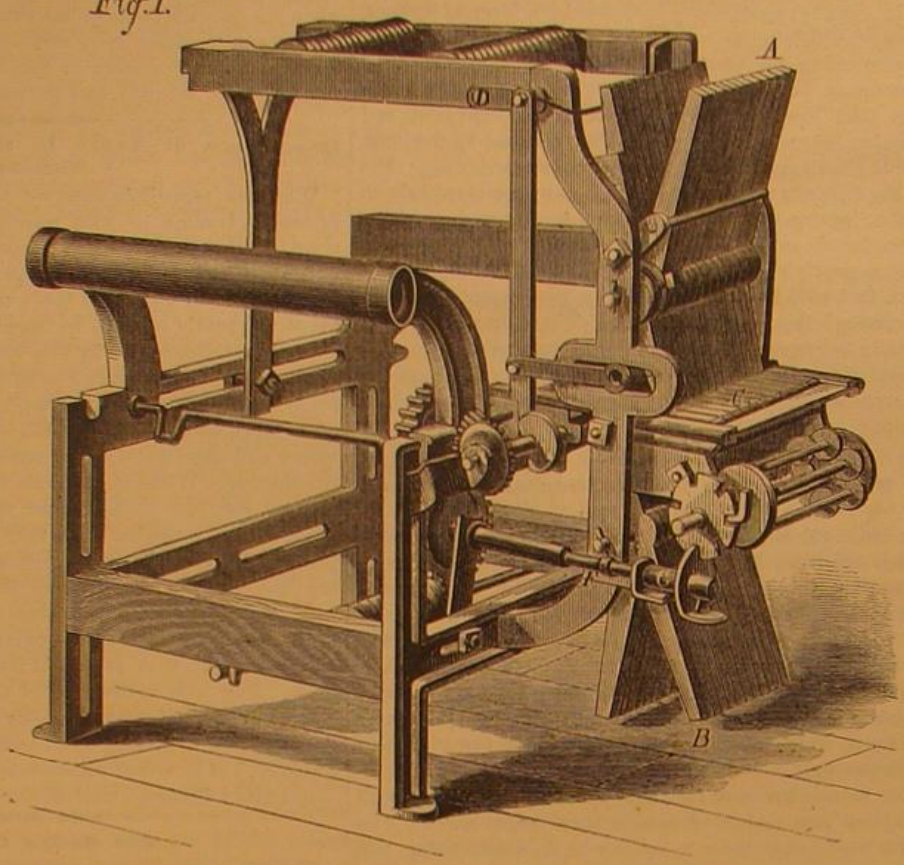
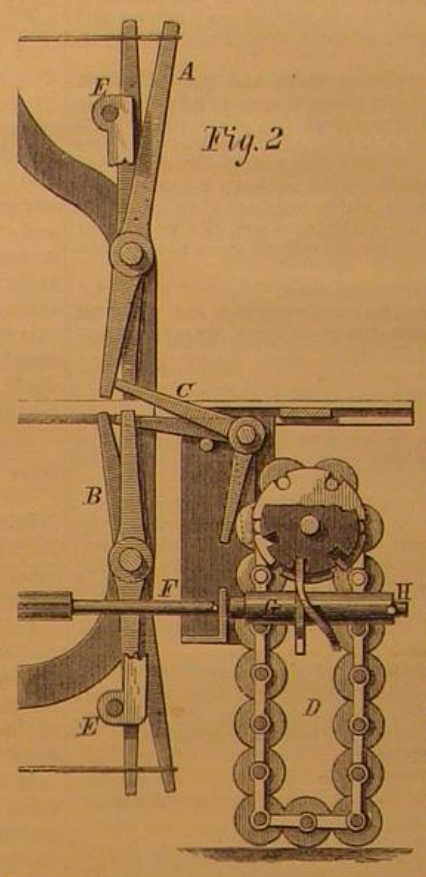


Fig. 2



CRAWSHAW'S FANCY WEAVING LOOM.

Architectural Millinery.

Architectural millinery is that class of unnecessary detail which is used simply because it is thought ornamental, and not because it in any way adds to the utility, comfort, or expression of a building. There is architectural millinery in all styles, and it might, if it would not lead to confusion of ides, be summed up as Flamboyant, as Mr. Ruskin employed that term. If we turn to the florid descriptions of the press, of the last reredos wrought for our own cathedrals at the price of a prince's ransom, twisted columns decked with glass mosaics, agate balls, and similar ladylike millinery, form the staple of the attractions dwelt upon. While we cannot but sigh over the waste in such trumpery of sums that might pay for real art, and by this have raised up the school of decorative artists we so much desiderate, we look with sterner eyes upon architectural millinery of the baser and more meretricious nature which flaunts itself before our eyes in the streets. If twisted columns are absurd, what is to be said of still more important features tortured, parodied, and misplaced, pediments cut in two, and the ends curled up: whole orders stuck on to facades, like false shirt fronts poised upon brackets or monstrous nondescript corbels: wreaths and masks and heads of marine deities applied without rhyme or reason? Such is architectural millinery, which no fellow can understand, and considering its enormous cost, utter uselessness, and amazing ugliness, one wonders that hard headed citizens are to be found who consent to have their pockets so rifled as they are by the architects they affect.

If a few of the magnates of the profession could be made to pay themselves for all the rubbish they design, and forced, under such a penalty, to give good reason for the architectural faith that is in them, they would soon learn to dispense with such things as they certainly cannot believe in themselves, and for which there is no other epithet so appropriate as architectural millinery.—*Building News.*

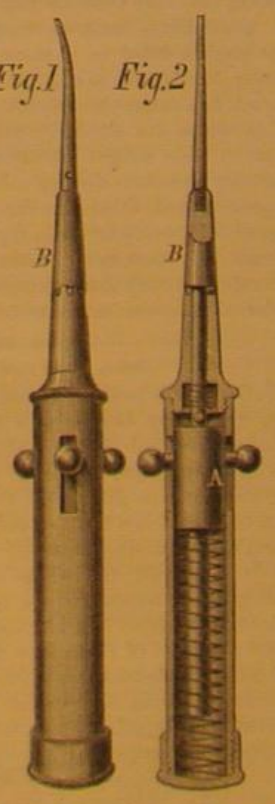
GRISWOLD'S DENTAL PLUGGING INSTRUMENT.

The improved dentist's plugger illustrated in our engraving is the invention of Mr. White F. Griswold, of Leavenworth, Kansas, and was patent d through the Scientific American Patent Agency, April 9, 1872.

Fig. 1 gives a perspective view of the instrument, and in the sectional view, Fig. 2, are shown all the parts in detail.

It will be seen to consist of a tubular case, within which is placed the sliding mallet, A. The mallet is drawn back by means of the studs shown, which pass through slots in the case; and is impelled forward by the spring seen in Fig. 2. B is the stock for holding the plugging tools, which are screwed into its forward end in the manner shown, and which are provided with holes for the introduction of a small lever when needed. The rod of the tool stock which passes into the case is connected therein, as in Fig. 2, with a spring, by which it is drawn back after being driven forward by the stroke of the mallet. On the end of the case are a number of radial notches, and on the opposed end of the tool stock are one or two radial pins, which are placed so that they fall into the notches that lie opposite and prevent the tool turning round while the instrument is being used. They further serve to keep the stock from turning while the tool is being screwed in or out, and thereby allow those operations to be performed by one hand only, which is a great advantage and sometimes a necessity. In so doing, the case is held against the palm of the hand by the third and fourth fingers, and the tool turned by the first finger and thumb. Heretofore instruments of the character have been made with but one stud for actuating the mallet. By attaching them at suitable intervals, as in this device, a stud is always presented for use when the instrument is rotated, which is often required to be done while the plugging is going on.

Fig. 1 Fig. 2



Further information may be obtained of the inventor at the foregoing address.

The Electrical Season.

The atmosphere seems to be surcharged with electricity at the present time, as is evidenced by the brilliant auroral displays, and the constant and violent thunderstorms which are of daily and nightly occurrence in different sections of the country. Telegraphic working is considerably impeded by this excess of atmospheric electricity, and telegraphers are having some lively and exciting experiences in their attempts to operate their instruments, though as yet we have heard of no serious injuries from this cause. It behoves all those having charge of telegraphic apparatus to be very careful how they handle them at such times, and to exercise more than usual caution and diligence in seeing that their lightning arresters are in good order and properly attached to the wires. They should also be careful to cut out of circuit their instruments, when left for the night or for any length of time unattended or unwatched.

We notice that the same electrical condition of the atmosphere exists in England, and much damage has been done to telegraph lines and instruments by violent electrical storms.

There have been recently some very brilliant displays of aurora borealis or northern lights, which are rather unusual at this season of the year. On Thursday evening, August 1st, the skies were lit up for some hours with a most magnificent exhibition of celestial fireworks, and again on Saturday, August 3d—both of which continued for some hours, and were visible over a great extent of country. The electrical character of these exhibitions is now generally known and conceded, though one of the great morning newspapers of this city, which is noted for its scientific information and accuracy, gravely argues that they are caused by the refraction of the sun's light from the great polar ice fields!

On the evening of August 15th, one of the northern wires of the Western Union Telegraph Company was worked from this city for some time with the auroral current, the batteries being disconnected; and on the evening of the 18th, one of the eastern wires of the same company was worked successfully from this city to Boston for half an hour with the auroral current. This was doing pretty well for the refraction of light from polar ice fields.—*Telegrapher,*

Cleaning off Panels.

In cleaning off, the different panels on heavy or light work requires close attention of the body maker. When the job is finished by the painter, all uneven places will show when exposed to the light. The body maker should have certain planes for cleaning off swelled and concave panels. Planes that are used upon coach quarters should be concaved from 1-6 to ¼ inch, so that they would remove all flat places; for concave panels on coaches when cleaned off, care should be taken that no short sweeps or concave are left. A few days ago we noticed a very fine finished coach in the street, but when the sun shone upon the concave, it showed a number of wrinkles, which were caused by the unevenness of the panel, and the quarters were the same. The generality of body makers can detect all uneven places by rubbing the hands over the panels while finishing; by constant practice the hand becomes sensitive to the least unevenness. In light bodies where the panel is plain or flat, the panel should always have a little fulness when cleaned off, for if not, when painted it looks as if it was sunk or concaved; a panel that is full shows the painting to a much better advantage. In sand papering off panels, a large block should be used; cork blocks are the best, as they can be used in almost any sweep, some use leather of two or three thicknesses for small concaves.—*Coachmakers' Journal.*

THE length of tacks, as understood and given by the manufacturers, is by the "ounce," which is printed on the label, and stenciled on the box or package in which the goods are placed for transportation. "Three ounce" means that the package so labeled contains tacks three eighths of an inch long, and that for every three ounces of tacks of that length there should be 1,000 tacks. Four ounce would be seven sixteenths inch long; six ounce, eight sixteenths; eight ounce, nine sixteenths; and for each "full weight" package thus labeled, there should be 1,000 tacks, and so on up to twenty-four ounce, which likewise is equivalent to one and a quarter inches long, and 1,000 tacks.

Scientific American.

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SCIENCE AND THEOLOGY.

One of our late semi-religious exchanges contains an editorial, in which the modern scientists, Huxley, Spencer, Darwin, *cum suis*, are taken to task for not being the same orthodox believers in the different dogmas of Christian theology as were Isaac Newton and the scientists of his time. The question is asked if the fame of the modern *savants* would not be just as great if, in religious matters, they had the faith of Newton; as if the opinion of a thinking being concerning such subjects was a matter of choice. The simple reason why men like Huxley are not as orthodox as similar men in the time of Newton is that we live now in the end of the nineteenth century, and that the world has progressed since Newton's time. The best half of the present civilized population of this earth has commenced to see that blind faith in matters of religion is by no means a virtue, as was formerly believed, but that reason is a Divine gift to mankind, the use of which it is highly sinful to despise.

We may as well ask why so many prominent modern theologians, and even laymen (we will not mention names), are now-a-days not so orthodox, and why they have not the same views on many important points of doctrine as those of a few centuries ago. We may as well point to the fact that the blind faith of the middle ages is no more to be found in the Christian world, except perhaps in the Leontine city of Rome; and even there the motives of that faith are open to strong suspicion that it is not a faith adhered to for its own sake, but instigated by self interest.

The effect, of the whole editorial referred to, does not amount to anything, as in place of giving a single argument against the tendency of modern science, it consists of a long winded lamentation that religion is not made as much of, by the modern scientists, as it used to be in olden times; and that science in place of being the handmaid of theology, has since those times frequently arrogated itself to contradict its teachings. And this is true.

THEOLOGICAL ERRORS CORRECTED BY SCIENCE.

Theology taught that the earth was flat, and supported on rocks, below which there were immense dark caves or spaces, the abode of evil spirits, while the firmament above was an arched vault supporting another immense space, full of light, the abode of the good spirits; science taught that the earth was round, in fact a sphere floating without support in space, and that the firmament was not an arched vault but surrounded the whole earth, and was an infinite space, full of suns and worlds.

Theology maintained that the earth was a stationary center around which the whole universe revolved; science took the conceit out of theology and mankind in general by proving that the earth was a comparatively insignificant globe, floating in the immensity of space, and revolving like a small inferior wheel in an immense piece of highly complicated machinery. Theology maintained, on the authority of a translated, mutilated, and obscure tradition, that the whole universe was created in six literal days; in fact theology made the absurd assertion that the Unchangeable Divine Being could have existed for all eternity without doing anything, and then suddenly changed his mind and in less than a week created a universe, set it all going, and then needed rest like a frail human body, suggesting the blasphemous idea that the Divine Creator was tired out. Science proved that, as far as concerns this earth, it was formed many millions of centuries ago, and went through different stages of transformation, each lasting immense periods of time, and that the Divine power was active all the time as it is now, and will be for ever. Theologians maintained, on the ground of the same tradition, which they continually have been misunderstanding and misinterpreting, that this single creative act took place six thousand years ago; but science produced relics of plants and animals which must have lived millions of years ago, while the circumstances and localities in which they were found proved that other millions of years preceded them.

In all these, as in every other instance, science has been triumphant, while theologians had to give in and acknowledge, however reluctantly, these triumphs; and notwithstanding they at first cried that religion was in danger, that they accused the scientists of Radicalism, Deism, Atheism, and hurled at their heads other accusations of the same sort, the only activity they exercise now, consists of attempts at reconciliation between science and theology; and this indeed is their legitimate calling.

In all the tumult created by this antagonism, which is unwisely kept up by a certain class of theologians, there is one great consolation. It is the consideration that the relative positions of theology and science have been changed since the time of Newton. Then the spirit of the tribunal which condemned Galileo still prevailed; every new scientific theory was tested by the teachings of the theologians of the day, and if these men decided that it was contrary to their doctrines, it was condemned; this being the spirit of the society which was under the tutelage of the clergy, no man, not even Newton, dared to be anything but orthodox. No doubt this had a great deal to do with the difference in the apparent theological opinions of the scientists of that time and of the present day, when science, by experience made conscious of her superiority, has lifted up her head, and in place of being the handmaid of theology, and being judged by theologians, has placed herself in position to judge the teachings of theology, and to decide which are true and which are erroneous. Let the reader keep in mind that we speak of theology and not of religion.

We maintain that a scientist who devotes his life to the study of God's own handiwork has more true religion and a more exalted idea of that mysterious Divine Being, who, with such wisdom, power, and superior conception of the truly beautiful, presides in the management of the infinite Universe, than the so-called theologian who, neglecting the study of God's own handiwork, confines himself to the discussion of old obscure literary traditions. For our part, at least, we must confess that our religious feelings of awe for the Creator have often been severely shocked by visits to a certain theological seminary, on hearing the professor expatiate before his class of theological students, on the classified properties of God, what He is, and what He is not. To the scientist such a lecture is nothing but arrogance and blasphemy, and such lectures are, alas, occasionally propounded in some of our orthodox churches.

PROGRESS OF AMERICAN INDUSTRY---INAUGURATION OF FIVE GRAND INDUSTRIAL EXPOSITIONS.

If we may judge from the magnitude of several expositions that have lately been inaugurated in different parts of the land, it is very evident that our country is now making the most gratifying industrial progress. Besides the usual town, county and State agricultural exhibitions, where the best products of local industry are always brought forward, we are favored this year with several extraordinary expositions, very comprehensive in their nature and highly creditable to the nation.

In New York city, the grand industrial exhibition of the American Institute, now about to open, will doubtless form a marked attraction. All the prominent industries are to be represented, while a series of remarkable experiments, new products and new inventions, for the first time made public, will lend interest to the occasion. The American Institute has purchased the buildings on Third avenue at 63d street, and they have been fitted up with special reference to the convenience of the public and the various exhibitors. The buildings cover some three acres of ground. Ample provision has been made for the operating machinery, a department which interests every visitor.

At Newark, N. J. the grand exhibition so long in preparation has lately been inaugurated with much enthusiasm, and its success is a matter of just pride to all the inhabitants of New Jersey. This State, although small, is remarkable for the wealth of its natural resources. A fertile soil covers its surface, beneath which are found rich and inexhaustible stores of iron, copper, zinc, and other valuable minerals. The wonderful growth of the city of Newark is itself an indication that these natural advantages are duly appreciated. Its population now exceeds one hundred thousand. Over a thousand railway trains daily connect it with New York. Newark is rapidly becoming the Birmingham of America. Every sort of manufacturing industry is carried on here in the most approved manner, and all are beautifully exemplified in the present exhibition. The building is very large and the display exceedingly good.

The exhibition of the Maryland Institute just opened at Baltimore is a splendid affair, and is attracting hosts of visitors. The display is very fine, and reflects great credit upon the abilities of its managers. The Institute building is large and commodious.

The Cincinnati National Exposition, open from Sept. 4th to Oct. 5th, is arranged in sixteen grand departments and is undoubtedly the most extensive exhibition that has taken place in the Northwest.

The Grand National Industrial Exposition, just opened at Louisville, Ky., marks a new era in the history of the southwestern States. An immense fireproof structure, of elegant design, has been erected at public expense in the heart of the city, for the special purposes of the exhibition. The building is said to be the largest ever erected in this country, and in it are collected all the noblest examples of American genius and industry.

PROGRESS OF THE NEW DOCKS IN THIS CITY.--ARTIFICIAL STONE BLOCKS WEIGHING SEVENTY-NINE TUNS.

We do not propose to consider at length the system of dock construction adopted by the Department two or three years since, which was in the main a composite plan, made up from scores of projects duly elaborated in drawings and specifications, and laid before the authorities in answer to their invitation. (This plan was illustrated in our issue of August 24, ult.) The fact that the famous European models of dock construction, those of Liverpool, for example, afforded no guide in selecting a system for New York, our tide rising but five feet instead of twenty five, left the field open for, and even demanded, considerable originality in providing a practical method. This last is now being put under way although it will doubtless be some years before it is completed. The improvements contemplated will, when finished give the city a wharfage of thirty-seven miles. The Commissioners seem disposed to employ, in their work, the means that experience has shown to be the most efficient, as for instance, in a trial of *Béton Coignet*, which, by the way depends rather upon the peculiarity of its making than upon any special novelty in its composition. On the dock at the foot of Little 12th street, two large blocks of this material are now lying, each weighing seventy-nine tuns, while two others of the same kind and weight are lying on the dock at foot of West 17th street. Each block is seven feet high, twelve long, and ten wide, but instead of being cast in molds of these internal dimensions, they are formed, as it were, in a succession of layers. A rectangular box, like the "cope" of an ironmolder's flask, ten by twelve feet internal area, is laid on a suitable flooring; the plastic material is then poured in and rammed until all the superfluous water is driven out; after which it is allowed to remain until tolerably hard. The mold or frame is then lifted up nearly but not quite clear of the mass. More material is then poured into the mold, above the other, and treated in the same way, and so on until the block is brought to the requisite hight. In building piers, bulk heads, etc., those blocks are laid on a "rip-rap" or foundation of broken stone.

The commencement on the west side, of the bulkhead that in time will surround the city, may be seen jutting out from the edge of the Battery, and the mode adopted in laying its foundations is the type of that to be employed in all similar cases in the dock improvements. A "rip-rap" foundation, formed by dumping broken stone upon the bottom, is first made. Into this, vertical piles are driven around the space to be occupied by the superstructure, this space being further enclosed by timbers laid on the broken stone and secured to the piles. Concrete in a plastic condition is then poured in, and two divers in armor take a mighty straight-edge and move it across to level off the top. When the concrete hardens, the piles and timbers are taken out of the way and the blocks of stone, natural or artificial, are laid upon the concrete in regular courses.

THE DERRICK FOR LAYING THE BLOCKS.

For laying the blocks and for other analogous purposes, a new floating derrick has just been completed. It draws ordinarily about five feet nine inches of water, and when engaged in very heavy hoisting, from eight to nine feet. The scow upon which the tower mast and boom are supported is about sixty feet square, and the arrangement is such that usually the weight on the deck of the scow is sufficient to balance or counterpoise that lifted when the derrick is in operation. The lifting power exceeds somewhat one hundred tuns, and the load can be lifted to a hight of sixty-four feet. The boom and mast are both of wrought iron, while the tower is of wood, strapped and bolted with iron. The mast is made hollow and the hoisting ropes pass up through it from the winding drums of the engines. Of these last, one is for lifting light and the other heavy weights. Each engine has two cylinders, one at each end of its drum shaft. Their cylinders are twelve inches in diameter, and fourteen inches piston stroke. The boiler is of the vertical tubular type, has two hundred tubes, is five feet six inches in diameter and eleven feet six inches high, and rated rather loosely at from fifty to one hundred horse power. It has eighteen feet of grate surface, and the tanks from which it is supplied with fresh water are located beneath the deck of the scow. We may further mention that the hight of the derrick from the deck to the top of the mast is one hundred and sixteen feet, and that the boom has a length of fifty feet one way and sixty the other, or one hundred and ten in all.

We note no unusual activity in the work of the department, but that there is some progress is shown by the items we have mentioned. The fact that changes are made at these points where the owners of water front property desire them, instead of continuously from any given locality renders any analysis of the advancement made extremely difficult, but as these changes are all in accordance with the comprehensive plan alluded to at the commencement of this article, every day's work is so much accomplished toward making our city docks and wharves somewhat in accordance with the magnitude of our commerce and the wealth and prosperity of our people.

IRIDESCENT ENGRAVINGS.

The beautiful iridiscence of the pearl has been ascertained by microscopic investigation to be due to the presence upon its surface of exceedingly fine ridges or lines, the edges of

which unequally refract the rays of light and produce many shades of color of marvelous delicacy. This effect may be artificially produced upon glass and other substances, by cutting lines thereon of sufficient fineness. Mr. Rutherford, the well known scientist of this city was, we believe, one of the first to construct a machine capable of engraving these iridescent lines. These he produced upon glass, as test objects for microscopes. The cutter was worked by an electro-magnetic machine. Another of these instruments is now to be seen at Harvard University, and is thus described in the Boston *Globe*:

Among the many curious inventions existing beneath the dome of the Cambridge observatory, there is a machine which is used to delineate upon glass the figure of a circle or square, by means of finely drawn lines. This machine, which is the invention of Mr. Rogers, who is connected with the observatory, is very simple in its operation, and draws each line with an accuracy which is very surprising. This is done by means of a graduated plate of metal, which acts upon a very sharply and very finely pointed needle, so that it may be set at any distance from a line already drawn. By actual trial, the skillful inventor drew upon a small piece of glass twenty-four lines, separated by a distance of a 2400th of an inch, in about a minute's time. These wonderful lines could be easily counted through a microscope, but viewed with the naked eye they formed a single, but somewhat imperceptible, line. It was nearly impossible to imagine the exceedingly minute distance which separated them. Parallel lines had been drawn upon other plates of glass, which, though apparently single, were found, when placed beneath the microscope, each to be composed of several distinct lines A circle, also, which was about a quarter of an inch in diameter, contained sixteen hundred lines. The light was very beautifully reflected from their minute sides, and the circle glistened and sparkled with all the colors of the rainbow. Upon one plate of glass had been traced circles within circles, the lines of which they were composed being scarcely discernible; but when perceived through the microscope each line assumed a perfect precision, and the delicate symmetry of each circle came out in exquisite relief. The extremely minute space in which this immense number of circular lines was contained appeared to be very wonderful. There were many other drawings, which were equally astonishing, and which showed equally well the fine skill of Mr. Rogers. It was curious to find among the great instruments of the observatory, which sweep every portion of the heavens and travel along the great equatorial circle, this little machine, capable of producing lines which hid themselves in their minuteness from the unaided eye of the observer.

THE LAKE SUPERIOR COPPER REGIONS.

It will be perceived from the letter of our esteemed correspondent, Professor Thurston, which we elsewhere publish, that he has reached the heart of the wonderful mining regions of Lake Superior, where he is busily engaged in the examination of the most important localities. He gives us the details of the methods now practiced there in mining copper, which will be read with much interest.

REMARKABLE THUNDERSTORMS.

Portions of New York State and the New England States were visited on August 14, 15, and 16 by some of the most terrific thunderstorms ever experienced. In a newspaper account of the results of one of these storms at Boston, Mass., and vicinity, the names of twenty-seven persons are given who were more or less injured by the lightning, while at least one hundred more individual cases are referred to whose names were not ascertained. Over fifty buildings are also particularly designated as having been struck and damaged, while many others are referred to as having been struck but not injured. In various other parts of the States mentioned, extensive damages were occasioned and some lives lost. The poet Whittier, at Amesbury, Mass., was struck, but not seriously hurt. His dwelling was somewhat broken. The aggregates reported, as near as we can estimate, indicate that some two hundred buildings were struck and damaged, over one hundred and fifty persons were struck, and some ten individuals were instantly killed. Quite a number of barns, with their contents, hay and cattle, were fired and consumed.

An intelligent observer at Arlington, Mass., writes to the *Boston Transcript*, describing a midnight thunderstorm at that place, August 14:

"Brilliant streams of the electric fluid darted athwart the sky in every direction, and the thunder which followed was constant for a period of thirteen minutes, without the intermission of an instant of silence. One flash of lightning followed another in such rapid succession as to excite curiosity to know how many occurred in a minute. With watch in hand, I counted them for seven minutes:

1st minute	there were	51	vivid flashes,	
2d	"	"	42	"
3d	"	"	39	"
4th	"	"	47	"
5th	"	"	37	"
6th	"	"	61	"
7th	"	"	54	"

making three hundred and thirty-one discharges of electricity in seven minutes, distinctly visible from one point; and each discharge was followed by loud and sometimes rattling reports, whose reverberations rolled through the heavens in an endless procession of majestic and terrific sounds.

"During this scene the moon, which was about half an hour above the western horizon, was visible, but so magnified through the haze and vapor as to appear like a brilliant flame suspended in the sky. For a period of twenty minutes, the scene was one of grandeur and sublimity rarely witnessed in a lifetime."

Nearly all of the church spires and dwellings that were provided with rods escaped injury, though heavy charges of electricity were observed to pass down the rods. Cars while running on some of the railroads were surrounded by the electric fluid, but no passengers were injured, although many were greatly alarmed. Telegraph wires were melted by the half mile, poles shattered in all directions, telegraph instruments in some cases broken, while the fingers of a number of telegraph operators were singed and temporarily paralyzed.

At Poughkeepsie, N. Y., during the storm on August 14, the following phenomena were observed, as reported in the New York *Herald*: "The lightning flashed from horizon to horizon incessantly in forked tongues and jagged chains, and it really seemed as if every flash struck something, because they were instantaneously followed by rattling and stunning thunderclaps. Looking up Main street from the Post Office, balls of fire were seen shooting into the Atlantic and Pacific Telegraph office, and explosion after explosion followed, like the rattle of musketry, as the electric fluid struck the telegraph instruments, creating terror in the hearts of everybody in the vicinity. At the Western Union Telegraph office, a ball of fire entered the window and exploded on the desk of the operator, and was followed by other electric explosions driving the operators away from their business.

"At the depot the effect was also startling. In the telegraph office, the Superintendent, J. M. Toucey, of the Hudson River Railroad, and Robert Wilkinson, the night operator, were seated at the instruments, and the operator was working the wires during the storm, because of the washing away of a culvert near Catskill making telegraphing necessary. While they were busily engaged, there came a blinding flash of lightning, and at the same instant a ball of fire dropped from the Poughkeepsie and Eastern Railroad wire and exploded on the desk between Mr. Toucey and Mr. Wilkinson. Both were affected, Mr. Wilkinson's ears and fingers tingling with electricity. Further work ceased at once till the storm subsided. The engineer of the down train witnessed fearful scenes along the railroad while his train was in motion. Streaks of lightning ran around his engine and over it, and down upon the railroad track, shooting far ahead of the advancing train, and the air seemed to be impregnated with sulphur.

"The steamer Mary Powell landed her passengers here while the storm was in progress. Captain Anderson took hold of the bell wire to ring the engineer's bell, and received a shock that came near knocking him down.

"Strange to say not a building in this city was struck. The lightning was of various colors—pale green, violet, and crimson. The people generally were much alarmed."

MANUFACTURE OF VINEGAR.

There is perhaps no process in the arts which proves more clearly the value of theoretical knowledge, when properly applied, than the manufacture of acetic acid or vinegar from wine, cider, spirits, malt, etc. Even the details of this process show how the apparently useless discoveries of the theoretical chemist may be made available to the manufacturer. So it was often a subject of wonder how some vinegar establishments, apparently conducted in a proper manner, could never obtain the quantity of acetic acid obtained by others, and requisite according to correct theory. This became all clear when Liebig discovered aldehyde, referred it to a low oxidation of alcohol, which by a large supply of oxygen would have become acetic acid. With his characteristic practical common sense, he applied this at once to the vinegar manufacture, and showed that the losses observed were solely due to the formation of aldehyde, from an insufficient supply of air, and that when admitting more air, by increasing the openings or by any other means, this difficulty would be entirely obviated.

We have received an interesting letter from one of our subscribers, a vinegar manufacturer in this State, extracts from which we publish in another column, which illustrates another point of a similar kind in the same business. He complains that his large stock of good cider vinegar on hand became weaker and weaker in the vats, and at last so tasteless that he had to run it in the canal. The loss was nearly his ruination, as there were several thousand gallons; it appeared to be contagious, as one vat after the other became thus contaminated. He gives us an elaborate account of the locality, the circumstances, manipulation, temperature, etc., so as to put us in a condition to judge about the causes and suggest preventives of its re-occurrence, and, thanks to the pains taken in this respect, we think we are able to point them out.

The whole cause of the trouble experienced, which is well known to practical chemists, is the so called mother of vinegar, a mold which, investigated by naturalists, has proved to be a vegetable parasite of great vitality, and is called *micoderma aceti* or *ulvina aceti*. It grows at the expense of the acid in the vinegar, and destroys it at last totally. It forms also on the beech shavings of the vats, but is then beneficial, as it assists in the change of the alcoholic into the acetic principle; but if once this change is totally accomplished, it is an enemy of the manufacturer, as its continued growth is at the expense of the acetic acid. Mulder, in Utrecht, Holland, investigated this subject minutely, and found that, when he removed the fine floating skin of this vegetable parasite with the utmost care, it always reappeared again, while the vinegar became weaker and weaker.

It is, of course, difficult to prevent the passage of the germs of this plant from the vat with the shavings into the storage vats. Heat will kill it, and therefore we would recommend the method followed in France for the improvement of some kinds of wines, namely, the passage of the liquid through a coil heated to 212° Fah., which destroys all vegetable life, and which we may describe more in detail in the future. It must also be observed that there is more danger of this deterioration taking place in weak vinegars than in strong ones, and that the presence of a little alcohol will prevent it for a time, as then the action of the vegetable parasite will be first expended to change this alcohol into acetic acid, and will not attack the latter before the former is all consumed. There is still another point: It is well to clean the vats with hot water, but it is advised by many writers on this subject to wash them afterwards with quite strong vinegar, so as to saturate the pores of the wood with this in place of with water, before introducing the vinegar. Still another point: As cider vinegar contains many other vegetable ingredients besides acetic acid, it is advisable to filter it when the fermentation has ceased. A deposit, near the bottom of the storage vats, of these vegetable matters is very apt to cause a putrefactive fermentation, which will also injure and at last destroy the acetic acid formed.

SCIENTIFIC AND PRACTICAL INFORMATION.

ORNAMENTAL WOODWORK.

C. Muratori, of London, makes wood ornaments by kneading alum, glue, and sawdust, with boiling water, into a dough which is pressed into molds. When dry, it is hard and capable of taking a high polish. Similar ornaments, of greater beauty and resembling carved woodwork very closely, are being made in this city by pressing veneers between steel or copper dyes.

GLYCERIN AND THE COAL TAR COLORS.

It may not be generally known to all our readers that the aniline colors are quite as soluble in glycerin as they are in water or alcohol. It has recently been suggested to use the glycerin bath for dyeing, and F. Springmühl has instituted a series of experiments with woolens, silks, and cottons, and has obtained very good results with all the coal tar colors. Whether glycerin will not prove too expensive is as yet doubtful. Some of the glycerin is of course lost when the goods are rinsed after being dyed, if no mordant is used, and it is seldom required when glycerin is employed. The glycerin of the bath itself can be used indefinitely by adding a fresh quantity of the dye stuff, which very readily dissolves in it.

Comparative experiments were made with wool and silk dyed in equal quantities of the same dyes dissolved in glycerin and in water, the temperature of the baths being the same. It was found that those dyed in the glycerin bath always had a livelier color, and the silks especially were more glossy than those dyed in aqueous solutions. If the temperature of the glycerin bath is raised above the boiling point of water, the colors are still better and faster.

If glycerin is too expensive, it could at least replace alcohol as the solvent. The addition of glycerin to a water bath raises its boiling point, which is of great use with iodine green, and makes it attach itself more readily to the fiber; this is strikingly noticeable in the case of cottons. The action of mordants is in no wise injured, but rather improved, by the dye bath containing glycerin. When alcohol is used as solvent for the dye stuff, a portion of it is lost by evaporation, while all the glycerin remains in the bath, even at the temperature of boiling water, and hence none of the dye stuff is precipitated.

PARIS GREEN AND POTATO BUGS.

A correspondent, Mr. E. Wolff, has experimented on this question, and thus describes the results:

"I filled two flower pots with garden earth, mixing in the top soil of one of them a pinch of Paris green; and I sowed in each about one hundred of canary and rape seeds, and plunged the pots side by side to the rim in the garden. The fourth and fifth day, all the seeds in the pure earth came up and are now growing lustily, while after the tenth day the seeds that had the Paris green with them show no sign of life, and are probably rotten. I am now making experiments with potatoes and other plants, but have not the slightest doubt that they will show the same results."

ANTIDOTE FOR ARSENIC.

Arsenic may be rendered inactive in the stomach by a dose of hydrated peroxide of iron, which is prepared by pouring a solution of green vitriol boiled with nitric acid, or of chloride of iron, into ammonia or soda, and washing the precipitate. Both arsenic and peroxide of iron can then be removed by the stomach pump or an emetic.

CONFLAGRATION OF COAL OIL.

To lessen the damage and save the oil, a correspondent, H. M. S., says: Let each floor where it is stored be divided into squares, sloping downward to the center so that, as each barrel bursts, its contents will run to the center, where they will be immediately extinguished and conducted to a place of safety by means of a siphon or S trap and pipe. That place of safety might be a large tank or cistern, even under the ground beneath the fire; but care should be taken that a pipe should lead off the air from the tank as it fills, which air, having become explosive, should be passed out through a gasometer, to prevent the fire from communicating with the air or gas in the tank. The amount which might be saved in insurance ought to provide the arrangement.

OZONE.—Houzeau, from a series of quantitative experiments, has come to the conclusion that country air contains one 450,000th of its weight, or one 700,000th of its volume, of ozone. He believes that its production is due to the continuous electrical discharges taking place between the earth and the clouds.

[Special Correspondence of the Scientific American.]

LETTER FROM PROFESSOR R. H. THURSTON.

Lake Superior.—Its wonderful mineral shores.—The Portage Lake.—The discovery of copper.—The Calumet and Hecla mines.—Interesting particulars concerning the process of mining copper.

MARQUETTE, Mich., July 20th, 1872.

Lake Superior, the largest of the great inland seas, has an area estimated at nearly 32,000 square miles and a length of shore line certainly not less than 1 200 miles.

This great body of water is becoming well known to tourists, who are attracted here by the magnificent scenery of its shores and its islands, by the wholesome climate, and by the excellent fishing to be found in the hundred rivers and creeks that feed it and in the lake itself.

LAKE SUPERIOR MINERAL RESOURCES.

To the geologist and to the engineer, it is no less interesting, as one of the most extensive and remarkable known mineral regions of the world. All along the north shore are deposits of copper and silver, some of which are opened and productive. One of these silver mines is at Silver Islet, a little rock lying near the Canadian shore and just opposite Isle Royale; and so small and low is it that it became necessary to partially enclose it by coffer dams and "crib-work" before much work could be done on the wave-washed veins. It is stated that the first 22 days' work on the island produced $100,000 worth of native silver, and the amount mined from the 1st September, 1870, to date was recently stated (*Duluth Herald*) as of such value as to give this little rock an estimated present value of $100,000,000. Silver has also been found and mines opened at several points on the main land.

Copper has been found at Pigeon river, the boundary between the United States and Canada at its junction with the lake,—on Isle Royale and Michipicoten Island, and on the main at the eastern end of the lake.

Houghton, the little town from which my last letter was written, lies near the middle of Keweenan Point, and is the principal town in the copper range on the south shore of Lake Superior. Keweenan Point extends some 60 miles out into the lake, and is traversed by a range of high hills, which yield, at many points, large quantities of native copper. At the Ontonagon mines, which are situated a few miles from the coast and behind the point, the copper is found in masses, which are frequently of great size, imbedded in the solid vein rock and almost absolutely pure; the "impurities" are, generally, merely a small percentage of iron and silver, alloyed with the copper. Occasionally a beautifully crystallized mass of silver is found attached to the copper and cemented to it by a slight film of alloy at the surfaces of contact, and instances have occurred in which masses of silver of considerable size and great value have been thus found.

As the Keweenan deposits are followed out toward the extremity of the Point, fewer large masses are found and the copper is more uniformly and finely diffused through the vein rock, until at some places it occurs in such extremely minute particles that they are quite invisible to the unaided eye, although they may form a very considerable percentage of the total weight of the mineral.

PORTAGE LAKE.

Portage Lake is situated near the middle of Keweenan Point, and, extending from the eastern to within about three miles of the western side, nearly makes an island of the outer portion. It thus happens that Houghton and its opposite neighbor, the village of Hancock, form excellent shipping ports for a large portion of this copper district. Several mines, the Quincy, the Pewabic, the Franklin and the Huron, among others, are within gunshot, almost, of the two villages. All vessels loading there pass out on the eastern side of the Point, but the Portage and Lake Superior Ship Canal Company is expected to cut a ship canal from Portage Lake to Lake Superior at the western side of the Point, and thus allow shipments to be made toward that end of Lake Superior; and also, by enabling vessels to cross through Portage Lake, instead of rounding Keweenan Point, to lessen the distance between ports on either side by at least 150 miles.

THE DISCOVERY OF COPPER.

The discovery of copper here, and probably at all other points where it exists in considerable quantity, was made years before the white man came across the Atlantic from the Eastern world. The Indians were familiar with the principal deposits of native copper and often picked up surface masses and slabs. Xavier, who explored a portion of North America in 1720 or 1721, states that they regarded them as divinities or as gifts from the water gods, and preserved them with the utmost care. These masses weighed from a few pounds up to several tuns. At several places, ancient mines have been discovered by modern explorers, and the stone tools—hammers and chisels—of the aboriginal miners are interesting specimens of primitive art.

At Hancock, we visited the works of the Detroit and Lake Superior Copper Company, where four reverberatory furnaces are at work melting down the mass copper and the copper from the stamps of the mines of the neighborhood. Very little refining is required, and after a little stirring of the melted metal with the rabble, it is poured into the ingot molds and is ready for the market. All of the copper shipped here is from deposits of native metal. No deposits of sulphurets are worked and but few are known in the Lake Superior districts, and it rarely happens that the copper here smelted is even slightly contaminated by sulphur.

Directly behind this village and at the top of the bank, 500 or 600 feet above the water, are the entrances to several mines, and at a similar altitude on the Houghton side are others. These mines are employing a large number of men and are producing large quantities of copper, but, to the stranger, the most interesting of all the mines of this section are, probably, the "Calumet" and the "Hecla," two mines situated side by side, formerly independent but now united under a single management. This is claimed to be the richest copper mine in the world, and an examination of the mine, as well as the market price of its stock, affords pretty strong evidence of the truth of the assertion. The Calumet and Hecla mine is about 14 miles distant from Houghton and Hancock, and we travelled over the road on a pleasant afternoon in a lumbering "stage," making the journey in two hours and a half.

At several points, we passed the deserted buildings and unused shafts of mines that were opened a few years ago, when the high price of copper stimulated production so wonderfully, but which have since—in consequence of the reduction in price at the close of our civil war, and partly perhaps in consequence of the "leanness" of the rock or of ignorance or recklessness in management—been deserted. In some of these mines, hundreds of thousands of dollars have been thrown away. Fine buildings and the best of machinery are immensely expensive, but yet cannot make a success of a mine which must compete with neighbors having richer ores or better management. There is, probably, little doubt that some of these mines, if now reopened, might be made to pay handsomely if properly worked, but good superintendents and skillful captains are not always readily obtained for even well established and long worked mines.

HOW THE COPPER IS MINED.

Arriving at the mine, we spent the evening with the superintendent, from whom we obtained a considerable amount of most valuable and interesting information, and whose fine cabinet of specimens from his own and other mines excited our vein of covetousness very seriously. Next morning we had an early breakfast and prepared to enter the mine.

At seven o'clock, we met the "Captains of the Mine" at the "Change House" and exchanged our travelling suits for the miner's uniform—a round crowned, narrow brimmed hat, a flannel shirt "converted" from a heavy blanket, a stiff canvas coat, strong linen trowsers, and clumsy cowhide boots; a candle enveloped in clay and stuck on the hat, and two others hung from the upper button, were to supply us with light during our underground journey. Thus equipped, we started down the ladders and were soon beyond the reach of daylight.

The Calumet and Hecla Mine extends, in the direction of the vein, nearly two miles, and has penetrated nearly 900 feet into the earth. The vein rock is a peculiar red "conglomerate," as the miners call it, penetrated in every direction, permeated by metallic copper. The "walls" of the mine are of hard trap rock, separated by the vein rock to a distance of, sometimes, fifteen feet or more. The mine is worked in a series of "levels," horizontal galleries or "drifts" being driven at intervals of about ninety feet, as the shafts are carried downward, and the "stopes" are opened out until all of the ore is worked out except a portion a few feet in thickness, which forms the floor of one level and the roof of the next level below. The rock is extremely hard and is all worked out by blasting. The drilling is principally done by hand, but two Burleigh drills, driven by compressed air, are on trial. We were much interested in their operations, and were pleased with their performance and by the ingenuity of their construction. They were said to be doing excellent work.

After the miner has done his work, under the careful supervision and direction of the captains of the mine, he is followed, if he has not been accompanied, by the "timbering party." The timbering of a mine is one of the most important branches of mining work, and is always directed by an experienced miner of unusually sound judgment. It is his duty to examine the walls of the mine with the captains, and, sometimes—consulting the superintendent—to support them, wherever necessary, by heavy timbers. At the Calumet and Hecla, we were particularly impressed with the care and the skill displayed in timbering, although, as a rule, the walls, both foot and hanging, are remarkably good. In a neighboring mine, but a few days since, the walls came together, crushing the timbering, and several miners, caught in the trap, perished at their work, victims of insufficient timbering. It seems remarkable, however, that the miners, who are more exposed to such dangers than other employees of the mine, are usually the most reckless in working under unsupported walls.

We spent a number of hours in the mine, exploring its several levels, sliding down "winzes," clambering over rocks and ore, climbing long ladders, and, now and then, warned by the cry of the miners, dodging into a cavity or behind a battery of timbers to escape the danger of being struck by flying masses of rock detached by a blast. In many places, the particles of copper were too minute to be detected by inexperienced explorers; at other places they glistened in the candle light and their sharp points tore the hand that was incautiously passed across them, while here and there, but very rarely, the metal in solid masses filled large chinks in the rock. After being dislodged by the blast, the ore is wheeled, on low cars, to the shaft, dumped into the iron "skip," and is hoisted rapidly up to the surface where it is thrown into cars and taken off to the stamps. At this mine, steam stamps are used, powerful steam hammers in fact, and under their tremendous blows the rock rapidly crumbles into dust; the copper is then readily washed clean and is next sent to the furnaces to be melted into ingots for the market. After exploring the mine to our satisfaction, watching the several methods employed in opening "shafts," "winzes," "stopes," etc., in securing the walls and in transporting material, a straight climb of 630 feet took us up to daylight once more, and we staggered to the nearest seat, decidedly "weak in the knees," but with an excellent appetite for the dinner which we found waiting for us at the house on our arrival there. This great mine employs about 600 people underground in its fifteen or eighteen miles of gallery and produces about 10,000 tuns of marketable copper per year.

We returned to Houghton, found the Atlantic in port and ready to sail, and took advantage of the opportunity to continue our journey. We entered the beautiful harbor of Marquette, the principal shipping port of the iron regions of Lake Superior, early next morning. The next letter will give you some account of the neighboring iron mines.

R. H. T.

Chances for Investment.

Many of our most successful business men invest their surplus capital entirely in railroad bonds. Such investments, when the securities are good, pay the best rate of interest with the least trouble to the holder of any class of investments that are made, and it is becoming usual for holders of Government securities which are selling at a high premium to exchange for railroad bonds at par or less, they paying the same or better rate of interest.

In this connection, we would refer to the advertisement of the Chicago and Canada Southern Railroad first mortgage seven per cent gold bonds, in another column. The names of the gentlemen connected with the road are among our best known citizens and capitalists, and the bankers through whom the loan is effected rank among the first in the city. By addressing either firm whose names appear in the advertisement, full information as to the character of the securities offered will be given.

Facts for the Ladies.—Mrs. J. Reilly, Washington, D. C., has used a Wheeler & Wilson Lock-Stitch Machine constantly since 1866, in dressmaking, with nothing for repairs. 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.—STAINS OF LEMON JUICE ON BLACK MARBLE.—The polished black marble case of my mantel clock is badly disfigured by white spots caused by drops of lemon juice. Will some one tell me how to restore the original black polish?—S. M. T.

2.—DEPILATORY.—Is there a compound that will remove the human hair without leaving a scar?—J. R. M.

3.—WORM EATEN BARREL STAVES.—Can you inform me of any sure method of keeping worms out of barrel staves? Sometimes, after having been long in use, when the danger is thought to be past, we suddenly find their depredations.—J. H. R.

4.—ICE HOUSE.—Will some one who knows give me the best plan in use for a family ice house?—C. C.

5.—PRUSSIATE OF POTASH PAPER.—How can this be prepared for use in Bain's telegraph instrument, and in the electric copying press recently illustrated in your journal?—F. H. H.

6.—FLEAS.—How can these pests be induced to entirely quit a house which they have succeeded in entering?—T. J. W.

7.—DESIGNS ON STEEL.—Will some one inform me how to make impressions on small steel articles? How long should the acid remain on? What acid should be used, and should it be diluted, or not?—J. K.

8.—GRATES FOR BURNING SAWDUST.—Can N. J., of N. Y., or any one else, inform me what kind of grates I need to burn sawdust in a common firebox?—B. W.

9.—NITRO-GLYCERIN.—Can nitro-glycerin be ignited by a common safety fuse?—O. J. K.

10.—BAITING FISH.—Will some of your readers inform me what is better than oil of aniseed to use on fish baits to cause the fish to bite?—W. H. O.

11.—MONKEY WRENCH.—Can you inform me, through your columns, the reason why a slide or screw wrench is called a "monkey wrench?"—H.

12.—THIN RUBBER GOODS.—I would like to know the manner in which thin rubber goods, such as hollow balls, shoes, etc., are formed.—G. C. D.

13.—POWER OF ENGINE.—What power should a double engine give, the cylinders being 2½ inches by 5 inches, working under 50 pounds to the square inch, and the engine at 150 revolutions a minute?—W. H. P.

14.—BISULPHIDE OF CARBON.—Can bisulphide of carbon be used with safety in the place of water for running a small engine, the exhaust vapor to be condensed? Where can it be obtained, or how can it be made?—W. H. P.

15.—SPECIFIC GRAVITY.—Is the attraction greater at the poles than at the equator? If so, please give the reasons. Will a body weigh less at the equator than at the poles?—J. P.

16.—BLACK SURFACE ON BRASS.—How can the brass work around the lock of a Winchester repeating rifle be made black without heating or removing from the rifle? If it be necessary to remove the black stain, what should be used?—C. W. L.

17.—GUNPOWDER IN CARTRIDGES.—Does gunpowder deteriorate by being kept any length of time in paper cartridges?—C. W. L.

18.—CUTTING GLASS.—Will some one of your readers give me plain directions for cutting glass with a common glazier's diamond? I can cut in a straight line very well; how can I cut a round or oval glass? Is it necessary to cut on both sides? If an imperfect cut is made, can I cut in the same place again, or must I move the straight edge and take another cut?—J. W. A.

20.—CUTTING THE COGS OF MORTISE WHEELS.—Can any of your readers give me any information about cutting the above by machinery? What sort of cutters are used? At what speed should they run? How do they stand? And what kind of wood was used?—J. 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.

C. R. M. Wall, Professional Brewer—The correct address is No. 69 36th st., S. Brooklyn, N. Y. See advertisement on back page.

The Best Water Pipe, also the Cheapest, when strength and durability are considered, is the TIN-LINED LEAD PIPE manufactured by the Colwells, Shaw & Willard M'f'g Co., No. 218 Centre Street, New York. Price 16½ cents a pound for all sizes. Send for circular.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 17c. a line.

Steel Castings to pattern, strong and tough. Can be forged and tempered. Address Collins & Co., 212 Water St., New York.

Wanted—A live man, acquainted with Turbine Wheels, to travel. Address Urbana Machine Works, Urbana, Ohio.

Gauge Lathes with attachment for turning Milled Rolls, Spindles, Moulding, &c., $33.00. Wm. Scott, Binghamton, N. Y.

Machinery, of all kinds. S. C. Hills, 32 Courtlandt St., N. Y.

Wanted—A first class, energetic and capable man as Foreman in a foundry working 100 men. Address "Foundry," care W. Bingham & Co., Cleveland, Ohio.

Beautiful Patent in iron to exchange for one in wood. Box 909, Saratoga Springs, N. Y.

Walrus Leather for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

5,000 Tinners should manufacture and sell Wilcox Self-Sealing Fruit Cans, patented March 19, 1872. State and County Rights for Sale. For particulars, address A. A. Wilcox, 400 Chestnut St., Phila., Pa.

$100 Reward—For instructions and drawings for setting galvanizing kettles or tanks for galvanizing Iron in the most improved method, preparing necessary acids, etc. Address D. R. Noble, 220 Washington Street, New York.

Ashcroft's Original Steam Gauge, best and cheapest in the market. Address E. H. Ashcroft, Sudbury St., Boston, Mass.

Ashcroft's Self-Testing Steam Gauge can be tested without removing it from its position.

Brown's Pipe Tongs—Manufactured exclusively by Ashcroft, Sudbury St., Boston, Mass.

Wanted—A Machine to cut Veneers for Berry Baskets. I. H. Marvel, Laurel, Delaware.

Page's patent Belt Lacing, as made by J. H. & N. A. Williams, Utica, N. Y., is the best and cheapest.

An Engineer and first class mechanical draftsman is open to an engagement. Permanent situation preferred to high salary. Address W. L., P. O. Box 866, New York.

The undersigned is in need of a first-rate barrel-packer, and will be glad to hear from those having such a machine to sell, with all details as to working, cost, &c. Address B. R. Smith, 4717 Main St., Germantown, Philadelphia, Pa.

Flouring Mill near St. Louis, Mo., for Sale. See back page.

For Sale—Retiring Partner's interest in a Sash, Door and Moulding Mill, located at one of the best points in the Northwest, and doing a large trade. A good opening to a paying business. Address "Mill Co." care Cook, Conurn & Co., Chicago, Ill.

Diamond Carbon of all sizes and shapes, furnished for drilling rock, sawing stone, and turning emery wheels or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

Valuable Invention for Sale, Pat'd. Box 116, Providence, R.I.

Turbine Water Wheels—Two twenty-four inch Reynolds Wheels—less than one year's wear and as good as new—for sale cheap. For further information, apply to J. G. Parker & Son, Poughkeepsie, N. Y.

American Boiler Powder Co, Box 797, Pittsburgh, Pa., make the only safe, sure, and cheap remedy for 'Scaly Boilers.' Orders solicited.

Pattern Letters and Figures, to put on patterns, for molding names, places and dates on castings, etc. H. W. Knight, Seneca Falls, N. Y.

Whitcher's Pat. Rotary Engine is the simplest, cheapest, and most economical. On exhibition at P. Fields & Son, North Point Foundry and Machine Works, Jersey City, N. J.

Platina Plating—Alb. Lovie, 729 N. 3d St., Philadelphia, Pa.

Windmills: Get the best. A. P. Brown & Co., 61 Park Place, N. Y.

Tested Machinery Oils—Kelley's Patent Sperm Oil, $1 gallon; Engine Oil, 75 cts.; Filtered Rock Lubricating Oil, 75 cts. Send for certificates. 116 Maiden Lane, New York.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N. J. Also 2-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

New Pat. Perforated Metallic Graining Tools, do first class work, in less than half the usual time and makes every man a first class Grainer. Address J. J. Callow, Cleveland, Ohio.

Brick and Mortar Elevator and Distributor—Patent for Sale. See description in SCI. AMERICAN, July 20, 1872. T. Shanks, Lombard and Sharp Streets, Baltimore, Md.

Kelley's Chemical Metallic Paints, $1, $1·50, $2 per gallon, mixed ready for use. Send for cards of colors, &c., 116 Maiden Lane, N. Y.

Kelley's Pat. Petroleum Linseed Oil, 50c. gal., 116 Maiden Lane.

The Berryman Manf. Co. make a specialty of the economical feeding and safety in working Steam Boilers. Address L. B. Davis & Co. Hartford, Conn.

The Berryman Heater and Regulator for Steam Boilers—No. one using Steam Boilers can afford to be without them. L. B. Davis & Co., Hartford, Conn.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N. Y.

For Machinists' Tools and Supplies of every description, address Kelly, Howell & Ludwig, 917 Market Street, Philadelphia, Pa.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1309.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies see Manufacturing News of United States in Boston Commercial Bulletin. Terms 4.00 year.

Hand Lathes, (foot or power), Punching Presses, Small Engines and Boilers, by John Dane, Jr., 93 Liberty St., New York.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $4. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Better than the Best—Davis' Patent Recording Steam Gauge Simple and Cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For 2, 4, 6 & 8 H.P. Engines, address Twiss Bro., New Haven, Ct.

For hand fire engines, address Rumsey & Co., Seneca Falls, N. Y.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

The best recipes on all subjects in the National Recipe Book. Post paid, $2.00. Michigan Publishing Company, Battle Creek, Mich.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

For Marble Floor Tile, address G. Barney, Swanton, Vt.

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

Portable Baths. Address Portable Bath Co., Sag Harbor, N. Y.

For Steam Fire Engines, address R. J. Gould, Newark, 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.

COINS.—M. S. is informed that the coin of which he sends impressions is a piece of 80 reis (=10 cents) of Portugal and Brazil. It bears the superscription of Joseph I., king of those countries from the year 1750 to 1770.

WATERWHEELS.—To W. D. W., of Pa.—The statement that any combination of wheels can utilize a fall of water so that each wheel will manifest the power that any one wheel would exert under the same fall is absurd.

RED ANTS.—C. E. G., of Conn., can try powdered borax, liberally spread around the places they frequent; but putting the legs of his refrigerator in water is the better way, although it is a little trouble.

A GOOD ENGINEER.—To S. B. H., of N. J.—The best method of acquiring the knowledge you seek is by reading good books. If you have a library near you, enquire for "Handbook of the Steam Engine" and "Catechism of the Steam Engine," both by John Bourne. Your practical daily acquaintance with the engine will help you to turn your reading to good account.

SKELETON LEAVES.—A. and D. will find good recipes on pages 267 and 314 of Vol. XXV. of the SCIENTIFIC AMERICAN.

FLOW OF WATER THROUGH SIPHON.—A. W., of Iowa, sends us a diagram of his water tank which is supplied by a ram through a half inch pipe. He employs an inch and a quarter overflow pipe, of considerable length, in which are two siphon turns or traps and eight elbows. The overflow pipe enters the tank very near the upper edge thereof. The water refuses to pass through the overflow pipe, but runs over the sides of the tank, and he desires to know the reason. Answer: You must increase the depth of water in the tank above the mouth of the escape pipe, until a flow is produced. It requires some little pressure to expel the air contained in the escape pipe; and this expulsion is made more difficult by the many elbows you have. As a temporary expedient, you can establish a current through the pipe by exhausting the air from the lower end.

SETTING SUN DIALS.—In answer to L. H., I will tell him how I set a sun dial. From a standard work on surveying, ascertain the time of night when the pole star is on the meridian; that is, 17 minutes after *Alioth* and the pole star are in the same vertical line; then with his compass (or, better, a transit) sight to the pole star over the point where the sun dial is to set, and mark the meridian line thus obtained; the meridian of the dial must then be made to coincide with the meridian line, and the dial is in position. Having obtained a meridian line, L. H. can ascertain the deviation of the needle of his compass by applying his compass to the line.—T. H. [*Alioth* is the star of smallest magnitude in the Great Bear, sometimes called the Great Dipper.—EDS.

FLY PAPER.—In answer to T. W. S., query 1, page 90, I have to say that I make a composition of rosin and lard, sperm, or some other non-drying oil by heating. When mixed, I spread a small quantity upon paper and throw a fly upon it; if it be too thick, a little more oil; if he can crawl off, more rosin. A small quantity of oil only is necessary; spread with a brush while hot.—W. A. B., of Conn.

THE MAGNETIC POLE AND THE MERIDIAN.—To L. H., query 3, page 106.—You can get your sun dial more perfect without a compass than with, unless you have a transit or its equivalent. The manner of working is this: The dial should have a good surface laid out in one or more circles about the right distance from the center; this can be determined by the length of the center, time of year, etc. The center should be a wire, about six inches long or more, or something, equivalent set perfectly true and at right angles with the surface; the whole must be set level upon a good foundation. To get the meridian: Upon a clear day, at or before 9 o'clock, watch till the shadow shortens and just strikes one of the circles, and mark the place. In the afternoon at the opposite hour, watch till the shadow lengthens and touches the same circle, mark as before; then with the dividers strike the point equidistant from the two which will be the true meridian. The two points should be taken as early in the day as convenient, and both on the same day.—W. A. B., of Conn.

MOUNTING CHROMOS.—To B. D. H., query 17, page 58, July 27.—Mount your picture on canvas stretched on a frame, using the same paste as that used by photographers, namely, starch. To mount your picture, have the canvas tightly stretched on the frame, cover the surface with the paste, rubbing it well into the cloth, using the palm of your hand for that purpose, leaving no lumps on the surface. Wet your picture on the under side, then lay it carefully on the pasted surface, pressing it well down with a soft dry cloth, but without straining the canvas; then reverse the frame, and lay it down with the face of the picture downwards on a level surface covered with a clean white sheet or cloth, and carefully press the canvas against the picture, so as to unite the two firmly; then set it away to dry. After the picture is thoroughly dry make a size by boiling parchment clippings, isinglass, or fish skins in clean water, and coat the face of the picture thoroughly. Let it dry; then prepare a varnish of one part Canada balsam, and two parts spirits of turpentine, mixed cold in a bottle, and varnish your picture with it, using a soft, broad, flat camel's hair brush. A second coat can be applied, if you think necessary, after the first is thoroughly dry. The varnish should be put on quickly and smoothly, and should the varnished surface not be even, take a clean brush and with clear spirits of turpentine wash the face of the picture until the lumps and streaked appearance disappear; then let your picture dry, and re-varnish with a varnish consisting of one part Canada balsam and three parts spirits of turpentine. Chromos covered by fly specks can be cleaned with a soft sponge and cold water. Any of the French or German colored engravings treated in the manner here before described will have the appearance of oil paintings, and can be framed without glass, and cleaned as easily as an oil painting, a soft sponge and cold water being all that is required.—W. T. H.

INCREASING THE POWER OF BOILERS.—Query 5, page 106.—As J. S. P. does not tell us how his boiler is set, it will be difficult to tell how to increase the power of it, but the way to get the best results from a boiler set horizontally is to heat as much of it as will be of any service. My plan is to allow the hot gases to reach the boiler as high up as the upper gage cock, leaving a space of about four inches between the boiler and brickwork. I make the bridge wall straight across and high enough to almost touch the boiler in the center at the bottom, and leave a large space or pit, behind the bridge wall, the entire length and width of the boiler and as deep as the ash pit floor. The opening at the rear end should be closed down to a level with the bottom of the boiler. In setting his boiler as above stated, he will get the best results with the greatest safety. If his engine is heavily loaded, he will do more work with the same amount of steam by running his shafting at the same speed he does now, and speeding up his engine to 75 or 85 revolutions per minute. His feed water apparatus is probably good enough.—A. L., of Mass.

POWER FOR STEAM YACHT.—In reply to W. S. B., query 17, page 90, I would say that he requires at least 50 actual horse power to drive his boat 15 miles per hour. The proportions of W. S. B.'s proposed yacht are bad for a screw steamer. If he will build his boat 37 feet long, 6 or 6½ feet beam, 3 feet 9 inches depth of hold, he will have a boat of equal tunnage and of much better proportions. Let him hollow the water lines at the stern so as to bring the water easily to the screw. Such a boat will draw about 2½ feet water at the stern, consequently he can use a 2½ foot wheel with 3½ feet pitch. With an engine of 12 actual horse power, running 300 revolutions per minute, such a boat will make 9 to 10 miles per hour. To double the speed requires four times the power and twice the number of revolutions per minute. A speed of 9 to 10 miles per hour will be found the most satisfactory. A very handy size of boat is one 25 feet long, 5 or 5½ feet beam, and 2½ feet depth of hold. For a speed of 9 or 10 miles per hour, it will require an engine of 5 or 6 actual horse power. The screw should be 21 to 24 inches diameter and 30 to 36 inch pitch, and be run about 400 revolutions per minute. Boilers for such boats must be as small and light as possible so as not to load down the boat; consequently they must work under a high pressure of steam—say from 70 to 100 pounds per square inch. The machinery for a 25 foot boat will cost about $600; for a 37 foot boat, $900 and upwards. These prices are at least double what they should be. If any manufacturer would make a specialty of machinery for such boats, making everything strong and substantial (working parts only polished) and sell it at a moderate price, hundreds of such boats would be built. At present prices, none but the rich can afford them.—J. T. B. S., 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.

MODE OF ATTACHING SPRINGS TO WAGONS.—Jonathan H. Cornwell, of Corry, Pa., assignor to himself and Clarence G. Harmon, of same place.—This invention consists in using curved springs of flat metal, and in attaching them at one end to the axle and at the other to the under side of the wagon body or frame at the center, in such manner that as the weight of the load is increased the springs are proportionately stiffened by the box or frame settling down upon them from the point of their connection with it toward the other end, thus lessening the distance between the bearing points so that their elasticity is proportionately lessened.

BALING PRESS.—Andrew J. Hunt, of Walla Walla, Washington Territory.—This invention furnishes an improved press, for compressing hay, straw, and other materials required to be put up into bales, which is simple, convenient and powerful in operation, and takes up no more room than presses constructed in the ordinary manner; it consists more prominently in providing an opening in the lower side of the baling box for the removal of the bale when tied, and in closing the same by a hinged door, which is secured by a peculiar arrangement of bolts and bars by means of which all the bolts are moved simultaneously to fasten or unfasten the door by a single movement of a single lever.

CARRIAGE WHEEL.—Christian Anderegg, Lawrenceburg, Ind.—This invention consists in a peculiar construction of the spoke tenons, and in a certain arrangement of the mortises in the hub, whereby the inventor's wheel patented January 2, 1872, and illustrated in the SCIENTIFIC AMERICAN last spring, is considerably improved upon.

PLOW.—Andrew P. Barry, Ashland, Mississippi.—This invention relates to improvements in scraper attachments to plows for scraping or "barring" off at the same time that the cotton is plowed. It consists in a broad thin concave plate of metal attached to the mold board at the front and about midway betweeen the junction of the mold board with the land side and the rear edge; it extends from the share to the top of the mold board, and projects beyond the land side in the direction of the curvature of the mold board, or thereabout, so as to make a kind of prolongation of the same for a considerable distance, by means of which the sloping surface of the ridge on which the cotton is planted is scraped off at the same time that the mold board scrapes off the level surface over which it runs.

PROTECTING SAFES AGAINST FIRE.—Stephen Martin, Chillicothe, Ill.—This invention consists in suspending safes, by means of a hinged metal platform or metal bars and by wooden bars connected therewith, the whole being arranged in such a manner that when the latter burn the hinged metal platform or bars are released, and the safe is allowed to fall into the bottom of a vault where it may be protected from undue heat.

COLORING TIN, ZINC, ETC., TO RESEMBLE GILDING.—Joseph Kintz, West Meriden, Conn., assignor to himself and P. J. Clark, of same place.—This invention consists of an improved method of producing a fine gilt finish on zinc, tin, or analogous metals by polishing the metal between the coppering and lacquering processes, whereby the same effect is produced as by a gold gilding, and at less than one fifth of the cost.

ELEVATOR AND CONVEYER.—William F. Shanks, Louisville, Ky.—This invention relates to a new apparatus for the elevation and conveyance of buckets so as to remove the earth in making sewers and other excavations. The invention consists in a new arrangement of a movable trestle frame which contains the elevator tracks and a windlass for raising the buckets, as well as in a series of connected trucks on the elevator tracks for conveying the buckets horizontally.

BAIL TIE AND STRAINING LEVER.—James C. Colt, Cheraw, S. C.—This invention improves the construction of the bale tie and straining lever, for which letters patent were granted to the present inventor, January 16, 1872, so as to make them more convenient and satisfactory in use; it consists in providing the straining lever with beveled guide ways formed upon the curved branches of the same, in combination with notches in the eye attached to the bale band, so as to prevent all chance of slip.

WINDOW FASTENING.—Edward H. Sweetser, Hamburg, Iowa.—The invention consists in attaching to and near the edge of the sash a bifurcated reversible lever with an angular friction block pivoted between its prongs. When the sash is raised, the lever is reversed, and one of the sides of the block placed against the frame. The sash holds the lever and block by its weight, while the possibility of the sash taking a downward course is entirely prevented.

SPARK ARRESTER.—James L. Ferris, South Brunswick, N. J.—This invention furnishes an improved spark arrester for attachment to locomotive boilers, which is so constructed as to prevent the sparks passing out through the smoke stack and setting fire to combustible substances at the sides of the road, and which is so arranged that the waste heat passing off with the products of combustion is utilized for superheating the steam.

ANTI-FRICTION BUSH FOR PULLEYS.—Joseph Palmer, of St. Catherine's' Canada, assignor to himself and H. F. Leavenworth, of same place.—This invention relates to a new and useful improvement in bushes for sheaves of pulley blocks and for other purposes. It consists of an outer case and a core, with friction rollers confined in the core; or of an outer case and a core without friction rollers.

SAW SET.—Samuel H. Cailigan, of Forest city, Maine.—This invention furnishes a simple implement for setting saws. It consists of a pair of handles and jaws which are pivoted together so as to work like pincers. One jaw forms a bed, and the other is pointed; between the two the saw tooth is griped. Two extra jaws extend from the bed jaw, between which the saw plate is held. One of the extra jaws is hinged at its inner end and is graduated by a set screw at its outer end to form more or less of an angle with the bed jaw. Upon this angle depends the amount of set given to the saw teeth.

GRINDING MILL.—George W. Loy and Francis C. Baker, of Jefferson, Texas.—This invention consists principally in making the spindle of the mill in as many sections as there are pairs of burrs, the lower section resting on a step and its upper end being squared and entering a socket in the section above; also in an improved manner of dressing the millstones so as to present the largest amount of grinding surface and prevent the too rapid escape of the material, and in an arrangement of a hopper, slides, etc., whereby the passage of the material is kept under control.

PLOW.—In this improved plow the standard which is bolted to the beam, s provided with a flange to receive the mold board and share, a brace to resist inward pressure, and a land slide; it is cast of malleable iron in one piece and forms a complete plow frame in itself. A double or branched brace is bolted by one branch to the land side and by the other to the mold board, the bolt in the latter case passing through a slot in the branch. The upper end of the brace, where the branches conjoin, has a slot to receive a bolt by which it is secured to the beam. By adjusting the beam to the standard so that its rear end is slightly raised, a large share of the draft strain is brought on the double brace and through it on the plow proper. By the construction described, the plow is readily adjustable to be run at any required depth. The handles are also arranged to be adjusted for convenient use. The plow, which is of very easy draft, is unusually durable, as the wear is taken off the mold board to such an extent as to render it almost impossible to wear a hole through its point. The improvement is the invention of Thomas E. Putnam, of Winneconne, Wis.

MACHINE FOR TURNING WOODEN AXLES.—Michael McMahon, of St. Peter, Minn.—This invention consists of certain combinations and arrangements of devices for rotating a cutter around the axle which is held in a clamp, and for feeding the cutter along the axle lengthwise in such a manner as to turn the bearing upon any taper; also for turning a part upon one taper and a part upon another, and one part in oval form; also, for turning for the right "gather" and "pitch."

VENTILATOR.—John H. Karnan, of Cambridgeport, Mass.—This invention consists of a combination of pipes with the exhaust pipe of a ventilator so that wind blowing against the side of the exhaust pipe is conducted into them and discharged up and through nozzles into, and also outwardly over, the top of the exhaust pipe, in such a manner as to increase the draft therein to a very great extent.

SAWING MACHINE.—August Scharnweber, of Davenport, Iowa.—This invention relates to improvements in sawing machines, more particularly those worked by manual power; it comprises the use of two driving levers which may be operated singly by one or simultaneously by two persons when greater power is required. One of the levers is so located that the person operating it can also feed the wood to the saw. The apparatus admits of various adjustments, and provision is made for the removal of the circular saw and the immediate introduction and throwing into gear of a straight saw.

MACHINE FOR DRIVING BRUSH HANDLES.—Peter Peartree, of Lansingburg, N. Y., assignor to John Ames, of same place.—This invention consists of several ingenious combinations of mechanism especially contrived for the following purposes: first, for holding the brush handle while being driven; second, for driving the brush handle, and third, for adjusting the driver of the machine so as to drive the handle exactly to the required point.

CLOTH MEASURING AND FOLDING MACHINE.—Leander Harvey, of New Castle, Ind., assignor to Leander Harvey and Co., of same place.—This invention relates to a new machine for measuring cloth that is being wound upon a beam or roller, and for folding it after it has been measured. It consists in the application to the winding up roller of a measuring friction wheel and spring snap, the latter serving to audibly announce every revolution of the measuring. After the cloth has been wound about the drum, one of the frame posts is disengaged and folded down. This liberates one end of the drum and allows the cloth thereon to be slipped off bodily, when it is properly folded for transportation or display.

CIGAR MACHINE.—Robert Neisch, of Allentown, Pa.—This invention relates to several improvements in the cigar machine for which letters patent were granted to the same party December 20, 1870. The present invention has for its object materially to simplify the devices shown in the former invention, and thereby to reduce the difficulty and expense of producing the machine and operating the same. It consists, first, in the use of a rotary serrated cutter hanging in spring bearings, and intended to cut off whatever may project beyond the top of the cigar; second, in the application, to the upper mold box lid, of a projecting arm, which serves to apply the aforesaid rotary cutter only while the mold is closed; third, in providing the frame which carries the knife for cutting the tip end of the wrapper with a weighted arm, whereby it is raised automatically off the platform unless when forced down for cutting, so that it will not interfere with the operation of the machine; finally, the invention consists of a new construction of paster, containing a spring plunger for forcing the gum through small apertures in the end.

MITER BOX.—John Hawkes, of New Brunswick, and Timothy Hawkes, of Jersey City, N. J.—The object of the present invention is to furnish an improved box for sawing a miter or any other desired bevel; it consists in a bed piece and back rest provided with one or more adjustable saw guides arranged on an adjustable slotted arch plate by means of vertical guides and screws; and also in a gage used in combination therewith.

LOZENGE MACHINE.—Ernest Greenfield, of New York city.—In this improved lozenge machine the type carrier consists of a vertically reciprocating gate working over the endless belt on which the paste to be printed, colored, or otherwise marked, is carried under the type and thence to the cutting devices; the gate is brought down at the proper time to print the paste while the belt is at rest by cams, and raised immediately afterwards by springs, and after it is raised an inking pad on a carriage above the belt is brought under the type and allowed to rest; the type is then brought down to the pad by other cams and again raised by the springs, after which the pad is moved back. This pad consists of an endless belt, working in a trough containing ink-over rollers, which are moved forward by a ratchet on the end of one roller striking a pawl as the pad moves under the inking type; and below the pad are rollers for delivering the ink up to the under side of it. The pad is considerably wider on the surface than the type, to adapt it to be shifted relatively to the type, so that it will not come down upon it always in the same place.

MODE OF MANUFACTURING WATERPROOF TUBING.—William H. Bates and Hugh Faulkner, of Leicester, England, assignors to Ezra Thomas Sawyer, of East Hampton, Mass.—This invention consists in providing an improved method of forming waterproof braiding or tubing by drawing a rubber tube over a flexible core, coating it with a rubber solution, then braiding the fabric thereon, and passing it through a heated cylinder; after which the core is easily removed from the braid by stretching the former lengthwise.

FLY TRAP.—Friederic Stengel, of New York city.—This invention furnishes an improved fly trap, which is composed of a transparent glass body raised on supports. It has a cone shaped bottom opening into the interior and is covered at the top. The bait is placed under the trap directly below the hole in the bottom, and the flies collected by it being disturbed fly up and enter the trap, from which they do not escape owing to their peculiar habit of not flying downward in a small chamber.

PIANOFORTE.—Paul Gmehlin, of New York city.—This invention relates to a new manner of sustaining the strings of a pianoforte, with the object of dispensing with the expensive agraffe and bridge systems heretofore in use. On the inner edge of the piano plate are formed projecting hooks, one between every pair of "cores" or set of strings; a bar of soft metal, ivory, or other material is placed against the under side of the hooks and extends along the inner side of the plate. The strings are drawn under the bar and then up over a projecting rib of the plate. The bar serves thus to define the length of the vibrating motion of each string.

WASHING MACHINE.—Thomas J. Wilkinson, of Highland, Kansas.—This invention furnishes an improved washing machine which consists of a rectangular box with a heating furnace attached. A cylinder is formed by attaching slats to three circular disks, one at each end and one at the center, and is revolved by a crank the shaft of which passes through the side of the box, through the end disks of the cylinder, and into or through a square hole in the central disk, so as to pivot the cylinder to the side of the box. To the end parts of the sides of the box are attached blocks which are so arranged as to receive the ends of spring bars, to the upper and lower ends of which are pivoted the ends of two small fluted rollers, which are held down upon the cylinder with sufficient force to squeeze out the water from the clothes operated upon; the elasticity of the spring bars allowing the rollers to adjust themselves to the varying thickness of the clothes.

CHURN.—David H. Gobin, of Springfield, Ill.—This invention furnishes an improved churning machine which is provided with a dasher in two parts driven by a crank shaft. An air pump is connected with the apparatus and is run by the crank shaft so that it may be used to force air into the churn. It is disconnected from the churn by the operation of a lever when desired.

PICTURE CASE.—Alvin R. Stone, of Baldwinsville, N. Y.—The object of this invention is to provide a convenient apparatus for holding, preserving, and exposing to view photographic and stereoscopic pictures; it consists in a cabinet constructed with two compartments for containing two tiers of pictures, and with straps or bars and heads, to which a vertical reciprocating motion is given, by which the position of the pictures is changed. Magnifying glasses may be applied to the apertures of the case, or a stereoscope may be attached thereto when it contains stereoscopic views.

LATHE CHUCK.—Cornelius Archer, of Nelsonville, Ohio.—This invention furnishes an improved lathe chuck for holding pieces having different sized holes formed through them, and for holding columns, half and quarter columns while being turned or polished, without the necessity of gluing. It consists of a holder, the stem of which is designed to be inserted in the lathe mandrel, and the head of which is made cylindrical to enter the hollow base of a cone attachment; it has inclined lugs formed upon its outer surface so as to interlock with corresponding lugs formed upon the inner surface of the hollow base of the cone, so that the cone is carried around with the holder in its revolution. The cone is designed to enter the hole in the piece to be turned or polished, whatever may be the size of the hole. To the side of the cone is attached a blade to prevent the piece from turning while being operated upon. The forward end or face of the holder is made with a flange around its edge to prevent the pieces from flying apart while being operated upon. The face of the holder is also provided with cross flanges or blades to adapt it for holding half and quarter columns.

CULTIVATOR.—William H. Griffith, of Lockhart, Texas, assignor to himself and Stokes Mincenhommer, of same place.—This invention furnishes an improved cultivator, which may be readily adjusted for cultivating plants, covering small grain, and breaking up the ground; it consists more particularly of a combination of three adjustable uprights and a cross bar, by means of which the plows are set more or less apart, and, through the operation of a lever, raised from the ground when required. Various kinds of plows may be used with the machine, which is adjustable in all respects, and it may be used for breaking up land by taking off the outer plows and standards.

DEVICE FOR CONVERTING MOTION.—Pelag Werni, of Elizabeth, N. J., assignor to himself and Henry Curtiss, of New York city.—This invention furnishes an improved device for converting rotary into reciprocating motion so as to move the reciprocating shaft in both directions with a positive movement, without the use of any separate device for shifting at the end of the stroke. To the driving shaft is attached a wheel, a segment of which is toothed, the plane part of the wheel being in the circle of the points of the teeth. The end of the reciprocating shaft is pivoted to the base of a fork upon the inner sides of the arms of which are formed teeth corresponding in form and number with the teeth of the segmental gear wheel. The arms of the fork are arranged at such a distance apart that when the teeth of the gear wheel are meshing into the teeth of either arm of the fork the plane part of the wheel is moving along the points of the teeth of the other arm. At the opposite ends of the two arms of the fork are formed projections which, as the last tooth of the gear wheel operates upon the last tooth of each arm of the fork, strike against the plane surface of the wheel and move the fork, so that the first tooth of the gear wheel meshes firmly with the first tooth of the other arm, and the fork and shaft are moved alternately in opposite directions with a positive movement by the continuous movement of the shaft.

SAW TEETH DRESSER.—Collin M. Cowardin, of Gardner, Tenn.—This invention consists of a pair of blocks of wood hinged together, and each provided with a spring plate and a file in the side fronting the other; the spring being next to the edge, and the file being between the spring and the hinge joint: behind the files is a screw for screwing the blocks together. It is employed for dressing off the outer corners of the teeth after the saw has been set, so as to equalize the width of the set throughout, and is applied by introducing the blade between the blocks, with the teeth between the files and with the spring behind the teeth so as to press on the blade; it is then moved along from end to end and files off all the points of the teeth alike.

BOAT DETACHING APPARATUS.—Thomas S. Seabury, of St. James, N. Y.—This invention relates to a new boat detaching apparatus which is so arranged that it operates automatically or only at the will of the occupants of the boat. It consists in constructing the link by which the boat is suspended from the davits of two pivoted claws, locking together, but so arranged that they uncouple as soon as the weight of the boat is no longer suspended from the davits, but is supported on the water. The invention also consists in combining with these claws a bolt by which they can be so connected as not to become automatically disengaged, but which can be drawn out whenever the detachment is to be effected.

SAWING MACHINE.—John C. Nelson, of Kingston, Tenn.—The object of this invention is to facilitate the operation of sawing timber across the grain; it consists in a bow spring for straining the saw, and in a vibrating lever with a slide attached to the shank of the saw. The saw is fed down by its own weight and that of the bow spring, while the reciprocating motion is given it by vibrating the lever by hand. In practice, the saw is started in a horizontal position, and as it works down it is kept in a nearly horizontal position by slipping the slide down on the lever.

WASHING MACHINE.—Ira Pratt, Jr., of Greenleaf, Minn.—This invention furnishes an improved washing machine, which is light, strong, durable, readily attached to an ordinary wash tub, and easily operated; it consists in a vertical corrugated wash board attached to a frame which is clamped to the side of the tub, and in an arrangement of levers, also attached to the frame, by the operation of which a corresponding corrugated board is moved towards and from the fixed one. Between them the clothes are squeezed and washed.

EXTENSION LOUNGE.—George H. Thomas, Quincy Point, Mass.—This invention furnishes an improved lounge which can be readily converted into a bed for two persons. It is so constructed that, when the extension is drawn out, the two parts of the bed are kept parallel with each other by means of certain bars which connect them. The back is made removable so as to facilitate the packing away of the combined article for storage or transportation.

DRYER.—William E. Wright, Rome, N. Y.—This invention relates to a new apparatus for drying peat, lumber, etc., by currents of heated air forced through a chamber that contains the matter to be dried, and afterwards ejected therefrom when charged with the moisture taken from such matter. By this arrangement the peat or other substance is exposed to the identical effect of hot wind and is thoroughly and rapidly dried.

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DISCLAIMER.

21,207.—HARVESTER.—C. W. and W. W. Marsh. August 13, 1872.

DESIGNS PATENTED.

6,017.—SMOKING PIPE CAP.—W. H. Blake, Waterbury, Conn.
6,018.—HEATING STOVE.—J. V. B. Carter, Detroit, Mich.
6,019.—DESK STANDARD.—J. D. Diffenderfer, East Lewisburg, Pa.

TRADE MARKS REGISTERED.

940.—STOMACH BITTERS.—J. Dreyfus, New Orleans, La.
941.—CRACKERS AND BISCUITS.—J. B. Kupfer, Kenosha, Wis.
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22,631.—RAILROAD CHAIR.—M. C. Cushman. Jan. 2, 1873.
22,071.—ELECTROMAGNETIC FIRE ALARM.—M. G. Farmer. Oct. 30, 1872.

EXTENSIONS GRANTED.

21,185.—STEAM HEATING APPARATUS.—H. G. Bulkley.
21,194.—MACHINE FOR CUTTING MITERS.—S. W. Hall.
21,207.—REAPING MACHINE.—C. W. and W. W. Marsh. Two divisions.
21,213.—NAIL FORGING MACHINE.—S. S. Putnam.

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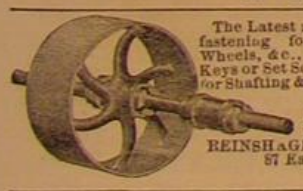


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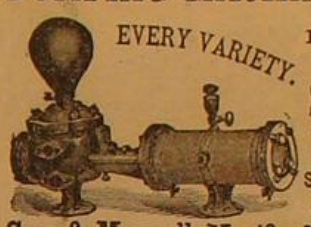
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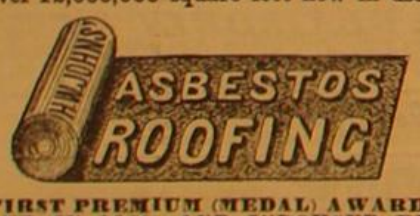
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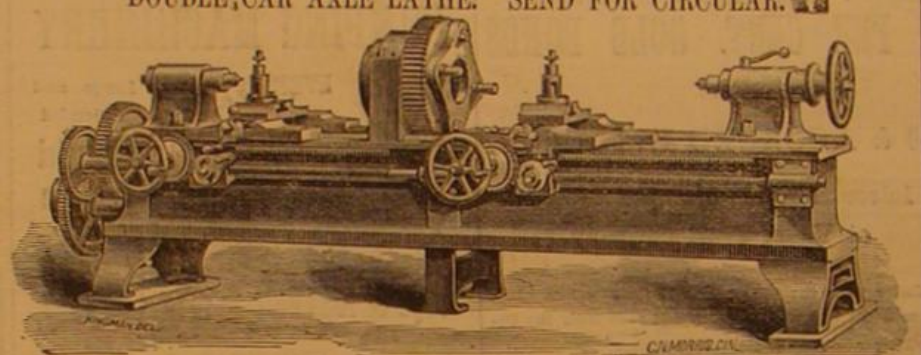
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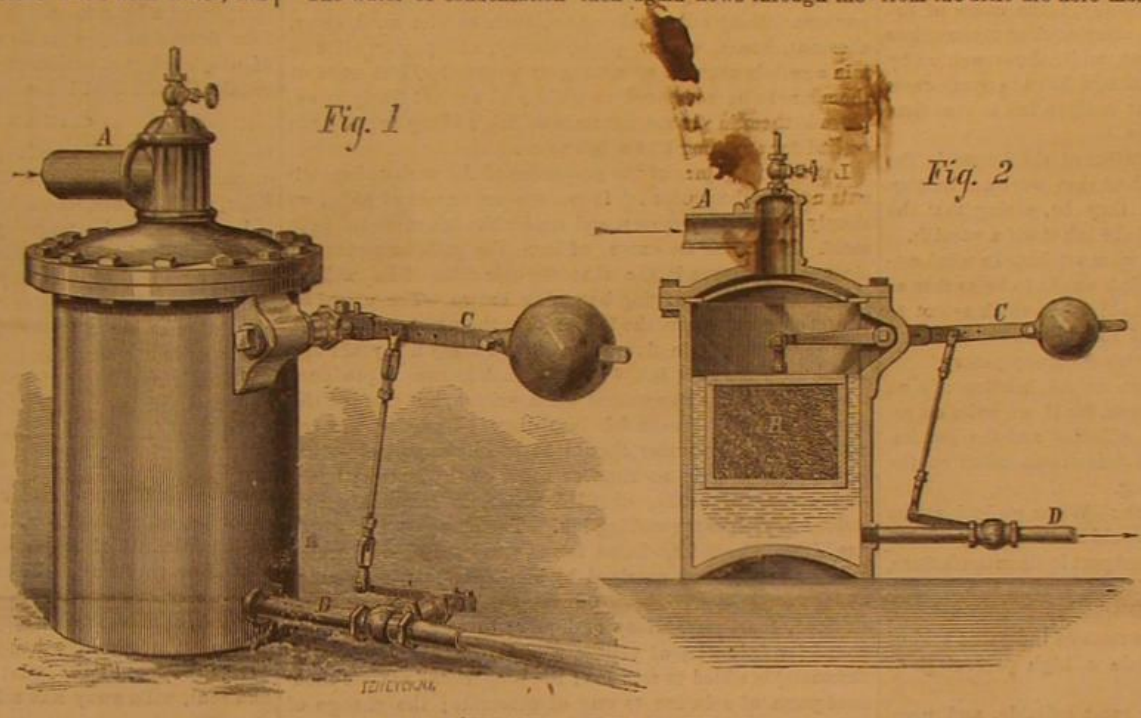
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IMPROVED STEAM TRAP.

In the many processes of manufactures, etc., where steam is employed as a heating agent, the removal of the water of condensation from the pipes of the heating apparatus as fast as it accumulates, without, at the same time, wasting steam, is an object of the most desirable character. Devices of various forms have been designed for its accomplishment, among which brass expansion tubes and copper floats have occupied a prominent position. The former, however, are rendered inoperative upon becoming slightly coated with deposit, and allow the steam to pass off with the water; while the float, which is likely to become filled with water, has proved unreliable in giving sufficient power to work the necessary mechanism. The steam trap now illustrated was designed to obviate the many difficulties experienced in using the ordinary traps, by providing a machine of simple construction, possessing the positive power adequate to its efficient operation. It is the invention of Mr. R. Berryman, of Hartford, Conn., whose feed water heater was lately illustrated in these columns. It is shown in perspective in Fig 1, and in section in Fig. 2 of our engravings.



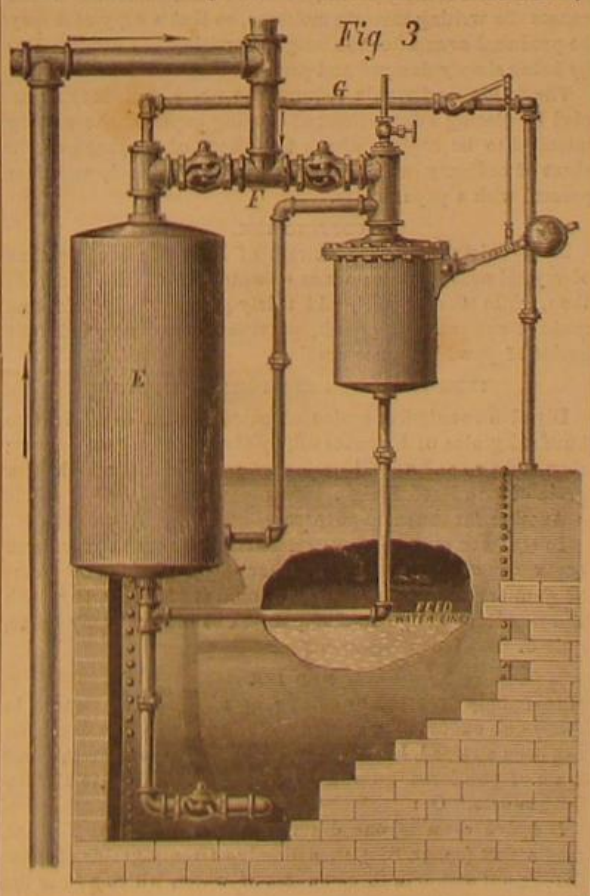
BERRYMAN'S STEAM TRAP.

The supply pipe, A, conveys to the trap the condensed water from whatever steam apparatus it may thereby be connected with. B is a bucket which is suspended from one end of the lever shown. This lever is fastened to a rock shaft or spindle, one end of which extends through the stuffing box shown more particularly in Fig 1. To the outer end of the rock shaft is attached the lever, C, which controls, by the connecting mechanism represented, the valve in the discharge pipe, D, through which the condensed water is conveyed to any desired place. The bucket, B, is partially counterbalanced by the weight seen on the lever, C, so that, when the trap fills with water and the bucket loses weight by being submerged therein, the weight on the lever, C, falls, depresses the lever, opens thereby the valve in the pipe, D, and allows the contained water to be discharged. These conditions are represented in Fig. 1.

When the condensed water falls to about half the hight of the trap casing, the bucket regains sufficient weight to raise the weighted lever, and thereby close the valve. When the valve is closed, at least six inches of water still covers the mouth of the discharge pipe, so that loss of steam is entirely prevented. The operation, as described, is repeated whenever the drip raises the water in the trap to the required hight.

The power exerted by the ordinary float is equal to the weight of water it displaces, or, in other words, to the weight of the material composing it. This cannot, of course, be great, as otherwise the float would either sink or have to be made of inconveniently large dimensions. The power derived from the bucket used, as described in this trap, is equal to the solid contents of the bucket in weight of water; that is to say, if the submerged bucket measures one cubic foot, the pull exerted by it, on withdrawal of the water, would equal 62½ pounds. The inventor claims that this construction renders the trap as sensitive in its action as a pair of scales. It adapts itself to all conditions, either discharging a very small volume or throwing a solid pipe full as occasion requires; when sufficient water is supplied by condensation, it stands on a balance and discharges a constant stream. It is further claimed that the facilities for repair are unsurpassed on account of the easy access to the valve. The cock seen at the top of the trap is to permit the expulsion of air.

Fig. 3 represents a modification of the apparatus, in which it is used to feed the condensed water back to the boiler without the intervention of pumps. E is a cylinder which is connected with the water space of the boiler by a pipe from its bottom, which pipe has the check valve shown opening outwardly from the cylinder. The inlet or drip pipe from the steam coils is connected, by the branch pipes at F, with the trap and with the cylinder, E, as shown. Each of these branch pipes is provided with the check valve represented, opening inwards. The pipe, G, connects the steam space of the boiler with the cylinder, and a valve in G is opened or closed by the trap lever, as indicated. The trap is connected by two pipes, one from its top and one from its bottom, with check valves, and the operation is continued. The latter modification, the inventor states, can be used economically only where the feed water is not heated to a temperature to which it can and ought to be raised by the exhaust. Where this occurs, there are usually pumps of some kind in use, so that the trap in Figs. 1 and 2 can be used. But where there is no engine, and direct steam is used for dry-



ing or heating purposes, the condensed water may be returned to the boiler with advantage by the latter device, which operates well with any number of coils, which may be situated either above or below the water line.

The Berryman Manufacturing Company, of Hartford, Conn., are the manufacturers, and further information may be obtained of J. B. Davis & Co., of the same city.

Prehistoric Museum.

The interesting collection of ethnology and prehistoric remains, bequeathed by the late Mr. Henry Christie, is now arranged in the museum, 103 Victoria street, Westminster, London, admission to which is by ticket, available only on Fridays, from ten to four. The tickets are obtained at the British Museum itself on any of the open days, on application. The collection (in four rooms) contains prehistoric remains of Europe, Asia, and Africa. The flint implements from the drift are here most beautifully and symmetrically arranged, and you can observe, even from that period, the advance from the rudely chipped celt to its more polished successor. Daggers, spear heads, saws, arrow heads, beside celts, chisels, and gouges, are here all represented. Some from Santon Downham, Norfolk, from Hoxne, Suffolk, the Yorkshire wolds, the Irish celt, axe, and hammer heads, etc., of their own peculiar type. Most interesting, too, are the remains from the caves of Dordogne, France, consisting chiefly of the animal remains of the mammoth, hyena, reindeer, and horse, some of the bones of the former having the figure of the animal itself engraved on them; of flint and worked bone implements, arrow heads and scrapers, barbed spear heads for fishing, and ornaments of fossil shells, with needles from the shank bones of the horse. These form the most valuable part of the collection. In contrast with them is the ethnographical collection (modern races), and notably in this are the Esquimaux, exhibiting, in the chipped arrow heads and scrapers of siliceous materials, harpoon heads, and bone needles, their identity with their prehistoric prototypes. Of special interest are the objects from ancient Mexico—sculpture, pottery of different kinds, arrow heads, etc., the most remarkable among which being a masked formed out of a human skull, coated entirely with a mosaic work of turquoise and obsidian. The eyes are made of iron pyrites, very highly polished, so as to resemble small convex mirrors; the teeth of a white stone, the mouth being made to open; the mask is furnished with straps, so as to be worn. Here are, also, ancient earthen pipes in the form of animals, from the mounds of Ohio, North America, which bring to mind the buried cities of the northern continent, a subject long the wonder of the historic student. In these divisions the ethnologist may study the manners, customs, and dress of the different races of man, shown in their war implements, articles of dress and domestic use, their musical instruments, etc., through tribes from the northwest coast of America, the Asiatic Islands, China, Japan, North and Central Africa, the Polynesian group, all exhibiting the characteristics of the various races. To be brought face to face with the remnants of a vast antiquity excites in the mind of the spectator a deep and thrilling interest, as he sees in these rude emergencies of almost primitive man the gradual development into higher and still higher types of civilization. —*Science Gossip.*

Sand Paper.

THE *American Builder* gives the following method of making sand paper of superior quality, at almost a nominal cost. The device for making sand paper is simple, and at hand to any one who has occasion to use the paper. A quantity of ordinary window glass is taken—that having a green color is said to be best—and pounded fine, after which it is poured through one or more sieves of different degrees of fineness to secure the glass for coarse or fine paper. Then any tough paper is covered evenly with glue, having about one third more water than is generally employed for wood work. The glass is sifted upon the paper, allowed a a day or two in which to become fixed in the glue, when the refuse glass is shaken off, and the paper is fit for use. This sand paper costs little, and is better than that ordinarily bought, in which sand is frequently mingled with the glass.

IN California they make "metallic tubular wheelbarrows," which are entirely of iron, stronger and lighter than the wooden ones, and much more durable withal.

WRITING FLUIDS.

Beyond the act of dipping a pen into an ink bottle, and lifting out a portion of the ink for the purpose of committing our thoughts to paper, we are unacquainted with the composition or mode of production of this useful material.

In a paper read by Mr. Archibald Paterson, before the Glasgow Chemists' and Druggists' Association, Glasgow, the various substances used in writing were treated on, as well as the processes by which writing fluids are produced. He said:

The writing fluids of the present day are the result of our commercial requirements, and are altogether unlike, in composition and properties, the ink of the ancients. They wrote; but their ink was what we should term a varnish or paint, being composed of carbon in very fine division, say either ivory or lamp black, held in suspension by any drying oil which was most approved of, or mixed with glue after the manner of Chinese ink, which requires to be dissolved in water before being used. The ingredients were combined by being rubbed together between stones, as we see painters of the present day grinding their paints. We are even told that the pleasing process of grinding was in schools placed as a punishment on the most indolent; or, failing this, the poorer scholars were pressed with the honorable task of keeping the school in ink. There can be no doubt that the carbon contained in these inks, and which is well known to possess peculiar properties of durability, is the cause of the fresh and black appearance which many ancient manuscripts retain, even after several centuries, while those written by our grandfathers fifty or sixty years ago have in many cases almost disappeared. Even the best modern ink in that time shows decided symptoms of old age.

From the care taken in the formation of the letters in the ancient manuscripts, it is very evident they were not written in a hurry; neither indeed could they be, seeing that the pens used were small brushes, and the ink itself a varnish.

To produce a good modern ink, we must bear in mind certain qualifications, namely, a good ink ought to be so thin as to flow freely from the pen; it should be so thick as not to spread or blur on the paper, and it should possess sufficient depth of color to retain its blackness for many years.

Much of the permanency of even an A1 ink depends on the material upon which it is written, for if we write on paper which has been bleached with chlorine and the gas imperfectly removed, it has a most deleterious effect on the beauty and durability of the writing.

Concerning the composition of ink: When we look at the usual source, namely, galls, one would at first imagine that gallic acid wrought a most important part in its manufacture, but such is not the case. The galls are used in the process, not because they are rich in gallic acid, which they are not, although it is from them we obtain most of the gallic acid of commerce, but because they contain a high percentage of tannic acid.

The proportions which appear most suitable, and upon which most dependence can be placed, are—bruised galls, one pound; to this add one gallon of boiling water, and one third of the weight of the galls, namely, five ounces and a third, of sulphate of iron in solution; also three ounces of gum arabic previously dissolved, and a few bruised cloves or a few drops of creosote or carbolic acid dissolved in methylated spirit. It is better to allow the galls to macerate for twenty-four hours, then to strain the infusion, and add the other ingredients.

I cannot do better at this part of the subject than offer you a formula used and recommended by that eminent chemist, the late Dr. Penny, of Anderson's University, in Glasgow.

Take of bruised galls twelve ounces, macerate for a week in one gallon of cold water, then add six ounces of sulphate of iron in solution, also six ounces of mucilage of gum arabic, and five or six drops of creosote.

The learned doctor has here taken advantage of a fact well known to chemists—namely, that tannic acid is more soluble in cold than in hot water—hence the cold maceration is prescribed, which I believe is pretty generally employed by first class ink manufacturers.

The celebrated blue-black ink prepared by Messrs. Duncan, Flockhart, and Company, is said to be made by the process of cold maceration. A formula, said to be theirs, of which the following is a copy, was printed and circulated some years ago by an English gentleman. It explains the process more fully:

RECIPE FOR PREPARING BLUE-BLACK WRITING INK,

(Which also serves well for Copying Ink.)

Blue Aleppo galls (free from insect perforation)	4½ ounces.
Bruised cloves	1 dram.
Cold water	40 ounces.
Purified sulphate of iron	1½ "
Pure sulphuric acid (by measure)	35 minims
Sulphate of indigo (in the form of a thinnish paste, and which should be neutral, or nearly so	¼ ounce.

Place the galls, when bruised, with the cloves, in a fifty ounce bottle, pour upon them the water, and digest, often daily shaking for a fortnight. Then filter through paper in another fifty ounce bottle. Get out, also, the refuse of the galls, and wring out of it the remaining liquor through a strong clean linen or cotton cloth into the filter, in order that as little as possible may be lost. Next put in the iron, dissolve completely, and filter through paper. Then the acid, and agitate briskly. Lastly the indigo, and thoroughly mix by shaking. Pass the whole through paper. Just filter out of one bottle into the other till the operation has been completed.

On a large scale, this fine ink may be made by percolation, as Duncan, Flockhart, and Company and others in Edinburgh do it, the above being said to be their recipe.

The weights used are avoirdupois, and the measures used are apothecaries' measures.

Note.—No gum or sugar is proper, and on no account must the acid be omitted. When intended for copying, 5½ ounces galls is the quantity.

You will observe that there are several peculiarities about this writing fluid, namely:—First, the cold process is used. Second, the want of gum. Third, the use of sulphate of indigo, which is a solvent for the black precipitate, the tannogallate of iron; hence the gum arabic is not required, as it is only used to suspend this precipitate. Fourth, the deficiency of iron, which may be accounted for by the pure protosulphate being used, which cannot contain, or should not contain, any oxide, so that all the iron is free to combine with the tannin. Fifth, the use of free sulphuric acid, which is generally looked upon as detrimental to writing fluids, but which must be introduced here for some purpose, of which I am as yet ignorant.

Thus far I have only spoken of high class inks, but it frequently occurs that an article is required to be sold at a cheaper rate than that wholly made from galls; and the vegetable world gives us an ample range of materials to select from, many of which contain tannin in fair quantity.

In this case other ingredients may be substituted instead of part of the galls; thus we often see logwood substituted, and catechu, sumach, and oak bark may be used for the same purpose. Many other substances, such as elm wood, elder, chestnut, beech, willow, plum, cherry, and poplar, all contain a certain amount of astringent properties, but none of them are to be compared to galls, and are not likely to supersede them in the manufacture of ink so long as galls can be had for anything like a fair price.

Let us now glance at the properties of the various ingredients used in the process. If we use an excess of galls, we simply throw away money, and render the ink more liable to mold. If we use an excess of iron, the galls being insufficient to decompose it, the characteristic color of its oxide is soon shown by the writing becoming brown. The use of an excess of gum causes the ink to clog the pens, and the writing to be wanting in fluency. About twenty-five years ago an ink named Japan ink was very much in use; it produced a beautiful glossy appearance when written, but clogged the pen so much that it soon fell into disuse; its defect was too much gum. The water should be as soft as possible—that is, it should contain no lime or other earthy matter; hence rain water, or, better, distilled water, is frequently prescribed in recipes for making ink. The cheapest ink which has hitherto been introduced is one composed of a saturated solution of logwood obtained by boiling twenty-two pounds of logwood in a sufficiency of water to produce, after being strained, fourteen gallons of liquor; to this decoction one pound (avoirdupois) of yellow chromate of potash (not bichromate) is added in solution; the proportions are one thousand parts of solution to one of chromate; the change of color is not an immediate one, but gradually becomes darker. The experiment may be tried, on the small scale, by using logwood, a quarter of a pound boiled in water to produce two pints, to which, when strained, add twenty grains of chromate of potash in solution.

We will now glance at the composition of "writing fluids" used for special purposes; thus we know that writing which is intended to be copied is written with ink containing either gum, sugar, treacle, glycerin, or some such substance which causes the writing to retain moisture, so that a copy of it may be produced even after the original writing has become dry, by being simply damped and pressed.

The following formula requires no press, but may be copied by placing a damp sheet of copying paper on the writing intended to be copied; above this sheet of copying paper a sheet of ordinary writing paper must be placed, and then pressed with a paper knife.

COPYING INK.

Mix—Thirty grains of extract of logwood; seven grains of crystal soda; half an ounce of water. Boil till dissolved; then, while stirring well, add thirty grains of glycerin, one grain of chromate of potash, previously dissolved, and four grains of powdered gum arabic.

INDESTRUCTIBLE INK FOR DEEDS, ETC.

Dissolve twenty-five grains of powder gum copal in two hundred grains of lavender oil, by the aid of a gentle heat; then add two and a half grains of lamp black, and half a grain of powdered indigo.

Another for the same purpose.

In eighteen ounces of water, boil shellac, two ounces, and borax, one ounce; when cold, filter and mix with one ounce of gum arabic dissolved in two ounces of water, to which add powdered indigo and lamp black as much as may be required.

RED INK

is commonly prepared by boiling brazil wood, two ounces, in thirty-two ounces of water, to which add, after the decoction has been strained, half an ounce of chloride of tin, and one dram of powdered gum arabic; then evaporate to sixteen fluid ounces. Or:

Dissolve carmine, one dram in half a dram of liq. ammonia fort (sp. gr. 880), then dissolve twenty grains of powdered gum arabic in three ounces of water, which add to the dissolved carmine.

BLUE INK

may be prepared by dissolving two or three ounces of sulphate of indigo in a gallon of water; or by rubbing together one ounce of oxalic acid, and two ounces of fine Prussian blue, to which add one quart of boiling water.

INK POWDER

may be prepared by mixing—Powdered galls, four ounces; powdered sulphate of iron, one ounce; powdered gum arabic, one ounce; powdered white sugar, half an ounce; powdered cloves, one dram.

To these proportions add of water one quart, and macerate for an hour or two.

Note.—The quantity of sulphate of iron is small because it has been dried, and has thus lost the weight of water evaporated.

INK IN CAKES

may be prepared by evaporating good ink to dryness in shallow dishes, but the best results are obtained by dissolving Chinese ink in water.

MARKING INK.

This substance is so well known that little may be said on the subject. The process is founded on the chemical fact that, by applying heat to a salt of silver in combination with other ingredients, the writing becomes immediately, and should remain, permanently black; the formula of Professor Redwood is a good one:

Dissolve separately—nitrate of silver, one ounce; crystal carbonate of soda, one and a half ounces; mix the solution, and collect the precipitate on a filter; wash well, then introduce the moist precipitate into a mortar, and add eight scruples of tartaric acid; triturate till effervescence ceases; then add of liq. ammonia fort. a sufficient quantity to dissolve the tartrate of silver, to which add four fluid drams of archil, four drams of powdered white sugar, and twelve drams of powdered gum arabic, and make up to six fluid ounces, if required, with distilled water.

CRIMSON MARKING INK

is prepared by adding six grains of carmine to the liquor ammonia of the above formula, but it soon loses its crimson color, and becomes, like other marking inks, a black color.

In conclusion, I cannot lay aside this subject without referring to the beauty, brilliancy, and variety of color produced from aniline, whereby we can procure any shade from the most brilliant scarlet to the most sombre black; and should we at any time be deprived of ink from the present sources, we may rest content that so long as our coal fields yield their sparkling riches, so long may we, without fear, look forward to an unlimited supply of our writing fluids.

Mysterious Influences.

Persons sometimes feel remarkably well—the appetite is vigorous, eating is a joy, digestion vigorous, sleep sound, with an alacrity of body and an exhilaration of spirits which altogether throw a charm over life that makes us pleased with everybody and everything. Next week, to-morrow, in an hour, a marvelous change comes over the spirit of the dream; the sunshine has gone, clouds portend, darkness covers the face of the great deep, and the whole man, body and soul, wilts away like a flower without water in midsummer.

When the weather is cool and clear and bracing, the atmosphere is full of electricity; when it is sultry and moist and without sunshine, it holds but a small amount of electricity, comparatively speaking, and we have to give up what little we have, moisture being a good conductor; thus, in giving up, instead of receiving more, as we would from the cool, pure air, the change is too great, and the whole man languishes. Many become uneasy under these circumstances; "they can't account for it;" they imagine that evil is impending and resort at once to tonics and stimulants. The tonics only increase the appetite, without imparting any additional power to work up the additional food, thus giving the system more work to do, instead of less. Stimulants seem to give more strength; they wake up the circulation, but it is only temporarily, and unless a new supply is soon taken, the system runs further down than it would have done without the stimulant: hence it is in a worse condition than if none had been taken. The better course would be to rest, take nothing but cooling fruits and berries and melons, and some acid drink when thirsty, adding, if desired, some cold bread and butter; the very next morning will bring a welcome change.—*Hall's Journal of Health.*

Slate Quarrying and Manufacture in America.

Vermont is distinguished as the headquarters in this country for the best and most extensive deposits of slates, and the region known as Lake St. Catherine is remarkable for its inexhaustible quarries of argillaceous slate, the commercial value of which is just beginning to be appreciated. From the rude Fairhaven school slates, for cyphering and drawing portraits of the master, this hardened clay has risen to an economical importance that puts it into competition with the choicest marbles. The quarries do not run several hundred feet deep like those of Wales, and are consequently worked with greater facility. Large blocks are blasted out and split with wedges, then raised with derricks, and separated into smaller slabs by deftly directed blows from a wooden beetle. The roofing slate is wet in order to facilitate splitting, the thinly laminated formation rendering the process an easy one with the chisel. It is not expedient to take from the quarry more than can be readily split, as the slate splits more freely when fresh, although it is said that frost will restore the splitting property.

The thickest slabs are readily sawn and planed by machinery. Large, handsome flagstones are prepared by simply sawing. Moldings and other decorative pieces are shaped with tools. A great impetus has been given to the slate trade by the demand which the Chicago fire has created, especially for roofing and [illegible] The slate companies interchange pro-

ducts with the marble companies, for interspersing white marble with dark slate for floors. Slate is rapidly taking the place of marble for interior decoration; but so long as our extensive forests remain, we shall not need to substitute it for wood, as the English do. With us it is still a luxury rather than an economy.

For ornamental purposes, the slate, after being properly cut and trimmed, is scoured with pumice stone, then rubbed with powdered pumice stone, and polished with felt. It is now ready to be transformed into marble. The slabs having been prepared, and painted with the groundwork color, they are ready to dip. A vat is at hand, containing water, and we cannot say what else. A man dips a small brush in oil colors, and sprinkles it on the surface; then he fans the water with a palm leaf, and draws the brush through it several times. The oil mixed paint spreads on the surface of the water, like the veining in marble, and the slab being gently raised against it receives the impression. A mere change of groundwork and colors gives the varieties of marble—Egyptian, Spanish, Galway, Pyrenese, etc. The most elaborate work, as for altar pieces, chessboards, and borders, is done by hand. After the application of colors, successive bakings and polishings finish the work. This marbleized slate is quite elegant, possessing sixteen times the strength of marble, and scarcely distinguishable from it. The imitation of marble in slate is employed for coffins, caskets, table tops, mantels, billiard beds, lamp stands, and innumerable domestic and ornamental uses. The best workmen here are from Wales, having learned the business in the immense quarries of Carnarvonshire. They are sober, industrious, moral people, provident for the future, noticeably fraternal among themselves, kind, and generous toward all. They take Saturday afternoons for holidays, and make up their hours during the rest of the week. These slates are not inferior in quality to those of Wales. The quarries are comparatively shallow, but more easily worked, and they are too numerous and extensive to be exhausted by a single generation.

The New York *Tribune*, from which we gather the above particulars, says the Vermont and neighboring slate trade is still in its infancy.

Gas Lighting by Electricity.

A new patent apparatus for the instantaneous lighting or extinguishing of gas lamps has just been successfully tried at Preston, England, and is thus described in the *Engineer:*

"The apparatus constituting the invention looks like a moderate sized globular inkstand of glass, surmounted by a tube of the same material, with a metallic top; and by screwing off the burner, it can be very easily attached to any lamp, chandelier, pipe, or ordinary gas jet. The base or globular portion is filled with a deep red colored liquid—a simple chemical mixture, with no combustible properties, almost without smell, and so cheap that three pennyworth of it will serve one lamp for twelve months. Over this liquid and within the glass tube, there is a plate of zinc, along with a piece of graphite or gas coal, and, between those and a thin coiled platinum wire fixed over the cap of the general vessel into which a gas burner is inserted, galvanic communication is obtained. A pipe, to be screwed to that up which the ordinary gas supply flows, runs through the base of the vessel to about the center of the surmounting tube; pressure brought to bear upon the gas in this pipe causes, by small collateral openings, a simultaneous depression upon the chemical solution which occupies a lower level in two side tubes; the gas occupies the vacuum caused by the displaced liquid, and then ascends to a chamber in connection with the burner; while the displaced liquid is pressed into two side tubes effecting contact with the zinc and graphite, generating galvanic activity, which is communicated to the platinum wire, and excites the catalytic power of the wire, which, when exposed to the ascending jet of gas, results in immediate, almost instantaneous, ignition. Each lamp requires one of these appliances; but, as stated, they are cheap, and the price of the requisite liquid may be termed nominal. The apparatus is virtually self acting; it requires no skilled hands to superintend its operations; it may be attached by a novice; it may be replenished at any ordinary chemist's shop for a few pence per year; it needs nothing but fixing, and then being subjected to the simple action of gas pressure."

The idea of attaching a separate galvanic battery to each gas burner, for the purpose of igniting and extinguishing the gas, may be novel, but certainly it is complicated. The method now extensively in use in this country is much better, and is as follows:

A galvanic battery is placed in the cellar, attic, or other convenient portion of the building, from which wires extend to the gas meter, and also to each gas burner over the orifice of every one of which a fine platinum wire is arranged in such a manner as to form a part of the electric circuit.

In connection with the battery and wires, two or more telegraph keys or buttons are employed, placed wherever convenience requires. By touching one of the keys, the electric current is made to operate a magnet and lever which is attached to the gas cock, whereby the latter is turned and the gas either let on or shut off. By touching the other key, the electrical current is made to pass through the several platinum wires on the burners, thereby almost instantly heating the platinum up to a nearly white heat and igniting the gas. It is a pretty sight to witness the sudden ignition of the jets of a large chandelier in this way. This plan of lighting, first practically applied by Professor Samuel Gardner, is employed for lighting the great dome and other apartments of the Capitol at Washington. Stewart's store and dwelling and Booth's Theater, New York, and in fact hundreds of buildings, public and private, in various parts of the country are electrically lighted in this manner, and the success of the system will now make its employment general.

The Albany Iron Works.

Forty years ago, the amount of finished iron yearly produced in the city of Troy was spoken of in the journals of the day as "the unprecedented quantity of twenty-four hundred tuns." At the present time, the manufactures of a single establishment located in the same city annually exceed seventeen thousand tuns; thus adding another and striking proof of the immensely rapid growth of our industrial enterprises.

The Albany Iron Works, owned by Messrs E. Corning & Co., is one of the largest manufactories of its kind in the country. Its buildings, which are substantially built of brick, are seven in number, exclusive of store houses, etc., and consist of steam mill, water mill, forges, spike, rivet and nail factories, and machine and pattern shops. The dimensions of the largest, the steam mill, are 350 by 155 feet.

The rivet and spike factory is one of the most interesting portions of the works. A number of ponderous machines are at work in the middle of the apartment, while at short distances apart along its sides are heating furnaces. Into these are placed the bundles of rods from which the spikes and rivets are to be made, and there brought to a red heat. They are then drawn out, one at a time, and their ends placed within the jaws of the machines. With almost magical rapidity, one hammer working horizontally forms the head, another with two or three blows sharpens the point, and lastly the jaws bite off from the bar the finished spike, which falls into its receptacle below. Rivets are made in a similar manner. This factory produces 68,000 kegs of railroad spikes, 11,000 kegs of boat and ship spikes, and 16,000 kegs of rivets annually.

The machines in the nail factory, 40 in number, manufacture 75,000 kegs of nails per year. The process of making the nails, like that of spikes, is accomplished entirely by a simple and ingeniously devised apparatus. A workman is seated before each machine; at his side is a heap of strips of iron of a width equal to the required length of the nail. Picking up one piece of iron at a time with his pincers, he places its extremity in the machine. Here a bit is cut off and pressed and hammered into shape in almost the twinkling of an eye, while a continuous stream of finished nails pours into the box beneath. In this factory are also the nut and bolt machines, great punches which penetrate the heavy pieces of iron as if they were dough, besides complicated though ingenious apparatus for cutting screw threads, finishing bolts, etc., the whole yearly furnishing to the market over 18,000 kegs of nuts and bolts.

The water mill is a spacious building containing furnaces, rolls and other machines for the manipulation of iron. Power is here supplied by an immense overshot water wheel of 150 horse power; water is also used to run the machines in the spike and nail factories, by means of a 150 horse power turbine wheel. In an apartment adjoining the main building, a large and newly completed horse shoe machine is being erected.

The steam mill and forges are huge edifices filled with a busy crowd and fairly deafening with an overpowering din. Here are six steam engines with an aggregate capacity of 700 horse power; besides a ponderous six tun steam hammer. There are also two squeezers, fifty puddling and heating furnaces, several merchant trains, and four cementation furnaces. In the manufacture of car axles, which is largely carried on, two powerful helve hammers are used. The number of men and boys employed is seven hundred. In addition to the products already alluded to, for information concerning which we are indebted to Mr. J. Keyes Paige, of the works, the establishment sends to the market, yearly, some 16,000 axles, 500,000 fish bars and about 1,000 tuns of safe and cultivator steel.

Specialties of some Tanning Materials.

Beech bark.—The tannin yielded by this bark makes a white but inferior leather, and is used only in places where oak is scarce.

Birch bark.—For tanning Russia leather, the inner bark is much used, especially on account of the brown oil which it yields, to which this leather owes its smell and durability.

Catechu.—This material produces leather, which, according to Professor H. Dussauce, "is very permeable to water, light and spongy, hard, and of a dark, reddish fawn color. The characteristic deposit, from oak bark and a few other tanning agents, known as bloom is not produced by catechu."

Divi divi.—Leather prepared by this substance is very porous, and sometimes tinged brown, unless the air be excluded in the process of tanning.

Hemlock bark, in union with oak bark, is supposed to produce the best leather. Hemlock alone produces leather inferior to that prepared with oak bark, and besides, imparts to it a red color. In America, it is largely used as a substitute for the bark of the oak.

Lombardy poplar imparts a fragrant smell to the leather, similar to that of Russia leather.

Valonia.—Leather prepared by this substance is harder and less permeable to water than that made with oak bark.

Willow bark (*Salix alba*) is remarkable for its astringent taste. Leathers made from kid and lamb skins owe their agreeable smell to this bark, with which they are tanned.

From experiments made in the tanning of calf skin with oak bark, divi divi, and catechu, in Germany, and published in the memoirs of the *Société d'Encouragement* of Berlin and the *Technologist*, it appears that oak bark and divi divi were shown to be the best, and that divi divi can be compared with the oak. The report states "the use of catechu as a dry matter in the tanning of skins is inadmissible The porous and thin texture of the leather thus manufactured is a poor guarantee against dampness, and permits of little duration.

"For the expense, there is little difference between oak bark and divi divi. Divi divi, it is true, is more costly; but as it possesses six times as much tannin as oak bark, the balance will be rather in favor of the latter.

Trials were also made with green Buenos Ayres hides, and the result was about the same as above. The divi divi is superior to catechu, and can be compared to the oak in many respects, but it requires more care in its use on a large scale, while the operation is one third shorter."

Liability of Telegraph Companies.

An important legal decision was announced at the last term of the law court in this district, which settles the law in this State as to the liability of telegraph companies to their employers in case of failure to transmit or deliver messages. As the case (George W. True *et als.* against International Telegraph Company) is of novel impression in our courts and of interest to the public, we give a brief statement of the facts. In 1870, George W. True & Co, of this city, sent a dispatch to their correspondents in Baltimore, accepting an offer of a cargo of corn at a given price and freight. The offer had been made by telegraph the same day, and the reply was sent on a "night blank" of the International Telegraph line at the usual night rates. The dispatch, on account of the carelessness of some operator on the line west of Boston, was not duly forwarded, and True & Co. failed to secure the cargo of corn. As the market price of corn and freights advanced immediately, they were obliged to buy other corn to meet the wants of their business at a price largely in advance of that offered. A claim was immediately preferred against the telegraph company for the damage resulting from their failure to promptly transmit the message to its destination, which was resisted by the company on the ground that one of the conditions printed on their "night blanks," subject to which the message was sent, was that the telegraph company should not be liable, in case of failure to deliver the message, to an amount greater than the sum paid for its transmission—in this case, forty eight cents. Suit was therefore brought to recover special damages; the case was argued July, 1870, and has been under consideration two years; the court has now rendered a decision in which the claim of the plaintiffs is sustained in full.

The ground of the decision was that, although telegraph companies may establish reasonable rules for the conduct of their business, they cannot by printed notices on their blanks relieve themselves from the liability which the law imposes on them from motives of public policy; that the courts are to determine in the last resort whether the rules and limitations prescribed by the company are reasonable, and that the condition set up in defense in this case was not binding upon the plaintiffs, as it attempted to relieve the telegraph company from all liability (beyond the amount paid for the message), whether arising from carelessness, accident or wilful default of the company and its servants. The measure of damage was declared to be the difference between the price of the cargo offered and of that bought to supply its place, with the additional freight.—*Portland (Me.) Press.*

Magnetism.

The French Academy of Sciences has received a paper from M. J. Jamin, in which he shows that magnetism may be condensed, just like electricity. Having, for some special purposes, had a large horseshoe magnet made, consisting of ten laminæ of perfectly homogeneous steel, each weighing ten kilogrammes, he suspended it to a hook attached to a strong beam, and, having wound copper wire around each of the legs, which were turned downwards, he put the latter into communication with a battery of fifty Bunsen's elements, by which means the horseshoe might be magnetised either positively or negatively, at pleasure. The variations were indicated by a small horizontal needle, situated in the plane of the poles. There was, further, a series of iron plates, which could be separately applied to each of the laminæ. Before attaching any of the latter, the electric current was driven through the apparatus for a few minutes and then interrupted, whereby the magnet acquired its first degree of saturation, marked by a certain deviation of the needle. One of the iron plates (usually called "contacts") was then put on, and it supported a weight of 140 kilogrammes. A second trial was now made; and the current having passed through again for a few seconds, it was found that the horseshoe would support 300 kilogrammes, instead of 140. The number of contacts being now increased to five, which together, in the natural state, supported 120 kilogrammes, it was found, after the passage of the current, that they could support the enormous weight of 680 kilogrammes, which they did for the space of a full week. No sooner, however, were th contacts taken off than the horse hoe returned to its usual permanent strength of 140 kilogrammes. This leads to show that magnetism may be condensed like electricity for a short period.

ON THE SPECTRA OF SULPHUR.—In the spectrum obtained in a closed Pluecker tube with the spark, says G. Salet, thirty two bands were measured. In the blue flame seen when hydrogen, made with sulphuric acid, strikes against a cold surface, the blueness of which is due to sulphur, twenty five bands were measured, eleven of which coincided with the former. The vapor of sulphur at a low red heat, examined by transmitted light, gave six bands.

DOUBLE TURBINE WATER WHEEL.

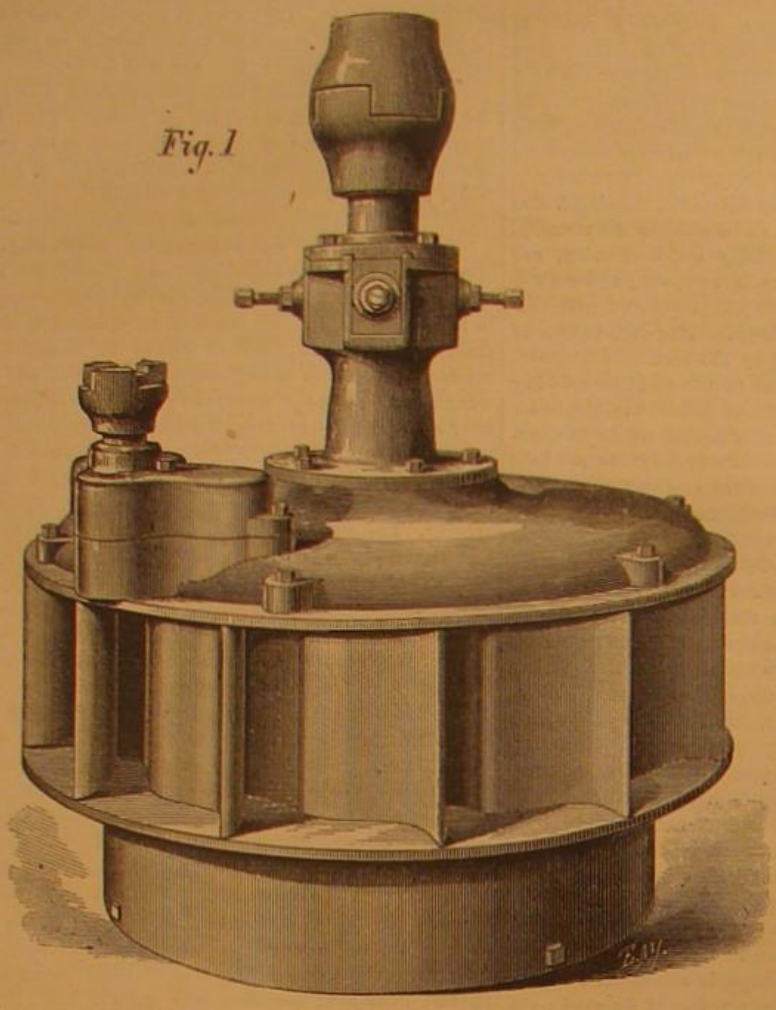
Fig. 1 of our engravings gives a perspective view, and Fig. 2, a detail vertical section of what is known as the "Eclipse" double turbine water wheel. We will at once proceed to describe its construction, and point out the advantages claimed for the same.

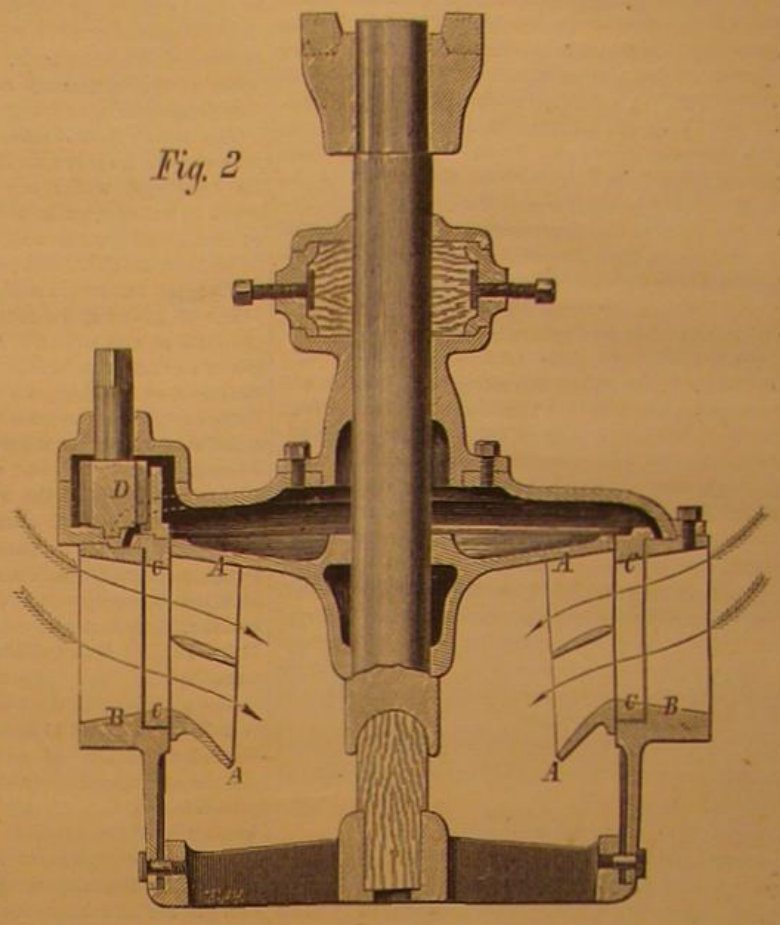
The wheel, A, Fig. 2, is composed of two tiers of buckets, as shown in the engraving, arranged alternately between three plates of different degrees of inclination, and which have an inward and downward discharge. It is cast in one piece and without cores, thus insuring great strength. It will be noticed that the interior of the wheel is somewhat of a conical form, by which construction a free vent for both tiers of buckets is provided. The cylinder, which supports the bridge tree, and the outer chute case are both comprised in one casting, shown at B. This cylinder and chute case are more fully represented in Fig. 1, from which the form of the outer chutes will readily be understood. The inside register gate, C, is also cast in one piece, with fixed water ways corresponding with the chutes in the outer case. The two combined form one duplex chute. This gate, C, hangs upon the outer case by one bearing only, as shown, and is moved, for the purposes of admitting and shutting off the water, by means of a segment and the pinion, D. By its operation an equal delivery of the water on to all parts of the wheel is secured; neither the direction of the current, nor the angle formed by the steam and the face of the bucket is ever changed, nor is the velocity of the water checked. The top of the wheel case, also a single casting, extends over the register gate, and is fastened by set screws to the outer chute case. This arrangement protects the gate from vertical pressure and renders the movement of it very easy. It may readily be operated by a governor. Facility of access to the wheel in case of accidents is also afforded, as by simply removing the set screws the top becomes detached and the wheel can be taken out of the case without disturbing the latter. It will be noticed that the pinion and segment by which the gate is operated are completely housed, so that they are protected from breakage by foreign substances getting between the teeth. The arrows in Fig. 2 indicate the course of the water through the outer chutes, the chutes of the register gate, and the upper and lower buckets of the wheel. A pedestal, with stuffing box and followers as represented, surmounts the wheel case and is fastened thereto by set screws. The arrangement, as shown, of the spider or bridge, by which the step for the wheel shaft is held, the hub of the wheel, and the stuffing box, is claimed to be such as to secure perfect steadiness of motion with the least possible friction and great strength and durability.

In the manufacture of this wheel, every part of the wheel and case is fitted up by machinery to standard gages, so that all parts can be readily duplicated. These parts are few in number and of great strength, while there is an entire absence of rings, bolts, bars, or traps of any kind which would be liable to derangement or breakage. Great general superiority, therefore, is claimed for these wheels, a large number of which are now in successful operation in the United States, Mexico, and Japan.

Patented March 24, 1868, and July 26, 1870, and a patent on recent improvements has just been allowed.

For further information, address the Stillwell & Bierce Manufacturing Company, Dayton, Ohio, by whom the wheels are made, and who have a properly constructed testing flume in their works for testing each wheel before delivery.



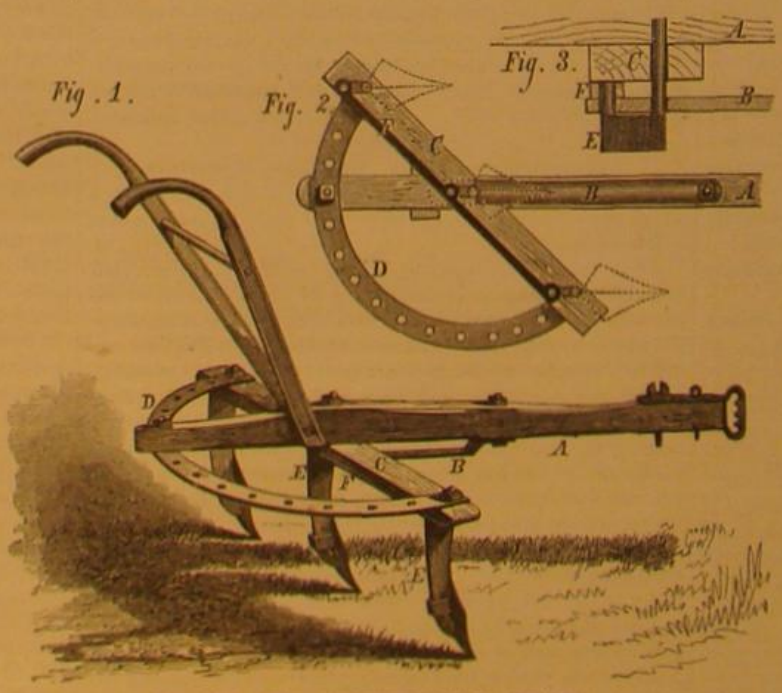


DOUBLE TURBINE WATER WHEEL.

ADJUSTABLE PLOW.

The improved plow, which forms the subject of our illustration, is the invention of Glover G. Foreman, of Stockton, Georgia, and was patented through the Scientific American Patent Agency, June 18, 1872. By means of a simple and ingenious device, it is rendered adjustable so as to be set to make the furrows various distances apart, without ever throwing the plows out of parallel.

Fig. 1 is a perspective view of the plow; A is the beam, B is a brace, attached to the beam as shown; C is a crossbar, and D is a semicircular metallic bar pierced with holes as represented. The plows, which may be of any desired kind, are secured by sockets and pins to the standard, E. The forward parts of the upper ends of these standards extend upward in the form of bolts, and the rear parts of the same are provided with upright pivots, in the manner shown in Fig. 3. Fig. 2 shows the under side of the plow frame. The bolts of the two outside standards pass through the crossbar, C, and through the ends of the curved bar, D, where they are secured by nuts. The rear pivots of these two standards enter holes formed to receive them in a small metallic bar, F, which extends along the under side of C, and is shown more clearly in Figs. 2 and 3. The bolt of the central standard passes up through the brace, B, the crossbar, C, and the beam, A, where it is secured by a nut. The pivot of this standard passes through the brace, B, and into the central hole in the metallic bar, F. This peculiar connection of the central standard with the other parts is shown enlarged in Fig. 3. It will readily be seen therefrom that the standard is thereby securely fixed in position, while the crossbar, C, is free to move around its bolt when loosened, and the metallic bar, F, around its pivot. By the construction described the parallelism of the three plows is not affected by the angle at which the crossbar, C, is placed to the beam, A, as will be seen by inspecting Fig. 2.



FOREMAN'S ADJUSTABLE PLOW.

The adjustment of the plows, to work closer together or further apart, is readily effected by loosening the nuts of the standard bolts, and by bolting the semicircular bar, D, through the proper hole to the rear end of the beam, A. By tightening up the standard bolts again, everything is made secure for work.

Further information may be obtained by communicating with the inventor at the foregoing address.

Old and New Ideas in Astronomy.

Theories have been advocated respecting the celestial bodies during the last few years, which, new though they seem, and new as the evidence certainly is on which they have been based, will yet be found in germ, and sometimes sufficiently well developed, in the works of former astronomers. The theory that the globes of Saturn and Jupiter are as heated as red hot iron was advanced by Buffon and entertained by Bailly. The theory that the sun was surrounded by a perpetual aurora was advocated by Sir W. Herschel. Mairan and the elder Cassini held that there is a connection between the frequency of sun spots and the occurrence of terrestrial auroras. Cassini also held the theory that the zodiacal light (which, by the way, astronomers would do well to call simply the zodiacal) is caused by multitudes of minute cosmical bodies traveling round the sun. The younger Cassini believed the rings of Saturn to be formed of multitudes of discrete satellites, as the sands on the sea shore for multitude. The theory of star drift was not indistinctly hinted at by the elder Herschel, while the theory of star systems subordinate to the galaxy was suggested by Lambert and strongly supported by Michell—Michell, that most unfortunate of scientific thinkers, who mathematically demonstrated the existence of binary star systems, the credit of which discovery adds to the already sufficient fame of Sir W. Herschel—Michell, who devised and constructed the very machine for weighing the earth, the credit of whose invention all our text books award to Cavendish.

We might cite other instances, but these will suffice to show with what good reason the students of astronomy in our day might say with Shakspeare:

> "If there be nothing new, but that which is
> Hath been before, how are our brains beguil'd,
> Which labouring for invention bear amiss
> The second burden of a former child!"

THREE Texas gentlemen have made arrangements for inclosing 145,000 acres of land in one body for pasturage.

THE CARPENTER BEE.

The name "carpenter bee" has been given to several species of solitary bees who construct their habitations and nests by working in wood, after the manner of the mason bees in earth. The habits of these insects are comparatively well known, but they are not the less interesting.

They usually select posts and the wood work of houses which have become soft from commencing to decay, as their field of operations. The violet colored species, which forms the subject of our illustration, makes her nest by gnawing out small pieces of the wood, which she carries to a short distance and drops for future use, after which she returns by a circuitous route, as if to conceal its location. The direction of the tunnel made by the insect is oblique for some distance, and then perpendicular in the axis of the wood, as shown in our engraving (for which we are indebted to the *Journal of the Farm*), in which the interior of the nest is exposed to view. The entrance hole above is placed at such an angle that the rain cannot enter the perpendicular tube. The opening immediately under the lowest cell serves as an outlet from which the fully developed insect emerges. The tunnel is divided into cells which are separated from each other by partitions made of the chips and dust cemented together. Some other species employ clay for making these partitions. At the bottom of the cell is placed an egg, and over it a paste composed of the pollen of flowers mixed with honey, which becomes the food of the larva when hatched. In a similar manner are completed sometimes as many as ten or twelve cells, one above the other, and then she closes the principal entrance by a sawdust covering, such as the partitions are made of.

Several weeks are occupied in these labors, and the eggs are deposited at considerable intervals. It is therefore evident that the first deposited egg will have become a perfect insect before the last one has passed the grub state, and in order to enable the young to escape as they mature, lateral openings must exist in each cell.

Where sufficient bulk of wood is worked in, sometimes three or four such excavations as described are made.



THE CARPENTER BEE.

Tea, Coffee, Cocoa, and Alcohol.

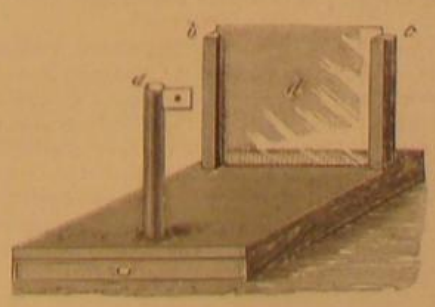
We extract from the *British Medical Journal* the conclusions of a French physician, Dr. Angel Marvaud, who has been experimenting on the physiological and therapeutical effects of coffee, tea, cocoa, matè or guaranâ (Paraguay tea), and alcohol, which he classes together as aliments of economy, or anti waste foods. He considers their influence on nutrition from two points of view: as stimulants to the nervous system, as anti-waste foods or anti-assimilators. Alcohol acts directly on the sensory apparatus of the spinal cord, and indirectly on the motor apparatus. Cocoa acts directly on the motor apparatus, which it excites in the same manner as strychnine. Coffee, tea, and matè act principally on the brain. Alcohol and cocoa excite the exercise of the muscles; coffee, tea, and matè, the exercise of thought. Further, by lessening the waste of the tissues, counteracting organic oxidation, and diminishing loss by means of the secretions, they all act as aliments of economy. In this way is explained their action in stimulating to work in the evening, in partly supplying the want of solid food, and in moderating vital combustion. Hence arises their increasing consumption, and their more general use as articles of daily régime; hence, too, their utility in alimentation, and their important place in hygiene. The abuse of these aliments has, it is true, two principal inconveniences. In the first place, the excitement of the nervous system which they cause is liable to be followed by fatigue, weakness, and even inertia. In the second place, by their interference with and reduction of the processes—indispensably necessary to life—of combination, transmutation, and decomposition, they may cause arrest, suspension, or even complete suppression of the nutritive changes in the cellular elements, and may produce as results, torpor, atony, fatty degeneration, and necrobiosis of the tissues. Thus are explained alcoholism, coffeism, theinism, and cocoaism.

Fences.

Two thousand millions of dollars is the estimated amount of money invested in fences in this country, which is nearly equal to the total amount of the national debt on which interest is paid, and about the same as the estimated value of all the farm animals in the United States. For every dollar invested in live stock, another dollar is required for the construction of defenses to resist their attacks on farm production. Experiment has proved that at least half this expense is unnecessary. Wherever it has been tried, wherever farm animals are restrained, and their owners are placed under (fence) bonds for the good behavior of their restless dependents, the system is regarded with general and growing satisfaction; capital is released from unprofitable investment and made available for farm improvement, soiling is encouraged, the manurial resources of stock husbanded, and the way prepared for larger production and higher profit. Even where a herd law of some sort has not been enacted, the tendency is strong, as many correspondents assert, toward the reduction of the amount of fencing; as repairs are needed, division fences are taken down and the material used to keep outside fences in repair; fields are almost everywhere becoming larger; in the younger States, a single field often answers all requirements, and sometimes a single inclosure embraces within its bounds many farms. The entire town of Greeley, in Colorado, with its suburbs for gardens and small market farms, is surrounded with a single fence, the cattle being excluded and kept outside upon the illimitable plains. It is possible to dispense with fencing to the value of one thousand million dollars, and the advantages of the change would greatly overbalance the inconvenience of it. Let the farmers discuss the subject in the light of actual experiment, rather than under the influence of ancient prejudice, and their views will soon coincide with their true interests.—*Agricultural Report.*

SIMPLE APPARATUS FOR OUT-DOOR SKETCHING.

Provide a small table with drawer. Mount two grooved movable uprights at one end, with glass between the grooves. Place an upright with a small eye hole, at the opposite end of the table, as shown in the engraving. Wash the glass with a thin solution of gum arabic and rock candy (20 parts of gum to 1 of candy). When the glass is dry, it is ready for use.



Look through the small hole to get the object or landscape subtended by the glass, and with a soft Paris Conté crayon outline the subject on the prepared surface; remove the glass and lay it over your sketch; if you require the outline, you should have a second plate of glass, and trace over it the reverse way with charcoal, then lay your paper on, and a little gentle rubbing will transfer the outline.

PAPER BOATS--HOW MADE.

The paper boat is a comparatively new invention, and for racing purposes is the most formidable rival of the mahogany and other wooden boats. The process of construction for the paper boats is as follows: A wooden model of the exact size of the required boat is first made from the lines of drawings previously determined upon. This is built of layers of pine fastened together in a solid mass, and its surface is made perfectly smooth. Suitable rabbets are cut to receive the keelson, the two inwales and the dead wood, which, being fitted therein, are worked off even with the surface of the model and covered with adhesive material so as to be attached firmly to the skin. For covering, two kinds of paper are used, that made from the best manilla, and that prepared from pure unbleached linen stock, the sheets being the full length of the model. If manilla is used, the first sheet is damped, laid smoothly on the model, and securely fastened in place by tacking it to certain rough strips attached to its upper face. A layer of adhesive varnish is then applied, and the sheet laid on, this process being continued until a sufficiently thick covering is obtained. If linen paper be used, but one sheet is employed, of such weight and dimensions (generally from $\frac{1}{50}$ to $\frac{1}{8}$ of an inch) as will, when dry, give just the required thickness of skin. The model, with its enveloping coat of paper, is now removed to the drying room where, at a heat of 150°, the wrinkles in the paper shortly disappear, and the substance hardens in the required shape. The paper is next covered with boiled oil and turpentine and then with shellac varnish, after which it is passed to the carpenter to put in the frame in the usual manner. The decks are then attached and the iron and brass work complete the fabric.

From examinations made of both wooden and paper boats, of all manner of varying shapes, sizes and workmanship, we are of opinion that the paper shells have a decided advantage. They are both strong and stiff. Their skin is not, as is the case with wood, twisted into an unnatural position from which it is ready at any time to spring. They are thoroughly impervious to water, and cannot become soaked; they are 30 per cent lighter than wood, their lines are equally fine, and they are easily and readily repaired.

IMPROVED SHOPS.

At a recent visit to the Littlefield Stove Works in Albany, N. Y., we noticed several features which might be advantageously introduced in many of the smallest foundries and manufactories. The buildings, which cover an area of 98,000 square feet, are constructed of wooden frames covered entirely with sheet iron. They are lathed and plastered on the inside, and, as we are informed by the proprietor, answer every requirement as fully as if constructed of brick, while costing far less.

Throughout the works, the utmost care has been taken of the health of the workmen. The buildings with one exception are but one story in hight. They are admirably ventilated and lighted with windows placed at a distance of every few feet. There is no hoisting of heavy castings into lofts, etc., material entering the molder's hands in its crude state and passing from room to room on the same level until it leaves the last apartment, perfectly finished.

By means of a tank in the main building an abundance of spring water is distributed throughout the foundery. The blast furnace and molding room is separate from the other buildings, so that all the dirt there made is kept within prescribed limits. The floor of the latter apartment is inclined and thoroughly drained, so that no dampness, a common defect in such places and a fruitful source of disease, can possibly exist.

The grounds around the buildings are tastefully laid out in paths and grass plats, and are as neatly kept as if belonging to a private residence. The center of the space between the buildings is occupied by a tasteful fountain and pond. Another addition, which should be supplied in every similar establishment, is a large swimming bath, to which the hands are constantly allowed access. Fresh water is obtained from a neighboring creek. In winter time, steam pipes are used to heat the bath to a comfortable temperature. Two hundred hands are employed, turning out some 12,000 stoves yearly.

MODIFICATION OF THE BUNSEN BATTERY.—It consists in placing a solution of sulphate of zinc in the porous jars, and pure water in the compartment where the zinc is. The solution of the sulphate of zinc is maintained to saturation point by placing in it a certain quantity of that salt. The current is not very powerful, but it lasts a long while—a month if desired, and the expense is trifling.

Correspondence.

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

Heating and Cooling our Dwellings.---What is Wanted.

To the Editor of the Scientific American:

It has long been to me a source of wonder that better provision has not been made for heating and cooling our dwellings. Undoubtedly hot water is best, steam next, and hot air furnaces last, in order of healthfulness, as heaters. The expense and liability of the two first to get out of order render them poorly adapted for use in private dwellings. In large establishments, such as hotels and factories, where a person can be kept to attend to them, they answer tolerably well; but as it costs from $1,000 upwards to fit a good sized dwelling with them, and then they require much more fuel and attention than a hot air furnace, it is obvious that they cannot come into general use, and hence we must depend on the furnace.

Now, there are three serious defects in hot air furnaces, which ought to be, and can be, easily remedied.

First. They leak gas. As is well known, the poisonous gases produced by combustion will permeate cast iron when heated to a certain degree. Besides, no matter how well the joints of a cast iron furnace may be fitted and cemented when set up, the subsequent expansion, contraction, and warping of the plates will open the joints and permit the escape of the gas, which, mingling with the heated air, renders it noxious and unfit to breathe.

Second. Their heating surfaces are too small. As a result of this, in order to heat the air sufficiently hot to warm the rooms, the metal of the furnace has to be heated almost, and frequently quite, red hot; and this again greatly vitiates the air, as has been frequently explained by Tyndall and other scientists, and as we all know by actual experience.

Third. They do not contain a sufficient quantity of air. The small quantity used necessitates heating it altogether too hot. It would be far better to use more air and heat it less, as by so doing it would be less vitiated, and the larger the quantity used, the more thoroughly and frequently would the volume of air in the room be changed, and hence be kept much more nearly pure.

The remedies for these evils are plain. First, furnaces should be made entirely of wrought iron, above the fire pot, at least. Second, they should be riveted together, and the points made gas tight, the same as a boiler. Third, the heating surface should be made at least double the present size, and then a larger supply of air furnished. If this were done, and plenty of water supplied for moistening the air by evaporation, hot air furnaces would be rendered far more complete and as healthful as open fires, the rooms, of course, being provided with ventilating flues and registers. It may be that somebody makes furnaces in this way now; but, after examining all I can find and corresponding with manufacturers, I am unable to find such. I have found one pattern in Philadelphia that is of wrought iron, with gastight joints: but it has not sufficient heating surface, and is made with the old-fashioned fire chamber, instead of being provided with a magazine or base burning arrangement, and consequently requires more constant attention. The man who will supply the public with a hot air furnace, such as above indicated, will not only find a large sale for it, but will prove himself a public benefactor. If there is such a man in the United States, I want to find him.

COOLING OUR DWELLINGS.

For years it has seemed to me that it is just as possible and as reasonable for us to cool our houses mechanically as to heat them mechanically. After having experimented on the matter for some years, I am now perfectly satisfied of its feasibility, and that, sooner or later, it will be done. All that is required is to cool a volume or current of air, and force it into our rooms. This can be done very easily. The manner in which I propose to do it is as follows: In a dwelling that I am now building, I am having placed in the walls tin tubes of not less than two inches diameter, extending from the basement all the way up to the topmost story, these tubes having an opening connecting with all the rooms on the several stories, with an arrangement for opening or closing them at pleasure. At the bottom they are connected with a rotary blower operated by a small hydraulic engine, to be fed by the service pipe from the water main that supplies the house. By this means I propose to force into any or all of my rooms a supply of air at any time desired; and this air is to be cooled by any suitable means. It may be passed through a chamber or tubes surrounded with ice or any cooling mixture, and may also be made to pass through a water jet or spray, which will also aid to cool as well as moisten it in a very dry dusty time. If one desires to be luxurious, the water spray may be perfumed, and made to impart its fragrance to the inflowing air; and, as suggested by a friend at my elbow, in the event of a social gathering, a supply of pure oxygen may be provided and forced in with the air, thus elevating the spirits of the company, instead of resorting to the deleterious plan of using champagne and similar liquids for that purpose.

The air should not be taken from the basement nor from near the surface of the earth, especially in summer nights, the time when it is most needed in this latitude, for the reason that all malaria are near the surface at night.

To supply the fan with air, a tube of proper size should be arranged with its upper opening near the top of the house, but not over the roof, because in that case it would receive the air heated by radiation from the roof. Air thus taken from above the surface would also be more free from dust and impurities, except when in the vicinity of chimneys or factories; and it should be located as far as possible from these, to avoid taking the impure or noxious gases emanating therefrom.

Since writing the above, my attention has been called to an extract from a communication to the *Nation* on this subject of cooling our dwellings. The correspondent proposes to force air into the rooms through tubes, and to cool the air by passing it through small tubes in a box packed with moss or other loose material kept wet by water dripping on it, with a current of air forced through the moss also to cause evaporation and thus reduce its temperature. He proposes to use a large but light bellows to supply the air for the rooms and the cooler, and to operate it by clockwork driven by a weight, to be wound up by a horse once a day or a week, as the case may be.

There are several practical objections to this plan. In the first place, no clockwork can be made with sufficient power to operate a bellows of suitable size for any great length of time. I have built two machines of this kind, and the experiments have satisfied me fully on this point.

To furnish a suitable supply of air, more power will be required than to run a sewing machine. A motor must be used to force in the air, and for this purpose there is nothing equal to the hydraulic engine. As stated in a recent article in the SCIENTIFIC AMERICAN, hydraulic motors are the best adapted of any for all such purposes. All cities and large towns are now provided with public waterworks, by means of which they can be operated, and during the night there is always plenty of water, even if not during the daytime.

It has occurred to me that the ether machines recently devised for making ice may be used for cooling the air, especially as they may be made much smaller and cheaper, when used for this purpose, as a much less degree of cold will be required; and on this point I should be gratified to obtain information. Of course it would depend upon the cost of the apparatus and the amount of power required; and as to these, I am not posted.

But that it is as practicable to cool our houses mechanically, as to warm them, I have not a doubt; and it will be done. It is only a question of time and expense, which latter need not be great. A person can stand the heat of the day far better, provided he can secure sound and refreshing sleep at night, and by this means it can be done. It is a disgrace to our civilization that we are compelled to toss about these hot sultry nights, and arise in the morning as weary and exhausted as when we retire at night; and equally so that we should be compelled to fry, stew, and roast in our cells of rooms and offices by day. It is high time there was a reform in this respect, and for one I am determined to have it.

W. C. D.

Washington, D. C.

American Inventions in the Vienna Exposition of 1873.

To the Editor of the Scientific American:

I have read, with much regret, an article in your issue of the 31st ult., intended to discourage American inventors from taking any part in the International Exhibition at Vienna, on the ground that "it is not possible for Americans to compete with Europeans in filling orders for manufactured goods, because the continental manufacturers can do the work much cheaper," and because "our best patterns would be copied without benefit or reward," etc. I think a little reflection will convince you that the view you have expressed is not a very liberal or comprehensive one. A very large portion of our people have come from the German Empire, and thousands more are yearly coming. An opportunity, such as this exhibition will afford to multitudes, to become acquainted with our machinery and inventions will certainly be appreciated by them, and, it appears to me, will more than remunerate the exhibitors, if not a specimen be ever sold in Austria.

But is it true that none can be sold there? Labor-saving machines of American invention and manufacture are now in operation in different parts of the Austrian empire, not in great numbers, it is true; but still the fact remains that they have found a footing there, and are commended by their superiority.

A remarkable interest in our machinery is growing throughout all the Austrian empire and in the surrounding countries; especially are the Hungarians full of admiration for the skill and industry of our people, and I venture the opinion that no part of the Great Exposition will prove as great a source of attraction as the American machinery.

As to the "piracy of inventions," I am glad to have it in my power to show you that your apprehensions are groundless.

By section 38 of the general regulations, which I have heretofore sent you, it is stated that "The chief manager has taken the necessary steps that the objects exhibited may, from the time of their arrival on the exhibition grounds until taken away, enjoy the benefit of the laws existing in Austria for the protection against piracy of inventions and designs—for instance, of the patent and registration laws." Detailed regulations will be published. "Reproductions (designs, photographs, &c.) of objects exhibited are only allowed if the exhibitor and the chief manager consent to it."

By a communication just received from a well known and very estimable American citizen now in Vienna, I learn "that a law was lately passed by both houses of the Austrian Parliament for the protection of foreign objects on exhibition against piracy of inventions and designs. Every foreign exhibitor can apply for a certificate, which secures to him the priority for obtaining an Austrian patent for his article, and such certificate will be issued free of charge."

"Moreover," says the correspondent, "I hear from Mr. Kirch, an American citizen, representing in this city the large manufacturing interest of Wheeler & Wilson in New York, that the Austrian government, in a correspondence with the American legation, is showing a disposition to concede to Americans (in deviation from the existing regulations for patents) the right to import from the United States their articles patented in Austria, without losing their patent, when not manufacturing there." Thus the Austrian government is doing all in its power to favor us.

I think you will agree with me that no fears need be entertained of extended piracy under these liberal provisions; and I am very certain that, feeling so assured, the SCIENTIFIC AMERICAN will throw its influence in favor of a large and creditable American representation at the exhibition.

You are also misinformed in regard to the number who are applying to me for space.

I have quite a large number of applicants, including many of our leading manufacturers, and the number is increasing daily.

That Congress made no appropriation is unfortunate; but the opposition of any portion of our press is to me a much greater misfortune. Congress, it is generally believed, will remedy its action in December; but the opposition of the press now will render my gratuitous and laborious efforts on behalf of our industrial interests very difficult, if not entirely useless.

THOS. B. VAN BUREN,
U. S. Commissioner to International Exposition, Vienna, 1873.

Force of Falling Bodies.

To the Editor of the Scientific American:

I see, in an article on page 131 of your paper, that Mr. John W. Nystrom acknowledges himself to be "one of those pretenders" who think that they "understand perfectly the subject" of measuring the force of a falling body by taking, as unit of measurement, the mere weight of matter without motion. I desire here to say to him and to all those interested in the important question of measuring forces, in consideration that force must be distinguished from mere weight, that weight is merely a measure for an amount of matter, for a mere mass, and for nothing else; such weight, of course, is caused by gravitation, and thus can exert pressure, but as long as the weight does not produce motion, there is no force generated; therefore strictly speaking gravitation is no force, notwithstanding the conventional way of speaking of the force of gravitation; however, gravitation can beget force, and only does so in case it is allowed to produce motion. According to the modern conception of force, it is not something immaterial, independent of matter, but absolutely nothing but matter in motion. This motion may be hidden, molecular, when the force manifests itself as heat, electricity, etc., or the motion may be in the masses, when the force is directly measurable by two elements, the mass and the velocity. Accepting the customary symbols for these two different elements, the different degrees of force are expressed by the formulæ $v \times m$ and $v^2 \times m$, which are both correct according to circumstances. In the case of the effect of a blow produced by a falling body, for instance, the driving in of a nail, the identical case represented on page 131, the latter formula, corresponding with the theory of the *vis viva* (see any textbook on mechanics), must be applied. This is the first point in which the formulæ of Mr. Nystrom are faulty, as they are based on the lever, and thus not on the square of the velocity or space, but on the simple velocity: $v \times m$.

The result of this law of the *vis viva* is that, where gravitation increases or decreases, and with it the velocity of the falling body, the force of the blow will increase or decrease as the square of the gravitation, while the weight of the body will only increase or decrease in the simple ratio of the gravitation. Mr. Nystrom's figure and formulæ fail to take any account of this whatsoever.

But let us consider the expressions $v \times m$ and $v^2 \times m$ theoretically. It is evident that they have no value at all as soon as either of the quantities v or m becomes immeasurably small or disappears. Let, for instance, in the function $v \times m$ or $v^2 \times m$, m become $= 0$; then we have $v \times 0 = 0$ and $v^2 \times 0 = 0$ which conform to practical experience, because a blow with a mass equivalent to nothing must necessarily amount to nothing. Let, inversely, v be $= 0$ and we have

$$0 \times m = 0 \text{ and } 0^2 \times m = 0,$$

again equivalent to nothing; a mathematical proof that a mere mass without velocity (motion) cannot possibly be reckoned equivalent to any force; and we see here the great mistake, thus far made by the authors of many textbooks, in speaking of a force of, say, 100 pounds, or a ton.

The cause of this error is mainly to be found in the fact that a mere weight by its pressure will in some cases produce results similar to that of a force or blow. If, however, we attempt to measure force (matter in motion) by mere weight (matter in rest), we must continually fail and obtain incongruous results, as they are two incomparable quantities. This confounding of an actual force produced by a moving mass with mere weight or pressure produced by a stationary body, is the cause of fifty per cent of the attempts, continually being made by the half educated, to find perpetual motion.

Now for a few practical illustrations: With a comparatively light hammer, we may easily drive a nail into a brick wall; if we try to do it by mere pressure, we shall crush the nail. or, to take Mr. Nystrom's own illustration, we can drive a nail into a board by the blow produced by dropping the head of a hammer on it from a suitable hight, directed by guiding pieces, as in a pile driver; but tak a similar nail, place it on the same board, attach the lever of proper length and hang the hammer head at the end of the lever, following practically the figure on page 131, and see if the nail will penetrate

at all. If Mr. Nystrom had tried the experiment, he surely would never have taken the trouble to illustrate and publish his explanation.

The blow or percussion gives to a mass a shock, transmitted through it with the same velocity as a wave of sound would travel in that same mass; when the blow is violent and there is somewhere a want of continuity, or lack of strength, which prevents the wave from pursuing its course, its power will be expended there in crushing the material. This is the case in driving a nail. The motion will not be communicated to the board, but the force will be expended in crushing and cutting the fibers of the wood under the nail, so as to allow it to enter, while a weight or pressure placed on the nail will have plenty of time to communicate itself to the whole board. A striking illustration of this may be had when balancing a heavy board on its center; it is then possible to drive a well pointed nail with a smart blow deep in the board without moving the latter, while the same nail with a weight on top will scarcely make a mark on its surface, but will move the whole board. A pistol ball may be fired through a door without moving it on its hinges, which latter may be done by the slightest pressure of the finger. Scores of other familiar examples may be adduced, all proving the immense difference between force and mere pressure, and it is only to be wondered at and at the same time deplored that still so much confusion prevails in regard to this all important subject.

P. H. VANDER WEYDE.

New York city.

To Detect Sulphuric Acid in Vinegar.

To the Editor of the Scientific American:

A few words further in relation to this matter: I never supposed, before, that such an article as that on page 132 of your journal could emanate from the apparently very erudite Dr. Vander Weyde. The process which he denounces as a "gross piece of stupidity" is, to an intelligent, chemist obviously a most excellent method of effecting the desired end; although, it is true, it is somewhat complicated. The process which he proposes is utterly worthless for detecting free sulphuric acid, for any sulphates that may be accidentally present will give precisely the same reaction; these must be gotten rid of, and the evaporation of the vinegar and subsequent extraction with alcohol, as directed in the process which the Doctor so strongly objects to, effects this perfectly, because all sulphates, being totally insoluble in alcohol, are left behind, while the free sulphuric acid is taken up. This alcoholic solution is mixed with water, the alcohol evaporated, and the aqueous solution thus obtained is ready to be tested with barium chloride. The Doctor says the alcobol is added "to destroy the acetic acid by changing it into the volatile acetic ether." This is certainly not so, for the presence of the acetic acid, as he admits, does not interfere with the test; and if it did, the evaporation of the vinegar to the consistence of an extract would volatilize all the acetic acid contained in it. I am sorry the Doctor has thus shown his defective knowledge of chemistry, and if he will be advised by a young pharmacist, he will hesitate next time before attempting to throw discredit upon a journal so ably conducted as is the *American Journal of Pharmacy*.

I will close with a process for detecting the fraud, which is a good one and simple, though not original: Boil a few grains of starch with an ounce or two of the suspected vinegar, for a few minutes in a glass vessel; when it has become cold, add a drop of tincture of iodine. If the vinegar contains no sulphuric acid, a beautiful blue color will be produced by the reaction of the iodine on the starch. But if a small quantity of sulphuric acid be present, no color will be developed, for the acid will have changed the starch to dextrin, which is not colored by iodine.

CHARLES LE R. SAYRE.

Washington, D. C.

Detection of Sulphuric Acid in Vinegar.

To the Editor of the Scientific American:

In the comments of Dr. Vander Weyde in regard to the detection of sulphuric acid in vinegar, the learned Dr. overlooked the main point, that is, the detection of the sulphuric acid and not the salts of sulphates in the vinegar. A great many samples of vinegar which are sold in the market contain small traces of sulphate of lime from the materials which are used in the manufacture, and this small amount will give a precipitate with solution of barium; but it can not be called an adulteration as it gives no acidity to the vinegar.

The adulteration of vinegar is done with sulphuric acid, and to detect such free sulphuric acid the test in the *American Journal of Pharmacy* is based on strict science. The treatment with alcohol will precipitate the sulphate of lime, and the addition of chloride of barium to the filtered solution will show any adulteration with free sulphuric acid.

FRANCIS SCHLEICHER, CHEMIST.

Hoboken, N. J.

Test for Sulphuric Acid in Vinegar.

To the Editor of the Scientific American:

Professor P. H. Vander Weyde, in his strictures on the tedious process, has evidently made a mistake. All that he says applies to acetic acid, but not to vinegar.

Acetic acid (being prepared by distillation) contains neither sulphates nor anything else but acetic acid and water. Vinegar (being prepared from cider, beer, or wine) must always contain extractive matter and earthy salts (generally sulphates). If prepared from diluted alcohol (quick process), in which there is common water, it always contains sulphates. Hence, by adding a solution of chloride of barium to vinegar (made by whatever process), a cloudiness will always be produced. In order to detect the sulphuric acid in vinegar, we have either to follow the above method with alcohol, or to distil a small quantity and test the distillate with solution of chloride of barium. A third method is to evaporate the vinegar over sugar, on a water bath, till dry; if the residue turns brown or blackens, then the vinegar in question contains free sulphuric acid. Of course, if the vinegar is of a brown color (as cider vinegar usually is), then the third method is unreliable.

H. M. WILDER.

Philadelphia, Pa.

The Risk of Buildings from Fire.

Captain Shaw, of the London Fire Brigade, has published a little book, under the title of "Fire Surveys," which, if well studied and acted on by those engaged in the construction and the guarding of buildings, will, says the *Builder*, save life and property in time to come. If it were desired that we should point out its main purpose, we should say it was to enforce the truth, which has only recently dawned upon legislators and constructors, that iron and stone are not fireproof materials; stone is absolutely inadmissible for stairs or to support weights internally, and no structure can properly be called fireproof, the ultimate strength of which depends on any metal.

In the whole range of building materials, the writer maintains, there is perhaps none so unsuited for resisting fire as that most commonly in use—stone. It is true that, if embedded in cement or in thoroughly good mortar of lime and sand, it will resist for a considerable time heat gradually applied; but even in such a case it will become calcined, and will crumble to so great an extent as to be unable to carry a load afterwards. In the case of any sudden change of temperature, either from cold to heat or from heat to cold, it cracks instantly without notice, not only leaving a passage for smoke and flame, but in many instances causing the wall to fall. Stone may, however, be used with a certain amount of safety for external walls, but even for this purpose it is very much inferior to bricks.

Walls should be constructed in such a manner as not to separate easily, either from defects in the foundation, irregularity of the loads placed on them, vibration, shocks, or other causes. A wall built of hard bricks laid in sound mortar or cement, and properly bonded, is perhaps the soundest of all for general purposes; but even such a wall is likely to fail on an emergency, if not firmly bonded into a cross wall.

Bond timber in walls is dangerous, as we have long taught, and should not be allowed. When it rots or burns, there is a tendency in the walls to crack. Hoop iron forms a much better bond, and is free from the drawbacks attending the use of wood. Lean-to buildings are dangerous if there are windows in the wall above them. Weather-boarding causes two dangers—one of taking fire from without, the other of conveying fire through the windows. Wherever iron is used, it must be allowed sufficient play for its elasticity, and also for the expansion and contraction which it undergoes unceasingly in consequence of changes of temperature.

Walls may be destroyed by buckling outwards from a thrust, or inwards after the falling of the floors, by inherent weakness, absence of proper ties, and in a variety of other ways; but the principal cause of their "tumbling about," to use a fireman's expression, is undoubtedly, in almost all cases, the want of a proper foundation. The weights carried by different parts of the same wall frequently vary very considerably, and if the ground underneath be all of the same consistency, as is generally the case, some intermediate structure beyond a common foundation is absolutely necessary for buildings liable to be heavily or irregularly loaded. The neglect of this precaution has frequently been the cause of heavy losses.

Copings, balconies, cornices, or other projections should never be constructed of stone, as this material is certain to fall down at an early stage of a fire, and is likely to kill both persons endeavoring to escape and those coming to render aid. Wherever such projections are placed, and whatever material they may be composed of, they should invariably be well supported from the inside, and should be of a weight in proper proportion to the strength and tenacity of the internal supports. Cornices and other projections of the same kind are very dangerous when the internal supports are burned away, and the bond stones by which they are generally fastened to the walls are of no use when the flames are coming out of the windows underneath. This is a point very much neglected in many large buildings, but it is one of paramount importance in connection with fires.

No fireman of large experience has ever seen a stone staircase escape when subjected to much heat; and this being the case, it would seem to be most desirable that there should be introduced a prohibition of the use of stone as a material for lobbies, corridors, passages, landings, or stairs, except where it is supported throughout and not overhanging in any part. We repeat that the use of stone is most dangerous for this purpose, except when it is supported throughout.

SCIENTIFIC AND PRACTICAL INFORMATION.

A NEW ARTIFICIAL MARBLE.

Imitative marble, made by a new process, has recently been introduced in London by Signor Raccotti. In forming the slabs, he commences by laying the veins of color upon a plate of glass, the veins being threads of silk saturated with dyes of the required hues. A semi-liquid cement is then sprinkled upon the glass to the thickness of an eighth of an inch, and is left on the glass to absorb the dye from the silk, the fibers of which are then removed. Cement is added till the slab is of the desired thickness, and twelve hours is sufficient time for it to become dry enough for the polisher. Its cost is in England about one tenth that of real marble; in this country, the saving would be still greater, especially in large slabs. Two slabs, each five feet square, were recently made in less than three quarters of an hour.

PRESERVATION OF HOPS.

It has been found in Bavaria that hops can be preserved by packing them in a tight barrel between ice. No perceptible change took place in hops which were so packed for a period of seven months.

THE SUNFLOWER.

A contemporary calls attention to the important uses to which the sunflower can be put. It will grow almost anywhere, and the growing plant and its flowers are well known absorbents of foul and miasmatic air. It is very productive of seed, yielding fifty bushels to the acre, which contain fifty gallons of easily expressed oil. The oil is readily burnt in lamps, and gives a clear white light; it can be used as a vehicle for paint, and is excellent for the soapmaker's use. The seeds can also be fed to poultry in winter with advantage. The stalks, which are large and coarse fibered, yield, on burning, a large proportion of potash; but a still more valuable product, a fiber of great strength and smoothness, can be obtained from them by "retting," as is done with the stalks of flax.

MERCURIAL OINTMENT.

M. Lucien Lebeuf prepares this by taking: Ether, 4 grammes, benzoin, 20 grammes, oil of sweet almonds, 5 grammes, and then mixing, dissolving, and filtering. He adds the mixture to 1 kilogramme mercury, and puts the whole in a glass stoppered jar of five or six times the capacity required by the compound. By shaking briskly and occasionally removing the stopper, the ether will be eliminated, and ultimately the mercury will be reduced to a fine powder. Then the supernatant liquid should be decanted, and the jar shaken vigorously till the mass becomes of an unctuous consistency. The more agitation is used to thoroughly subdivide the mercury, the easier will be the completion of the process, which is effected by taking 920 grammes lard and 80 grammes wax, melting them together in a mild heat, and, when cold, triturating a part with the divided mercury. The bottle should be rinsed out, from time to time, with the decanted tincture, which should be added to the contents of the mortar. If sufficiently triturated, the ether will be entirely evaporated and the mercury extinguished. The remainder of the lard and wax should then be added, and the whole triturated for twenty minutes.

KILLING RATS.

There are many ways of disestablishing rats besides the short and ready methods of poisons or traps, which we find described in a foreign contemporary.

First, there is the old French plan; this is followed chiefly in Paris by men who make it a special business. They take a deep tub with water on the bottom, and a little elevation in the middle like an island, on which is only place for just one rat to sit. The top is covered and has a large balanced valve, opening downward; on the middle of this valve a piece of fried pork or cheese is fixed, and when a rat walks on it to get the cheese, the valve goes down, drops the rat in the water, and moves back in position. A road is made from a rat hole to the top of the tub, by means of a piece of board rubbed with cheese, so as to make the walk attractive for the rats. In the course of a single night some ten, twenty, or even more rats may go down, and if the island was not there, they would be found almost all alive in the morning, quietly swimming round; but the provision of the little island saves the trouble of killing them, because their egotistic instinct of self preservation causes them to fight for the exclusive possession of the island, on which in the morning the strongest rat is found in solitary possession, all the others being killed and drowned around him.

Secondly, we come to the New York plan. The floor near the rat hole is covered with a thin layer of moist caustic potassa. When the rats walk on this, it makes their feet sore; these they lick with their tongues, which makes their mouths sore; and the result is that they shun this locality, not alone, but appear to tell all the rats in the neighborhood about it, and eventually the house is entirely abandoned by them, notwithstanding the houses around may be teeming with rats.

Thirdly, we have the Dutch method, a very cunning device, but probably difficult to experiment about. A number of rats are left to themselves in a very large trap or cage, with no food whatever; their craving hunger will cause them to fight, and the weakest will be eaten by the strongest. After a short time the fight is renewed, and the next weakest is the next victim, and so it goes on until one strong rat is left. When this one has eaten the last remains of any of the others, it is set loose; the animal has now acquired such a taste for rat flesh, that he is the terror of ratdom, going round seeking what rat he may devour. In an incredibly short time the premises are abandoned by all other rats, which will not come back before this cannibal rat has left or has died.

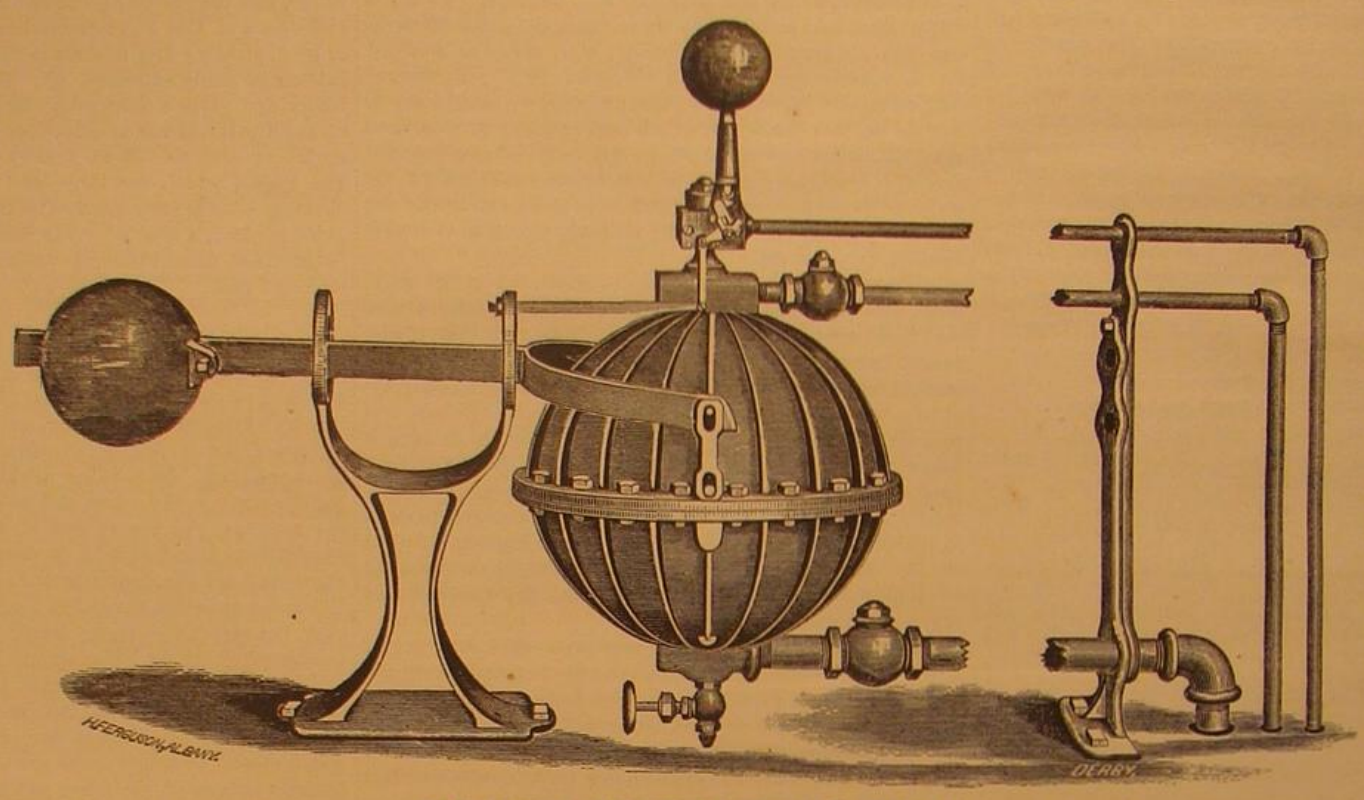
STEAM GAGES.

A test of steam gages was made recently at the show yard of the Royal (British) Agricultural Society, at Cardiff. Sixty-four gages made by different manufacturers were subjected to the tests. Out of these, sixteen were correct; sixteen varied one pound from the true pressure; seventeen, two pounds; six, three pounds; three, four pounds; four, five pounds; and two, seven pounds. If so great a difference was shown in the gages made for exhibition, what must it be in those made for ordinary sale? The *Railroad Gazette* asks: Who will try the experiment on American gages?

ALBANY STEAM TRAP.

In using steam for heating purposes, where all or any portion of the heating apparatus is situated below the water level in the boiler, it is necessary to use a device of some kind for getting rid of the water of condensation as fast as it is formed, as otherwise it backs up in the pipes and stops radiation. In apparatus heretofore contrived for the purpose, water at a high temperature has been allowed to run to waste, excepting where it was sought to return it to the boiler, in which case it was necessary to trap it into a tank and thence, after considerable loss of heat, to force it back into the boiler by the aid of a pump.

The object of the invention now illustrated is to keep the heating apparatus free from water and to effect the restoration of the water to the boiler at a temperature only a few degrees lower than that of the steam itself, by the automatic operation of a simple trap, unaided by pumps or other means. This trap is represented in the accompanying engraving, and its construction will no doubt be readily understood from the same and the following explanation; premising that the three connecting pipes which are broken apart in the engraving are, in reality, extended sufficiently far horizontally to give them elasticity enough to allow the apparatus to operate easily.



BLESSING'S STEAM TRAP AND FEED.

It consists essentially of a hollow globe, supported by one end of a lever and counterbalanced by a weight at the other. The topmost pipe is connected with the steam space of the boiler, and is opened and closed to the globe by the automatic weighted valve seen on the top of the same. The larger pipe beneath supplies the globe or trap with the condensed water from the heating apparatus. It is provided with a check valve opening inward. The pipe at the bottom connects the globe with the water space of the boiler, and is furnished with a check valve opening outward. The operation is as follows: When the globe gets filled with a certain weight of the condensed water, it overbalances the weight at the other end of the lever, and descends. In descending, it moves the mechanism of the steam valve sufficiently to shift the center of gravity of the attached weight beyond its supporting point, which causes the ball to fall and open the steam valve. The steam pressure closes the check valve in the supply pipe, and allows the water in the trap to flow into the boiler through the bottom pipe, whose check valve opens to let it pass. When the globe has lost sufficient weight through the escape of the water, it is raised again by the weighted lever, and the steam valve is shut by the operation of its attendant mechanism. The condensed water is again admitted by the opening of the check valve in the supply pipe, and the operation is repeated continuously.

The steam valve apparatus is so nicely adjusted that the machine cannot, by any possibility, rest on a center; the valve must always be fully opened or closely shut. An air valve is also attached to the globe, by which the air is expelled.

The inventor estimates that the use of this trap secures a saving of certainly not less than ten per cent over any other method of returning water of condensation to the boiler, where the coils are below the water level. Where the coils are all above the water line, and the return is made by "direct circulation," a large saving is still effected by using the trap, as its action is such as to force a continual circulation without intermission, and thereby to keep the coils nearly up to boiler heat all the time. He claims, as a consequence, that a given space may be heated to a given temperature with one fourth less pipe, by this method, than by any other.

The invention, which was patented by Mr. James H Blessing, Feb. 13, 1872, has been in satisfactory practical operation in a variety of manufacturing and other establishments for the past year.

For further information, Townsend & Blessing, care of Townsend & Jackson, Albany, N. Y., may be addressed.

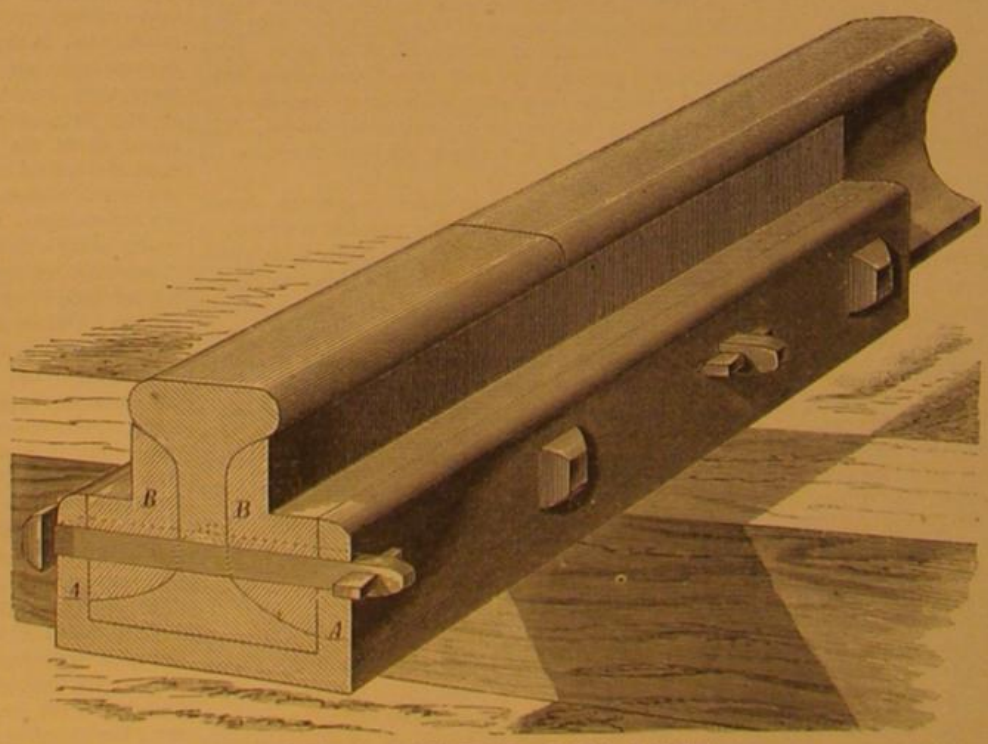
A SCIENCE teaches us to know; an art, to do. In art, truth is a means; in science, it is the end.

Lessons from a Brick.

An Austrian *savant* has discovered, by means of a microscope, in a brick taken from the pyramid of Dashour, many interesting particulars connected with the life of the ancient Egyptians. The brick itself is made of mud of the Nile, chopped straw, and sand, thus confirming what the Bible and Herodotus had handed down to us as to the Egyptian method of brick-making. Besides these materials, the microscope has brought other things to light—the *débris* of river shells, of fish, and of insects, seed of wild and cultivated flowers, corn and barley, the field pea, and the common flax, cultivated probably both for food and textile purposes, and the radish, with many others known to science. There were also manufactured products, such as fragments of tiles and pottery, and even small pieces of string made of flax and sheeps' wool.

RAILWAY RAIL JOINT.

The importance of keeping the upper surfaces of railroad rails at their joined ends in the same plane, so that neither shall rise above or fall below the other, and also of furnishing adequate support for the heads of the rails forming the joint, is so well known and has been so often commented on by us as to render a further discussion of the subject in this place unnecessary. The intention of the invention now illustrated is to furnish a joint or support by the use of which both the objects referred to are fully accomplished, and, at the same time, at a cost insufficient to preclude its practical use.



STELL'S RAILWAY RAIL JOINT.

Our engraving gives a view of the ends of two rails joined by this device, a cross section of the rail and coupling being shown in detail. A is a box which may be made either of cast or wrought iron, the latter being preferable, and of a width sufficient to receive the base of the rail. The length may be as desired; when used to extend over more than one tie, it should be about 18 inches, and the box should be made thick enough to firmly support the rails and prevent any great deflection from the weight of passing trains; when the joint is made upon a single tie only, the length may be reduced to about 8 inches. When the rail ends are placed in the box, the fish bars, B, are inserted between the box and the rail, in the manner shown. It will be seen that their form is such as to fill up snugly the spaces between the rail and the sides of the box, and that their upwardly projecting parts fit neatly against the under surface of the heads of the rails. They thus form a support for the rail heads throughout the entire length of the bar and preserve the ends, particularly, from being battered down. In order to hold the parts together securely and in proper position, bolts, as shown in the engraving, are passed through the box, the fish bars, and the web of the rail, and are fastened by keys, as represented. The rails are slotted where the bolts pass through, so as to allow for the expansion and contraction consequent on changes of temperature. Round bolts with nuts may be used if preferred, though the square bolts are less expensive, and where keys are used the parts can be tightened at any time by driving them. They are prevented working out by bending down their small ends.

It is claimed that there is no possibility, by this construction, of the joint getting loose, and that it secures all the advantages belonging to a smooth, continuous rail; for which reasons the liability of injury to either rails or rolling stock is very much reduced. The fastening admits of easy and economic application to rails now joined by the ordinary fish bar.

The invention was patented May 28, 1872, by J. W. Stell, of Gonzales, Texas, of whom further information may be obtained.

Gasolene, Naphtha, and Benzine more Dangerous than Gunpowder.

Professor C. F. Chandler, in the *American Chemist*, says:—

It is not possible to make gasolene, naphtha, or benzine safe by any addition that can be made to it. Nor is any oil safe that can be set on fire at the ordinary temperature of the air.

Special lamps, some of them of very elegant design, have been introduced for burning the liquid gas (naphtha). They are all provided with a reservoir for the dangerous fluid, and a burner by which it is vaporized and burns like gas.

The apathy of the public in regard to this matter is beyond my comprehension. These facts are well known in almost every community, and yet, though it is now twelve or thirteen years since this class of oils came into general use, we have as yet no adequate legislation for the protection of life or property. Nothing but the most stringent laws, making it a State prison offence to mix naphtha and illuminating oil, or to sell any product of petroleum, as an illuminating oil or fluid to be used in lamps or to be burned except in air gas machines, that will evolve an inflammable vapor below 100° Fah., or, better, 110° Fah., will be effectual in remedying the evil. In case of an accident from the sale of oil below the standard, the seller should be compelled to pay all damage to property, and, if a life is sacrificed, should be punished for manslaughter. It should be made extremely hazardous to sell such oils.

Naphtha, under whatever name it passes, is, in one respect, more dangerous than gunpowder. Gunpowder never explodes unless fire is brought to it. Naphtha, on the other hand, sends out its inflammable vapor and brings the fire from a distance. Gunpowder is thus a passive agent, while naphtha is an active one; and when introduced under the treacherous disguise of safe oil, it is not to be wondered that frightful accidents occur.

In this connection the "vapor stoves" demand some consideration. These stoves are supplied with naphtha (sold under various names) from a reservoir at one side, the supply being regulated by a stop cock. The naphtha flows into a tube or chamber, which is maintained at a high temperature by the combustion; here it is vaporized to escape through suitable orifices and burn. These stoves are arranged for cooking, as well as for heating apartments.

These contrivances are all, without exception, highly dangerous. They are all supplied with benzine or naphtha, which is always liable to take fire and to produce explosive vapors.

A keg of gunpowder in a building is not as dangerous as one of these stoves.

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TERRESTRIAL MAGNETISM.

Its influence upon the compass needle. The supposed iron islands of the sun and their effect upon the magnetic currents of the earth.

The compass or magnetic needle does not ordinarily point to the true north, but varies to the east or west, in different parts of the globe. This variation is called the declination of the needle. The declination varies slightly with the different seasons, also with the hours of the day, and forms the subject of scientific observations, made in magnetic observatories expressly built for this purpose in different parts of the world; other magnetic observations are made in regard to the amount of inclination from the horizontal line, called the dip of the needle, which strongly increases when approaching the magnetic poles of the earth, until, on the poles themselves, the needle stands in a vertical position. The line surrounding the earth between the tropics, where the needle is horizontal, is called the magnetic equator; north of this line, the north pole dips; south of it, the south pole dips, until it reaches its maximum dip of 90° or a vertical position, at 74° south latitude and 140° longitude east of Greenwich where the magnetic south pole is situated.

Another element of observation is added also, that of

MAGNETIC INTENSITY.

This may be measured by the velocity of oscillation of the compass needle when disturbed from its natural position. It is founded on the same principle as the measuring of the intensity of gravitation in different parts of the earth by the pendulum; where the gravitation is stronger, as is the case at the poles, the same pendulum oscillates faster; where gravitation is less, as at the equator, the same pendulum oscillates slower. It is so with the compass needle; where the magnetic attraction is greater, as is the case near the magnetic poles of the earth, the needle will oscillate faster; where this attraction is less, as at the equator, the same needle oscillates slower.

INFLUENCE OF HEAT AND COLD UPON THE MAGNETIC NEEDLE.

As heat diminishes the magnetism of the needle itself, this has influence on the results, and must be brought into account in the same way as is done in regard to the pendulum, which becomes longer, and therefore oscillates slower, by rise in temperature. For this reason, well constructed magnetic observatories, like that at Toronto, Canada, are entirely under ground, in vaults where the temperature can be kept equal the whole year round.

This decrease of magnetic power by heat may be observed on any compass needle; it oscillates slower when heated, before coming to rest, than when cold. So that heat produces the same result as bringing the needle into a locality where the earth's magnetism is weaker, and *vice versâ*. Cooling the needle produces the same result as bringing it into a locality where the earth's magnetic intensity is greater.

ACTION OF THE COMPASS IN A BALLOON.

If we rise in a balloon to a distance from the earth gravitation will become less and the pendulum oscillate slower; terrestrial magnetism also becomes less, and therefore the compass needle should oscillate slower. This might be reasonably expected, and therefore a great surprise was experienced, when it was found that the experiments in France, in the beginning of this century, did not verify this expectation. The compass needle was found to oscillate about as fast at a hight of 15,000 feet as near the earth's surface. But the correction had been overlooked; at that hight the temperature was so much lower than at the earth's surface that it had increased the magnetic intensity of the compass needle itself about in the same degree as the distance from the earth's surface had decreased the earth's attraction. Therefore, when this correction for temperature was applied, or the needle tested on the earth's surface at the same low temperature as was observed in the upper regions, it was decidedly found that the earth's magnetism decreased with the distance from its surface, as expected.

EFFECT OF EARTHQUAKES UPON THE COMPASS.

Besides the periodical changes described, the compass needle is subject to irregular motions, caused by earthquakes or volcanic eruptions, of which the effect on the needle will manifest itself over large tracts of country, a thousand or more miles in extent, and always everywhere at exactly the same instant; according to the theory of electric currents as cause of the earth's magnetism, this is easily explained, as such violent disturbances in the crust must necessarily also disturb the currents passing through the same.

EFFECT OF THE AURORA BOREALIS UPON THE COMPASS.

Another disturber of the compass needle is the *aurora borealis*, and this is a deciding proof that this phenomenon is due to electric currents, which, running north and south through the upper rarefied and therefore conducting strata of our atmosphere, of course give a tendency to the needle to deviate to the east or west, as it is then affected by two sets of currents, the stronger steady subterranean current running east and west and causing it to point north and south, and the weaker unsteady auroral current in the upper regions running north and south and attempting to deviate it east and west.

THE ELECTRICITY OF THUNDERSTORMS AND THE COMPASS.

The electricity of thunderstorms has been found not to have any effect on the compass, except when the compass itself was struck and its magnetism reversed, or when a vessel was struck and its iron acquired so much magnetism as to affect the correct indications of the compasses on board.

EFFECT OF SUN SPOTS UPON THE COMPASS.

A most striking fact, however, is the relation of the sun spots on the declination of the needle. It is found that, during periods when the sun shows a great number of spots, the variations of the needle are greatest; and even that at the appearance of a very large spot, the needle was affected at different places of the earth's surface at the same instant. Two explanations may be given for this surprising phenomenon. The first is that the revolving east and west electric currents in the earth's crust, which are the cause of the earth's magnetism, are caused by the solar radiation of heat, before which the earth revolves east and west, and thus must be affected by any change in the solar surface by which this radiation of heat is modified. The second is that the sun contains enormous quantities of iron, which, in the ordinary condition of liquidity and gaseousness, are at so high a temperature as to be beyond the magnetic influence; we know, namely, that white hot iron or steel loses all magnetism, and cannot be affected by any magnet.

ISLANDS OF SOLID IRON ON THE SUN.

If, now, on the solar surface a spot appears, it is probably a solid island in a liquid ocean; and if this island contains as much iron as the rest of the solar body, which is probable, and is several hundred times larger than our whole earth, which is certain, it would be quite reasonable to expect that the sudden formation of such a mass, accessible to magnetic influences, would make itself at once felt here on earth.

THE ATTRACTION OF GRAVITATION AND MAGNETIC ATTRACTION INSTANTANEOUSLY TRANSMITTED.

Astronomy proves, indeed, that the attraction of gravitation does not require time for its transmission, but is transmitted at once through any distance; this appears to be the case also with the magnetic attraction, which in fact is probably only a special modification of the general law of gravitating attraction, which is as wonderful as magnetism; but gravitation is so familiar to us all, from our childhood upward, we take it as a matter of course, while magnetic attraction excites surprise, especially among the ignorant, simply because it is to them a new fact, with which they are unfamiliar.

SUBSTANCES ACTING MECHANICALLY TO PREVENT THE FORMATION OF SCALE IN BOILERS.

Besides the substances which act chemically, like soda ash, chloride of barium, carbonate of ammonia, extract of oak bark, etc., to prevent the formation of scale in boilers, there have been from time to time materials proposed which act either by commingling with the mineral particles, thus retaining them in suspension, or by rendering adhesion difficult. To these latter belong the various paints, about which we shall speak further on. Professor Bolley, late professor of applied chemistry at the Polytechnic school at Zurich, Switzerland, has investigated this subject, and we find in his report much valuable information. Saw dust from mahogany, as well as from coniferous trees, has been used with success. The former acts also chemically, as well as mechanically, owing to the tannic acid it contains. This acid combines with the lime, forming tannate of lime, which deposits itself as a slimy body, without adhering to the walls of the boiler. The saw dust from pine and other similar woods possesses only a mechanical action. Both, however, are soon reduced to a slime, and are thus objectionable for the reason that they are easily thrown by priming between the valves and the packings of the piston, and interfere seriously with their operation.

Clay free from sand has been proposed by a Frenchman, M. Chaix, and has been found to answer well; boilers, in which it was used, were found free from scale two or three months afterward. Still, its use has been discontinued, owing to the fact that the valve surfaces and the interior of the steam cylinders have been found scratched and covered with dirt.

Scrap iron acts not on the sides, but merely on the bottom, which is often much worn by its use.

Among others, starch and sugary substances have been applied. Potatoes have been in use for a long time for the the purpose in question. The starch, of which they mainly consist, is soon converted into dextrin or starch gum, whereby the water becomes viscid. Molasses acts in the same manner, as observed by M. Guinon in Lyons (France) and confirmed by Guimet; and both these gentlemen state that for a boiler of 17½ feet length and 8½ feet diameter, 10 lbs. of molasses was amply sufficient to completely prevent the formation of scale for two months. Formerly it was necessary to remove the scale every month from this boiler. Guimet uses six pounds of starch sirup every month in a boiler of eight horse power, with the best success. Steam is kept up in the boiler in question for fourteen hours a day. To the same series of substances belong also dye wood extracts, since they yield glucose when acted upon for some time by hot water. This substance produces the same effects as sugary liquids. Bran and succory root, both of which contain starch, belong to this class. Payen recommends to add to the water in a boiler producing 600 lbs. of steam daily, per month, 9 lbs. mashed potatoes, 3 lbs. molasses, ½ lb. dye wood extract, or, instead of the last named, 3 lbs. of bran. As dye wood extracts contain tannic acid, they will also act chemically, hence the small amount recommended. It may well be supposed that all slimy substances, or such that are rendered slimy, continuously prevent the deposit of the mineral because their smallest particles serve as points of agglomeration for the minute crystals, and thus render their aggregation and accumulation impossible. But there is one grave objection to the application of all slimy substances. In boilers of somewhat complicated construction, they collect upon parts where the water boils least, adhering there readily to the boiler; and since the water attains through them a higher specific gravity and produces scum, they are readily thrown into the steam pipes and engine cylinders. In spacious and simple boilers, they may, however, render good service.

Fatty bodies and tar serve to diminish adhesion. Spermaceti oil alone, according to Bedford, gives good results. It has been recommended to cover the tubes and parts exposed to the fire with a mixture of 3 lbs graphite powder and 18 lbs. molten tallow. Newton communicated a recipe for a mass, which is said to adhere still better. It consists of 8 parts tallow or lard, which is first mixed with 8 parts fine graphite (olumbago) and then well kneaded with one part fine charcoal powder, while warm. When it is to be applied, the mass is rubbed together with oil or gas tar. In applying these proposed remedies, it is not to be overlooked that, although only small quantities of fat and tar are rendered volatile by the steam, they may at times become troublesome. Some deny their efficiency entirely, maintaining that scale is formed wherever surfaces are directly exposed to the fire; but others say that this scale is more easily detached. There is here a large and highly remunerative field for inventors, and we hope it will not long remain unexplored.

THE STAR SIRIUS.

The apparent orbit of Sirius, the "dog star," to whose ascendancy the heat of the summer months and the prevalence of hydrophobia at this season have from time immemorial been attributed, is at the present time so near to that of the sun that the star is invisible to us. But although absent from our nightly field of stellar observation, we are continually reminded, by the thermometer and otherwise, of the supposed influence of this body; and a few considerations of its peculiarities will not, therefore, be out of place.

Of the enormous distance of Sirius and the other stars, no adequate conception can be formed; but here statistics come to our aid. It has been demonstrated that, if our sun were removed to the distance of the nearest so called fixed star, it would assume the apparent size of a star of the second magnitude. But Sirius is many times as far from our earth as the nearest fixed star, and its immense separation may be formulated by stating that it is 1,375,000 times the radius of the earth's orbit away from our planet. This radius equals 92,400 000 miles, and the result of the calculation astounds us with its magnitude, and leads us to still further astonishment at the distance of the multitudinous bodies of the nebulæ which, when congregated millions together, scarcely suffice, in some instances, to render the aggregation visible to the unaided eye.

Such is the enormous mass of the star Sirius that it has frequently been supposed to be the center of the universe, as far as our powers of research can reach. It is certainly possible that our whole solar system is revolving around this bright particular star, but its obviously increasing distance points out the deduction that the orbit of the system is an eccentric one, and that its center is still traveling away from that part of the heavens with which we are familiar. Of the rate at which Sirius is leaving us behind, it is sufficient to give the results of the best astronomical observation. Mr. Huggins, whose discoveries with the spectroscope have done much to make us familiar with the enormous powers of that invaluable instrument, has found by watching the hydrogen line given by this star that its displacement equals $\frac{1}{1\,3}$ of an inch towards the red end of the spectrum, and he deduces from this fact that the refrangibility of the light of Sirius is much diminished, as the red are the least refrangible of all the colored rays, and this is a complete proof that Sirius is receding from the earth. Then the question arises: At what rate is this retrograde motion taking place? Computation from the spectrum gives it at about 41¼ miles per second; but at the time in question, the earth was, by its own revolution, receding from Sirius at the rate of 12 miles per second, and the motion of our whole solar system accounts for an

additional 5 miles per second. This reduces Sirius' retrograde speed to about 24½ miles per second. Further modifying this figure by the result of Sirius' transverse motion, we arrive at 29 miles per second, or 900,000,000 miles per year.

What result does this enormous increase of distance have upon this star, so well known to us in the wintry heavens? Sirius is the fiery red *Sothis* of the Egyptians, and Seneca described it as being redder than Mars. But in these days it shines with a perfectly white light, and it was so even in the days of the Danish astronomer Tycho Brahe. Its rapid recession is thus causing a constantly varying change in its color. Whether any further mutation in its aspect will take place during the lives of our now living observers, it would perhaps be presumptuous to predict; and as to what color it will next assume, we have no guide. At its present rate of travel, it will take 20,000 years to double its distance, and as it is now a star of the first magnitude, almost an infinity of time must elapse before it is no longer accessible to the instruments of modern astronomers.

However, we must believe the effect of the ascendancy of the dog star to be a mere superstition. The concurrence of this event with the hot weather of summer is a mere coincidence, and dogs are effected by rabies and men by sunstroke without regard to the position of Sirius in the heavens. Indeed, the so called dog days, according to the almanac, are over before the star rises with the sun, and thus are twenty days too early to be justified by the theory that caused the ancients to describe them as the *caniculares*. There is no doubt, therefore, that the effects of summer heat will continue long after the power of Sirius in our skies is considerably diminished; and the dog days must certainly be considered as a curious tradition, only important so far as it throws light on the condition of learning among the ancients.

RENEWED ACTIVITY AT THE PATENT OFFICE.—RE-ORGANIZATION AND NEW CLASSIFICATION.—APPOINTMENTS AND PROMOTIONS.

The increasing business of the Patent Office has for some time past rendered the old system of classification of the inventions inadequate, and has occasioned much delay in the business of examination. As a remedy for this state of things, the Commissioner of Patents has very wisely decided to institute an entirely new classification, introducing a large number of subdivisions, which will greatly add to the convenience of all who are connected with the department. Formerly, the inventions were divided into twenty-one classes, each of which was managed by one principal examiner and one assistant. Under the new organization, which went into operation on the 15th ult., the inventions are formed into twenty-two grand divisions, at the head of which is a principal examiner. These divisions are separated into one hundred and fifty classes, or subdivisions, administered by some sixty principal and assistant examiners. The work of re-arranging the drawings and documents of the establishment, in accordance with this new organization, is now going on at the Patent Office, and as soon as it is completed, we may expect to see a marked improvement in the general working of the bureau. Every case will be promptly examined and decided, the tedious delays now too often experienced will be avoided, every part of the business of the establishment being carried on with ease and regularity.

The following gentlemen, who have held positions as second assistant examiners, have been promoted, on merit, to be first assistant examiners:—C. W. Forbes, O. C. Fox, C. W. Chapman, and H. Seymour.

The following have been appointed second assistant examiners:—J. A. Brown, J. B. Church, and R. G. Dyrenforth.

Ed. H. Knight, formerly editor of the Patent Office *Gazette*, has been appointed a principal examiner and placed in charge of the classification, indexing, and official publications.

Professor H. H. Botes, formerly in charge of division B of Agriculture, has been assigned to duty in charge of the class of Civil Engineering, to fill the vacancy caused by the promotion of General Ellis Spear to be one of the Examiners-in-chief.

Major J. C. Woodward has been placed in charge of a new class formed out of the division of the classes of Civil Engineering and Land Conveyance.

AN ASTRONOMICAL ROBBERY.

We regret to learn that the Allegheny Observatory, Pittsburgh, Pa. has suffered a serious loss by the depredations of thieves, who recently broke into the dome room in the night time, unscrewed and carried off the object glass of the great equatorial telescope. This lens was the most desirable piece of property in the establishment, its value being $4,000. Nothing else was stolen; it is therefore evident that the robbers knew what they were about. This lens was one of rare excellence, thirteen inches in diameter, and the third largest, we believe, in the United States. It was made by the late Henry Fitz of this city. The loss of the lens is keenly felt by Professor Langley as it of course renders the telescope useless. It is probable that the robber will hold the precious glass in concealment, hoping for the offer of a handsome reward for its return. This is the only way in which the thief can hope to realize from it any considerable amount. On page 34 of our last volume will be found a large engraving of the splendid instrument from which this lens was stolen, with the various appurtenances, such as spectroscopes, micrometers, eye pieces, galvanometers, operating mechanism, etc.

The interior of the observatory appears to have been well supplied with electrical instruments; but unfortunately the simple burglar alarm was not included. This singular robbery will, we trust, be of useful effect to the managers of other institutions where valuable instruments are employed, by inducing them to place electric alarm wires in connection with the doors and windows. We presume this will be done at the Allegheny Observatory now that the lens is gone.

THE NEWARK INDUSTRIAL EXPOSITION.

The first Exposition of Newark manufactures, which for the past two weeks has been in progress in that city, is not only creditable to the enterprise of the gentlemen through whose exertions it was called into existence, but it is especially noteworthy from the fact of its being the first exhibition of the purely local industries of any particular city or town that has taken place in this country.

It is perhaps hardly fair to draw conclusions, as to what the exhibition will be towards its close, from its incomplete condition at present. Several parties who doubted the final success of the undertaking have been tardy in sending in their goods, so that many vexatious delays have been necessitated in the different departments.

The building in which the fair is held is the Skating Rink of the city, to which additions have been made, so that the entire edifice now covers an area of some 50,000 square feet. On entering, the visitor is confronted by a handsome fountain, profusely surrounded with exotics and tropical plants, arranged in excellent taste. On either side of the door a fig and lemon tree in full bearing produce, by their thick foliage, a pleasing and unique effect. In the middle of the hall a large Matthews soda water fountain of white marble (and not a Newark manufacture, by the way) serves as a central ornament. From the arched roof, a number of flags hanging from transverse ropes complete the interior embellishments.

It is, of course, impossible in the space allotted to mention all the exhibitors whose manufactures are to be found on the various tables, so that we are obliged to omit reference to many whose goods doubtless deserve extended notice. In the Rink proper, Mr. A. F. Conery exhibits a finely arranged selection of brushes of various kinds. Those for painting purposes are constructed on an improved method, whereby the handles are freed from the common defect of shrinking. Harness, hardware, and fittings occupy several cases and tables, making a dazzling display of gold and silver ornamentation. The Hedenberg Works contribute a case of tools of different descriptions and an assortment of "Diamond" saws. The Newark Tea Tray Company fill a large compartment with their products. This corporation manufactures an immense number of japanned tin and iron articles, and supplies not only a local but a large foreign trade. By a peculiar process, the japan is so attached to the metal that it is prevented from peeling or cracking off, no matter how severe the usage to which the article is put. The cutlery establishments of R. Heinisch, Furness, Bannister & Co., and others, exhibit several cases of elaborately made knives, shears, etc. Durand & Co., manufacturing jewelers, contribute a magnificent show of jewelry valued at a fabulous sum. In the center of the case, surrounded by ornaments of every description, is a circular box of some two or three inches in diameter filled with superb diamonds, which produce a dazzling effect.

There are the usual articles which somehow creep into every fair, made after much labor with the most inappropriate tools. This time they are a baby carriage and card table constructed of over a thousand bits of wood by some patient individual, aided solely by a shoe knife. We have but one comment to make on such work, and that is that it only evidences a great amount of time and labor totally wasted, which might have been applied to useful and productive results.

In the rear of the apartment are some handsome pieces of furniture by local makers, and a design in plaster, finely conceived and executed, for a Firemen's Monument, by E. J. Kisling. We shall look with some interest for further products of this artist. Charles Cooper & Co. exhibit specimens of chemicals manufactured at their factory, and the Passaic Carbon Works present samples of ground bone and other artificial fertilizers. To the left of the main building is a large room containing carriages of different patterns and some excellent specimens of beveled, bent, and cut glass. This department is not complete at present.

The machinery department on the opposite side of the Rink will doubtless be better filled when the Exposition has been longer in progress. At the present time, we notice three of the well known Baxter engines and a large horizontal forty horse power engine, made by Watts, Campbell & Co., which is to furnish motive power to other machinery. A Bailey & Burnet steam pump is at work raising water from a small tank for about three feet and then sending it back again, thereby making considerable show, but proving absolutely nothing as to its merits. Other machines lie scattered around in picturesque disorder, on which we make no comment as, besides being already familiar to our readers, they are not in proper condition to pass judgment upon. A few specimens of artificial stone are exhibited from the works of Thomas Gay & Son. The Oraton Paint Works contribute samples of zinc and lead paint, and Blanchard Brothers & Lamb, John Young, and other firms, several cases of patent and enameled leather, cloth, etc.

In the art department, above the main Rink, a collection of paintings is on exhibition. A few pleasing works, occupying by no means the most prominent places, brighten up the display which is otherwise below mediocrity. In architectural drawings, we notice especially some excellent designs for the proposed Roman Catholic cathedral in Newark, and also plans of inexpensive country residences, which display considerable taste. The photographs are ordinarily good.

Altogether the Exposition, for the inception of which credit is due to Mr. Holbrook, its present Secretary, and Mr. Tombs, of the Newark *Evening Courier*, has set a worthy example, which deserves to be followed by other manufacturing communities.

[Special Correspondence of the Scientific American.]

LETTER FROM PROFESSOR R. H. THURSTON.

The great iron mines of Michigan.—Magnetic and hematite ores.—Their characteristics and values.—Evidences of ancient earthquakes.—Method of mining and shipping the ores.—Climate, scenery, and attractions of Marquette.

NEGAUNEE, Mich., July 24, 1872.

From Marquette, the Peninsular railroad runs its trains to Escanaba, on Green Bay, and the Marquette and Outonagon railroad runs through all the towns of the iron range, as far as now opened, to Champion, a distance of about thirty miles. This latter road will probably be extended as new mines are opened, and will finally connect the iron with the copper regions terminating at L'Anse or at Outonagon. This is a busy road, its loaded ore trains and empty cars going into Marquette and returning up the road as frequently as time and a single track will permit. As on the Reading railroad of Pennsylvania, the loaded trains are, on this road, almost carried to tide water by their own weight, so uniform and heavy are the down grades. The road is well managed and, I was told, had paid dividends from the beginning. Its repair shops are exceptionally well arranged. The road strikes the iron range at Negaunee, a village about twelve miles south of Marquette, and then follows its course, passing through the several mining towns, nearly to the shore of Lake Michigammi, and is already laid out to new mines to be opened in that beautiful and prospectively wealthy district. I have made Negaunee my headquarters while exploring this part of the country, and have usually been able to make my excursions to the several mines and to return during the same day.

This iron range, although at present only worked along the line of completed railroad, over a distance of about twenty miles, has been explored and found to promise excellent workings throughout a tract of country a hundred miles long and four or five miles in breadth. The Menominee is another range which crosses this, the intersection being at Lake Michigammi, and, although less completely prospected, is known to be equally, if not more, extensive and rich in the best of ores. Copper and lead have also been found in these districts and, at one point, gold has been detected. The whole of this part of the country is, in fact, filled with mineral deposits whose extent and value will probably be not fully determined for many years, notwithstanding the fact that capital is now rapidly supplying the means for exploration and development. The ores of iron are generally found in hills like the Iron Mountain of Missouri, and, in some places, all of the visible rocks and pebbles are composed of pure rich iron ores; and stripping off a few feet of earth or a thin layer of quartzite reveals ore deposits everywhere along the range. The extent and richness as well as, in places, the variety of these deposits are wonderful.

MAGNETIC AND HEMATITE ORES.

The ores vary in character in different districts, and sometimes in different parts of the same district. At one point, the beautiful crystalline magnetic black oxide, somewhat resembling the Lake Champlain ores, is obtained, of which seven tenths is metallic iron. At another point, in the same mine not unfrequently, the ore is heavy, black, brilliantly glistening and equally rich; this is the specular red hematite, called red hematite because, when rubbed, its mark is bright red. Other mines yield a crumbling brown earthy material which one, who had only known the other forms, would hardly suppose to be an iron ore; this is brown hematite, yielding a brown streak when scratched. Some of these soft hematites contain manganese, a most valuable constituent where the ore is intended to be reduced for Bessemer metal. Others contain quantities of lime, an essential material in the blast furnace, where it forms a glass or "slag" with the silica and other impurities of the ore and carries them away, leaving the melted metal, purified, in the hearth of the furnace. I doubt if, in any other part of the world, there can be found such extent and variety of valuable ore deposits.

The ores exported from the district are principally of the richer varieties, and the shipping standard is intended to be 66 per cent of metallic iron.

EVIDENCES OF ANCIENT EARTHQUAKES.

The ores sometimes lie in tolerably regular beds, but more frequently in very irregular masses. The impression acquired by examining the Jackson mine particularly is that, in some geological period of long ago, this part of the country was agitated by a terrible earthquake, and that, among the cracks and ragged chasms of the disrupted and shattered rocks, these vast deposits were gradually precipitated from an aqueous solution by some, as yet unknown, chemical process. In attempting to secure for me a fine specimen of ore at the Grand Central mine, a mass was broken by the blow of the miner's "pick," and, from a cavity in its center, flowed a quantity of water which had probably been imprisoned ages ago when the ore first arranged itself in minute crystals to form the chamber. At another place, a water worn quartz pebble was found enclosed in the mass of dense hematite or specular ore in which the mine was worked. These are both interesting evidences of the aqueous origin of these ores. The former specimen is preserved, with many others from the mineral districts visited, in the cabinets of the Stevens Institute of Technology.

These great deposits of iron ore have been known from a very early period, but it was not until 1846 that the first mine

was opened—the Jackson, here at Negaunee. Now there are about twenty-five mines sending off ore from this Marquette range alone. In 1850, 5,000 tuns were exported annually; this year the exports will reach 800 000 tuns, and the quantity mined will nearly reach 1,000,000 tuns.

METHOD OF MINING.

The method adopted in mining is usually that of open working, already described as in operation at the Iron Mountain of Missouri, precisely that adopted in every stone quarry. In one or two mines, the character of the deposit has induced the proprietors to proceed in the regular system of underground working of all deep mines, that which has been described in the preceding letter from the copper district. At the Jackson mine, nearly all of the ore, which is a specular hematite, is won by quarrying; at the mines at the other, the western, end of the line, a considerable amount of ore is obtained, from deposits of mixed magnetic and specular ore extending far down into the rock, by "candle light work." The ores are shipped principally from Marquette, but some cargoes are loaded at Escanaba and a small quantity goes to market by rail. The loading docks at Marquette are well designed and exceedingly convenient. The cars run upon them, drop their loads into "pockets," which, in the principal dock of the railroad company, can, altogether, receive 10,000 tuns, and can be discharged in a single day, should a sufficient number of vessels be obtained to receive so much. The amount shipped per day at Marquette is, just now, about 3,500 tuns.

From the shipping ports, it is taken to the principal lower lake ports and is thence distributed to all parts of the country between the Alleghanies and the Mississippi and between the lakes and the Ohio.

CLIMATE AND FEATURES OF MARQUETTE.

This part of the country is just now frequently visited by tourists, who explore the mines, fish in the beautiful clear streams that abound here or in the lakes, and enjoy themselves in innumerable ways. Marquette will probably soon become a famous watering place, and it has already a large number of annual visitors. The climate here is delightful at this season, and, sitting by the fire in the evening or walking out, comfortably wrapped in shawls or overcoats, we can hardly realize that, in New York, you are suffering with heat and that each day has a record of deaths from sunstroke. The climate of this region must be a healthy one at all seasons, I should suppose, for a stronger looking people and healthier appearing children are not to be found anywhere, even though they do, occasionally, find the mercury frozen in the bulb of the thermometer during their long cold winter.

It was with great reluctance that I compelled myself to refuse the many invitations extended to visit parts of the country which I had not found time to explore, and to defer to some subsequent occasion further examination of this wonderfully interesting and most important section of the northwest. I hope and anticipate that circumstances may, at some time, permit another and a longer visit. R. H. T.

Kemmer's Patent System of Fresco Painting.

In our issue of June 22d we alluded to the new system of oil fresco painting, invented and recently patented by Mr. Charles T. Kemmer, of Newark, N. J. At that time we had not seen any of his decorations upon the wall, but, from the description in his patent and the inventor's explanation of the process, we predicted that it was likely to supersede the ordinary mode of frescoing. We have since had an opportunity of seeing the ceilings and walls of a large hall in the process of decoration, and have examined them since the completion; and our good opinion of the invention, as previously expressed, is more than confirmed.

The work done has all the appearance of, and in fact is, elaborate frescoing in oil, and yet is not only more durable but less expensive, equally artistic, and far more readily accomplished. A reference to our issue of the date above referred to will inform our readers of the peculiar manner in which these decorations are prepared, although the method may be briefly stated to be the formation, on a prepared sheet of muslin, of a thick film of paint which is easily removed and readily cemented to the plaster of a ceiling or wall.

As this invention has been proved to be so eminently successful, it carries with it advantages which make it greatly superior to the ordinary method of fresco painting. The use of scaffolding, expensive and cumbrous, in one's apartments for weeks at a stretch is avoided. The decorations can be designed according to order, executed in the shop, brought to the house, and put in place; and instead of the whole building being in confusion for weeks at a time, three or four days will suffice to complete the job. Moreover, better work can be done; the artist is not obliged to labor lying on his back or twisting his head into awkward and painful positions —often in the worst of lights.

Interior decoration is carried on principally during the summer months. Necessarily work is plentiful, skilled workmen are difficult to obtain, and expenses are proportionately great. Using the Kemmer process, the labor can be done during the cold weather, when the best of artists are out of employment and can be had at low wages.

The film above alluded to is composed of six coats of the best oil fresco paint, and the gilding is pure gold leaf. Consequently a wall or ceiling may be washed like ordinary paint with soap and water, a proceeding which is impossible with common fresco work. The film, though thin, is elastic and does not crack with the wall, unless very large openings appear, which are generally few and susceptible of easy repair. The most elaborate designs can be prepared for any sized apartments.

We speak thus approvingly of the process of Mr. Kemmer because we believe it to be the best yet invented. The proprietors of the St. Nicholas Hotel in this city have had a parlor decorated after this plan, and other hotels are about to try it. It is stated that a manufactory on a large scale, devoted to this invention, is contemplated. If so, it will inaugurate an entirely new industry and one well worthy of the attention of capitalists and business men. Charles T. Kemmer & Co., office at 4 Warren street, New York city, or at Bower's boat house, East Newark, N. J. may be addressed for any further information.

The Kitchen Range.

If Satan himself, says the New York *Express*, had put his wits to work this hot weather to give city mankind a foretaste of his infernal regions, he could not have constructed a machine more diabolical than the kitchen range, filled with red hot anthracite coal, in a block of city houses, to roast cits therewith. Think of it! you have not only one red hot kitchen range to roast you, but two, on each side of your house, one from your neighbor's kitchen on the right, and the other from the other neighbor's kitchen on the left! There are thus three fires to open their blazes upon you, when the thermometer is near the hundred—and while the salamander cook can stand it, the dwellers above and the sleepers in the chambers, where the fiery flues go, feverishly flit about by day, and groan in heated agony all night.

Cannot some American genius supplant Satan in this diabolical invention for cooking? In other climates, where, bless fortune, there is no anthracite coal, and where wood, weighed by the pound, costs something, all the cooking is done—and as well done as we do it, if not better—with a fiftieth part of the fuel we use; and so in the cooler climates of Europe, where charcoal is used or bituminous coal, which is not "red hot" like the anthracite. Are Americans only born to be roasted in summer fires of the kitchen? Is it the glorious privilege of our country to use fifty pounds of fuel to cook with when other nations use but one? Wake up, Yankee inventor, and invent or discover for us something to save us poor summer cits from being carbonized these hot days, or from melting away into grease! The kitchen range will do, as conducted in winter, when the thermometer is down to zero, but never, never in such summer weather as we have been having for twenty days past.

Genius solved this problem long ago by the invention of the gas stove. For summer use, in cities, nothing can be more convenient or economical. Placed upon the kitchen table, you can broil your steak or chicken in the most admirable manner, boil your coffee, roast your potatoes, bake your biscuits, fry your cakes and heat your flat irons. The range fire with its overpowering heat is rendered quite unnecessary. People who make complaints ought to look a trifle beyond their noses before they cry out. People who make the loudest complaints are apt to be those who have not looked beyond their noses.

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.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 17c. a line.

Wanted—The New York Steam Engine Co., Manufacturers of Machinists' and Railway Tools, can give steady employment to a number of good machinists used to tool work. At their Shop in Passaic, N. J., 11 miles from New York, on Erie Railway.

Large lot of Machinery for Sale. See adv. of Geo. Place & Co.

Engine for plowing—I have a traveling engine for plowing and all other draft and stationary purpose. Has a new device for overcoming hills. Will draw six times its own weight. Light, cheap, durable, and effective. Will be on exhibition in Oct., at Kalamazoo, Mich. D. C. Pierce.

Rust's Boiler Plate Hand Punches. S. C. Hills, 32 Courtlandt st.

Circular Saw Arbors, all styles and sizes. Wm. Scott, Binghamton, N. Y.

For Patent Vertical Portable Engines and Saw Mills, with all late improvements, apply to Griffith and Wedge, Zanesville, Ohio.

A first class Machinist and Tool maker, fair Draughtsman, wishes a situation. Address Tool Maker, Plainville, Conn.

A Chance for a Big Speculation!—A valuable Patent, and Machinery, Stock, &c., which cost over $3,000, can be bought very cheap as the parties are out of funds. Address P. O. Box 204, Bellefonte, Pa.

Engine and Speed Lathes of superior quality, with hardened Steel bearings, just finished at the Washburn Shop, connected with the Free Institute, Worcester, Mass.

Brick and Mortar Elevator and Distributor—Patent for Sale. See description in SCI. AMERICAN, July 20, 1872. T. Shanks, Lombard and Sharp Streets, Baltimore, Md.

The Berryman Manf. Co. make a specialty of the economical feeding and safety in working Steam Boilers. Address I. B. Davis & Co. Hartford, Conn.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co., Hartford, Conn.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro. 414 Water st., N. Y.

For Machinists' Tools and Supplies of every description, address Kelly, Howell & Ludwig, 917 Market Street, Philadelphia, Pa.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 33 Broadway, N. Y., or Box 1809.

Belting 41 is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies see Manufacturing News of United States in Boston Commercial Bulletin. Terms 4.00 year.

Large lot of Machinery for Sale. See adv. of Geo. Place & Co

Microscope—Zeutmayer wanted. Address H. F., Box 608, Baltimore, Md.

Stove Pattern Makers, please send address to Thomas Rosere, Bellaire, Ohio.

Meat Chopper—The Union Meat Chopper—the Best in the country. For Circulars and Price Lists, address J. Dyer, Elizabethtown, Pa.

For the best Gauge Lathe, address T. R. Bailey & Vail, Lockport, N. Y.

Models and Patterns of all kinds made in the best manner at lowest prices. Geo. B. Kilbon, 35 Market St., Springfield, Mass.

Who fits up and furnishes the tools, machinery, and fixtures for factories of shoe lasts, especially polishing and grinding machines? Offers, with illustrated catalogues and prices, to be addressed to T. V., 780, care of Messrs. Haasenstein & Vogler, Stuttgart, Germany.

A practical Circular Sawyer wants a Situation in the United States after January 1, 1873. Address Yankee Sawyer, Arthabaska Station, Province of Quebec, C. E.

Wanted—Engagement as Manager in a Machine Works by a thorough Practical Engineer and Draughtsman: large experience home and abroad, designing and constructing Special tools, Steam and general Machinery. Address "Machinist," care A. D. Haight, 229 Broadway, N. Y.

Knitting Machinery—Wanted to superintend the practical working of Improved Knitting Machines—23 years' experience: England, France and Germany. "Self-acting," Windsor Locks, Conn.

Flouring Mill near St. Louis, Mo., for Sale. See back page.

Steel Castings to pattern, strong and tough. Can be forged and tempered. Address Collins & Co., 212 Water St., New York.

Wanted—A live man, acquainted with Turbine Wheels, to travel. Address Urbana Machine Works, Urbana, Ohio.

It is better to purchase one of the American Twist Drill Company's Celebrated Patent Emery Grinders than to wish you had.

Walrus Leather for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

Ashcroft's Original Steam Gauge, best and cheapest in the market. Address E. H. Ashcroft, Sudbury St., Boston, Mass.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company foot East 9th Street, New York—1202 N. 2d Street, St. Louis.

Ashcroft's Self-Testing Steam Gauge can be tested without removing it from its position.

Brown's Pipe Tongs—Manufactured exclusively by Ashcroft, Sudbury St., Boston, Mass.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20 1869. 64 Nassau st., New York.

Page's patent Belt Lacing, as made by J. H. & N. A. Williams, Utica, N. Y., is the best and cheapest.

American Boiler Powder Co, Box 797, Pittsburgh, Pa., make the only safe, sure, and cheap remedy for 'Scaly Boilers.' Orders solicited.

Machinery Paint, all shades. Will dry with a fine gloss as soon as put on. $1 to $1.50 per gal. New York City Oil Company, Sole Agents, 116 Maiden Lane.

Whitcher's Pat. Rotary Engine is the simplest, cheapest, and most economical. On exhibition at P. Fields & Son, North Point Foundry and Machine Works, Jersey City, N. J.

Windmills: Get the best. A. P. Brown & Co., 61 Park Place, N. Y.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $4. E. M. Boynton, 80 Beekman Street, New York. Sole Proprietor.

Better than the Best—Davis' Patent Recording Steam Gauge Simple and Cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For hand fire engines, address Rumsey & Co., Seneca Falls, N. Y.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

For Marble Floor Tile, address G. Barney, Swanton, Vt.

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

Portable Baths. Address Portable Bath Co., Sag Harbor, N. Y.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N. J. Also 3-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

New Pat. Perforated Metallic Graining Tools, do first class work, in less than half the usual time and makes every man a first class Grainer. Address J. J. Callow, Cleveland, Ohio.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

BOILER EXPLOSIONS.—T. K.

BURNING BRICKS.—J. D.

CARBONIC ACID GAS.—L. G. F.

EXPLOSION AND BURSTING OF STEAM BOILERS.—A. F. W. N

LAWS OF ELECTRICITY.

MECHANICAL FORCES.—J. W.

MECHANICAL POWER.—H. H.

MINERAL SPRING.—J. C.

PRODUCERS AND CONSUMERS.—J. E. S.

PROPORTIONS OF ENGINES.—H. A. B.

SPECTRUM ANALYSIS.—W. A. M.

TIME.—A. M. T., Jr.

WATER FROM THE DEPTHS OF THE SEA.—M. D. M.

"YOUNG MACHINIST."—F. B. C.—S.

NOTES AND QUERIES.—J. M. E.

ANSWERS TO CORRESPONDENTS.—W. H. P.—M. R.—E. J.—H. H. L.—A. H. G.

Facts for the Ladies.—Mrs. M. C. Wheeler, Wolcottville, Ct., has used a Wheeler & Wilson Lock-Stitch Machine constantly, since 1858 in family sewing, with no expense for repairs and only two needles broken. 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.—CHLOROFORM.—Can any one give a simple method of making chloroform?—C. T. B.

2.—SHADE TREES.—What is the best time of year for topping oak and hickory trees to make a shade?—T. C. J.

3.—ACTION OF MILK ON INK STAINS.—"To remove from clothing stains of common writing ink, dip the fabric in sweet milk, and it will wash white at next washing." Will some one give the chemistry of this?—P.

4.—KOUMISS.—Will any of your readers give a formula for making, or any information respecting, koumiss, or where it may be obtained?—W. R. J.

5.—BURNING CHARCOAL.—What is the best mode of burning charcoal on a small scale, say six or eight bushels at a time? I would prefer to use a cone of sheet iron instead of the old plan. How must I construct the cone, and how must I proceed to get charcoal?—C. G.

6.—ADHESIVE CEMENTS.—What is the best paste and preparation of the same for pasting prints on muslin, as is done in map mounting? What would be the strongest gum for fastening muslin upon wood? It should be colorless and as nearly insoluble in water as possible.—A. B.

7.—MULTIPLYING GEAR FOR PROPELLER.—How are the quick revolutions of the screw of a propeller produced, as used in the propulsion of vessels in New York harbor? Is it done by cog gearing, or how?—T. and W. M.

8.—PORTABLE FURNACE FOR MELTING IRON.—How can I construct a small portable furnace, suitable for melting small quantities of metal at a time, that will produce sufficient heat to melt iron?—D. M.

9.—RUST JOINTS.—How can conical lathe centers, that have become fastened in their sockets by rust, be got out?—D. M.

10.—WEIGHT OF WATER.—How much pressure will there be on each square inch of the bottom of a hogshead if there are three feet of water in the hogshead, when the air over the water is exhausted from the hogshead? In other words, how much pressure will the weight of the water make on each square inch, taking the atmospheric pressure off from the top of the water?—J. J. T.

11.—CHURNING BUTTER.—Why does cream produced from milk of the same cow, and churned at the same temperature, require two and oft times more hours at some churnings, and but fifteen minutes at others, before the butter has become sufficiently collected or compact to be removed? The butter is visible in small particles after a few minutes churning, and so remains for the time specified.—A. T. M.

12.—RELATIVE HIGHTS OF THE ATLANTIC AND PACIFIC OCEANS.—Can any of your correspondents inform me which ocean is the highest at the isthmus, the Atlantic or the Pacific? What is the difference? Has there recently been a survey for a ship canal between the two oceans?—J. P. W.

13.—INDELIBLE PRINTING INK.—Can any of your readers give a recipe for making a printers' ink that is indelible?—W. C. D.

14.—TRANSFERRING CHROMOS TO GLASS.—I have seen in England windows beautifully adorned with chromos and other pictures transferred to the glass, so well done that the effect is like that of painted glass. In my dining room is a large bay window, the lower half of which I want to embellish in this way, chiefly for the purpose of masking a fence. How can the pictures be transferred to the glass so as to make a good job of it?—N. D.

15.—THE "JAWSHARP."—Why does the jawsharp (not jewsharp) give all the notes of the scale, having but one note when held in the hand? Is the vibration of the tongue governed by all of the vocal organs?—B.

16.—DIMENSIONS OF BOILER.—Please inform me what are the proper dimensions of a horizontal boiler with two flues in it, for running a small horizontal stationary steam engine, with a four inch stroke, with a cylinder of one half inch diameter, the drive wheel weighing about thirty pounds? It is used in running a foot lathe.—A. F. B.

17.—PHOSPHORESCENT OIL.—I have tried the phosphorescent light described on page 10 of your current volume. I prepared it with phosphorus and olive oil, but I only get a faint light on removing the cork, not sufficient to be of any service. What is the trouble? I followed D. B.'s directions in preparing it. Can any correspondent give me some light as to where the fault is?—A. H. S.

18.—CEMENTING COLD STEEL AND MELTED IRON.—Is there any preparation that can be applied to cold steel so that, when melted cast iron comes in contact, they will unite?—A. W. B.

19.—DIURNAL MAGNETIC VARIATION.—Is there any diurnal variation of the needle on the line of no variation? Here the diurnal variation is from 10′ to 15′, according to temperature, and is greatest about 2 or 3 P.M., the variation being west. Where the variation is east, is it greater or less in the after part of the day?—T. H.

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.

DISTANCE OF LIGHTNING STROKE.—H. H. L. Jr., is informed that the error he alludes to is caused by the misplacement of the decimal point. The correct reading is obvious to everybody.

WOODEN RAILWAYS.—We are again asked for further information on this subject. We shall be glad to hear from Mr. J. B. Hulbert on the subject.

THE ANCIENT EGYPTIANS.—T. C. J., of Tenn., is informed that the Caucasian origin of this people has long been an ascertained fact. Their language had an affinity to the Hebrew and Arabic tongues, and craniology points out a wide difference between them and the Africans. Herodotus certainly speaks of them as being black and woolly haired; but it is more than probable that, previous to his day, they had largely intermingled with the native races of Africa. That the statements of the Greek historian are not correct as to the Egyptians in early times, the thousands of mummies in existence at this day furnish abundant testimony.

PERPETUAL MOTION.—C. A. N., of Tenn., is informed that a machine run by magnetic attraction cannot be called a perpetual motion. Gravity cannot impart perpetual motion, for, as soon as the weight reaches the center of attraction, the force ceases; and as soon as the armature touches the magnet, the motion is at an end. We are not aware that any reward for the discovery of perpetual motion was ever offered by either the United States or British government. The impossibility of arriving at the result has long been demonstrated; and probably no government would encourage the ignorant to waste their time on a chimera.

WATERPROOFING COTTON CLOTH.—F. C. is informed that we have recently published many recipes for this, and have referred many of our correspondents to them. See Answers to Correspondents, page 10 of our current volume.

METAL LINING IN CAST IRON BOXES.—What metal does W. A. use, that his linings get in six weeks a play of a sixteenth of an inch? Is it Babbitt metal, *minus* the antimony, mentioned by him in his original query? The defect is probably in the metal. If it be hard enough, the plan illustrated by us on page 90, current volume, will hold the lining till it is all worn away.

PROTECTING BRICK WALLS.—Is it practicable to use silicate of soda (liquid glass) for painting or coating a brick wall, and then to render it insoluble by the application of chloride of calcium or any other chemical? I am informed that the idea was suggested in Muspratt's "Chemistry." It has been objected that the salts would appear on the surface as an efflorescence, and thus disfigure the building. Can any one tell me as to this, and is there any other objection? I believe it would form the best possible protection for brick walls, especially against moisture, which is our great trouble in this latitude.—I. Answer: Muspratt's proposition is to use the silicate of soda to preserve the oolitic and dolomitic limestones, which are continually being disintegrated by the sulphurous acid in the atmosphere of cities. Well burnt brick is not subject to this influence, and is, as we see in Egypt and Palestine, the least perishable of all human productions.

A. H. M. & Co., Ala.—The mineral you send is talcose slate, and like steatite, to which it is related, it is infusible. When sufficiently compact, it may be worked into fire stoves; one variety is used for hones and scythe stones.

CLOCKWORK TO RAISE WATER.—B. Smith is referred to us by the editor of the *Rural New Yorker* for a reply to the following enquiry: Would a machine constructed on the order of clockwork, and run by a weight, raise 100 gallons of water, in twenty-four hours, from a well 25 feet deep, to a point 10 feet above the ground, said machine to run for 24 hours without being wound up more than once? If so, what would be the arrangement of the wheels to do the required work? Answer: Yes, a clockwork machine, driven by a weight, to be wound once in 24 hours, might easily be made to do the above work. The arrangement of gearing would be similar to the churn drivers, now in common use, which consist of four cog wheels, rope, and weight. 100 gallons of water weigh 833 pounds. The work to be done is therefore to lift 833 pounds of water 35 feet high in 24 hours. A man could do that work with a pump or buckets in ten minutes; and would be occupied about the same length of time in winding the machine we have described.

MILLING COINS.—To C. A., query 4, page 122.—The milling is done by engraving one of the dies in a cavity in the steel, the cavity being of the depth of the thickness of the coin, and having its edges milled. The pressure of the coining press forces the metal into the milled rim of the die.—D. B., of N. Y.

THE EARTH'S ORBIT.—O. F., query 6, page 106, is informed that, owing to the elliptical form of the earth's orbit, that the distance between the earth and the sun is greatest in January and least in July.—D. B., of N. Y.

POWER OF ENGINE.—Query 13, page 153.—W. H. P.'s engine shows by the usual formula a power of between 9 and 10 horses. But the percentage of friction is usually large in cylinders of such small dimensions, and the application of an indicator would probably show a considerable discrepancy between the pressure in the cylinder and that of the boiler.—D. B., of N. Y.

SPECIFIC GRAVITY.—J. P., query 15, page 153, is informed that there is a greater attraction, that is, a body will weigh more, at the poles than at the equator. This is owing to the flatness of the earth at the poles, and the attraction, according to the law discovered by Newton, varies inversely as the square of the distance.—D. B., of N. Y.

IRON RUST STAINS.—To R., query 1, page 122.—Soak the stained parts in a mixture of sulphuric acid one part, and water two parts, having the mixture pretty hot; then thoroughly wash in clean water.—E. H. H., of Mass.

ROOT BEER.—To G. W. E., query 3, page 122.—You may adopt the following plan, but must be careful to use an ordinary soda water copper fountain or other vessel to stand the pressure of the gas. To the beer add one ounce and a quarter of bicarbonate of soda and one ounce of tartaric acid to each gallon. The tartaric acid will combine with the soda, and form tartrate of soda, and liberate carbonic acid gas; this, being confined in the vessel, will exert so much pressure as to easily force the effervescing beer up the pipe into the fountain. The tartrate of soda is perfectly harmless, but has a slight aperient property. Each soda fountain usually holds ten gallons, so you will add 12½ ounces of soda and 10 ounces of crystal or powder acid.—E. H. H., of Mass.

WHITE VINEGAR.—To L. C. M., query 7, page 112.—Cider vinegar may be decolorized by digesting with and filtering through fresh burned animal charcoal, as used by sugar refiners. Cider vinegar, however, will not answer for pickling large fleshy cucumbers, tomatoes, etc., but may do well enough for small radish pods, gherkins, small pepper pods, etc. The reason is this: Large cucumbers, etc., already contain a large quantity of juice or water; if you add a comparatively weak vinegar, this juice will still further reduce the strength below the point necessary to preserve from putrefaction. Large and juicy fruit with strong acid, and small dry fruit with weaker acid will do.—E. H. H., of Mass.

SPONTANEOUS IGNITION.—To G. T. R., query 9, page 122.—Make a stiff paste, with water, of equal parts of powdered white sugar and chlorate of potash; dip the ends of match sticks until thickly coated, and dry. Have a small bottle half full of sand, saturated with sulphuric acid. On dipping a prepared match into the acid, you will have a spontaneous flame. Use a little care in trying this.—E. H. H., of Mass.

LINSEED OIL FOR WATERPROOFING.—To B. B. B., query 10, page 122.—Boil pure linseed oil in an iron pot over the fire for four or five hours, or until it has become thick and viscid; towards the close of the operation, set the fumes of the oil on fire for five minutes or so, and put out the flames by putting sheet iron or a board over the vessel, and so excluding the air. Have the vessel abundantly large, and if it accidentally inflames, and you want to extinguish it, on no account use a drop of water, but rather throw over the vessel a wetted thick blanket or piece of carpet, or adopt the iron or board plan. Be prepared beforehand for the emergency. When boiled to the proper consistency, spread while hot on to your fabric, or, if more convenient, allow to cool and dissolve in benzine to a suitable attenuation, and apply in successive coats till thick enough. Mix lamp or ivory black to give your color. You will find this varnish act perfectly for your boat, and the benzine dries very rapidly.—E. H. H., of Mass.

DIAMONDS.—To C. W. P., query 1, page 138.—You will find on experiment that fluoric acid will corrode any of the precious stones except diamonds. The value of a diamond is estimated by its color and density.—H. M. B. of W. Va.

Recent American and Foreign Patents.

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

HEATING STOVE.—Thomas Scantlin, of Evansville, Ind.—This invention has for its object to furnish an improved heating stove so constructed and arranged as to utilize the most of the heat contained in the smoke and other products of combustion before allowing them to escape into the chimney and so as to enable a direct draft to be conveniently obtained when desired.

SAFETY VALVE.—Michael Smart and Thomas W. Gaynor, New York city.—This invention has for its object to so arrange a safety valve for steam boilers that it will be sensitive to the action of the steam, and not liable to become obstructed, and it consists in providing the valve chamber with escape steam ports and with a chambered extension, in which is arranged a spiral spring that acts through the medium of a collar and piston rod to partly hold the piston against the pressure of steam in the boiler.

KEY TAG, WATCH KEY, AND KNIFE SHARPENER.—Our engraving represents a combined key tag, watch key, and knife sharpener, which was patented April 2, 1872. Fig. 1 shows the face, and Fig. 2, a side or edge view of the same.

Fig. 1



Fig. 2.



The key is made of gold or other suitable material and is of a convenient shape to have the name, etc., of the owner engraved thereon, while it is provided with a ring for attachment to a bunch of keys. Pivoted to its lower side will be seen the watch key, which is represented in position for use. When not required, it is turned back out of the way until it rests against the small post shown at the upper part of the figures, as indicated by the dotted lines. In this position no dust or other matter can enter the tube of the key. The knife sharpening apparatus consists of the two disks seen in the figures, which lie in a space cut out of the tag, and which are pivoted by rivets to ears left for the purpose, as shown. The edges of the disks are beveled, so that upon drawing a knife across and between them, at right angles, their sharp edges remove a small shaving from each side of the blade. Our engraving is half the actual size of the article, which will no doubt prove a desirable addition to the key bunch without being in any way cumbrous. Propositions for the purchase of the patent will be received by the inventor, John C. Schlarbaum, P. O. B. 245, Virginia City, Nevada.

LIME KILN.—Elisha Randall, of Mason City, Iowa.—This invention consists of a metal hopper at the bottom of the cupola, with an open bottom for discharging and a slide for closing it; also with a revolving grate, with a hand crank above the slide, adapted to pick the pieces of lime apart and facilitate the discharge of it by turning said grate. At a short distance above the hopper, there are two fireplaces on opposite sides of the cupola arranged and adapted to act quickly on a large surface of the limestone, as to expedite the burning without overburning any part. And below the hopper is an open archway through the stack and an elevated railway, on which the discharged lime is received in a truck, with a box mounted on journals and designed to be turned bottom side up by gravity for discharging.

HAY STACKING APPARATUS.—Cyrus H. Kirkpatrick, of Sugar Grove, Ind.—This invention has for its object to furnish an improved apparatus for stacking hay, simple, strong, durable, convenient in use and effective in operation, and it consists in the construction and arrangement of the base or platform and post, secured to the platform to the upper end of which is pivoted a crane. To the lower end of the post and to the platform is attached a flanged socket, which is designed to serve as a journal for the driving wheel to which is attached the sweep to which the horse is attached and a leading pole to which the horse's halter is tied.

GAME.—Robert Patterson, of New Santa Fé, Mo.—This invention relates to a new alphabetical game to be used by children to make them fully acquainted with the appearance and the differences of letters and numerals. The invention consists in the use of printed tables containing rows of letters or figures and in the employment of cards or small disks containing similar letters and figures, but singly, so that such disks or cards may be used to cover the places on the printed tables.

EXTENSION SCAFFOLD.—Isaac Noggle, of Butler, Ill.—The object of this invention is to provide suitable and convenient means to enable masons and others to raise themselves to their work; and it consists in an extension framework so constructed as to be used as a scaffold or staging. It is formed of legs or supports, a rail, and bands by which the parts of each are screwed together, so that they may slide and be elongated; and two bands are employed for each leg, one band being attached to one piece and the other to the other piece. The two parts of the rail are confined together in the same manner. The legs are connected together near the top by a screw bolt, and by a link, which latter holds the legs spread at the bottom, so that they will brace the rail laterally. The two legs also form a slot at their top ends to receive the rail, and each part of the rail is recessed on its sides so that the timber will fit into the slots. The recesses in the rail are cut on an incline, so that the legs stand bracing from the center. There is a spring attached to one part of the leg which enters recesses in the other part, which prevents the parts from slipping. The legs may be so adjusted that the rail will stand on a level on uneven ground.

EQUESTRIAN GYMNASIUM.—Eliphalet S. Scripture, of Williamsburg, N. Y.—This invention relates to an apparatus on which imaginary horseback riding, riding in a flying hammock, swinging on a jerking rope, etc. can be enjoyed. The exercises are both amusing and difficult to perform, as they are alternately aided and obstructed by mechanical power. The invention consists in an ingenious arrangement of mechanism for imparting the desired movements to the devices on which the persons taking the exercise are either supported or from which they are suspended.

MACHINE FOR THE MANUFACTURE OF TOBACCO.—Elijah Robinson, Charles F. Robinson, and James E. H. Andrew, Stockport, England.—The invention consists in the combination of three rollers, the surfaces of which are solid or made of segments, to which lateral to and fro motions are given by cams or other equivalents connected to the stands on which the axles of the rollers rotate. The tobacco to be operated upon occupies the central space between the three rollers, and it is carried through the machine by the lateral to and fro motions given to the rollers or segments. In manufacturing roll or twist tobacco, the filler and the covering leaves are laid on a table connected to the machine. The filler is placed in the cover, and they pass together between the rollers, the action of which twists and compresses the tobacco into a roll or twist, which is carried forward and wound on a bobbin. The bobbin revolves in an open frame, and the guide is traversed to and fro to distribute the twist of tobacco on the surface of the bobbin.

FENCE.—Isaac N. Lerick, San Antonio, Texas.—In western Texas, where fence timber is extremely scarce and expensive, a resort to iron as a material for fencing is a necessity; and the object of this invention is to so construct an iron fence that in point of cheapness and durability it may be used as a substitute for wood. The post and the brace are made of thin angle iron, and are pivoted together at their top ends. Mortises or orinces are made through the posts for the rails. The rails are made endless and are spliced together by button rivets in one part and button holes in the other. The post and the brace are tied together and held a sufficient distance apart by a bar which is pivoted to the brace and hooked on to a button in the post.

SLOTTING AND SHAPING MACHINE.—William H. Warren, of Worcester, Mass.—This invention has for its object to combine a shaper and slotter in a single machine, mounted upon one frame, and driven by the same driving device, in such a way that they may both work at the same time, or either separately, as desired; and it consists in the two rams, one moving vertically and the other horizontally, and both mounted upon the same traverse shoe and driven by the same driving device. The inventor claims the horizontal and vertical shaping rams combined with the traverse shoe, feed screw, and lath shear, as and for the purpose described.

EYEGLASS.—Arabella Sds, of Edgewater, N. Y.—This invention has for its object to improve eyeglasses in such a manner that the spring connecting the frames cannot become bent to one side or twisted out of shape. It consists in adapting the pin, on which the glasses hook when folded, to project from either side of the handle or frame, so that the hook on the other frame may be secured to either side *ad libitum*. This gives sufficient change in the positions of the spring when folded as to prevent its being twisted in one direction only. The pin is made of the usual length, and is fitted loosely through the handle, so that it can be pushed from one side to the other. It is also headed at both ends to adapt it to retain its places on the hook and frame.

STONE GATHERER.—Benjamin R. Tupper, of Odessa, Michigan.—This invention consists in a peculiar mode of combining rake teeth and revolving arms so as to transfer stones from the surface of the ground to an endless carrier. The lower end of the truck of the gatherer is armed with strong curved metal teeth, adapted to run under the stones and gather them upon their upper sides. Arms are arranged to revolve on the truck axle and pass between the teeth in such a manner as to force the stones up and along them on to the endless carrier, by which they are delivered into a box.

CELERY COLLAR.—John Simpson, of York, Eng. assignor to himself and William Blake, of Liverpool, Eng.—This invention relates to a new shield or collar for celery and other plants, by the use of which they are kept from unduly expanding, are bleached, and prevented from becoming soiled. The invention consists in making a collar of stout paper perforated with a row of holes and provided at one end with a hook. It is placed around the plant with the hook fitted through one aperture, and allows the plant to become expanded during growth by bearing against the collar and causing the hook to tear its way from the inner gradually to the outer aperture. It protects the plant and holds its branches properly elevated.

HORSE POWER.—Samuel E. Tooly, of Delphi, N. Y.—This invention consists of a horse power for driving crosscut sawing machines and other machinery, in which there is a simple and economical duplicate arrangement for working two crosscut saws, together with a shifting gear for connecting and disconnecting the saws alternately; by which means one is kept at work while the other is resting and the log is being adjusted, so that the team and attendant are employed the whole time, and the stopping and starting, necessary when only one saw is used, is avoided.

ELECTRO-MAGNETIC APPARATUS.—Rudolph Sayer, of New York city.—This invention relates to several improvements in the construction and arrangement of electric apparatus to be used for medical or other purposes; it consists in making the vibrating hammer or armature of gradated form, and in combining with it a vertically adjustable frame which can be set opposite any one of its steps and thereby enlarge or diminish its vibrations. The interval of the electric shocks can be conveniently changed by means of the adjustable frame, which is further connected with an index showing the degree of motion allowed to the hammer. The invention also consists in a new swivel post, which connects with the conductors from the magnetic coil and sleeve, and with the wires which connect with the patient or with the article to be acted upon. By turning this post the direction of the current through the last named wires can be reversed, and it has metal arms connecting with the branched ends of the conductors, respectively, in the desired manner. There is also a vibrating wire frame, whereby the primary current can be used alone whenever desired.

REEL.—Louis Weins, of Rhine, Wis.—This invention relates to a new arrangement of yarn reel, which can be placed in a horizontal or vertical position, according to the purposes for which it is intended. It consists in a new manner of fitting the shaft through a swivel ring, so that it can, with said ring, be swung into the desired position and there fastened in sockets provided for its reception.

HOT BLAST OVEN PIPE.—J. King McLanahan, of Hollidaysburg, Pa.—This is an improvement in the mode of casting the upper ends of the diaphragm pipes used in hot air ovens for blast furnaces, so as to dispense with the cemented plugs as heretofore, made and obviate the necessity of cooling down the blast furnace on their burning out. The invention presents, as a new manufacture, a diaphragm pipe with the top cast on solid with the sides or cylindrical parts.

SAW MILL.—James M. Rees, Scott, Ohio.—This improvement has for its object the regulation of the sweep or rake of the saw, which the inventor claims to have effected by the use of saw guides which are carried by fender posts. It is an ingenious invention.

RAILROAD AND MARINE SIGNAL LAMP.—James F. Veronee, of Charleston, S. C.—This invention has for its object to improve the construction of railroad and marine signal lamps so as to make them more convenient and effective in use, by throwing the light stronger and thus further than lamps constructed in the ordinary manner; and it consists in various combinations of cylindrical and flaring or conical hand reflectors with the lenses and illuminating lamps.

DOOR KNOB LOCK.—C. M. Jordan, of Stillwater, Mich.—This invention provides a door knob spindle, so arranged that when the inner knob is drawn away from the door, the spindle cannot be turned or moved longitudinally, thus effectually preventing the door from being opened from the outside. By pushing the inner knob towards the door, the spindle is put into position to throw the bolt, and can be operated by either knob and the door opened.

LOOM.—James Short, of New Brunswick, N. J.—This invention relates to a positive motion loom with a suitable number of shuttles, of which either one can be used at any one time, all others being held at rest until they are to be used one after another, which permits the weaving of many colored fabrics on a loom whose length of shuttle motion is unlimited. An important feature of the invention consists in imparting to the belt such motion and in so connecting it that it can, after having moved a shuttle in one direction, be continued in the same direction to bring another shuttle from the end whence the former was conveyed; although, if required, the belt may also be moved in the opposite direction either to return the first shuttle or to move another on the return stroke. By this motion of the belt in either direction, in connection with a suitable box shifting mechanism, the weaver is enabled to take at any one stage of the operation any one shuttle from either end of the loom for use. Thus, whatever the number of shuttles employed in a fabric and the number of different colored spools they carry, the operator has power to use them in suitable succession. There are several other improvements in this machine. Thus there is a cam mechanism for automatically regulating the belt motion on a predetermined design. With similar purpose the above mentioned vibrating frames are moved to bring the several shuttles into action in the required succession.

COTTON SEED PLANTER.—William Gessner, of Cape Girardeau, Mo.—This invention relates to a new drop arrangement and to a new combination of the furrow opening and closing devices that pertain to a cotton planter, and its object is to simplify the operations of separating and dropping the seeds and embedding the same in the soil. It consists principally in providing the double conical drop drum with circular rows of projecting teeth, and in combining it with a box shaped upper attachment of the drop tube, whose back plate extends up to the drum and is notched to admit the teeth. No seed can thus enter the tube except what is just in front of the teeth. The necessary separation of the adhesive cotton seeds is thus effected and waste of seed prevented. The invention also consists in two mold boards forming the ridge of a scraper for opening the furrow, and in a roller for closing it.

CLOTH CUTTING MACHINE.—Solomon M. Eiseman, of New York city.—This invention furnishes an improved machine for cutting cloth, paper, woven or felted fabrics, metals, and substances of all kinds formed in sheets, into any desired form. The cutting knives are operated by means of a gravitating cutter head so arranged and constructed that, by the fall of the cutter head and knives, several thicknesses or sheets of the material are simultaneously cut. The knives are made of spring steel or other elastic material, so that they take any desired curve. In using the machine the pattern of the piece to be cut is drawn upon the face of the plate. Knives of the proper length are then adjusted to the pattern by means of studs and belts, as many studs being used as may be required to bring the knives to and hold them in the proper shape.

HEATING ATTACHMENT FOR COOKING STOVE.—John Beeler, of Brownsville, Mo., assignor to himself and Morris Monheim.—This invention has for its object to supply a heater attachment to cooking stoves, whereby the surplus heat of the latter is utilized for baking, for keeping irons hot, and for other similar purposes. The heater, which is placed on the top of the stove, is made hollow at its sides and top, thereby forming an outer heating compartment and an inner receiving space. The hot gases from the stove are admitted through sides to the heating compartment and are allowed to escape through a pipe into the stove pipe. When not wanted, it can be removed.

HARVESTER.—Nathan T. Veatch, Camden, Ill.—This improved reaper consists in the construction and combination of various parts of a reaping machine which can be arranged for use either in reaping or mowing, the change from one form to another being easily made. When the machine is adjusted for use as a reaper, the outer end of a finger bar is supported by a grain wheel, upon the upper end of the standard of which is formed a circular toothed or notched face, which fits upon a similar faced arm pivoted to the outer end of the said finger bar. When the machine is to be adjusted for use as a mower, the platforms, reel, grain dividers, and grain wheel are taken off.

STARCHING MACHINE.—Uriah W. Carrell, of Belleville, N. J.—This invention furnishes an improved machine for starching clothes, which is designed especially for laundry use, for starching the bosoms and cuffs of shirts; it consists principally in arranging two perforated rubbers worked by a crank, between which the bosoms and cuffs are inserted after being dipped in the starch, and by which the starch is rubbed thoroughly into and through the clothes, and the surplus squeezed out.

SEWING MACHINE.—Volney Parks, of Fort Wayne, Ind.—This invention relates to an improvement in the class of sewing machines in which a hollow circular rotating hook is employed to receive a case adapted to contain an ordinary thread spool, the arrangement being such as to allow the hook to form a loop from the upper thread and carry it completely around the spool case or bobbin. In this invention, the rotating hook is provided with a rounded peripheral projection or cam surface to adapt it to act upon a bar which is connected with the spool case, arranged within the rotating hook, so as to cause the retraction of the case and permit the passage of the upper thread around it.

VACUUM CLOTHES WASHER.—McKewn Johnstone, of Spartanburg, S. C.—This invention consists of a wash tub with a chamber situated between an upper and lower bottom; a pump, and valves in the bottoms; all so arranged that a vacuum may be formed under the clothes, which are supported on a wire screen above the top of the vacuum chamber, and soap water in the tub forced through the clothes into the vacuum chamber by atmospheric pressure when a valve at the top of the chamber is suddenly opened; and so that after washing sufficiently the air may be forced through in like manner to dry them. From the vacuum chamber the water may be pumped back into the tub and the operation repeated as long as the state of the water will allow, after which, by the same pump, the foul water is discharged from the machine.

RAILWAY CAR BRAKE.—James S. Lamar, of Augusta, Ga.—In this improved car brake apparatus there are a friction wheel and drum on each car, with the brake chain connected to the drum and with toggle-jointed bars and a lever for throwing the friction wheel into gear with the axle for winding up the drum and putting on the brake; the brakes of all the cars are connected by a long cord or chain with a drum on the locomotive or tender, which is also actuated by the axle through the medium of a friction wheel, and this friction wheel is, in like manner, thrown into gear by a lever and toggle-jointed bars; this lever is operated by the brakeman by a cord, rod, or other contrivance provided for the purpose, and arranged to be actuated in the cabin. The long cord connecting all the brake levers is arranged in a peculiar manner, and works with equal efficiency whether the car couplings are slack and the cars are close together, or whether they are taut and the train is extended to its greatest length.

ROTARY STEAM ENGINE.—Robert T. P. Allen, Farmdale, Ky.—The object of this invention is to obviate many of the objections to rotary engines heretofore made; it consists in a stationary surrounding casing, in which the steam drum revolves, and in which it is made steam tight by packing. Within the drum is a stationary steam pipe from the boiler; and a variable cut-off surrounds the steam pipe, around which the steam drum revolves. The cut-off tube is connected with the governor of the engine by means of an arm, by which it is partially rotated on the steam pipe. Steam ports in the pipe and in the cut-off tube open to steam ways or channels in the steam drum. The steam drum is a round cylinder with two cams which form two offsets or pistons on its periphery. The channels discharge the steam through these offsets against sliding abutments in the casing. As the drum revolves, the abutments are forced through the casing by the cams so as to allow the drum to continue its revolution. Springs are attached to the casing at one end and to the abutments at the other, so as to force the abutments back into the steam space and in contact with the drum, as soon as the offsets have passed by.

FRUIT PICKER.—David W. Thompson, St. Joseph, Mo.—The invention relates to that class of fruit pickers provided with a long handle, a vessel at the upper end to receive the fruit, and some means to detach the said fruit from the branches. The invention consists in the mode of detaching the fruit by one or more traps on the upper edge of the vessel, and in the mode of attaching the handle so that any desired lean or inclination may be given to the fruit-receiving vessel.

INVALID BEDSTEAD.—Henry A. Scott, Winchester, N. H., assignor to himself and Howard B. Hunt, Athol, Mass.—This invention relates to certain improvements on the invalid bedstead for which letters patent were granted the present inventor April 9, 1872. Its object is to obtain the transmission of greater power from the operating crank to the vertically adjustable frame, as the direct turning of the original geared cams is frequently too difficult for persons of little strength. The present invention consists in the combination, with the geared segments that hold the elevating arms, of a longitudinal shaft carrying pinions that match into them, and of a transverse operating shaft, which is, by worm and worm wheel, connected with the longitudinal shaft to turn the same. By this transmitting mechanism, the labor of elevating or lowering the invalid can be easily performed.

LOCK NUT.—Levi Arnold, Belchertown, and James B. Atwood, Palmer, Mass.—This invention consists of a nut divided in halves or more pieces in the lengthwise direction of the bolt, each part having a portion of its exterior surface constructed in a concentric line and a portion constructed in an eccentric line; with this divided nut is combined a washer with concentric and eccentric parts in the wall of the hole through it corresponding to the concentric and eccentric parts of the sectional nut; so that, after the nut is screwed home, the washer, when turned so as to force its eccentric parts up the eccentric parts of the nut, binds the threads of the nut in the threads of the screw so as to hold it on the bolt by friction. The eccentric parts of the washer are turned entirely up on to the concentric parts of the nut, and are held thereon against sliding back, as they would do if allowed to rest on the eccentric parts of the nut. The washer is prevented from coming off the nut by a collar on the latter.

HEAD BLOCK FOR CARRIAGE.—Frederick Van Patten, Auburn, N. Y., assignor to himself, M. S. Fitch, and H. D. Clapp, of same place.—The object of this invention is to furnish to carriage makers what is known as the T-plate or head block in a more perfect form and at a cheaper rate than it has heretofore been obtained; it consists in a head block stamped or pressed out by machinery to a perfect form, with the bolt holes formed with bosses or raised portions around them so as to secure extra strength. The ends are left unfinished so that they may afterwards be drawn out to proper length and size.

SLIDE VALVE.—Frederick Glasson, New York city, and William Gilfillan, Paterson, N. J.—This invention refers to that class of slide valves used in steam force pumps or other steam engines, which, being actuated by tappets or stops on moving parts thereof, are required to perform their function with as little lost motion of the tappets as possible, in order to reverse the engine and pass the dead point thereof; it consists in the construction of the valve seat and its fixed abutment, and in the combination with the latter of a valve of peculiar construction, which is reciprocated by the force of the steam acting between it and the said abutment.

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Valve, oscillating steam, H. P. Jones 130,506
Valve, railroad tank, C. W. Chappell 130,411
Vehicles, axle for, M. R. Brown ..... 13[illegible],359
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Vessels, means for propelling, W. Shepard 130,391
Vessels, means for propelling, G. Titcomb 130,455
Vessels, grain ceiling for, C. Lazarevitch 130,434
Wagon body, J. D. Pettit 130,531
Wagon brake, Pavey and Martin 130,429
Wagon brake, self-acting, O. Fisk 130,364
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Washing machine, bottle, Werk and Verdin 130,552
Water cut off, rain, L. Baltz ..... 130,3[illegible]
Water cut off, rain, Abercrombie and Miner 130,400
Water wheel, turbine, G. C. and J. F. Stevens 130,448

DESIGNS PATENTED.

6,020.—TOP OF BURIAL CASKET.—S. Avery, Phœnix, N. Y.
6,021.—PERFUME BOTTLE.—P. Doflein, Philadelphia, Pa.
6,022 and 6,023.—OIL CLOTHS.—H. Kagy, Philadelphia, Pa.
6,024.—VASE.—B. Levene, New York city.
,025.—STAMP.—C. C. Morgan, Brooklyn, N. Y.

TRADE MARKS REGISTERED.

944.—RAZOR STROP.—B. F. Badger, Charlestown, Mass.
945.—WINE TONIC.—C. W. Benson, Baltimore, Md.
946.—BRIDLE BITS, ETC.—K. Brodhurst, Bloxwich, England.
947 and 948.—WHISKIES.—Cahn, Belt & Co., Philadelphia, Pa.
949.—SPOOL THREAD.—Clark Thread Company, Newark, N. J.
950.—LINIMENT.—G. O. Clark, College Point, N. Y.
951.—LACE LEATHER.—W. Cowpe & Co., South Attleborough, Mass.
952.—CIGARS.—G. Falk & Brother, New York city.
953.—CORSETS.—Globe Collar Company, New York city.
954.—WHISKY.—Rowland, Raphael & Co., Philadelphia, Pa.
955.—CURED MEATS.—G. Schrander, Cincinnati, O.

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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:

22,089.—COOKING RANGE.—G. Chilson. Dec. 18, 1872.
22,104.—REFRIGERATOR.—A. H. Bartlett. Nov. 6, 1872.
22,166.—HOSE COUPLING.—J. C. Cooke. Nov. 13, 1872.
22,129.—MOLD FOR MAKING BOTTLES.—J. L. Mason. Nov. 6, 1872.
22,186.—SCREW NECK BOTTLE.—J. L. Mason. Nov. 13, 1872.

EXTENSIONS GRANTED.

20,345.—CUTTER HEAD AND REST FOR IRREGULAR FORMS.—J. P. Grosvenor.

DISCLAIMER.

20,345.—CUTTER HEAD AND REST FOR IRREGULAR FORMS.—J. P. Grosvenor. Filed August 19, 1872.

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[Compiled from the Commissioners of Patents' Journal.]
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BED BOTTOM.—J. D. Frary, New Britain, Conn.
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FIRE ARM, ETC.—A. Burgess, Owego, N. Y.
GAS LIGHTING.—E. Myers, New York city.
INK ERASER.—J. C. De Voy, San Francisco, Cal.
LAMP BURNER.—T. Silver (of New York city), London, England.
MAKING STEEL, ETC.—J. Henderson (of New York city), Glasgow, Scotland.
NUTRITIOUS COMPOUND.—J. R. Weed, New York city.
PEGGING MACHINE.—W. R. Landfear, Jersey City, N. J.
PHOSPHATE OF LIME.—C. Morfit (of Baltimore, Md.), London, England.
REED ORGAN.—G. Woods, Cambridgeport, Mass.
REFRIGERATOR.—S. B. Martin, J. M. Beath, San Francisco, Cal.
ROTARY ENGINE, ETC.—E. S. Bennett, Brooklyn, N. Y.
SEWING MACHINE.—S. W. Wardwell, Jr., St. Louis, Mo.
SEWING MACHINE.—T. J. Harper, Atlanta, Ga.
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STONE DRESSING MACHINE.—C. Parker, Meriden, Conn.
SUBSTITUTE FOR GUANO.—C. Morfit (of Baltimore, Md.), London, England.
TELEGRAPH INSTRUMENT.—E. A. Calahan (of Brooklyn, N. Y.), London, Eng.
TREATMENT OF PHOSPHATES.—C. Morfit (of Baltimore, Md.), London, Eng.
TURNING SCREWS, ETC.—F. A. Pratt, Hartford, Conn.
WARPING MACHINE.—P. Wilson, Maynard, Mass., J. Hunter, Manchester, N. H., G. Heyes, T. Entwistle, Accrington, England.

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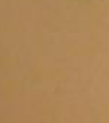
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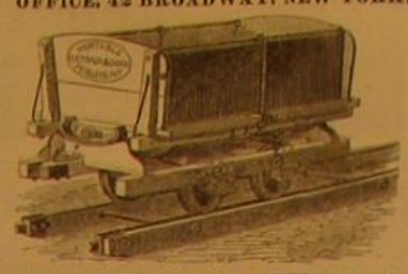
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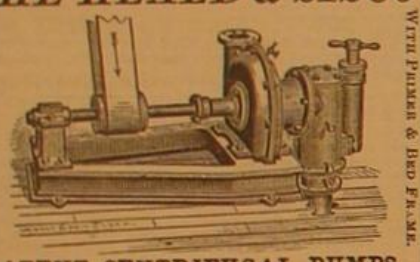
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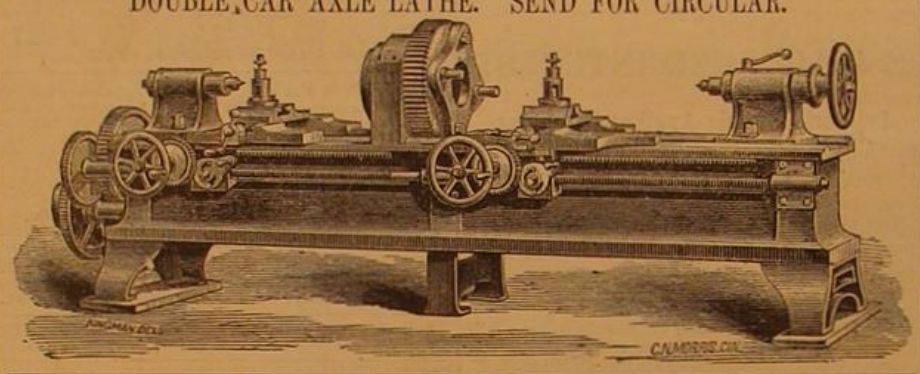
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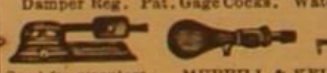
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Molecular Motion the Fundamental Problem of Nature.

It is thought by the advocates of the physical school that, although at present we are unable to explain how organic nature can be built up by the play of the ordinary chemical forces, yet at some future day when we shall have come to know far more of molecular physics than we do at present, then we may be able to explain the mystery. This is the cherished hope of modern evolutionists, and of the advocates of the physical theory of life. But it is, says Mr. Croll, in a late number of the *Philosophical Magazine*, a mental delusion, a dream which will never be realized.

It is from the effects produced that we know that that mode of molecular motion called heat differs from that mode called electricity. The effects do not as yet enable us to determine wherein this difference consists; but it enables us to conclude with certainty that there is a difference.

Effects which are electrical we refer to that unknown mode of motion called electricity. We do not refer them to that mode called heat, because the effects are different from those which we ascribe to heat. Each mode of motion, each energy, is distinguished by the effects which it produces. Determination of the molecules of matter according to the objective idea of a plant or an animal is an effect which is constantly taking place in organic nature. To attribute this effect to electricity, for example, would be far more absurd than to attribute electrical effects to gravitation or to heat; for the difference between this effect and any electrical effect is immeasurably greater than between electrical effect and any effects produced by heat, or by gravitation, or by any other of the forces of inorganic nature. It would be far more rational to attribute all the phenomena of the inorganic world, say, to heat, than to attribute the determination of molecular motion in the organic world to chemical and physical energies.

Nothing which can be determined by the comparative anatomist, no biological researches, no microscopic investigations, no considerations regarding natural selection or the survival of the fittest, can solve the great problem of nature; for it lies in the background of all such investigations. The problem is molecular. From the hugest plant and animal on the globe down to the smallest organic speck visible under the microscope, all have been built up, molecule by molecule, and the problem is to explain this molecular process. If one plant or animal differs from another, or the parent from the child, it is because in the building-u pprocess the determinations of molecular motion were different in the two cases; and the true and fundamental ground of the difference must be sought for in the cause of the determination of molecular motion. Here in this region, the doctrine of natural selection and the struggle for existence can afford no more light on the matter than the fortuitous concourse of atoms and the atomical philosophy of the ancients.

Locating the Great Refracting Telescope.

The United States Coast Survey Bureau is about to locate an elevated astronomical station, somewhere among the Sierra Nevada mountains. The San Francisco *Bulletin* says that Professor Davidson, of the Coast Survey, is experimenting near Summit Station, at an elevation of 7,200 feet above the sea, to determine the relative importance of great and small altitudes in the use of the telescope for investigations of physical astronomy. It is understood that he has been completely successful, and will recommend a location about 10,000 feet above the sea, near the line of the Central Pacific Railroad, from which it can be readily reached by a short and easily constructed wagon road. Professor Young, of Dartmouth College, has been experimenting with larger instruments at Sherman, on the Rocky Mountains, at an elevation of 8,242 feet above the sea.

The results of these observers will be presented in reports that will probably lead to the locating of the twenty-seven inch refracting telescope at one of these elevations. The lenses for this telescope are being ground by the Messrs. Clark, of Cambridgeport, Mass., for the United States Government, at an expense of nearly $50,000. With such a telescope, and the high magnifying power of which it will admit the use, there is not over one or two nights per year on the low Atlantic coast where it could be used with its highest magnifying powers. On the Sierra, with the long freedom from clouds, many more favorable opportunities must exist for observations, and we may look forward for marvelous revelations in physical astronomy.

Progress of Atlantic Steam Navigation.

The *California* is the name of a new steamship, lately arrived at New York, belonging to the Anchor line, plying between New York and Glasgow, Scotland. The *California* was built and finished at Glasgow, Scotland, during the present year, by Alexander Stephens & Sons, and is an iron screw steamer of 3,287·08 gross tuns, is 361·5 feet in length, 40·5 feet in beam, and 24·5 feet depth from tunnage deck to ceiling, and 31·5 feet from upper deck to ceiling. Her beam being so great makes her a very safe and easy vessel at sea. She has two compound vertical direct-acting engines, with one cylinder 103 inches in diameter and one 57 inches in diameter, with 4 feet stroke of piston, working up to 1,047 H. P., and built at the Finnieston Steamship Works. Her steam power is generated in six boilers, tested to a pressure of 70 lbs., and a donkey boiler for supplying steam to the windlass, winch, and other labor-saving engines.

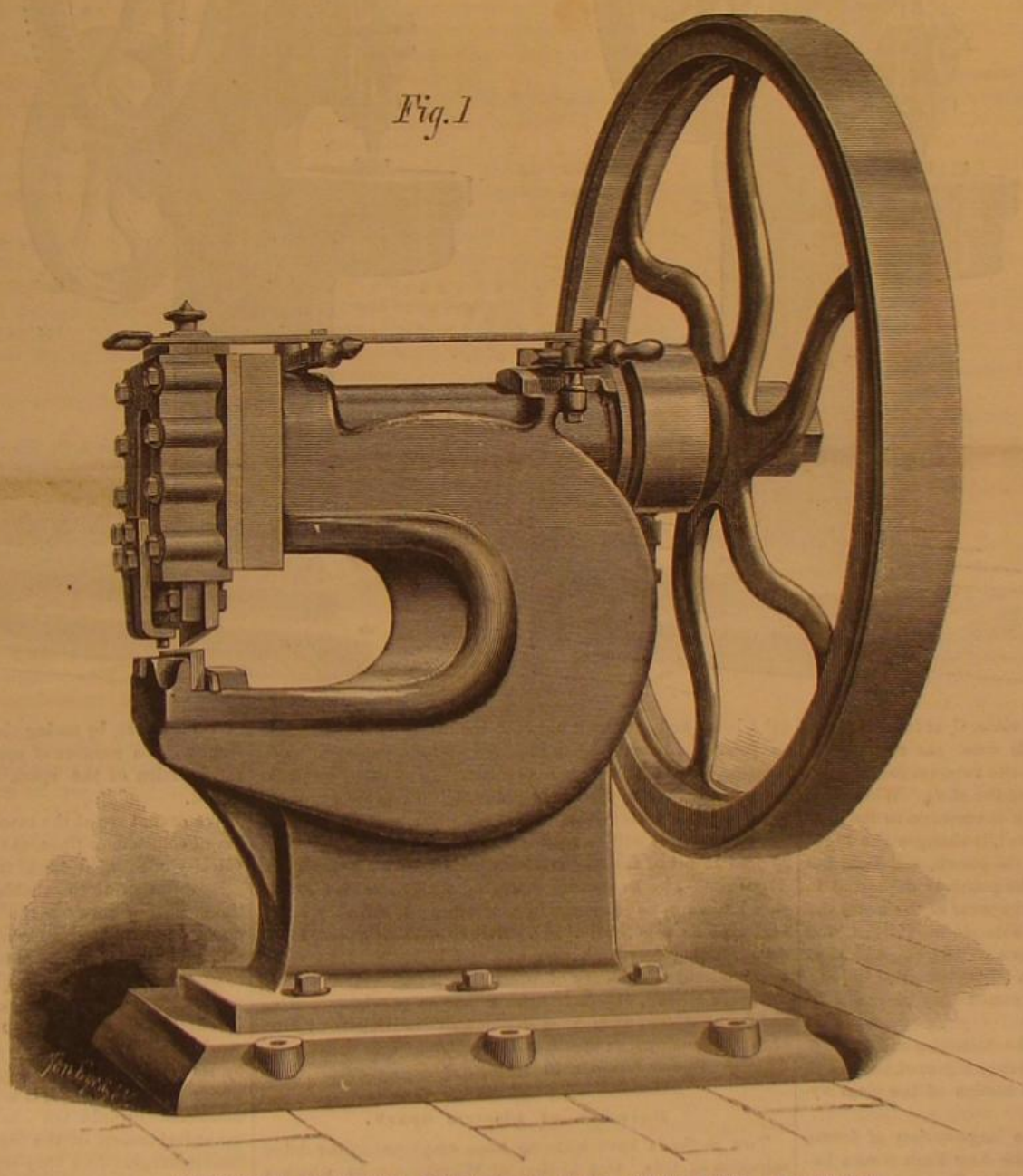
The second of the new fleet, the *Victoria*, a sister ship to the *California*, has just been launched, and the *Bolivia* and *Ethiopia*, of 4,500 tuns each, are well forward. Three other steamers are in frames, viz., the Eutopia, Castilia, and Italia, making in all seven steamers, of over 23,000 tons in the aggregate, and valued at $500,000 each, all to be built within one year.

PATENT PUNCHING AND SHEARING MACHINE.

Perhaps in no branch of metal working has there been greater progress than is shown in the manufacture of all descriptions of punched and stamped ware. There are, in fact, but few of the myriad of metal articles found upon the shelves of our hardware and house-furnishing stores which are not, in some stage of their manufacture, subjected to the action of a machine of this class. That high degree of skill which was necessary to produce each article is now made available through these machines, in producing a thousand articles precisely alike, and at a price very low in comparison with former times, when such work was done by hand.

Our illustrations represent three forms of machines made under patents granted to Moses G. Wilder, bearing date June 27, 1871, and May 28, 1867 (reissued June 27, 1871)

Fig. 1



WILDER'S PATENT PUNCHING AND SHEARING MACHINE.

Fig. 1 is known as Wilder's patent combined punching and shearing machine. This apparatus is made to punch holes three fourths of an inch in diameter, in iron one half inch thick, to the center of a forty inch sheet, and will shear half inch iron to the center of a thirty-six inch sheet. It is constructed in two forms, one with a plain fly wheel of large size, as shown in the engraving, for use where a somewhat rapid motion is possible. The other, with a geared driving train, permits a slower motion of the punch and increases the power of the machine, so that, when geared, it will punch three fourths inch holes in three fourths inch iron, and will shear three fourths inch plates or bars. The engraving shows both the punch and shear blades in position, though this is never the case when the machine is in use. The punch and upper shear blade are so arranged that either may be removed instantly or replaced with perfect certainty. The die and lower shear blade remain fixed at all times, except when it is necessary to change the size of the holes to be punched or to sharpen the shears.

Among the advantages claimed for this machine are that its form is such that it may be set back against a wall or partition, instead of in the center of the shop floor, as is now the case with the ordinary combined punch and shears. Owing to the peculiar manner of combining the punch and shears in one pair of jaws, instead of making the machine double, it can be sold at a low price, while it has every capacity for work. The machine may be run continuously or arrested after each movement, or may be arranged to stop at any point in the revolution. The distribution of metal is such that the machine is rigid and stiff, and does not spring perceptibly in doing its heaviest work.

In Fig. 2 is shown another form of these machines, such as is used for punching sheet metal into the great variety of shapes required by brass and hardware manufacturers, silversmiths, tinners, etc., in cases where rapidity of movement is of more importance than great power. The die is held in any suitable manner upon the bolster plate, A. This, in its

turn, is fastened by bolts to the die bed, B. The punch is held in the lower part of the slide or gate, C, in such manner as that, when the slide descends, it will enter the die, cutting out a piece from any material previously interposed between it and the die, and of the precise form of the latter. Motion is given to the slide, C, by an eccentric or crank wrist on the front end of the shaft, D, through a pitman or connection, E, which is pivoted at its lower end to the slide, C, and which, at its upper end, surrounds the crank, D. The shaft, D, receives motion from the flywheel, F, which runs loosely upon it and is connected to it by the sliding bolt of the stop motion, G, when the treadle, H, is depressed by the foot of the operator. This sliding bolt is so formed that, when the press is at rest, the pressure of the operator's foot forces it into engagement with the wheel positively. As the press starts, this bolt, which is fitted to slide back and forward in an arm or reinforce, I (which is keyed rigidly to the shaft, D, and revolves with the shaft), also revolves with the wheel and shaft. The stop bolt is moved back and forward by means of a sliding cam plate, which is fitted to the frame of the machine at G. This cam plate has a channel way with inclined faces through which the stop bolt passes in each revolution. These inclined faces act upon the bolt to move it in or out, and are governed by the treadle worked by the operator. The cam plate is connected to the treadle by means of an eccentric gear working upon a fixed stud placed in the side of the frame, a toothed sector which acts upon the gear, and a small rod to connect this sector to the treadle, H. Inside of the frame is a counter weight which acts upon the treadle rod, at J, to lift the treadle, H, when the operator's foot is removed. When the treadle is depressed, the press starts and will continue running while the treadle remains down. When the foot is removed, the weight at J operates to move the cam plate back from the arm, I. The stop bolt, as it enters the channel way in the cam plate, is withdrawn, releasing the wheel, F, and the press stops, remaining at rest until the treadle is again depressed. The parts of this stop motion are strong and simple in form and work wholly without springs.

Fig. 2.

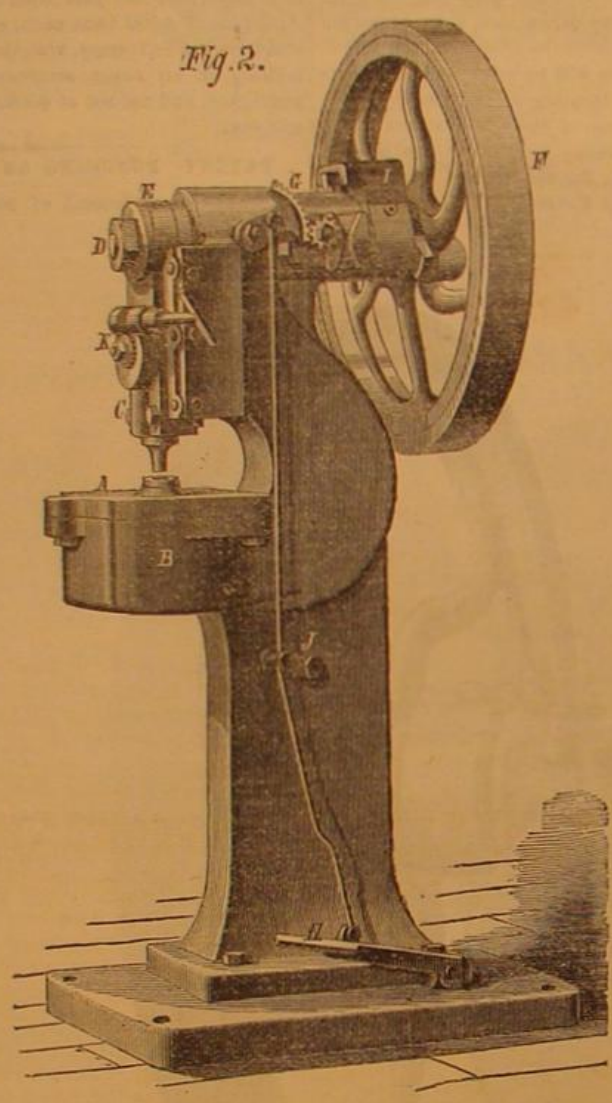
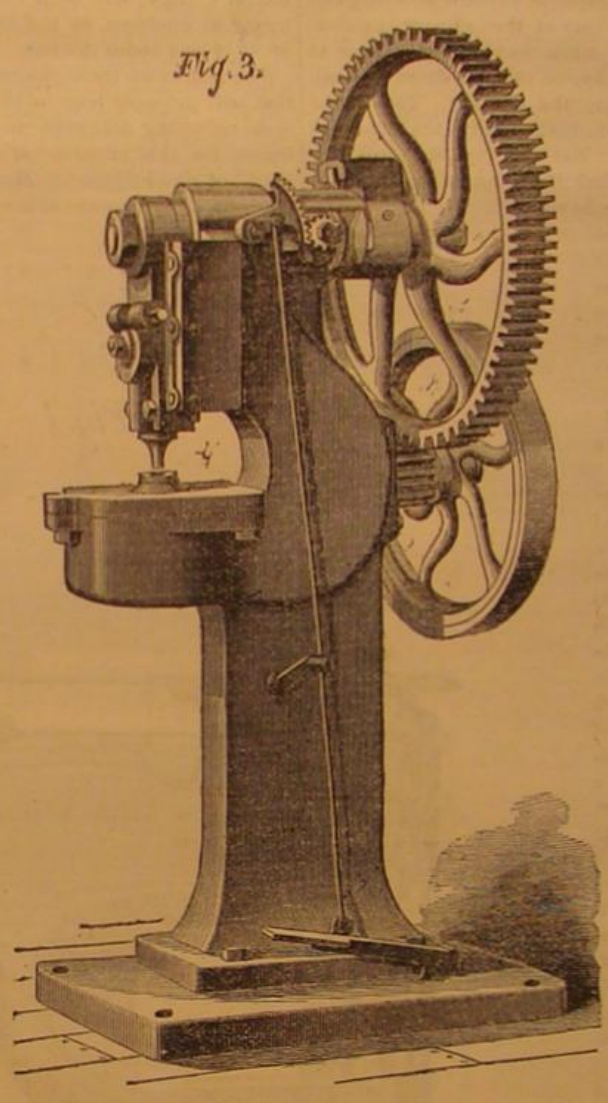


Fig. 3.



The pitman, E, is pivoted to the slide, C, at its lower end by an eccentric wrist pin, K. This wrist pin revolves in bearings in the slide, C, and forms the fulcrum for the pitman through which the latter moves the slide. Where surrounded by the pitman the wrist pin is eccentric to its journals. When the wrist pin is revolved, it changes the hight of the pivot or fulcrum relative to the punch, and thus not only varies the distance to which the punch is depressed in working, but also compensates for the wear of the latter and of the die. The front end of this wristpin is enlarged, and is made with a toothed periphery as a worm gear, and is so arranged that, by turning the worm which is carried in journals formed upon the slide, C, the punch may be raised or lowered to any desired extent.

Fig. 3 shows a geared press of the same size and description as that shown in Fig. 2, but having a geared train such as would be used where the rapid motion of the plain flywheel would be objectionable.

These presses are now made in a large variety of forms, adapted to all kinds of work, by the New York Steam Engine Company, 121 Chambers street, New York, to whom application should be made for further information.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the months of June and July, 1872:

During these months, 1,680 visits of inspection were made, and 3,449 boilers examined—3,371 externally, and 1,336 internally—while 357 were tested by hydraulic pressure. The defects in all discovered were 1,804, of which 347 were regarded as dangerous. These defects were as follows:

Furnaces out of shape, 78—18 dangerous; fractures, 180—99 dangerous. These defects have been generally around the heads and fire sheets. Some instances have been discovered where mud drums have been badly burned. This comes about frequently from malconstruction. The sheet to which the water leg connecting with the boiler is attached should over lap the sheets on either side, so that any steam generated in the mud drum may find easy escape into the boiler. If, on the contrary, the sheets on either side of the water leg over lap, the point of escape to the boiler is depressed by the thickness of one sheet, and steam generated in the drum will accumulate at the higher points on either side and remain, having no means of escape. By thus keeping the water from contact with the iron, the plate may become badly burned and consequently fractured. Mud drums are so situated that they are frequently subjected to intense heat, especially on the top. Burned plates, 127—54 dangerous; blistered plates, 253—27 dangerous; sediment and deposit, 293—20 dangerous; incrustation and scale, 328—13 dangerous; external corrosion, 129—28 dangerous; internal corrosion, 54—22 dangerous; internal grooving, 43—8 dangerous; water gages defective, 68—12 dangerous; blow-out defective, 20—15 dangerous; safety valves overloaded and out of order, 46—14 dangerous. It takes a long time for some engineers to understand that when a safety valve leaks steam, it is kept from its seat by some foreign substance, or that it needs grinding. If an engineer does not understand how to properly manage his safety valves, he should seek information at once. During the past month, a case was found where the engineer had cut a brace and driven it between the safety valve lever and the joist over head. When inquired of for a reason for such practice, he said "it was to save steam!" Let every engineer say, "Such shall never be my practice." Pressure gages defective, 195—28 worthless. These defective ones varied from —7 to +35. It will be readily seen that a steam gage 20 or 30 pounds out of the way is a very unsafe boiler attachment. Gages should be frequently compared with some standard or gage known to be correct. These attachments are very much neglected as a general thing. Boilers without gages, 19—5 were running very high pressure, and hence were regarded as dangerous; deficiency of water, 12—6 dangerous; braces and stays broken, 41—23 left the boilers so poorly supported and secured that they were in a dangerous condition; mud drums condemned, 4; steam drum condemned, 1; boilers condemned as beyond repair, 12.

Duration of Electric Spark.

Two methods have hitherto been employed in the determination of this. One is that of Wheatstone, in which a small mirror is made to rotate at a high velocity round an axis in its own plane, and the image of the spark is observed in it. In this way the discharges from batteries have been made to give images elongated in the direction of rotation; showing a sensible duration in the spark. By measuring the elongation and the velocity of rotation, the duration may be ascertained.

The other method is that of Arago, in which a disk with white sectors on a dark ground is made to rotate about an axis perpendicular to its plane, and the enlargement of the sectors in the light of the spark affords a means of determining the duration of the latter.

MM. Lucas and Cazin recently described to the Paris Academy a method which gives somewhat more precise results, and on which a committee of the Academy have reported favorably.

They employ a movable disk (made of plates of mica), the rim of which is situated between the observer's eye and the spark. On the rim are traced very fine lines, transparent and equidistant, and which are obtained by photographic reproduction. This disk is placed before a second opaque disk of the same diameter, which is fixed, and has on its rim seven fine lines, comprising six divisions, with a width which is equal to five divisions of the movable disk, so that this second disk forms a vernier, by which the one sixth of a division of the first disk may be estimated.

The spark appears in the focus of the lens of a collimator, which gives the rays (passing to the vernier) a direction parallel to the axis of rotation of the movable disk. On the opposite side of the disks, a small telescope is placed for observation of the luminous effects.

If the spark has an inappreciable duration, the observer may either see a bright line or he may not. In the former case, the spark appears at the moment of coincidence of a line on the movable disk with one on the fixed disk; in the latter case, the spark appears between two coincidences. There is, however, a certain probability of coincidence of lines and spark, depending on the breadth of the lines on the disks, and also the number of those on the vernier. This has been determined experimentally for the apparatus now considered, and found equal to 0·70; that is, if an instantaneous spark be produced at any instant, then, out of 100 instances, it will give a bright line 70 times, while 30 times it will give none.

Suppose, now, the duration of a spark is a little greater than that of the passage of a line on the movable disk before two lines on the vernier: then, if the commencement of the spark happens at the instant of the first coincidence, the bright line from this coincidence will (owing to persistence of impression on the retina) continue visible at the time at the second coincidence, and two lines will thus be seen of once.

If, with the same duration, the spark commences between two coincidences, it will have ceased when the third arrives. And thus there will only be one bright line, that from the second coincidence. In this way (as the committee point out) there may be either one or two bright lines for the same duration of spark. But if the duration of the spark be greater than that nowspoken of, it will be comprised between two numbers that are easily determined, the difference of which is equal to the time elapsing between two successive coincidences. A very close approximation may be arrived at, and the inventors of the method show that, in virtue of the above mentioned probability of coincidence, by noting the total number of lines observed from a given number of sparks, and the velocity of rotation, the duration of the spark may be pretty accurately determined.

We cannot see at the same time more than a limited number of coincidence lines, so that if they exceed five or six, the velocity of rotation ought to be diminished.

By duration of the visible spark is to be understood the time elapsing between the instant at which the spark commences and the instant when, owing to a diminution in luminous intensity, it ceases to illuminate sufficiently the lines of the apparatus, so as to give a sensible image to the observer. The entire duration may be much greater.

The committee further remark that the duration of the spark being determined by the number of coincidences seen by the observer, if the degree of illumination of the lines were much diminished, it is to be feared that the number of coincidences would not diminish equally, in consequence of the enfeeblement of the light corresponding to the end of the discharge. And they think it would be of use to ascertain the effect of variations in luminous intensity, as in discharge between electrodes of various metals, placed at different distances, in gases at different pressures.

The proposers of the method have not been able to make appreciable the duration of a spark from an ordinary machine; but they found the duration of the discharges of condensers varies with the surface of these, with their arrangement, and the resistance of the circuit. It varies, also, with the striking distance, the nature of the balls, and the humidity of the air. In general, the duration increases with the condensing surface, and with the distance between the balls, and diminishes with the length of the circuit.

The limits of duration, given by their observations, are four millionths of a second, and eighty six-millionths of a second, with a possible error of one millionth of a second.

WHEN two or more colors are mixed together, the hue produced does not result from the loss of the particles of either of the colors by absorption or chemical changes of any kind. The microscope reveals the fact that minute particles of each color remain entirely separate.

A NEW green pigment, said to be brilliant, is composed of twenty parts of oxide of zinc and one of sulphate of cobalt, mixed into a paste with water, and exposed to a red heat.

A LIST OF VELOCITIES.

Dr. E. Hartig, one of the professors of the Royal Polytechnic School at Dresden, has recently published a catalogue of the various velocities at which machinery, etc., should be run, as well as of the speeds at which many natural phenomena take place. The following is a translation of Dr. Hartig's list, made for this journal by Dr. Adolph Ott, who commences by giving the following explanation of the figures:

The velocities given in the following list are indicated in meters per second, and are arranged progressively by the figures. One meter being 39·37 inches, very nearly, it is only necessary to multiply the number with the values expressed, in order to convert them into the denominations in use in this country. For example: 0·11 meters (the usual average cutting velocity in turning wrought iron) is equal to 0·11×39·37=4·33 inches. The notation officially adopted in the German empire is for meter, m; for decimeter, dcm; for centimeter, cm; for millimeter, mm. The great completeness and the excellent selection of the list appended, which contains many numbers otherwise difficult to obtain, give it a lasting value.

0·010 Average velocity of the burning of Bickford's fuse.
0·015 Velocity in turning the outside of case-hardened cylinders.
0·015 Most preferable peripherical velocity of iron roll trains and rail bending machines.
0·018 Average velocity of the movable shear blade in parallel shears, and of the punch in a punching machine.
0·025 Working velocity of the opener (willow) and beater for cotton, measured at the licker-in.
0·030 Average peripherical velocity of the screw tap and dies in screw cutting engines.
0·040 Average working velocity of shearing machines.
0·040 Working velocity of the twisting frame for short wool.
0·050 Average cutting velocity in turning, boring, and planing steel.
0·060 Peripherical velocity of the rotary cylindrical rag boiling apparatus, used in paper manufacture.
0·064 Average working velocity of the doubling machine for silk.
0·070 Greatest velocity of water at which deposits of mud and fine sand (to the size of one half mm. for quartz) in rivers are not carried off (Telford, Rittinger).
0·075 Working velocity of paper machines in making strong pasteboard, according to Püschel.
0·080 Average working velocity of the gig mill (cloth manufacture).
0·080 Medium cutting velocity in turning, boring, and planing cast iron.
0·10 Best working velocity of sheet iron rolling machines.
0·10 Medium working velocity of cloth drying machines with endless stretching chains (Semper).
0·10 Velocity of an ascending water current, whereby angular quartz grains of 1 mm. in size are retained in falling suspension (Rittinger).
0·11 Average cutting velocity in turning, boring, and planing wrought iron.
0·13 Average working velocity of cloth brushing machines.
0·14 Working velocity of shear machines for short wool.
0·14 Velocity of an ascending water current, in which angular quartz grains of 2 mm. size are retained in suspension (Rittinger).
0·15 Greatest velocity of water whereby deposits of rich clay in rivers are not carried away (Telford).
0·15 Medium cutting velocity in turning, boring, and planing hard brass.
0·19 Velocity of an ascending water current, in which angular quartz grains of 4 mm. size are retained in falling suspension (Rittinger).
0·20 Working velocity in drawing the strongest iron wire.
0·21 Peripherical velocity of paper rollers in the smoothing machines of paper mills (Püschel).
0·24 Proper working velocity of the pitch chain of a river dredging engine.
0·25 Peripherical velocity of wood when turning it off with hand tools.
0·33 Best working velocity of steam drying machines for cotton fabrics.
0·35 Best peripherical velocity of the cutter in cutting cast iron and wrought iron cog wheels.
0·35 Working velocity of the paper machine in making thin writing paper (Püschel).
0·40 Medium velocity of the water in the upper and lower channels of hydraulic motors.
0·44 Best cutting velocity of the chisel in mortising machines.
0·47 Best peripherical velocity of rollers for breaking ores (Wertheim).
0·60 Proper velocity of the oxen in the whimsey.
0·63 Greatest velocity of the water in rivers whereby deposited sand of 10 mm. size is not set in motion. (Telford, Rittinger).
0·67 Greatest admissible velocity of the shuttle with a silk weft.
0·67 Most advantageous velocity of the elevators for grain.
0·70 Medium peripherical velocity of bruising mills for oil seeds.
0·75 Most advantageous velocity of the hackle bars in flax heckling machines.
0·75 Average working velocity in calendering fabrics.
0·75 Most advantageous velocity of cranks turned by manual power.
0·80 Most advantageous peripherical velocity of revolving cutters and rotary shears.
0·80 Most advantageous velocity of an axe in a winding engine.
0·82 Greatest admissible peripherical velocity of the sieves in the concentration of ores (Rittinger).
0·90 Most advantageous velocity of the horse in the whimsey.
0·92 The maximum velocity of water whereby round pebbles of 20 mm. diameter in rivers and streams are not set in motion (Telford, Rittinger).
0·95 Average velocity in descending and ascending pit shaft.
1·00 Velocity of the air in a scarcely perceptible wind.
1·00 Most advantageous velocity of the water in the suction and pressure pipes of singly acting piston pumps.
1·00 Average working velocity of gassing machines.
1·10 Most advantageous working velocity of cloth washing machines and fulling mills.
1·30 Peripherical velocity of the pressing rollers in wool drying machines.
1·30 Working velocity in drawing fine iron wire.
1·32 Regulation velocity of a German foot soldier when on march (108 steps of 0·732 m. length per minute) and with full baggage (20 kilogrammes).
1·33 Greatest admissible velocity of the shuttle for linen yarn.
1·50 Average velocity of a pedestrian without baggage on a horizontal road.
1·50 Most advantageous peripherical velocity of rail rolls.
1·50 Most advantageous peripherical velocity of rolls for merchant iron bars.
1·53 Greatest velocity of the water in rivulets and rivers in which conglomerates and slate are not set in motion (Telford).
1·60 Most advantageous velocity of water in the suction and pressure pipes of double acting piston pumps.
1·67 Greatest admissible velocity of the shuttle for short wool (Streichgarn).
1·70 Medium working velocity of rollers for sheet iron.
1·80 Most advantageous velocity of chain steamboats in dead water.
2·00 Velocity of the air at a moderate wind.
2·20 Most advantageous average velocity of the shear blades of reaping machines (Perels).
2·30 Most advantageous velocity of fulling rollers for cloth.
2·44 Highest admissible velocity with which oats, bran, flour, etc., may be transported on an endless cloth, without being scattered by the air.
2·50 Average cutting velocity of veneer saws.
2·50 Most advantageous peripherical velocity in rolling refined iron.
2·50 Highest admissible velocity of the shuttle for combed wool yarn.
2·54 Highest admissible velocity in pits for the descent of miners.
2·75 Highest admissible velocity for the transportation of heavy and clean grain on an endless cloth.
3·00 Highest admissible peripherical velocity of the rollers in wire mills.
3·00 Peripherical velocity of the cutters of the culling willows in spinning carded wool.
3·33 Highest admissible velocity of the shuttle for cotton yarn.
3·36 Relative velocity between the cloth cylinder and shear cylinder in long shear machines for cloth.
3·50 Most advantageous velocity of street gas in pipes.
3·68 Highest admissible velocity of the drawing in pits for the ascent of miners.
4·00 Velocity of the air at a fresh breeze.
4·00 Highest admissible peripherical velocity of drills in wood.
4·00 Average velocity of river steamers in still water.
4·50 Most advantageous peripherical velocity of the drum in Taylor's cotton opener.
4·50 Average peripherical velocity of the cutting tool in cutting toothed wheel work.
4·75 Relative velocity between cloth cylinder and brushing cylinder in brushing machines for cloth.
5·00 Average velocity of marine steamers.
5·00 Average peripherical velocity of the whetstones used for grinding chisels.
5·00 Peripherical velocity of wood in turning it in a slide lathe.
5·10 Average peripherical velocity of the cylinder of carding machines for sheeps' wool.
5·60 Average peripherical velocity of the cylinder in breaking, and fleece cards in spinning, short wool.
6·50 Most advantageous velocity of the air for the working of windmills.
7·00 Average peripherical velocity of the cylinder in the manufacture of paper.
7·43 Most advantageous velocity of the rag knives in rag cutting machines.
8·00 Most advantageous peripherical velocity of the cylinder in the cotton carding engine.
8·50 Most advantageous peripherical velocity of the grindstones of Voelter, which are now being used for the conversion of wood into paper pulp.
9·00 Velocity of the air in a fresh wind.
10·0 Highest advisable peripherical velocity of millstones.
10·0 Most advantageous peripherical velocity of fine grained grindstones.
10·0 Most advantageous velocity of the blade in endless saws.
10·0 Medium peripherical velocity of the large grindstones in machine shops.
10·0 Most advantageous velocity of the air in the conduit pipes of blowing engines.
12·5 Highest admissible velocity of the freight trains on the German railways.
13·5 Most advantageous peripherical velocity of the cylinder of the breaking card and finishing card for hemp.
15·0 Medium peripherical velocity of the cylinder in the openers in wool spinning mills.
15·0 Most advantageous peripherical velocity of emery wheels for polishing and finishing off.
15·0 Velocity of the air in very high winds.
18·0 Most advantageous peripherical velocity of the cutter heads of wood shaping machines.
18·0 Medium flying velocity of the carrier pigeon.
20·0 Highest admissible velocity of passenger trains on the German railways.
25·0 Highest admissible velocity of express trains on the German railways.
25·0 Highest admissible peripherical velocity of large grindstones, consisting of the best material, in machine shops.
25·0 Most advantageous velocity of the driving rope of cranes, in the system of Ramsbottom.
27·0 Most advantageous peripherical velocity of the emery wheels in saw sharpening machines.
30·0 Velocity of the transmission of the irritation in the sensatory and motatory nerves (Preyer).
35·0 Highest admissible peripherical velocity of a cotton beater.
35·0 Medium flying velocity of the swallow (Sonnet).
37·0 Flying velocity of the eagle (Simmler).
40·0 Most advantageous velocity of circular saws for wood and hot iron.
50·0 Most advantageous peripherical velocity of centrifugal machines for woolen cloth and other fabrics.
60·0 Highest peripherical velocity of the tappets in the attrition mill of Carr, for pulverizing the hardest materials.
75·0 Most advantageous peripherical velocity of the cylinders of rag devils in the manufacture of shoddy.
332·77 Most probable value of the velocity of sound in open dry air at a temperature of 32° Fah., according to the computation of Schroeder van der Kolk (1865) from the experiment made in 1823 by Moll and Van Beck at Utrecht.
7,263·75 miles. Velocity of voltaic currents in telegraph wires, according to experiments made by Plantamour and Hirsch.
11,433·55 miles. Velocity of induction currents in telegraph wires, according to experiments made by Plantamour and Hirsch.
185,164 miles. Velocity of light, according to experiments of Foucault.
288,004·8 miles. Velocity of the discharging current of a Leyden jar in a copper wire of 1·70 millimeters thickness, according to Wheatstone.

Distillation by Cold.

Alfred H. Smee, the inventor of the voltaic battery named after him, has communicated to the Royal Society a method which he has devised, and which he names "distillation by cold," by which he believes the detection and determination of ammonia and other organic impurities existing in the atmosphere will be greatly facilitated.

A glass funnel—usually of 8 or 9 inches—is drawn to a point and closed. It is supported in an ordinary stand, and filled with ice. Condensation of the watery vapor of the atmosphere then takes place; the dew collects into drops, which trickle down the outside of the funnel, and at last fall from the point, under which a small receiver is placed to catch them. The total quantity of liquid collected in a given time is measured, and the quantity of ammonia determined by Nessler's test.

By the method of distillation by cold, the author found it possible to distil many substances which are decomposed at a high temperature. Thus many delicate odors of flowers were distilled by placing the flowers under a bell glass sufficiently large to cover the funnel containing the ice. The odors were found to be more rapidly and completely abstracted by placing a dish with a little ether under the bell-glass at the time of distillation.

The paper was accompanied by tables giving the results obtained in 107 experiments, together with the atmospheric conditions prevailing at the time. The experiments were made in a garden, in a bedroom, in hospital wards, in the open country, etc. A few of the numbers obtained are here given by way of example:

Fluid collected, in minims.	Ammonia in grs. per gallon.	Source.
150	1·9742	Erysipelas.
120	0·1791	Garden.
55	6·8807	Drains.
90	2·1000	Bedroom.
	2·9568	Stables.
150	0·0985	Victoria Park

THE celebrated cathedral of Canterbury, England, was badly damaged by fire on September 3. The same sort of carelessness that has led to the destruction of many other valuable public buildings by fire was the occasion of the present injury, namely, a charcoal furnace, used by workmen who were repairing the roof, was accidentally upset. One hundred feet of the roof was completely destroyed. This cathedral is one of great antiquity, dating back to A. D. 500; many important historical events are with it associated.

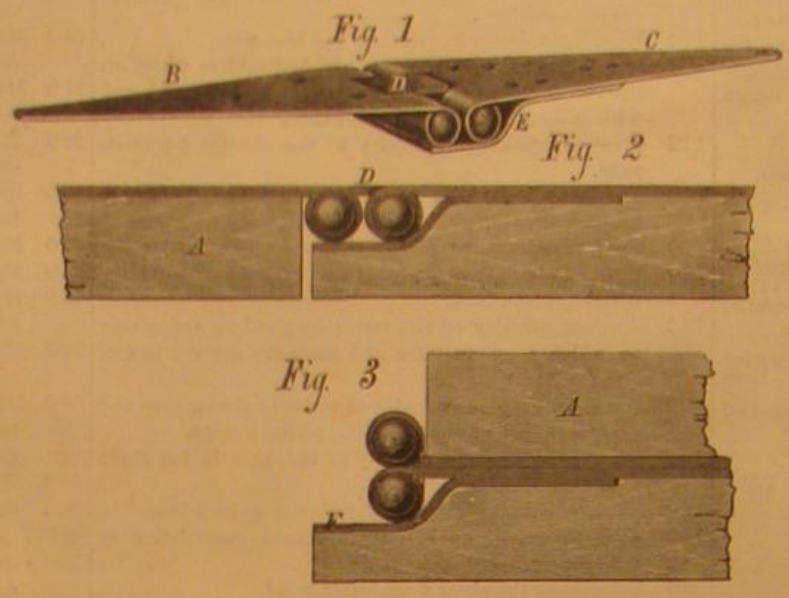
Two new locomotives have recently been put in ure at Connellsville, Pennsylvania, for regulating purposes, or for making up trains. These locomotives have bumpers on both ends, the tender is done away with, and water is carried in a tank placed over the boiler. The fireman's foot board is so made as to hold sufficient fuel for several hours' consumption,

IMPROVED FLUSH STRAP HINGE.

The chief defect of the ordinary strap hinge, such as is used for hanging trap or scuttle doors, has been that the joint made by its two parts forms a projection above the floor or roof which, being very easily overlooked, proves a stumbling block and thus a cause of troublesome accidents. To remedy this difficulty, the invention shown in our illustration is devised. It consists of what is known as a flush strap hinge, so constructed as to present a perfectly smooth surface and be hardly observable when the door is closed, while it permits the latter to be swung all the way back when opened.

Fig. 1 shows the device in perspective; Fig. 2 is an edge view with the door, A, closed, and Fig. 3, a similar view with the door open. Referring to all three engravings, B and C are the straps of the hinge, on which are formed eyes, which tightly enclose the pivot pins. D, shown more clearly in Fig. 1, is a clasp, which is received in the openings cut in the parts of the straps which form the eyes, and the ends of which are bent around and move freely upon the pivot pins. It will be seen that a double joint is thus formed whereby the hinge when extended as in Fig. 1 presents on its upper portion a uniformly flat surface. E is a plate attached firmly to the strap, C, and projecting under the eye of the strap, B. Its object, as shown in Fig. 2, is to receive and support the inner edge of the closed door. Fig. 3 plainly represents the location of the different parts with the door open and also shows the movement of the hinge in permitting the door to be thrown flat back, the clasp, D, working freely around the pivot pins and eventually assuming with the latter a perpendicular position.

This useful invention, which will doubtless attract the attention of architects and builders, is manufactured by the Stanley Works at New Britain, Conn. Patented through the Scientific American Patent Agency, January 3, 1871, by J. S. Jenness, of Bangor, Maine, of whom, or by addressing Mr. A. T. Young, agent, 139 Federal street, Boston, Mass., further information may be had.



JENNESS' FLUSH STRAP HINGE.

GOLD PEN MAKING.

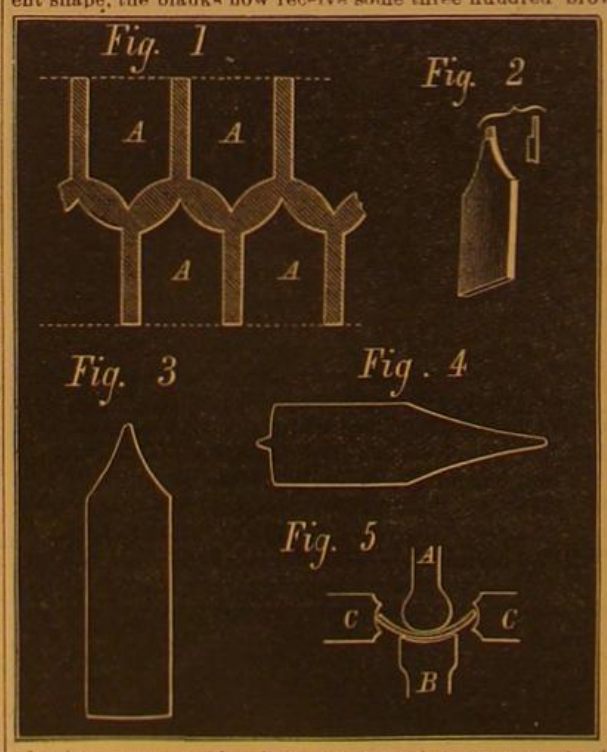
Pure gold, pure silver, and pure copper are the materials from which the alloy used in the manufacture of gold pens is made. Gold alone, from its softness, cannot be used, but combined with the baser metals, in degrees of 14, 16, and 18 carats, it forms a composition of great hardness, durability, and elasticity.

If the reader will accompany us in imagination through one of the manufactories in this city, the largest perhaps of its kind in the world, owned by Messrs. Mabie and Todd, we will endeavor to point out the many ingenious processes through which the metal, or rather the alloy, passes from the time it undergoes its first melting to its final exit into the world in the shape of finished pens.

Our attention is first called to the uncombined metals; virgin gold in little irregular shaped nuggets so soft as to be easily scratched by the thumb nail, silver in like form, and copper in odd pieces of wire and thin plate. Into a delicate pair of scales, certain portions of each of these metals are thrown. A nice adjustment of weights, a few seconds of wavering of the beam, and, the operation being finished, the contents of the scale pan are handed over to the melter. This workman we find busily engaged in blowing a small charcoal fire made in an open furnace. As soon as a fierce heat is obtained, a hole is raked in the coals and a small crucible containing the metals placed in the fiery bed. More coal is heaped on, the blast is made stronger, and we can see the crucible gradually turn white hot as the fire increases. Meanwhile, the workman is preparing his mold, two simple pieces of iron which, fitting close together on their edges, leave a space between for the shaping of a small ingot. This he places conveniently at hand, and then, with his tongs, lifts the crucible from the fire. Out flows the metal, a liquid stream of dazzing brilliancy. A moment of waiting, the mold is opened, and a dull yellow ingot lies before us; seizing it with his pincers, the melter thrusts it among the coals. This is the annealing process, and we watch the bar gradually turn to a deep cherry red. Then it is quickly withdrawn and plunged, hissing, into a bath of very weak sulphuric acid water. It cools quickly, for not a minute seems to elapse before the ingot is placed in our hands for examination. It is about a foot long, two and a half inches wide, and about three sixteenths of an inch thick. Its value is about $250. A small set of rolls, which a workman has been adjusting during our inspection of the ingot, is now ready. The machine is set in motion, and into it passes the bar of metal: once through, it is very slightly flattened but not much changed; back again, the workman tries it with his gage, but it is far too thick. It goes between the rollers again and again, until finally the before solid bar is but a thin ribbon of elastic metal. Thin, we say, but still much too thick for its final condition in the shape of pens.

Thus prepared, the gold is passed to another operative who proceeds to cut it into blanks; that is to say, he holds the ribbon under a small press, in which a punch and a die of the proper shape and size are fitted. By this means, the first crude form of the pen—the blank—is cut out in the shape shown in the engraving, A, Fig. 1. The ribbon of metal, after these pieces are removed, is more particularly intended to be shown by this illustration, the blanks being so cut out as to economize material to the greatest extent.

A quantity of blanks being completed, the next process is to fit them with so-called "diamond" points. A gold point would wear away almost immediately; even platinum is incapable of resisting the friction of constant use. Consequently the point of the pen is tipped with a very hard substance: not diamond, as is popularly supposed, for these gems could not be soldered to the gold and could only be attached by a setting which would render the pen useless to write with: but iridium, a rare grayish white metal furnished for the purpose in fine grains, costing about $150 per ounce. It is generally obtained from gold bearing ore, and is often found in the bottom of crucibles after gold has been melted in them. It is separated from the latter metal by the action of *aqua regia* which dissolves the gold, leaving the iridium untouched. By another process, the gold thus put in solution is regained. To place the iridium point, the blank must be fitted to receive it. This is done with great rapidity by a small revolving stone which cuts a piece from the end of the blank, as shown enlarged in Fig. 2. Some twenty blanks, being thus prepared, are ranged on a table before a workman, who, with the aid of a lens, selects bits of iridium of the proper size to fit the points. These bits he places in the notches before cut, together with a drop of a solution of borax and water. Then picking up each carefully, he spreads the blanks along on a piece of charcoal, and brings to bear, by means of a blow pipe, upon every point an intense flame. The gold around the nibs is thus fused, and the borax, forming a flux, flows around and solders the iridium firmly into position. The blanks are next passed through sets of rolls until they are squeezed into the shape shown at Fig. 3, the metal, of course, being rendered much thinner by the compression. The rolls employed are steel cylinders, on the lower one of which is an arrangement whereby the iridium point of the blank is prevented from receiving any pressure, as in such case it would be crushed or broken. In their present shape, the blanks now receive some three hundred blow of a hammer, the object being to give them temper, elasticity and hardness. They are then placed under another punch which, descending, forces the metal into a die, whence it emerges shaped as shown in Fig. 4, a small projection termed a "tit" being left at the end in order to guide the pen during subsequent operations. While the pen is in this condition, the manufacturer's name, its number, etc., are stamped upon it.



If the reader will examine an ordinary gold pen, he will notice that its shape is peculiar, that its middle portion is constructed on a curve of much greater radius than the upper part, while around its nibs and point the metal is almost flat. In order to change the pen from its present form—a simple flat blank—to the required shape, a very ingenious machine is used. Described briefly, it consists of a convex plunger, of a length equal to that of the pen, which fits into a concave die of steel placed beneath it. The blank being laid above this lower die, the plunger descends upon it, forcing it into the concavity of the former; at the same time two concave horizontal hammers strike the pen at either side, thus turning up its edges around the vertical plunger. A perpendicular section of this instrument is outlined in Fig. 5. A is the plunger, B, the die below, C C, the horizontal hammers, while the section of the blank is shown in position between the parts.

So far as form goes, our pen is now complete, but it is as useless as ever as a writing implement. The slit at the points is yet to be cut. This is done by very thin circular sheets of refined copper, covered with fine emery flour and oil and revolved with great rapidity. Each sheet is held by clamps, which are dressed to perfect trueness. Against the edge, the point of the pen is pressed; and in a few revolutions, it is cut through. This process requires the utmost accuracy and delicacy of perception, as the slit must be directly in the middle, a cobweb's breadth to either side ruining the pen. A steel knife fixed in a kind of hand stamp next lengthens the slit, the upper end of which is cut square by means of a rapidly revolving and extremely fine saw.

The pen now passes to the grinders. These men have before them a number of copper cylinders, of varying diameters, which are covered with a paste of emery and oil. To these the points and sides of the pens are held. As fast as a little metal is removed, the pen is tried and the somewhat tedious process is continued until the operator is satisfied that his work is complete. The inside of the pen is then smoothed with a kind of steel burnisher, and finally a cutting wheel is allowed to rotate for a second or two in the slit to remove any roughness which may remain. The pen is next polished by holding it against revolving cylinders made of circular layers of felt. The outside surface of the cylinder is composed of the edges of the layers, and is covered with a mixture of fine German tripoli and candle wax. The inside of the pen, which cannot be reached by this method, is burnished by a small revolving spindle covered with cotton and jeweler's rouge. Rubbing with Scotch hone roughens or frosts the metal inside of the nibs, and so prevents the ink flowing too rapidly to the point. Lastly, the pen is sent back to the grinder, who sets the nibs and adjusts the pen to write with perfect smoothness. Nothing now remains to be done but to pack the finished pens in boxes and send them to the market.

The bar of gold, which we first saw cast and which we valued at $250, is now made into pens worth $350, and yet over 40 per cent of the metal has been lost or unused during the processes of manufacture. The unused gold is in the form of scraps and cuttings, which are remelted. Ten per cent, however, of the entire amount of the gold brought into the factory is irretrievably lost. It is carried off in fine particles on the clothes, disappears in the machines, is blown away by drafts, and, in fact, it is hardly known what becomes of it. Every year a large quantity of metal is reclaimed from the water the workmen wash in, from their working clothes, and from the sweepings of the factory. In the establishment visited by us, where 60 hands are employed and 1,500 pens are produced weekly, eighty dollars worth of gold has been found in the dirty water during a period of six months, and it is estimated that $1,500 is yearly reclaimed from the sweepings and refuse.

Curious Preservation of a Dead Body.

At South Bend, Ind., the body of a deceased lady, buried ten years ago, was lately uncovered for re-interment, when the corpse was found to be in an excellent state of preservation. Although petrification had not taken place, the body was as perfect as the day it was placed in the coffin. The whole body was perfectly preserved, even to such parts as the tongue, which could be moved back and forth in the mouth. The expression of the face was retained and the color of the flesh was natural, except for its waxy appearance. The shroud, when exposed to the air, fell to dust.

If the chemical nature of the soil were known, and also the medicines administered during the sickness of the deceased, it is possible that the reason for this singular preservation might be ascertained. From the description given, it would seem as if it might be due to the presence of arsenic.

White Building Stone.

For a number of years, people have been aware of the existence of a valuable building stone, found between Glasgow Junction and Cave City, Ky., and have long been in the habit of resorting to its bed for the purpose of securing its rich treasures for hearth stones, window sills and step stones, and other purposes requiring a handsome and durable stone. When first taken from its bed it presents a bright gray appearance, which, upon exposure, fades to a beautiful white, slightly shaded with the faintest gray. A company has been organized under the name of the "Glasgow Granite Company," for the purpose of extensively mining and introducing this peculiar stone.

Progress of Iron Manufacturing in Kentucky.

A large furnace and nail factory is building at Ashland, Ky. The capital stock of the new company is $700,000, and nearly the entire amount has been raised. The furnace will have capacity for turning out fifty tuns of pig iron a day, to be converted into nails. Ashland and the district around it has been demonstrated, and is by iron men generally conceded, to be the place in the United States where iron can be most cheaply manufactured. It is beautifully situated on the Ohio river, with an excellent harbor, and is a fine site for a large city.

GLASGOW UNIVERSITY BUILDINGS.

The University of Glasgow (Scotland) having sold its old site and buildings to a railroad company, erected a new structure on Gilmore Hill, in the suburbs of the city. Sir George Gilbert Scott was commissioned to prepare plans for the erection of a new building, large enough to accommodate the rapidly growing institution, to be built in a style worthy, both as to solidity and beauty, of the purpose for which it was destined. Of the extent of the new structure, some idea may be formed from our engraving. It is a large oblong rectangular pile, about 600 feet long by 300 feet wide, and divided in the middle by a building which separates two quadrangles, each of which is about 180 feet square.



GLASGOW UNIVERSITY BUILDINGS.

The great tower in the center forms the main entrance for the students; on the first floor is the court room, with direct communication into the great forehall. Besides the belfry, clock room, etc., in the upper stages, there is the cold air chamber in the sub-basement, through which every hour 1,000,000 cubic feet of fresh air are to pass, for the supply of fresh and hot air for the heating and ventilating of the whole building, the cold air chamber being fed through four large extraction shafts, in hight about 150 feet. The tower is 200 feet; the wooden spire, covered with lead and slate 110 feet high. With each class room is a professor's private room, in connection with a mezzanine above, fitted up as a private library or museum, as the case may be. On the ground floor is the valuable collection of books and coins by Dr. Hunter, from whom it derives its name, the Hunterian Museum. The library contains over 100,000 volumes, with extensive premises for workshops, etc., in the basement. The attics are used for model rooms and museum purposes. The professors' court, at the west of the college buildings, consists of 13 houses. The students' recreation ground contains about 5 acres.

The dimensions of some of the principal apartments are as follows: Library, 129 feet by 60 feet; museum, 129 feet by 60 feet; central hall, 114 feet 6 inches by 70 feet; Latin, chemistry, natural history, and Greek class rooms, each 40 feet by 40 feet; laboratory, 52 feet 7 inches by 34 feet; moral philosophy, 37 feet 10 inches by 34 feet; physiology, 34 feet by 34 feet; medica jurisprudence, 34 feet by 30 feet; small museums, each 30 feet by 22 feet 6 inches; reading room, 73 feet by 51 feet. The amount expended is over two millions of dollars.

PHOTOGRAPHIC HINTS.

It is sometimes desirable, if not necessary, that a photographer be able to take a picture of a specified object without including in the view any other undesirable object, as, for example, an old brick wall. The following method is exceedingly suggestive, and, if skilfully managed, very good. We once saw it practically tested by a photographer under the following circumstances:

In a certain garden in London, there is a beautiful statue of black marble which had been repeatedly brought under the "eye" of the camera, but always without pictorial success, on account of the close proximity of one or two trees and a brick house, which were only twenty feet behind the statue, and which invariably appeared in the picture with a most unbecoming and undesirable degree of prominence. Having been consulted by the proprietor, we suggested that the offensive brick building might be excluded from the view presented to the camera, either by placing a large background of uniform color behind it, or, still more readily, by burning a quantity of damp hay between the statue and the house, the smoke from which would obliterate the details of the latter. This advice was promptly acted upon; and the wind being in a favorable direction—that is, blowing from the direction of the camera towards the statue—three heaps of litter were quickly raked together and ignited, these being placed in a line about ten feet behind the statue and a few feet apart. A plate was now exposed, and, so fantastical had been the gyrations of the smoke and so well had it played its part that, when the photographer developed the picture, the statue stood out in excellent, nay brilliant, definition on a background upon which neither trees or brick edifice were visible. The success of the experiment was most complete. In repeating this experiment, however, care must be taken that not a curl of smoke, even of the most delicate kind, be allowed to obtrude between the camera and the object being photographed, otherwise failure will be the certain result, for smoke is frequently of a highly intense actinic color.—*British Journal of Photography.*

Prices and Qualities of Rubber Springs.

So long as the market price of crude rubber rules as high as it now does and is likely to do for some time to come, the minimum price of a fair standard quality of spring cannot fall below fifty-five cents per pound.

The first essential of a good spring, says the *National Car Builder*, is a suitable quantity of fine Para gum, pure and dry. A good quality of fine sheet Central American may be used with the Para in proper proportion. These will absorb a certain amount of dry white lead and bolted whiting, but no more than is requisite. Sulphur is also used merely as a vulcanizing agent, its action being analogous to that of yeast in bread making. There is a definite and fixed relation between the quality of the pure or crude gum and the quantity of foreign ingredients necessarily combined with it, not for the purpose of adulterating and cheapening, but to impart to the mass of material constituting the spring a body and solidity it could not have in any other way. The cheap springs offered in the market do not contain more than twenty-five per cent of good gum, the remainder consisting of coarse and inferior grades, with old rubber frequently mixed with it, and capable of absorbing a much greater quantity of adulterating material than good and fine gum.

The tenacity, power, and durability of the spring are impaired just to the extent that bad material enters into its composition, and the foreign ingredients are out of proportion to the rubber. Springs can be made to weigh less by using less lead and more whiting, but the quality suffers in a corresponding degree, as the lead has a metallic and durable body, and the whiting a perishable one.

It requires but a very little figuring to form an idea of the adulteration of low priced springs. Fine Para rubber is worth to-day eighty-five cents in the market, and fine Central American sheet rubber sixty-five cents, and the difference between these prices and the lowest spring quotations indicates very clearly the nature of the process by which low-priced springs are produced.

THE Chicago and Alton Railroad Company have just completed, and are now running as day express on their road, one of the most complete trains in the world. It consists of a baggage and mail car, four coaches, and a palace dining car. It is equipped with Thornton's spark arrester and patent dust shield, Goodale's steam brake, Creamer's safety brake, Blackstone's patent platform and coupler, and Reniff & Buttolph's ventilators. The managers announce that the whole road will shortly be equipped in the same way.

Correspondence.

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

Theology and Science.

To the Editor of the Scientific American:

As a constant reader of your paper, I was very much grieved and disappointed by your editorial on "Science and Theology" in your issue of Sept. 7, 1872.

I presume, indeed, upon what I know of scientific editorials in religious papers, that your criticisms may have been just with regard to the editorial which called forth your remarks; but I must strongly object to the style and facts of your reply.

Why do you entitle the Bible a "mutilated and obscure tradition?" Why do you treat that figure of speech, so often used not only in the Bible but everywhere else, called "anthropomorphism" (or representing God as man) as an "absurd assertion" and a "blasphemous idea?" That science has helped, and most wonderfully helped, to a true interpretation of the Bible cannot be denied. But why charge upon theologians a constant change in their interpretation of the Bible, while it is equally true that scientists have been as constantly changing their interpretation of Nature?

You and your readers will know what I mean when I say that the theory of "a single creative act," which has ever since been successively developing its principle in necessary results, is essentially of deistic, and not Christian, origin.

Again I would ask: Why do you as a scientist undertake to "judge the teachings of theology, and to decide which are true and which are erroneous?" It seems to me that an attempt to judge of theology from a scientific standpoint is just as absurd as to judge of science from a theological standpoint; and while you have been shocked yourself, as I have often been, with the mapping out of the Deity, so prevalent in the so called "orthodox" churches of the day, I have been shocked, as I doubt not many of your readers have been, with the whole style and manner of this editorial of yours, which only repeats the language and shows the spirit of certain scientists of the present day. Men who will labor days, weeks, months, and even years on a small point respecting molecular motion will afterwards, in the most careless, heedless and flippant way, dogmatize upon prayer and miracles, and the method of the Divine government. Nothing is more untheological than for men to theologize about science, and nothing is more unscientific than for men to scientize about theology.

But I do not stop here. I am willing to join issue with you on your statements as to facts as follows: "Theology taught that the earth was flat," "that the earth was a stationary center," "science proved that the earth was formed many millions of centuries ago," etc. Now I am ready to maintain that at no time have theologians asserted any thing different from what has been the accepted faith of scientists themselves, and that what was finally developed into the Copernican and Newtonian system was, since Christ, first originated among the Christian "theologians," as you call them. In St. Augustine's writings, you will find the antiquity of the earth suggested, and the very interpretation of the Christian narrative, which scientists pretend to despise as modern make shifts, announced, more than thirteen centuries ago.

Indeed I think that it may be proved by actual quotations that the Copernican system was promulgated, as a theory, by Christian theologians against the objections and the ridicule of the scientists of their days

In fact, whether this can be done or not, it does appear, to me at least, a gross misrepresentation of facts to state that theologians have made these assertions with any more confidence than scientists have made them themselves; or that they are the cast-off clothing of theology, rather than of philosophy.

The advance of science to-day is as antagonistic to the science of yesterday as it is to the theology of a thousand years ago. How lately was the fixedness of species a doctrine alike of theologians and scientists? But now behold we have the new doctrine of the evolution of species, held by both. It is just as difficult to harmonize the two theories as to harmonize the old with that new theology which is growing up around our scientific progress.

A few months ago you had a most excellent editorial on these very subjects, but now you have taken the unscientific position of the anti theologians, which you then denounced. Why is this? A THEOLOGIAN AND ALSO A SCIENTIST.

The One Hundred Thousand Dollar Canal Boat Prize.

To the Editor of the Scientific American:

I have been a constant reader of your valuable paper for almost six years, and in that time I have not seen anything in the paper to displease me until last evening, after returning from Buffalo. I picked up last week's paper, and saw therein an article headed "New Canal Steamer," giving a flattering account of Captain Goodwin's boat now being built at Buffalo. One would naturally infer from the account that Captain Goodwin's boat would certainly win the reward.

Such articles have a tendency to discourage other competitors for the prize, who make the remark that, if friends and relatives, money and secret orders are to have influence with the commission, the sooner that inventors who have not these advantages withdraw from the field the better, because the expense of building a boat for competition is great.

Besides, there is the opposition that an inventor meets around Buffalo and other ports. For instance, a man has his boat completed and removed from the docks; while going to some place of level water for trial, some little tug with a loaded boat will smash into her, giving her no chance for getting out of the way. It is ten chances to one that the damaged boat must return to the dock to repair, at the inventor's expense. These things are done because, if steam should be used on canal boats, the tug business will not be more than half as good as it was. These oppositions are enough, without their being backed up by such articles as that in No. 9 of present volume of the SCIENTIFIC AMERICAN. If the papers would but state the speed, construction, time of building or changing from the old canal boat, it would be a help to all instead of a detriment.

Now, as to the boat, it was distinctly understood by all that the boat was not to exceed 90 feet in length, nor 18 feet in width, because old canal boatmen say that some of the present locks (not all) are too small to let a boat exceeding these dimensions through. If this is the case, how is the Goodwin boat of 96 feet in length, together with the wheel in front and the peculiar construction in the rear for the connection of other boats, going to get through? Again, the law says the construction must be applicable to the old canal boat; and on the Goodwin plan it cannot be so with a boat carrying 240 tuns, or much over 210 tuns; but if new canal boats of such extensive dimensions as the Goodwin be permitted, others, of many principles, can carry 250 or 275 tuns. But most inventors want to come to the requirements of the law as nearly as possible.

I hope you will take no umbrage at this little statement of the feelings of many inventors.

Fagundus, Pa. A COMPETITOR.

[We are surprised that our correspondent should find anything in the article he mentions to justify a suspicion that "friends, relatives, money and secret orders" would be able to influence the commission, or a statement that we have "backed up" the conduct of the Buffalo tug boat men. Will he please read the article again? Captain Goodwin must suffer the loss of his time, trouble and money if his boat is too long.—EDS.]

Detection of Sulphuric Acid in Vinegar.

To the Editor of the Scientific American:

The question as to the value of a prescription, for the chemical manipulation of a common test, depends on its practical nature and by no means on the fact that a roundabout operation may be defended by an ingenious scientific reasoning. In the name of common sense, I ask what practical chemist, when he obtains several samples of vinegar to test for adulteration with sulphuric acid, will commence with going through all the operations described on page 120, of evaporation, cooling, trituration with alcohol, filtration, dilution with water, again evaporation, again filtration, and acidulation with hydrochloric acid before he applies the actual test with a soluble salt of barium? Surely any such will commence by applying this latter test at once, as mentioned by me on page 132, and, in at least ten cases out of twenty, he will find no precipitate, proving that neither free sulphuric acid nor sulphates are present. If so, he has disposed of the matter without much unnecessary trouble and loss of valuable time.

In case the vinegar naturally contains sulphates without being adulterated with sulphuric acid, every chemist of experience knows that the appearance of the precipitate produced by such a cause is quite different from that produced by an adulteration with free sulphuric acid. In the first case it will be a mere milkiness; in the second case, a much more copious precipitate will be thrown down. But if any doubt is left, advantage may be taken from the facts that the natural sulphate in vinegar is (if not always, at least very often) sulphate of lime, and that chloride of calcium will give no precipitate when only this sulphate is present; while at the same time it will give a precipitate if free sulphuric acid is present, in a quantity more than one tenth of one per cent only. Another simple test is the mouth; any liquid containing free sulphuric acid even in comparatively small quantities, will act on the teeth and take their natural smoothness away; while vinegar without mineral acids will not. Notwithstanding such a test is only good to aid other tests, there are experts in the business who rely upon it to a great extent.

If, however, the combination of the three tests mentioned: the barium salt, the chloride of lime, and the taste, which all may be made in a few seconds, leave doubt, we may add the first step of the operation described on page 120, about which one of my critics says: "The evaporation of the vinegar to the consistency of an extract volatilizes all the acetic acid contained in it." If this be so we may stop there, as any acid left and indicated, by the usual test, must be the non-volatile sulphuric acid, except, perhaps, some traces of tartaric acid in wine vinegar, or malic acid in cider vinegar, which are easily neutralized by a single drop of liquid ammonia, which would be insufficient to neutralize the powerful sulphuric acid, except when this was only present in such small quantities as to amount to very little, even after the concentration. In order to be sure in regard to the removal of all the acetic acid, some alcohol may be added while the liquid is yet hot; this will, as I have stated, change the acetic acid, if any be present, into the more volatile acetic ether, which may then be driven off with the alcohol, when the removal of all traces of acetic acid is more certain.

I am aware that Fehlig, in his chemical dictionary, besides describing the iodide of starch test, brought forth in the last number of the SCIENTIFIC AMERICAN, describes also the test mentioned on page 120, but disposes of it in three lines, while on page 120 this is expanded into 15 lines, and some totally unnecessary details added; for instance, the acidulation with hydrochloric acid. This added complexity and elaboration prejudiced me against the whole operation; then from many samples of vinegar of different origin I have tested, none gave proof of adulteration with sulphuric acid and only one a slight indication of sulphates. I must confess that from these causes I attacked the prescription with more severity than it deserved.

The plan of Mr. Wilder to distil the vinegar and test the distillate with barium will fail, as the sulphuric acid is not volatile enough to go over with the acetic acid. It remains behind with the sulphates. P. H. VANDER WEYDE.

New York city.

The Dangers of Car Coupling.

To the Editor of the Scientific American:

One of the oldest and most respected men employed on the Michigan Central Railroad was killed, while coupling cars, on the 24th ult. I was at the depot yesterday, and met a shipping clerk checking cars, whose face was familiar. I enquired of him at what spot was the man killed a few days ago. He burst into tears and pointed with his hand at the place, and said, through his sobs: "It was my father. Oh! such a good father; there was no other like him. We never shall get over it. My mother, or any of us, cannot realize it yet. He left us at the breakfast table, in such good spirits. Before noon he was brought home, crushed but still living, and died amid terrible sufferings."

There is no railroad yard but kills or cripples a man now and then; in the yards of Kansas city four men were crushed last month. This city of Detroit has had as many victims of bad couplings within two months, and at that rate they would number thousands throughout the continent during a year. And it is our best young men who are thus sacrificed; they must be steady, faithful, active and strong. To the wrought iron draw bar, and to the false economy of railroad managers, belong most of these murders. Any one, who has to handle such couplings, reading this, will say: "Yes, confound the wrought iron draw bars. I don't see why they use them, any how." I ask now through your columns the opinion of master mechanics, yard masters, conductors and brakemen on the subject of wrought iron draw bars. The public will soon learn from them that those narrow mouthed and open back draw bars compel them to hold the link with their fingers till the cars almost touch each other, or the link will strike the edge of the opening and be pushed back in the open space; and the men would be compelled to move the train again to make the coupling. Consequently they run any risk to make the connection. Perhaps a Congressional committee could find a coupling in the Patent Office which would save life and not fill our streets with armless and crippled men. J. WHITEFORD.

Detroit, Mich.

An Improved Flooring.

To the Editor of the Scientific American:

In one of the late numbers of your admirable paper (the reading of which is a weekly source of pleasure to me), I perceive a notice of wooden carpeting, made by a company of your city. This induces me to explain a method I have adopted for summer use in my dining room:

I first had the floor made perfectly smooth and flat; then I stretched good strong cotton cloth ("domestic") all over the floor, and soaked it well with very hot strong glue. This completely fastened it to the floor. When perfectly hard and dry, I laid down, with paste, a good quality of wall paper (marble pattern), having both edges of the paper trimmed so as to make no ridges, and afterwards varnished with three coats of coach varnish, permitting each to dry thoroughly. By this means I have a solid floor, very beautiful in appearance, and, after six months' wear, quite as perfect as the first day it was used. Twelve years before the war, I had a room covered in this manner at the plantation; and in 1864, when the house was burned, the floor was still in a much better state of preservation than other rooms covered with oil cloth that had less wear. I have often thought, if thin wood of different kinds could be laid down in the same manner, that perfect floors could be made, quite as handsome as the inlaid floors I have seen in Europe, and at a very trifling cost, which, in the impoverished condition of our southern country, is a great *desideratum*.

Natchez, Miss. H. L. SELLERS.

A Hint to Chemists.

To the Editor of the Scientific American:

A few experiments with animals, similar to those that Salm-Hortsmar and others have made with plants, would be of great advantage to our knowlege of physiology.

By rearing animals on pure starch and gluten, with varying and known kinds of mineral substances, and then examining their bodies chemically to see that no other matter had obtained admittance, the essential elements of animal life might be determined.

By feeding animals for a long time on food with a very small proportion of a non-essential mineral substance added, and then examining, both chemically and microscopically, to ascertain to what extent the substance under experiment had accumulated, and whether it had substituted any other element, or existed as a foreign aggregation merely, some light might be thrown on the action of accumulated mineral poisons.

It is known that animals grow by digesting and decomposing vegetable products; on the contrary, it is also known that hogs fed on madder absorbed so much of it in an undecomposed state as to change their bones to a red color. By dosing animals with small quantities of vegetable acids, alkaloids, etc., and then testing their bodies, the question as to whether all vegetable substances may be decomposed by the

stomach, when presented in not too large quantities, might be answered.

I would suggest that rats, mice and guinea pigs would be cheap and convenient animals for experiment.

If any of the above experiments have already been made, doubtless many of the readers of the SCIENTIFIC AMERICAN would be glad to see an account of the particulars.

Charlotte, Me. H. A. S.

Iron Pins.

To the Editor of the Scientific American:

One of the abominations of this nineteenth century is making iron pins in place of brass ones, and making them, too, so that even careful housewives are imposed upon, until rusty clothing, bad points, and bad temper of both pins and owner betrays the swindle on peaceful unconscious humanity.

In vain good old-fashioned pins are called for and prices paid to fully cover the difference in value between brass and iron. To prevent the imposture, the writer hit upon a happy expedient, namely, testing them with a magnet; even the magnetized blade of a pocket knife is sufficient. If the least disposition is shown, in the innocent but truthful household implement, to hop towards the blade, refuse them at once and tell your dealer to get you some good old brass pins, and to "sin no more." NOVICE.

Medina, Ohio.

KNITTED GOODS AND THEIR MANUFACTURE.

The material used for making knitted garments, such as are employed for ordinary underwear is a mixture of cotton and wool. The industry is a growing one, and is largely carried on in New England and in certain portions of northeastern New York.

The wool is received in the bale, and is first cleansed. This process consists in scouring it in a hot solution which removes the grease and dirt, and then passing it through rollers which wring out the moisture. Drying follows, in summer by means of a blast of air, in winter by exposing the material in rooms heated to about 120°. The wool is then burred, sharp steel teeth separating its fibers, which afterwards pass into an enclosed case, where a current of air tosses them about until they become in a literally perfect fleecy condition. Indeed, it is difficult to recognize the pure white substance which leaves the burring machine as the coarse filthy matted masses which are first encountered on entering the factory. Meanwhile the cotton is also being cleaned and separated. Ingenious machines take it as it comes from the bales, pull it apart, remove its impurities, and finally leave it in a condition as soft and pure as its future companion, the wool. Now comes the mixing of the two ingredients, so to speak, which form the knit web. The proportions vary according to the articles made and the peculiar ideas of the manufacturer. Garments of this nature are seldom "all wool," although often sold under such representation. The mingling is done by pickers, steel points which work the two kinds of fiber intimately together, turning out the mass evenly incorporated throughout.

The material is now complete and ready to undergo the processes preliminary to weaving, or rather knitting. It first finds its way to a "lapper" or machine which detaches the fibers and then passes them to the outside of a wire gauze rotary cylinder, to which they are forced to adhere by means of a partial vacuum produced inside by rapidly revolving fans. On this cylinder, the fibers become slightly felted together so that the material is removed in the form of loosely made batting, and in this state is rolled upon large reels. In the next machine, a "double lapper," four rolls of this mixed wool and cotton batting are used at once, being made to "lap" over each other and to pass through rollers so that they finally emerge combined in the shape of a thick loose fabric.

Carding is the next process, the same machines being employed as are used in all cotton or other weaving mills. As this operation is doubtless familiar to almost every body, we shall not stop to describe it, but simply note the change which it produces in the material from a cloth or batting to the form of a soft thick rope. This, passing through another machine, emerges in shape of a cord resembling worsted. Then it is taken to the spinning apparatus and finally comes out a stout firmly made yarn, which, being wound upon bobbins, is ready for the knitting machines.

It is difficult without the aid of diagrams to convey to the reader an accurate idea of these last mentioned somewhat intricate pieces of mechanism. New improvements are constantly being made in their construction. Some manufacturers have special appliances of their own devising, which they reserve for use in their particular establishments; so that a description of any single machine would fail in many details to be applicable to all. There are some points, in common, however, to nearly every pattern, which may be generally cited. The needles resemble in form those used in making crochet work. They are arranged in a circle, the number used depending upon the fabric to be knit. The measure for their number, technically termed the "gage," is so many needles to three inches space on the circumference of the circle. Thus, a machine having 14 needles within the above limit is called of "14 gage" and makes a coarser material than one, for instance, of "18 gage." The strand of yarn passes around the circle and is brought under the hooks of the needles. The latter move up and down successively, while a suitable device holds each row of loops as it is formed until the next row is made. The fabric is thus knit in the form of a tube and passes upwards to a large roller, suspended above the machine around which it is tightly wound. From fifty to one hundred yards of finished knitting are thus daily produced.

The cloth is next washed and either hung in heated apartments to dry or else the moisture is removed by passing a current of hot air through its length, it being still in the tubular form in which it is finished.

From the laundry, the cloth passes to the hands of an army of women. Some, provided with huge shears, spread the material on long tables in layers of six or seven thicknesses, placing upon it wooden patterns and rapidly marking and cutting out garments. Others, seated before long tables on which are sewing machines driven by the power of the establishment, baste, sew, and finish, in a single manufactory, as many as 200 dozen underclothes per day.

The finished goods then pass to the packers, who fold them and press them in a powerful steam press. Next comes the sorting of sizes, packing in boxes, and, lastly, the labeling with trade mark, etc., when the garments are ready for the wholesale dealer.

SCIENTIFIC AND PRACTICAL INFORMATION.

PICKLES.

The following recipe for pickling cucumbers, etc., has been sent us by a valued correspondent, and will be generally acceptable at this season of the year: Wash the cucumbers clean. Place about a dozen leaves of a grape vine on the bottom of the pickling vessel (a barrel or stone jar will do). Pack a layer of cucumbers snugly on the leaves, and sprinkle over them a small handful of salt. Then lay vine leaves again, and then cucumbers and salt, and repeat the order till the vessel is nearly full. Cover over with vine leaves, and put a round board on the leaves with a clean stone on the top. Fill the vessel with water till the cucumbers are covered; the board will prevent them from swimming on the water and so becoming exposed to the air. Taste the liquid; it should be pleasantly salt; add a little salt if it is too flat. Let the whole stand, in a not too cool place, for three weeks, when the cucumbers will be sour and ready to eat. They will keep all the winter if put in a cool place. No vinegar is necessary. The pickles will be of an olive color, and are more wholesome than poisonous bright green sulphuric acid and brass kettle pickles sold in almost every store. The Germans use altogether the above recipe for pickles; but it is a fact that dentistry is more perfect in America than in Germany, and our correspondent does not wonder that the pickles here have done much to give that science its present perfection.

TO DETECT SULPHURIC ACID IN VINEGAR.

We have received so many letters on this subject that we are compelled to decline publishing many good methods which our correspondents have forwarded. The following, however, will give housekeepers, and others to whom chemical processes are not accessible, an opportunity of testing the purity of the article: F. S. G., of D. C., sends Fresenius' test, simplified for general purposes: Put a wine glassful of the vinegar into a china tea cup, and let the cup float in water in a pint cup of tin or other metal that will stand heat. Boil the water till half the vinegar has evaporated, then drop into the cup a piece of (cane) loaf sugar about the size of a grain of wheat. Continue the boiling till the liquid in the cup has evaporated, when, if the vinegar contains free sulphuric acid, the dry residue will be found to be blackened. The charring of the sugar is due to free sulphuric acid. The presence of sulphates does not affect this test.

E. C. H., of N. H., puts a clear solution of a few grains of sugar of lead with the vinegar; and he states that if the mixture remains transparent, the vinegar is pure, but sulphuric acid betrays itself by forming a milky precipitate.

New Method of Printing on Cloth.

Mr. E. Vial, of France, proposes to first impregnate the tissues to be printed with a solution of nitrate of silver, or of some other metallic salt, which, when brought into contact with zinc or copper, will be reduced to the metallic state. His design is in this way to print upon the impregnated tissue with a zinc (or copper) pattern. The result of this process, is that, wherever contact is made between the metal plate and the cloth, there is formed a metallic precipitate of silver (if the nitrate of silver was used to saturate the tissue) which is firmly fixed upon it. The color of the precipitated metal may be varied, according to the strength of solution used, from a brilliant grey to a deep black. The color is declared to be very fast, withstanding acids, alkalies or soaps.

A New American Steamer.

The citizens of Philadelphia, represented by the American Steamship Company, are determined to have a first class steamer line of their own, to run between that city and Liverpool. The first vessel of the new line, named the *Pennsylvania*, was lately landed at Philadelphia with much success. She is a large and splendid vessel. Length, 355 feet; beam, 43 feet; depth, 33 feet 6 inches; capacity, 3,854 tuns; draft, 20 feet 6 inches. Is to have accommodations for a thousand passengers, is to run 11½ knots per hour on 40 tuns of coal per day. We heartily wish for the success of this new enterprise.

PROFESSOR KING and Mr. Schaeffer made a balloon ascension from Rochester, N. Y., on September 3, went up 6,000 feet, staid up an hour and twenty minutes, and then landed at East Bloomfield, twenty miles distant, we believe, from Rochester.

PROFESSOR De Volson Wood of the University of Michigan has accepted the professorship of mathematics in the Stevens Institute of Technology, Hoboken, N. J. Professor Wood is one of the most able and distinguished mathematicians in the country.

The Whistling Lantern---A New Safety Lamp for Miners.

Dr. A. K. Irvine, Glasgow, lately read before the Iron and Steel Institute a paper on "A new safety lamp for miners, for indicating by sound the presence of explosive mixture of gas and air, based on a new form of singing flame and on a fog horn on the same principle." In the course of his paper, Dr. Irvine 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 lowest end, the disk, preventing 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. The conditions under which this flame is produced differ considerably, from those of other singing flames. The hydrogen jet, for instance, is burned in an open tube, to which air is freely admitted at the lower end, and it is necessary that the tube enclosing the jet should be lowered more or less till the singing point is found. In Irvine's singing flame the tube is not open at the bottom, and no admission takes place except through the wire gauze, and the note is produced when the flame is at the lower extremity of the tube or chimney. The fact of the combustion of an explosive compound on the surface of a material impervious to flame (namely, wire gauze, originally employed by Sir Humphrey Davy in the construction of safety lamps) suggested the possibility of employing this flame for the purpose of giving warning by sound of the presence of an explosive atmosphere, or elsewhere, by means of a lamp suitably constructed. Accordingly, Dr. Irvine said he had had lamps made for giving light, which, while the atmosphere is not contaminated by fire damp or other 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 is 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 celling 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.

An Electrical Fire.

A fire recently broke out in the flooring of one of the offices of the Western Union Telegraph Company in this city, which was found to have originated in a cable of cotton covered wire saturated with paraffin, through which the lines entered the office beneath the floor. From some cause, probably lightning, a connection had been formed between two through wires attached to large main batteries at the general office, and which were connected with opposite poles to the ground. Two large batteries were thus connected and thrown into short circuit, developing an intense heat and setting fire to the inflammable paraffin covering of the wire. If this singular occurrence had happened after the closing of the office at night, it might have resulted in the destruction of the building, and the cause of the fire would have remained a mystery. Of course an accident of this kind could hardly have been foreseen, but it serves to point out the necessity of caution in running wires under the peculiar conditions described.

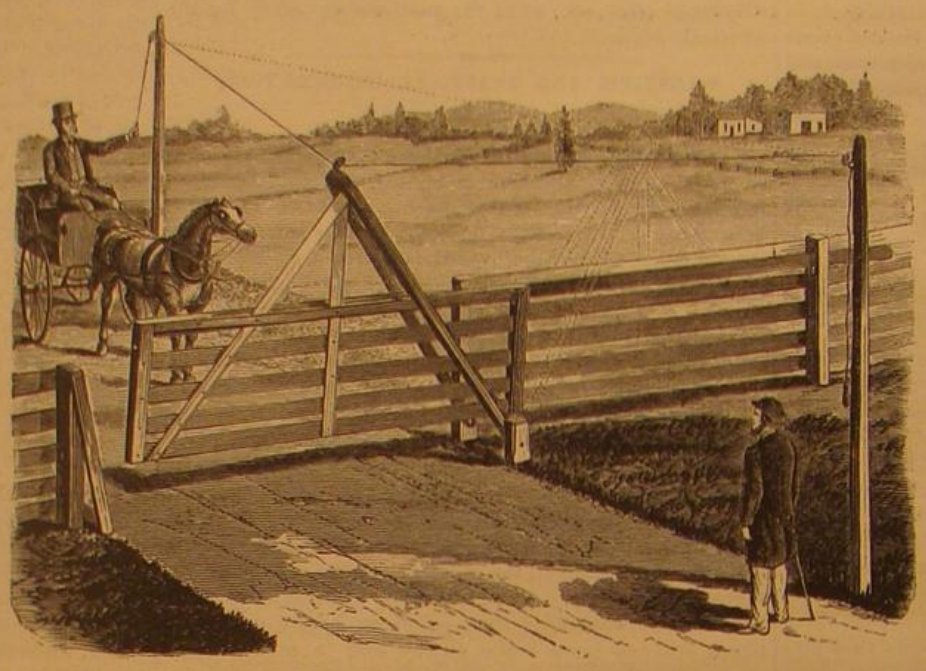
ROMANCE OF THE TELEGRAPH.—A telegraph clerk of London, who was engaged on a wire to Berlin, formed an acquaintance with and an attachment for a female clerk, who worked on the same wire in Berlin. He made proposals of marriage to her, and she accepted him without having seen him. They were married, and the marriage resulting from their electric affinities is supposed to have turned out as well as those in which the senses are more apparently concerned. These young clerks, however, were not very rash, nor did they marry without due acquaintance with each other, as many prudent persons might suppose—for, according to Mr. Scudamore, a clerk at one end of the wire can readily tell, by the way in which a clerk at the other does his work, "whether he is passionate or sulky, cheerful or dull, sanguine or phlegmatic, ill natured or good natured."

THERE are now in daily use on the Michigan Central Railroad fifty one cars fitted up expressly for carrying butter, beef and eggs from Chicago to Boston and New York. An average of four of these cars start east each day, and are inspected and re-iced at Detroit before they go further. Each car consumes four tuns of ice on the trip

IMPROVED ROAD OR FARM GATE.

The object of the invention shown in our illustration is to afford a means of opening and shutting gates without requiring the occupant of the vehicle passing through to descend for the purpose. The device is at once simple and effective, and but few words of description, added to its graphic delineation in the engraving, are needed for its explanation.

The gate is constructed, as shown, in a firm and substantial manner of any suitable material, and is freely suspended by means of a pivot passing through the extremities of the three braces represented as extending from the lower corners and from the center of the bottom rail, between two swinging posts. The upper extremities of the latter are connected together while the lower ends are arranged to pivot readily on the solid blocks of wood or stone set in the ground. The highest bar of the gate, it will be noticed, is prolonged, and passes loosely through a slot cut in the upper part of one of the adjoining fence posts. To the ends of the two uprights by the road side, one of which is represented in the foreground and the other beside the wagon, single pulleys are suitably attached, while at the top of the swinging posts which support the gate, a similar pulley is fastened. A rope passes through all three of these pulleys, its ends hanging beside the uprights.



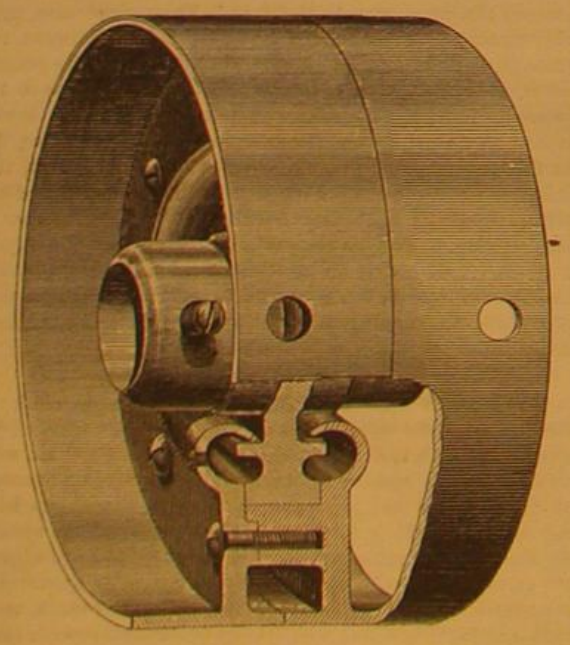
HOOKER'S ROAD OR FARM GATE.

The method of working this apparatus is as follows: The gate being closed, the driver of the vehicle pulls upon the rope, which extends down to a convenient distance from the pulley on the upright beside him. The other extremity of the line being stopped by means of a knot cast in it, the strain is brought to bear upon the swinging posts of the gate. These, moving freely on their lower pivoted extremities, are lifted from a diagonal to a vertical position, and then, swinging pass their center, fall as shown by the dotted lines in the engraving. The gate, which is guided by the prolonged bar before referred to, is bodily lifted, and its upper left hand corner describes the arc of a circle which, dotted in the illustration, it is represented as beginning to traverse. At the end of its movement, the gate is found to have been transported sideways clear of the road, and to rest beside and parallel to the fence. The position of its parts and the direction which the rope assumes are clearly represented by the dotted outlines. After passing through, it is only necessary for the driver to repeat the foregoing operation, pulling on the other extremity of the rope, when the gate returns to its former position and is closed. By the use of a balance weight, the gate may be easily lifted.

This device has been successfully employed in several of the Western States for some three years past. Further particulars concerning it may be obtained by addressing W. C. Hooker, Abingdon, Ill.

GROSVENOR'S SELF-LUBRICATING LOOSE PULLEY.

The self-lubricating loose pulley which forms the subject of the present article was patented April 9, 1872, by Mr. J. P. Grosvenor, of Lowell, Mass., some of whose previous inventions in this and other directions have been already illustrated and noticed in the SCIENTIFIC AMERICAN.



Our engraving represents the pulley, which has part of the face broken away to show a detail section of the working parts. It is composed of a hub and disk, which are made fast to the shaft by set screws, one of which is shown in the engraving. The pulley is made in two parts, as represented, and it revolves on the outer circumference of the disk. The parts are fitted together by an oil-tight joint, and are secured to each other by set screws, by which construction the disk is introduced within the pulley, to the interior of which it is fitted on its rim. The oil chamber is annular and runs entirely round the sides of the disk. It is formed by curving the sides of the pulley outward, and then around and within the annular projections shown on each side of the disk. The chamber is supplied with oil by removing the set screw shown in one side of it.

As the pulley revolves upon the disk, every part of its bearing surface passes through the oil at each revolution, and at the same time the peculiar form of the sides of the oil chamber and the disk prevents any oil escaping while it is being carried round the top of the pulley by dripping down, for it is carried round to the lower side. It may be taken off the shaft and carried in any position without the oil escaping.

It will be seen that this pulley is constructed upon a novel principle, the oil chamber being placed within the circumference of the bearing upon which the pulley revolves. This insures the constant lubrication of all the parts by reason of the centrifugal force developed by its revolution; and it is stated that in consequence thereof there is hardly any wear in the pulley or its bearings. The inventor says these loose pulleys have been run at the rate of one thousand revolutions per minute for eight weeks without re-oiling and without escape of oil, and sufficient oil was then left in the chamber for a longer run.

Further information may be obtained of the patentee and manufacturer at the address stated above.

Catching Shad with Hook and Line.

Mr. Thomas Chalmers, after repeated experiments, has succeeded in devising a bait by which he has been enabled to book shad without difficulty. He says: A careful examination of the stomach of the shad gave no light as to what they fed upon. Various kinds of bait, natural and artificial, were tried, and for a considerable time without satisfactory result. At length some flies were dressed in a peculiar manner, and these the shad took and were captured in considerable numbers with hook and line. In July, 1871, 168 shad were taken on two poles. Three flies were used on one line, and sometimes as many as three shad were taken at one cast—the whole weighing eight and a half pounds. The present season has not been so good, owing partly to roily water, but the sport has been fair. In one evening, between 7 and 8:30, himself and a companion took in twenty shad on hooks and lines. Mr. Chalmers says that from boyhood he has been given to sport with rod and line, and thinks the catching of shad with hook and line the best angling he has found. He desires that this method of shad fishing be tried in other waters than the Connecticut. His experiments were made in that river, at Holyoke, Mass.

New Route between New York and Boston.

A new route for travel has just been opened between New York and Boston. Passengers take the cars at Brooklyn, N. Y., and ride to the east end of Long Island at Greenport, ninety miles, where they go on board a steamer and sail thirty miles, across Long Island Sound, to New London, Conn., thence by rail over the Northern and Boston, Hartford and Erie roads, one hundred and twenty-six miles, to Boston. Time, nine hours—about the same as the other routes. This Long Island route was operated some years ago, but, not proving profitable, was abandoned.

The Adaptation of Electricity and the Telegraph to General Use.

The telegraph and electricity are yearly entering more and more intimately into the daily service and convenience of the people. It sounds the alarm and brings speedy succor when fire threatens devastation and ruin. It furnishes to every merchant, broker, and business man who desires it, in the more important business centers, a constant record in his own office or counting room of the condition and transactions of our exchange, and the quotations of leading articles of traffic and commerce. It calls messengers and assistants, when needed, to any locality, at all hours of the day and night. It furnishes communication between the offices, manufactories, and places of business of merchants, manufacturers, shippers, and others. The editors of our great newspapers can sit in their libraries at home and direct, by means of telegraphs, easily operated by themselves or members of their families, the management of their papers. The liability to danger and destruction on railroads is greatly lessened, and disasters averted, through the use of electrical signals. The engineer, as his locomotive dashes along the iron rail at a speed which outstrips the wind, can, at a glance at the signal by the road side, know the condition of the line for miles ahead, and whether other trains are likely to be encountered, or misplaced switches and open drawbridges invite him to death and destruction. Our bells are rung by electricity, our clocks are regulated by the electrical current, the fidelity of watchmen is assured or their lack of vigilance recorded with unfailing accuracy by the electrical tell-tale. The concealed wire and electric circuit betray the operations of the burglar and thief, and our gas is lighted by electricity.

The uses to which the electric current and the telegraph have been and shall yet be adapted are so numerous even now as to surpass our comprehension. It is the mightiest agency of modern times, the true wizard's wand, which manipulates and controls the affairs of mankind.

In the science and administration of this mighty agency, many thousands of people are constantly engaged, and their number is yearly and almost daily augmented. They constitute a large community, and upon their intelligence, capacity, and fidelity the most momentous and important interests constantly depend.

It is impossible even now to predict what advances and discoveries may yet be made in electrical science and telegraphy. Astonishing as these have already been, there is undoubtedly much yet to be learned, and new adaptations will continue to be made; and those who would profit by them professionally must be diligent and persevering in their studies and efforts to acquire and maintain an advanced state of knowledge and information. In science and art, there is no royal road to success.—*The Telegrapher.*

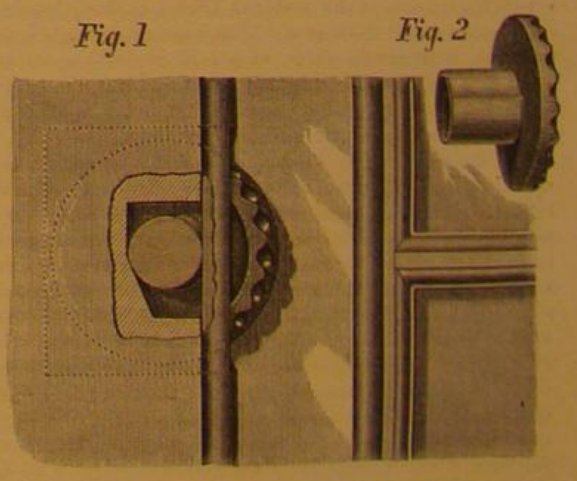
WHEEL AND ROLLER SASH CATCH.

The sash catch herewith illustrated is a most simple contrivance, and apparently of a very effective character. It consists simply of a wheel and roller cast in one piece, and is fixed in position to do duty very readily.

Fig. 1 shows the catch applied to the frame and sash, and Fig. 2 gives a perspective view of the wheel roller.

A is the sash, B the window frame, and C the covering strip. In order to insert the catch, the wedge-shaped hole exposed in the frame is cut to receive the roller, and a mortise is also framed for the reception of part of the wheel, while a recess is formed on the under side of the covering strip for the remainder of the latter to pass through. The roller and wheel are placed in the excavation made for them, and the covering strip is attached, when the parts occupy the position represented in Fig. 1, where the situation of the covered part of the wheel and the mortise are indicated by dotted lines. For the better understanding of the foregoing, the reader will bear in mind that, in our engraving, parts of the frame and covering strip, together with such part of the wheel as would be otherwise disclosed by their removal, are broken away in order to show the shape of the recess and the position of the roller therein.

The operation is as follows: The tendency of the roller is to press downward, into the wedge-shaped cavity formed by the frame and the juxtaposed sash, by its own weight, and when a very slight partial rotation is caused in it by the friction of the descending sash, this tendency is so much augmented as to instantly wedge it tightly therein, and thereby secure the sash at whatever altitude it may happen to be. To release the sash, all that is necessary is to push up the projecting edge of the wheel, which is very easily done, as it is



sufficiently roughened to be readily rotated by the fingers The window stops instantly at whatever point it is pushed up to, and is so firmly wedged there as to prevent rattling of the sash, should the same be loosely fitted.

The catches are said to answer well for weights of house sashes; they are not liable to break or to get out of order, do not mar the sash, and are furnished very cheap.

The device was patented July 23, 1872, and further information in regard thereto may be obtained of the inventor, T McDonough, Montclair, N. J.

Scientific American.

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SERIOUS MARINE DISASTERS---IMPROVED SAFETY APPLIANCES GREATLY NEEDED.

A fearful record of loss, both of property and life, has filled the columns of the daily press during the past week. The somber category shows four fine vessels of our merchant marine totally wrecked and scores of human lives sacrificed.

The propeller Metis, plying between New York and Providence, on the morning of the 29th of August last, while in Long Island Sound, five miles off Watch Hill, Rhode Island, came in collision with a coasting schooner and speedily sank. As the ship sank, her spar deck was lifted bodily clear of the hull, and remained on the water a floating raft, thus saving many passengers who would otherwise have perished. As it was, some forty lives were lost.

The Metis was constructed with three compartments formed by bulkheads placed athwart her hold. It is stated that she had just been thoroughly refitted, and was to all intents a new vessel. How "thoroughly" this work was done is amply evidenced by the fact that two compartments, which should have remained intact and floated the vessel, even if the third had filled, must have given way—the bulkheads bursting in—so that they were no protection whatever.

There is no subject which calls for peremptory legislation more than the proper construction of the hulls of vessels. The compartment system should be made obligatory in every passenger ship, and the spaces divided off should be actually, not theoretically, watertight, and totally distinct from each other. Cases are numerous where the safety of vessels has been solely due to this method of construction. The collision off Newfoundland, resulting in the sinking of the ill fated Arctic, injured the propeller which she struck only to the extent of breaking in a portion of one of her compartments, which did not prevent her from making the nearest port in safety. The Great Eastern, built with a double skin and amply strong compartments, struck on a rock, during her passage through Long Island Sound, tearing open the plates of her bottom for a length of some twenty feet, and yet no difficulty was experienced in keeping her afloat. On the other hand, the terrible calamity of the United States frigate Oneida, which had no compartments, and consequently foundered a few minutes after being injured, is yet fresh in the public mind. In our own experience, we have seen one of the largest and most powerful steam frigates in the navy compelled to bring by the wind, shift all her guns and heavy weights, and range all her crew to leeward, in order to heel her over sufficiently to raise the outboard delivery opening, which is below the water line, out of water. Some of the valve gear had been carried away, and a stream of water twenty inches in diameter had already risen above the fire room floor and menaced the fires. Luckily the weather was calm and the sea smooth, as otherwise the difficulty in stopping the leak would have rendered the ship in imminent danger. Had she been properly constructed, a single compartment would have filled and there the mischief would have ended.

The great corporations owning lines of steamers, though lavish in expenditure for elaborate upholstery and gorgeous decorations, with strange inconsistency are parsimonious in the extreme in matters of the most vital importance regarding the safety of their vessels and passengers.

The cases of the side wheel steamer Bienville, of the Pacific Mail Company, which was burned at sea on her passage from New York to Aspinwall on the 5th of August, also of the America, another large steamer belonging to the same company, burned at Yokohama, Japan, August 24, and that of the propeller Nevada, consumed by fire in New London harbor on the 31st of the same month, are similar in many respects. Both doubtless owe their loss to spontaneous combustion taking place in their cargoes. The Bienville, though fitted with steam pumps and other fire extinguishing apparatus, found in the hour of danger that they were useless.

Complete immunity from the dangers of marine conflagrations we hardly expect. As if in mockery of man's best efforts, the news comes to us from Yokohama (Japan) of the burning of the magnificent steamer America, belonging to the Pacific Mail Line, and one of the largest side wheel vessels in the world, in the harbor of that city. She contained every improved appliance, and her fire regulations were supposed to be nearly perfect. She arrived at Yokohama on the morning of August 24, and at 11 o'clock on the same night the freight deck took fire, and immediately the whole ship was enveloped in flames, defying all efforts to extinguish them. The vessel was totally destroyed, together with the mails, freight, and the luggage of the passengers and officers. The rapid progress made by the fire forced all hands to jump into the water, there not being time even to lower the boats. The America measured 4,454 tuns, hull of live oak, divided into compartments by means of three bulkheads. Her engine was 2,230 horse power, steam cylinder 105 inches in diameter, piston stroke 12 feet, wheels 42 feet diameter, 12 feet face; four boilers, each having six furnaces.

For use, in case of fire or leakage, the vessel is said to have been provided with an independent boiler and pump upon each deck, throwing from seven to ten streams, besides other devices for extinguishing fire.

There seems to be no really valuable system for extinguishing fire aboard ship. Even closing all hatches and ports does not render the hull airtight, and unless it is very nearly so, jets of steam or of gas from extinguishers are of little avail. A mode of completely flooding a vessel is needed, and the subject is worthy of the attention of inventors. We published, a short time since, a valuable method of laying pipes through factories and other large buildings, by means of which the most spacious apartment can be completely drenched in a few seconds. Repeated tests have proved the efficiency of this system, which may be easily modified for vessels. We are of opinion that owners should be compelled to locate pipes through which water might be forced into every part of the cargo without breaking bulk, and more especially should this be insisted upon in cases where, like that of the Nevada, the vessel is loaded with dangerous materials.

CAR COUPLING DANGERS.

We publish in another column the letter of an esteemed correspondent, who complains very strongly against the railway companies for their neglect in not supplying proper means or enforcing proper regulations for the coupling of their cars. It is undoubtedly true, as he states, that many lives are annually lost, and many families reduced to bitter distress in consequence of this neglect.

How to remedy the matter in an effectual manner appears to be a question somewhat difficult of solution.

The common method of coupling is by means of an open link, each end of which is secured in the end of the platform buffer or drawhead by means of an iron pin. In the act of coupling, it is common for the brakeman to stand between the two cars that are to be connected, for the purpose of holding up and guiding the link into the mouth of the opposite buffer; the engineer now backs the train, and, as the cars approach, the brakeman directs the link with one hand and with the other drops in the pin when the link has reached its place in the buffer. This is a quick and simple operation, and would not be especially dangerous if the track were always level, the cars all of uniform weight, and engineers always careful and dextrous in the management of their locomotives. But such is not the case, and the cars are sometimes brought together with such rapidity and force that the poor brakeman is crushed before he can jump out from between them.

Of all people in the world, railway operatives are the most reckless in regard to their lives, which they do not hesitate to hazard for the purpose of saving themselves the slightest trouble. This matter of car coupling is an example. We believe it to be entirely unnecessary for the brakeman to stand upon the platform and, by the use of a loop of twine or a crooked stick, hold up and direct the link into its proper place, and so avoid all danger to his person. But this precaution is attended with the trouble of climbing to the car platform, providing the string, keeping it always in readiness, etc. Rather than do this, he recklessly places himself between the cars, and runs the terrible risk of his life.

Multitudes of self acting car couplers have been invented, and some of them have been brought into use. But the link and pin is so simple, so well adapted to cars of varying hights and sizes, so easily renewed when broken, so quick, effective and safe if properly treated, that their displacement by a more expensive or complicated device is difficult, if not impossible.

We should be glad to receive the views of other correspondents upon the subject, especially of practical railway men.

AN AUCTION SALE OF MODELS AT THE PATENT OFFICE.

For the past few years the Commissioner of Patents has been puzzled to know what to do with the great number of models of rejected applications which have accumulated during more than thirty years, and occupying, as they have done until the past year, the whole of the west wing of the model room in the Patent Office. But an act of Congress, approved July 8, 1872, solved the problem, by authorizing the Commissioner of Patents to restore to the respective applicants such of the models, belonging to applications that have been finally rejected for one year, as he should not think proper to be preserved, or to sell or otherwise dispose of them as he might think proper. In considering in what way he could dispose of these models, he conceived the idea of using them to educate the youth in the different institutions of learning throughout the country, and accordingly, by an Associated Press dispatch, made known the fact that such institutions of learning as desired the models could have them, subject to a stipulation that they were to be preserved in good condition and returned to the Office upon the order of the Commissioner. This was a little more than a year ago, since when some seventy institutions have availed themselves of the privilege afforded of getting these models, and have received in all upwards of seventy thousand of them. Each institution sent a representative, who selected such of the models as he thought proper, and of these was made a list, which is preserved by the Commissioner, so that, in the event of any of the models that have been given out being required, the Office can obtain them. Of the models not wanted by any institution, there were some thousands, mostly in a broken and dilapidated condition: and these were a few days since sold at auction, in accordance with an advertisement which had appeared in the papers for a month previously. On the day of sale, the models and fragments were heaped together in sixty lots on the floor of the west hall of the Patent Office building, and the sale of them realized to the Office between seven and eight hundred dollars only, the prices varying from five dollars to one hundred and twenty-five dollars per lot. One lot of lamps sold for forty dollars to a gentleman, to be taken to Chicago; and another, a lot of sewing machines, some sixty in number, together with a quantity of odds and ends of sewing machine attachments, brought sixty dollars.

THE CINCINNATI INDUSTRIAL EXPOSITION.

The third Industrial Exposition in Cincinnati opened on September 3, and, we are informed, will surpass anything of the kind ever before held in that city. The buildings devoted to the fair have been greatly enlarged, until at present nearly four acres of ground are under roof, while altogether there are seven acres of exhibiting space. The exhibitors this year at present number 1,500, with 4,000 entries.

The premium list for this year is especially attractive. There are ninety medals of gold, three hundred and ten of silver, and three hundred and seventy of bronze, the whole costing some $12,000. The interior of the main hall is beautifully decorated, while the floral hall contains three miles of evergreens. The latter covers 21,000 square feet of ground space, and is surmounted by a roof containing 12,000 feet of glass. A superb display of rare and exotic plants, rustic work and ornamental gardening is to be exhibited. In the natural history department, which is not yet completed, innumerable *fossils*, skeletons and shells are being arranged. The power hall is not large enough, as it covers only about two thirds of an acre. Machinery of all descriptions will be represented. Fifteen engines are now in position, most of them running. Altogether over three hundred machines will be actually worked by steam power, the conditions of their exhibition being such that they will not be allowed to remain at rest. Wood working machinery, it is stated, will preponderate. The art hall contains five hundred oil paintings, contributed by citizens, many of which are by celebrated masters. Besides oil paintings, there will be a large display of water colors, engravings and photographs.

This exposition will be one of the largest ever held in this country and is especially remarkable as contrasted with its predecessors, which, though of much interest, were of no great magnitude. The railroads, extending in all over some 15,000 miles, communicating with Cincinnati have made liberal half fare arrangements, to continue during the fair, and the hotels of the city are making every preparation for the reception of the expected throng of visitors.

MEETING OF THE BRITISH ASSOCIATION.---ADDRESS BY A NEW YORK HERALD REPORTER.---LIVINGSTONE IN AFRICA.

The British Association met this year at Brighton, August 14, and on the next day Dr. Carpenter, the newly elected President, delivered his inaugural oration. But the great feature of a following meeting was the address of Mr. Henry M. Stanley, a correspondent of the New York *Herald*, who has suddenly achieved fame, if not fortune, by a successful adventure in Africa in search of the famous traveller, Dr. Livingstone. The Doctor had not been heard from for nearly three years, and much anxiety was felt in England in regard to his safety. The public interest in his behalf reached such a pitch that the Government finally organized an expedition for a search after the missing explorer, while a voluntary contribution for supplies and other assistance, amounting to some $25,000, was gathered. The starting point for these relief expeditions was Zanzibar, a well known settlement and steam packet post on the east coast of Africa, six degrees south of the equator. On this parallel, the width of the African continent, from the Indian ocean to the Atlantic, is only about eighteen hundred miles. The headquarters of Livingstone were known to be somewhere in the vicinity of a collection of native huts, designated as Ujiji, on the banks of a great lake, discovered by previous travellers, and called Lake Tanganyika. The route from Zanzibar to Ujiji is well known, distance about seven hundred miles, the first four hundred of which are very difficult to pass on account of the marshy nature of the ground and the extreme warmth of the climate.

The newspaper discussions, preparations and movements connected with the sending of the relief expedition excited

much interest in Great Britain, and it occurred to Mr. James Gordon Bennett, proprietor of the New York *Herald*, who was in England at this time, that it would not be a bad idea to dispatch one of his reporters to Zanzibar, and if possible send him on ahead of the relief party to interview Dr. Livingstone, and bring back news of the celebrated traveller in advance of other newspapers. No sooner thought of than done. A reporter was selected in the person of a young American rover, named Henry M. Stanley, who at once started for Zanzibar, where he engaged guides and men to accompany him, and then pushed on through the forest for Ujiji, which place they reached after some difficulties, and here they found Dr. Livingstone, waiting for long expected supplies.

The reporter was enabled to relieve the Doctor's immediate necessities; and after procuring from him letters giving an outline of his discoveries, with messages for friends at home, the enterprising Stanley posted back to the sea coast, then on to England with the great news, first directing further supplies to be sent from Zanzibar to Dr. Livingstone, who will proceed with his explorations. Stanley's recent arrival in England produced, as might have been expected, an immense sensation. His pluck in walking six hundred miles through the woodsand mires, under a broiling sun, to interview Livingstone,and the enterprise of the New York *Herald* in sending him, have formed the subject of many columns of laudation in the various British papers.

At the meeting of the British Association, Mr. Stanley, by special invitation, gave an account of his African march before a very large and distinguished audience, composed of the members of the Association and their invited guests, among whom the nobility were strongly represented. The Ex-Emperor Napoleon, Eugénie and son were among the most interested auditors.

In the discussion which followed, some of the geographers pointed out the improbability of certain deductions made by Livingstone in respect to the sources of the Nile, while other places, reported by Stanley as the discoveries of Livingstone, were declared to have been visited by other travellers, among them Dr. Schweinfurth, the celebrated German *savant*. One of the reports says that Stanley "did not content himself with refuting Dr. Beke or Sir Henry Rawlinson; he abused them in a rhetorical way for differing from his friend Dr. Livingstone. Every one was glad to see the brave and absent and ancient explorer have so stout a champion present at the meeting. The Doctor must have charmed and inspired Stanley, or Stanley, with the generous heroism of youth and sympathy for common danger and suffering, resolutely liked the Doctor, and took his part against all adversaries and critics. Sometimes he answered by a dramatic grimace alone, and anon by a thundering denunciation of those who sat at home and criticized maps to contradict those who, by travel and peril and patience, have penetrated the dangerous lands and seen for themselves. When he referred to Schweinfurth, he exclaimed, 'I never heard the name of that German Doctor before. Ladies and gentlemen, there never was an Englishman who discovered anything, lake or land, river or mountain, or went anywhere, but immediately arises some red haired German and says he has been there before.' This thrust at the Germans delighted the Imperial party beyond measure. The Emperor shook with merriment. The Empress contrived to understand it, and for the first time was convulsed with laughter, in which her son also joined."

From the letters brought home by Stanley from Dr. Livingstone, it appears that he has been principally engaged during the past three years in tracing out the watershed of the Nile, and thinks that he has now nearly finished the business. He has discovered some very remarkable regions, full of great fountains, streams, and lakes. "I have ascertained," he says, "that the watershed of the Nile is a broad upland, between 10° and 12° south latitude, and from 4,000 to 5,000 feet above the level of the sea. Mountains stand on it at various points, which, though not apparently very high, are between 6,000 and 7,000 feet of actual altitude. The watershed is over 700 miles in length from east to west. The springs that rise on it are almost innumerable."

THE OPENING OF THE AMERICAN INSTITUTE FAIR.

The forty-first Annual Exposition of the American Institute was formally opened at the building of the association on the corner of 63d street and Third avenue, in this city, on the morning of the 4th ultimo. The exercises consisted of music by the orchestra, and an address delivered by Hon. F. A. P. Barnard, the President of the Institute, in which the prominent position and rapid progress of the United States in industrial matters, and the value of the efforts of the American Institute in forwarding and fostering native talent, were especially dwelt upon. The speaker considered that the productive power of manufacturing industry has more than doubled since the foundation of the Institute, and has increased tenfold since the Declaration of Independence. The relation of the industrial arts to civilization, the progress of modern industry, and the influence of science upon improvements, were learnedly discussed. In speaking on the last mentioned topic, the latest discoveries and inventions in dyeing, weaving, printing, ice making, explosives, intercommunication, and transportation were cited as examples. An earnest advocacy of international exhibitions in general, and an appeal in behalf of the coming Vienna Exposition in particular, concluded the oration.

As is usual on every opening day, the internal arrangements of the building were in a state of disorganization, and workmen were still busy in the different departments, completing the alterations necessary to accommodate the increased demands for space. Very few articles were in position, though exhibitors are now sending and arranging their goods with all possible dispatch. The applications for space, we learn, are more numerous than ever before, so that the Exposition bids fair to be far superior to that of last year. The managers are using every endeavor to finish the preparations for the reception of visitors, and they state that everything will be in place in a few days.

The department of engines and machinery, at the time of writing, is quite unprepared. All the boilers but two have been placed, and most of the shafting has been hung. We notice a rotary engine and a portable saw mill among the novelties. In the large hall, a vast variety of articles is present, which, in their present confused condition, it is impossible to particularize. In the art gallery, an elaborate display of photographs, drawings, etc., is expected. The department of the dwelling, which is rather more advanced than the other portions of the fair, contains several unique improvements in household furniture and appliances, which we shall notice in detail hereafter. In the center of the main floor is a huge soda water fountain surmounted by a colossal statue, which will doubtless prove an object of considerable attraction. The interior of the building is quite tastefully decorated, and will be brilliantly illuminated.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The twenty-first session of the American Association for the Advancement of Science has recently been held at Dubuque, Iowa. Several of our most eminent scientists were unfortunately absent, so that, as compared with those of last year, the transactions of the meeting present much fewer points of interest.

We regret to notice that the proceedings were not conducted with that gravity and dignity which we might expect from a learned body strictly devoted to the investigation of scientific subjects. The much vexed subject of temperance and the political discussion, into which the resolutions relative to the disposition of the Chinese indemnity fund seem to have drifted, were entirely out of the province of the meeting, and have only served as a text for the inane ridicule in which certain of our daily journals seem to revel, whenever they perceive anything at all extraordinary in the, to them, incomprehensible proceedings of scientific associations.

The session terminated with the usual excursions of the members to the interesting localities in the vicinity of Dubuque. The place of meeting next year, on the third Wednesday of August, will be Portland, Me. The officers elected for 1873 are Professor Joseph Lovering, of Harvard University, President; Professor A. H. Worthen, State Geologist of Illinois, Vice President; Professor F. W. Putnam, of Salem, Mass., Permanent Secretary; Professor C. A. White, General Secretary, and W. S. Vaux of Philadelphia, Treasurer.

We shall give from time to time brief condensations of the most interesting and valuable of the papers read.

A NEW SPECIES OF FOSSIL ELEPHANT.

J. W. Foster, LL. D., of Chicago, pronounces a fossil tooth, which has been found near Terre Haute, Indiana, to be that of an elephant, but of a particular species of the animal which differs specifically from any yet discovered. He states that not only is the tooth admirably adapted to the three fold work of crushing, grinding, and triturating the food as it passes in the various stages of mastication through the mouth, but that there seem to be high ridges of enamel and deep valleys of cement in it, which lend peculiar efficiency to its work, the arrangement of the teeth and jaws being like a curiously devised hopper with an upper and a nether millstone, in which the coarsest fibrous materials could be reduced to a pulpy mass. The characteristics of the teeth of all known species of elephants, fossil or surviving, brought into comparison with the tooth in question, exhibit striking differences—which are held to be sufficient to constitute the new species of *Elephas Mississippiensis*, whose hight did not probably exceed six feet, being diminutive in comparison with the gigantic *Elephas Primigenius*; but nevertheless equally a mammal of the post-pliocene epoch, deserving of the closest study by American palæontologists.

POSITIONS FOR ASTRONOMICAL OBSERVATIONS.

Astronomical observations should be made from high elevations. Professor Young reports the whole number of lines in the chromosphere seen from Sherman, a lofty station on the Rocky Mountains, as 150, which is three times as great a number as have been observed before. In these localities, it is said, the atmosphere is steadier, and it is considered as owing to this fact that a star has been recognized at these high altitudes as having a companion or being a double star, not previously known as such.

An observer on the Pacific coast reports to Professor Pierce that he can see the companion of the star *Polaris* from a high point on the Sierra Nevada. It is well known that this is a test of great nicety, requiring the utmost purity of atmosphere. Telescopes will hereafter be placed higher than ever before—in Europe, probably on the Alps.

THE LOCOMOTION OF ANIMALS.

One of the most interesting papers read was prepared and delivered by Professor E. S. Morse, of Cambridge. The subject was the locomotion of animals, and the lecture, intended not merely for scientific consideration, was admirably adapted to popular comprehension by the graphic drawings made by the Professor on the black board during his discourse.

Microscopic animals were first treated. These move rapidly through the water by means of little oars or *ciliæ*. There are creatures which are destitute of shape and yet can form any part of themselves into stomach and digestive organs, or can temporarily assume forms which give them means of locomotion. Others throw out arms and seize their food, but yet have no specific shape when at rest.

Belonging to a higher order are the jelly fish. These strange creatures which, while in the water are perhaps as large as a wash tub, if dried scarcely weigh an ounce. They do not move by means of muscles, but by cells independent of each other, which, by contraction and expansion, answer the purpose of paddles.

The star fish is among the most curious of ocean forms, having his mouth in the center of his body, his eyes at the end of his arms, and a series of suckers, constituting locomotive appendages, thrown out from beneath the animal in the water. If the star fish wishes to travel, he attaches these suckers to whatever is ahead on the ocean bed before him and pulls himself forward. The common fresh water mussel has large muscles which give motion to a long foot which it wedges into the sand, and then, by contracting the foot, draws the shell after it. As they work along the shore, these fresh water mussels make grooves in the sand by which they can be tracked; in fact, wherever such a groove is, a mussel can usually be found at the end of it. There is another fresh water shell fish which darts out its foot with great rapidity and as suddenly contracts it, and by this propulsion swims through the water. The shell that pincushions are made of —the scollop—is that of an animal which swims by opening and closing its shells, forcing the water out from between them. The cuttle fish has two broad fins behind and a series of long arms in front. It draws in water as most shell fish do, but, unlike others, pumps it out in front so that it swims backward, though it has also, by other means, the power of swimming forward.

Worms move by means of little bristles which stick out from the sides of the body, and are used to hold part of the body while the rest expands, or while part expands the rest contracts, and thus the worm is drawn forward in sections. This is the case with the common angle worm. Among the crustaceans, the lobster either crawls forward with his legs or jumps backward by strokes with his tail. The eyes mounted on the end of long feelers can look over the shoulder of the animal while he is jumping backward.

In commenting upon lepidopterous and hymenopterous insects, the lecturer stated that, as with birds, if the wings are small, they move rapidly; if large, slowly. The grasshopper was referred to as having a variety of modes of locomotion; and the cheese mite or "skipper," it was stated, hopped by coiling his head and tail together in a ring and pulling them suddenly apart with a snap. After illustrating the movements of the fish and frog, those of the snake were explained. Its locomotion is obtained by means of scales, which are thrust against the ground by motions of the ribs, actuated by powerful muscles. It results that if a snake, though capable of the most rapid movement on the ground, be put on a smooth surface like that of glass or varnished wood, he will wriggle with great efforts, but make no forward progress.

The variety of functions performed by the muscles of the birds and the singular shapes of their bills, adapted to their various modes of feeding, were next illustrated. The arms are to become the organs of flight, and the bones are bridged, and trussed, and modified so as to give the requisite power. Below the heel and bones are extended and anchylosed so as to furnish the requisite prehensile strength. The tendons naturally close the toes when the weight of the body rests so as to bend the leg; thus the bird rests securely on its perch. Hence, also, the fowl always shuts its toes as it lifts them, because bending the leg draws the tendons. The modification of the arm in the bat still leaves it an organ of flight.

In the lower vertebrates we have simple fins; going up step by step the functions of the arm by degrees escape the need of use for locomotion. The higher the grade of animals, the greater the power of the arm for other purposes than that of locomotion. The monkey uses the arm and hand for a great variety of other purposes, such as for feeding itself, and the female monkey holds its young to its breast by means of its arms. At last with man the arm becomes a cephalic appendage, and is no longer used for purposes of locomotion, unless, indeed, he drives a hand car. Step by step among the lower animals we may trace the improvement of organ and of function until we reach its highest development in a species where only the lower limbs are employed to carry the body, and the upper become exclusively the servants of the brain.

TABLE OF VELOCITIES.

We publish in another column a list of one hundred and thirty velocities, interesting to engineers and mechanics, compiled by Dr. E. Hartig, Professor at the Royal Polytechnic School at Dresden, and translated for our journal by Dr. Adolph Ott. Information is given regarding the velocity of parts of almost every kind of machine, of mechanical tools, of water and air under varied circumstances, of vessels, of grain in elevators, of the flight of birds, of the transmission of sensation through the nerves, of railroad trains, of sound, of light, and finally of the electric current. The lowest velocity given is that of the burning of Beckford's fuse, which is consumed at the rate of ·39 inches per second; the highest is that of the discharging current of a Leyden jar in copper wire 1·7 millimeters in thickness, by which the inconceivable speed of 288,004 $\frac{8}{10}$ miles is obtained in the same space of time. The table is worthy of careful perusal and preservation, as it contains many curious and interesting facts obtained by comparisons of the data given. Thus the highest velocity of the express trains on German railways (about 50·3 miles per hour) is greater than that of a strong wind. The velocity of the transmission of irritation in our sensa

tory or motatory nerves is exceeded in rapidity by the flight of the swallow or eagle.

The compilation is of direct practical value, as it gives not only the highest admissible velocities, but also those that are the most advantageous in running a large number of the mechanical appliances in common use.

EXTENSION OF PATENTS. VALUE OF THE INVENTION.

To one who is conversant with the proceedings of the Patent Office upon application for the extension of patents, it is painful to observe how many of them fail, though they deserve success, because the requisite formalities have not been well understood and observed. While it is often obvious that the patent ought to be renewed, yet the privilege has to be denied, because the proper information has not been furnished to justify the Commissioner in granting it.

Before acting favorably in such cases, he ought to be satisfied, for instance, that the invention covered by the patent is of sufficient importance to warrant his action. It is a very common incident to find the device wholly frivolous, or so poorly adapted to practical use as to be of no value whatever. Yet the patent for it may stand in the way of others who are endeavoring to achieve some highly useful improvements, but cannot bring them to perfection without infringing the patent. It not unfrequently happens, also, that the patentee has received a greater or less sum from his invention, and the question will arise whether that is not as large a remuneration as his invention is entitled to. There are abundant reasons, in short, why the petitioner should make the value of the invention to appear. Accordingly the applicant for an extension is required in every instance to give a detailed statement of the value under his own oath, and to corroborate it by the evidence of disinterested witnesses. Something more is intended by this than a naked averment that the invention is worth a certain specified sum. The Commissioner should have the means of judging for himself what it is worth. The data should be furnished upon which he can decide for himself, and form an intelligent estimate of his own. Otherwise he might just as well take the petitioner's naked assurance that the invention is of sufficient value to entitle it to an extension.

The most satisfactory way in which this requirement is usually met is to show how many machines (if such is the invention) have been built and put in operation under the patent, and what is the net gain per day, or year, of running such a machine over those of the same kind which were known before. It can generally be made to appear that the products are so many more in number, or are worth so much more. If these statements are confirmed by disinterested witnesses, they constitute data from which a very fair calculation of the value of the invention can be made, and one that can usually be relied on.

When the invention is merely an improvement on some old instrument, a similar course can be pursued, and a comparison instituted between the instrument without the improvement, and the new one which embodies it.

It sometimes happens that, through poverty or injudicious sale of the invention, the patentee has been prevented from introducing it into use, as he might otherwise have done, and hence cannot furnish such a statement. He should explain this in making his application, and should satisfy the Commissioner by other means how much more valuable his machine is than others intended for the same purpose, and also whether it would go into use if he should obtain an extension of his patent. He may by these means furnish the Commissioner with good grounds for granting his petition.

These examples may serve to illustrate the measures necessary to be taken in order to establish the importance of the invention, to show that the patent deserves to be prolonged, and that the remuneration already received is less than the patentee is justly entitled to. The point to be kept in view is to furnish the Office with such information as will enable it to form an independent judgment upon the subject. The facts are what are wanted, not the opinions of others The affidavits of the most skillful experts that the invention is worth any particular sum, or is of great consequence, are of no use, because they undertake to substitute the estimates of other men in the place of those who have been designated by law to exercise their own facilities in forming the estimates to be acted upon. No one would think of asking a judge sitting in a court of law to rest his decision upon the views entertained by the ablest of his bar. Neither should the Commissioner, in determining whether a patent should be extended, be governed by the conclusions which any one else has formed, however competent he may be. His country holds the Commissioner responsible for what he decides, and relies on him for being guided by his own views.

A New Fuel for Locomotives.

The Russian Steamship and Railway Company announces that it has found the use of naphtha for steam generation, with locomotives, very advantageous. The material employed by the company is the crude oil from the Caucasian and Volga regions, and, compared by weight, the amount consumed was about one half that of coal. The arrangement for burning naphtha is stated to be of such a nature that no difficulty will be experienced in substituting one for coal consumption in place of it, should it be found desirable so to do.

Careful and repeated experiments made in this country during the past five years, in the burning of crude petroleum as a fuel for locomotives and ocean steamers, established the fact that the oil was a much dearer fuel than coal. Reports of these experiments will be found in the back volumes of the SCIENTIFIC AMERICAN.

Facts for the Ladies.—Mrs. C. G. Dodd, Bloomfield, N. J., has used a $50 Wheeler & Wilson Lock-Stitch Machine since 1860, in family and general sewing, without repairs, and but one needle broken. See the new Improvements and Woods' Lock-Stitch Ripper.

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.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 12c. a line.

Rotary Hoisting Machines; Reversible, no centers; recommended by best Engineers. Send orders to Lighthall, Beekman & Co.

Gauge Lathes for Handles, and all kinds of straight and taper turning, $30.00. Wm. Scott, Binghamton, N. Y.

T. R. Bailey & Vail, Lockport, N. Y., Manf. Gauge Lathes.

Wanted—A large iron Cylinder Tank, six or eight feet in diameter, suitable for preparing wood under pressure. Address Baugh & Sons, 20 South Delaware Avenue, Philadelphia, Pa.

Manufacturers of Water Meters and other Water Works Supplies, send Circulars to Water Company, Memphis, Tenn.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co., Hartford, Conn.

Wanted—Hydraulic Press, ram 6 to 8 in. diam., platen about 40 in. between bolts. Address Joseph C. Hewitt, 17 Burling Slip, New York.

Wanted—Machines for making percussion caps. Address A. Ott, P. O. Box 2705, New York city.

For Sale—Machine Shop for light work, complete. Terms easy, or real estate. Address M. Cooke, 95 Liberty Street, New York.

Wanted—Copper, Brass, Tea Lead, and Turnings from all parts of the United States and Canada. Duplaine & Reeves, 760 South Broad Street, Philadelphia, Pa.

Engine and Speed Lathes of superior quality, with hardened Steel bearings, just finished at the Washburn Shop, connected with the Free Institute, Worcester, Mass.

Brick and Mortar Elevator and Distributor—Patent for Sale. See description in SCI. AMERICAN, July 20, 1872. T. Shanks, Lombard and Sharp Streets, Baltimore, Md.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th 1869. Also, Glazier's Diamonds John Dickinson, 64 Nassau st., N. Y.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 414 Water st., N. Y.

For Machinists' Tools and Supplies of every description, address Kelly, Howell & Ludwig, 917 Market Street, Philadelphia, Pa.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1909.

Sixty Rotary Engines, 2 to 80 H.P., working in and about New York city, as Steam Engines, Hoisting Machines, and Air Pumps. Send for Circular to Lighthall, Beekman & Co., 5 Bowling Green, N. Y. city.

Alcott Lathes, for Broom, Rake, and Hoe Handles. S. C. Hills, 32 Courtlandt street, New York.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Models and Patterns of all kinds made in the best manner at lowest prices. Geo. B. Kilbon, 35 Market St., Springfield, Mass.

Who fits up and furnishes the tools, machinery, and fixtures for factories of shoe lasts, especially polishing and grinding machines? Offers, with illustrated catalogues and prices, to be addressed to T. V., 788, care of Messrs. Hassenstein & Vogler, Stuttgart, Germany.

Tested Machinery Oils—Kelley's Patent Sperm Oil, $1 gallon; Engine Oil, 75 cts.; Filtered Rock Lubricating Oil, 75 cts. Send for certificates. 116 Maiden Lane, New York.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

Flouring Mill near St. Louis, Mo., for Sale. See back page.

Steel Castings to pattern, strong and tough. Can be forged and tempered. Address Collins & Co., 212 Water St., New York.

Walrus Leather for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

Kelley's Chemical Metallic Paints, $1, $1·50, $2 per gallon, mixed ready for use. Send for cards of colors, &c., 116 Maiden Lane, N. Y.

Kelley's Pat. Petroleum Linseed Oil, 50c. gal., 116 Maiden Lane.

Ashcroft's Original Steam Gauge, best and cheapest in the market. Address E. H. Ashcroft, Sudbury St., Boston, Mass.

Ashcroft's Self-Testing Steam Gauge can be tested without removing it from its position.

Air Pumps—Rotary Air Pumps, the simplest, best and cheapest. Send for circular to Lighthall, Beekman & Co., 5 Bowling Green, New York city.

Brown's Pipe Tongs—Manufactured exclusively by Ashcroft, Sudbury St., Boston, Mass.

For 2, 4, 6 & 8 H.P. Engines, address Twiss Bro., New Haven, Ct.

American Boiler Powder Co., Box 797, Pittsburgh, Pa., make the only safe, sure, and cheap remedy for 'Scaly Boilers.' Orders solicited.

Windmills: Get the best. A. P. Brown & Co., 61 Park Place, N. Y.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Better than the Best—Davis' Patent Recording Steam Gauge. Simple and Cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

The Berryman Manf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For hand fire engines, address Rumsey & Co., Seneca Falls, N. Y.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies see Manufacturing News of United States in Boston Commercial Bulletin. Terms $3 a year

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

Portable Baths. Address Portable Bath Co., Sag Harbor, N. Y.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N. J. Also 2-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

New Pat. Perforated Metallic Graining Tools, do first class work, in less than half the usual time and makes every man a first class Grainer. Address J. J. Callow, Cleveland, Ohio.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

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.—PRINTING ON METAL.—Can any one inform me if printing with ordinary type can be done on polished surfaces of either brass or iron, and how?—T. S. R.

2.—INJECTOR.—Will any of your readers tell me how to make an injector for the boiler of a one half horse power steam engine?—F. W.

3.—PARASITE OF THE BLACK CRICKET.—I recently crushed a common black cricket, about three fourths of an inch in length; and there came out of the body of the insect a brownish colored water snake more than 9 inches long, about one sixteenth of an inch at the largest diameter or center, and about one thirty-second of an inch at the smallest, or neck, with some appearance of a head. It has lived now 48 hours in water, and there is no diminution of vigor. It is very active. The cricket was very lively with its strange burden which was packed into the body between the soft parts and the external shell. Can you tell me what the phenomenon means? Did the cricket swallow the snake, or did the snake originate there?—H. E. C.

4.—SAW MILL QUERIES.—I am about erecting a saw mill on a small stream, under a 10 feet head; and I propose using a center vent wooden wheel of 5 feet diameter, with 14 inches depth of bucket. What number of inches of water under that head will it be necessary to use to drive a 5½ feet circular saw at the speed of from 900 to 1,000 revolutions per minute with a capacity of 6,000 feet of lumber in 12 hours? What number of revolutions would such a wheel make per minute when laboring under the full capacity? Is there any system of feed works whereby feed can be regulated while the saw is running? I do not like the system of cone pulleys or the sliding belt cone feed. I wish to arrange so that I can change the cut of the saw to light or heavy feed, without shifting belts. If there is any such device, I would like to have a description of it.—P. P. S.

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.

MAKING WOOD AIRTIGHT.—O. S. C.'s query is too vague. Does he mean stopping the cracks in wooden buildings, or closing the pores of porous timber?

B. F. C.—The mineral you send is iron pyrites—sulphur and iron; it is of no special value.

W. M., of Minn.—We do not recommend the use of any patent eye cups for improving the sight. If we ever advocated their use, it must have been many years ago, when we were young and inexperienced.

THE TRANSPARENT LIQUID OF THE ORGANS OF VISION.—J. De W. C.'s suggestion can easily be tried by himself or the nearest photographer. How does he propose to make the liquid deposit a film?

RUST INDUCED BY SODA AND CHLORIDE OF LIME.—S. A. T., of Pa., should be careful not to leave any salts exposed to the air near bright steel goods. Chloride of lime will absorb moisture till all the chlorine is set free, and will then yield it again to the atmosphere.

REMOVING IRON RUST.—To R., query 1, page 122.—Put one half teaspoonful oxalic acid to one half teacup of water, and apply it to iron rust, fruit and other stains. Exposure to the sun will remove them.—Mrs. P., of Tenn. [Yes, and the acid will destroy the fabric unless washed off soon after its application.—EDS.

CHLOROFORM.—C. T. B., query 1, page 170, is informed that chloroform consists of three atoms of chlorine and one atom of formyl, which latter is a bicarburet of hydrogen. It may be thus called terchloride of formyl, and it has the formula

$$C_2HCl_3.$$

Its manufacture is always a complicated process, one of the simplest forms being as follows: Put three pounds chlorinated lime into two gallons alcohol of sp. gr. ·84; distil a gallon from this mixture, and rectify by redistillation, first from a great excess of chlorinated lime and afterwards from carbonate of potassa.—D. B., of N. Y.

THE JAWSHARP.—B. query 15, page 170, may be assured that the various tones of the jawsharp are caused by the different pressures of the breath on the tongue of the harp, which tongue is kept in motion by the touch of a finger. The vibration of the vocal organ would not affect it, unless the player sang on to the instrument.—D. B., of N. Y.

MILK AND INK STAINS.—P., query 3, page 170, is informed that the milk, being left to dry in the fabric, develops lactic acid, which is the only matter in milk that could affect an ink stain. I do not think an ink blot that had been dry for a few weeks could be affected by this acid.—D. B., of N. Y.

KOUMISS.—Query 4, page 170.—W. R. J. will find some difficulty in preparing koumiss unless he has access to a horse breeding farm. The genuine koumiss of Tartary is distilled from mare's milk while undergoing fermentation, and the milk will yield the large proportion of 14 ounces of an alcoholic fluid for every 21 ounces milk. This fluid contains about 6 ounces alcohol. Cow's milk contains less saccharine matter, and consequently yields less alcohol in distillation.—D. B., of N. Y.

RUST JOINTS.—Query 9, page 170.—Has D. M. tried the effect of heat, applied externally, so as to expand the socket?—D. B., of N. Y.

SPONTANEOUS IGNITION.—To G. T. R., query 9, page 122.—Mix a tablespoonful of chlorate of potassium with about the same amount of brown sugar. If a few drops of ordinary sulphuric acid be poured on this mixture, it will ignite and burn with a beautiful violet colored flame, giving sufficient light for your purpose.—P. T. B., of N. Y.

SOLDERING LEAD.—To J. C. H., query 4, page 138.—Plumbers' solder is an alloy of 1 part lead and ½ part tin; apply with an ordinary soldering iron, the joint having been first scraped clean and rubbed with tallow or rosin.—C. O. I., of Pa.

Recent American and Foreign Patents.

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

DREDGING MACHINE.—Hyacinthe Gonellaz, of Houma, La.—This invention relates to a new dredging machine, to be used in rivers, canals, or lakes; and consists in a novel arrangement of colters and buckets with swinging backs or dumping spoons, receiving pans, and operating mechanism. Whenever a filled bucket arrives in front of the receiving pan, the latter is swung toward the same into position to receive the contents discharged therefrom. The pan is then carried back and dumps its contents into a second distributing pan, receiving reservoir, or tank. Whenever a bucket arrives in front of the pan, in position for discharging its contents, the spoon in such bucket is vibrated by gravity and by its connection, or either, to insure a complete discharge.

INK FOUNTAIN FOR PRINTING PRESS.—Henry B. Allen, Brooklyn, N. Y.—This invention has for its object to facilitate the adjustment of the bottom of an ink fountain during operation of the press with which the same is connected. Ink fountains having adjustable bottoms were heretofore provided with screws beneath the bottoms for regulating the same and thereby controlling the efflux of ink. It was difficult to reach the screws under the fountain, and occasioned at times injury to the hands of the attendants, which were jammed between the fountain and the ink disk. This invention consists in applying the screw by which the bottom of the fountain is adjusted above the bottom through a bridge that extends across the top of the fountain. The screw or the nut thereon is thereby exposed and in convenient position for adjustment.

CARRIAGE RUNNING GEAR.—William Hemme, Michigan Valley, Kan.—This invention refers to an improved running gear in which the two axles are connected with each other, not by a perch, as usually, but by a rod, which is jointed at both ends. This rod keeps the axles in the middle a certain distance apart, and at the same time permits their being easily turned in a horizontal direction. By an improved connection at the hounds the hind axle will, whenever the front axle is turned, be swung in the opposite direction, carrying the hind wheels into the track in which the front wheels are running. The turning of the vehicle and its management are thereby materially facilitated. The claims allowed cover the combination with the axles of the rod jointed at each end to one of said axles, the slotted rear hound, and the overlapping front hound having a pivot on the end.

GLOVE.—Solomon J. Clute and Daniel M. Durfee, Rockwood, N. Y.—The gloves upon which this claims to be an improvement are mainly formed of a plain piece and two fourchettes, the former being cut so as to lap and constitute the back of the first and fourth fingers, and the latter to form the back of the second and third fingers. By the new method of cutting out gloves the palm piece is made of such form and size, and so much of the glove is taken up by the three fourchettes, that a skin which is defective may be utilized, without any increased cost in sewing or making up the glove, labor being always a small item of expense as compared with the stock or material used, thus saving a great amount of stock.

COUGH LOZENGE.—Edmond Gauvreau, Quebec, Canada.—This invention or discovery relates to a new and useful compound, in the form of lozenges, for the cure of coughs, colds, and affections of the throat and lungs, and all diseases of the respiratory organs. The inventor takes two parts of pulverized Ipecacuanha and opium, sixty-four parts sugar, one part citric acid (solution), two parts alcohol, one part sirup of pine apple; tragacanth sufficient for coloring. These ingredients are mixed together to form a solid mass of paste, which is then cut into lozenges, and put up in boxes for use.

PERAMBULATOR.—Thomas Galt, Rock Island, Ill.—This invention relates to a new perambulator whose handle is connected with the front axle, to steer by means of the front wheels, and it chiefly consists in a new manner of connecting the handle with the axle; also, in a reversible feature which allows the handle to be applied to the front of the vehicle to convert it into a four wheeled carriage that is drawn forward instead of pushed; and, further in the use of stops on the under side of the carriage for arresting the perambulator handle during the side motion, and preventing it from becoming disconnected from the axle.

MOTIVE POWER FOR OPERATING SEWING MACHINES.—Henry Warren and Charles H. Luther, Providence, R. I.—This invention consists of a nove and efficient arrangement of a spring winding, holding, regulating, and transmitting apparatus. A crank shaft has a drum inclosing a spring fixed loosely on it, said spring being connected at its outer end to said drum, and at the inner end to a hub made fast to the shaft. The face of this drum gears with a small roller, by frictional contact, to transmit the motion through a shaft and pulley. A disk at one side of the drum, attached to brackets, projects from one side of the frame, and has a ratchet toothed hub, on the outside, for holding the shaft after the spring has been wound up by a pawl, pivoted on an arm of said shaft. There is a friction holding disk on one side of the drum, opposite to the one where the ratchet is arranged. Its hub is pivoted in the ends of a crotched shifting lever pivoted on the bracket. This disk, being pressed against the side of the drum, will stop the machine or slow the motion, as required. It also holds the disk while winding up the spring, which is done by turning a hand crank. This arrangement affords a simple and efficient apparatus, which may be wound up by a few turns of the crank, and will run a sewing machine or other light machinery very much longer than the time required to wind it up.

FLOUR PACKER.—Charles E. Zimmerman, Frederick, Md.—This invention is an improvement in flour packers of the class in which an ascending and descending platform for carrying the barrel is operated by a counterpoise weight and graduated conical roller, said platform acting in connection with a fixed curb that enters the barrel, and within which the packing devices proper are rotated. The invention consists of a drop plug for cutting off the flour, and contrivances, to be set free by the descending platform, for dropping the plug at the proper time; and it also consists of a register arranged in connection with the apparatus, and having a weighted lever for actuating the pawl so arranged as to be tripped by the platform when it goes down, so as to register each time.

RAIN WATER CUT OFF.—John Abercrombie and Elijah D. Miner, of Morrisania, N. Y.—This invention consists of a spout pivoted to a leader pipe at a hole in the side of said pipe in such manner that it will swing up against the pipe, close the hole, and constitute a part of the side of the pipe when it is desired to have the water run straight down through the pipe to the cistern below; and when it is desired to shut the water off from the cistern and spout it out upon the ground or into a trough or the like the said spout will swing down to a standing position, close the passage down the pipe, and open the one through the side. The inner end at this time closes up against a curved deflecting plate fitted on the inside of the leader pipe in such manner as to fit snugly into the upper side of the spout and make a tight joint between the said inner end of the spout and the side of the leader pipe.

PISTON ROD PACKING.—James Melledge Flagg, of Providence, R. I.—The object of this invention is to furnish an article for packing the piston rods and valve rods of steam engines that can be easily applied, and that will stand heat and pressure without being injured. The inventor takes a cord of rubber, prepared by a process of his own. Over this cord he braids a covering of cotton yarn, then soaks the cord so arranged in a solution of alum, and then applies, with a brush or in some other manner, a mixture composed of: argillaceous mineral, silica, water; a trace of magnesium, iron, and lime, ground asbestos, powdered plumbago, alum, and common hard soap are added. After two or three coats of the mixture have been applied and while yet in a moist state, a coating of undressed hemp, twine or similar material is braided over it. Other coats of the mixture are applied until the packing is of the desired diameter; it is then finished with a braiding of cotton yarn. The packing after being soaked in a solution of the argillaceous mineral and alum is wound spirally around an arbor and by means of a screw forced into a mold or tube of the desired size. Finally the vulcanizing process, before referred to, is applied, and when the packing is removed from the mold it retains the spiral shape, so that it can be applied to piston or valve rods by what is known as "cork screwing" and ushed "home" into the gland, which it is designed to exactly fit.

VARNISH PACKAGE.—William C. Kennedy, New York city, and Peter T. Kennedy, Bradford, Pa.—This invention relates to an improved keg for holding and transporting varnish, and the improvement consists in giving an arched form to the metal head, to which the lifting handle or bail is applied, and in fitting its circular edge in a V shaped croze. The combination of a concavo convex metal head, with a wooden body or keg, provided with a V shaped croze, for the purpose specified, is the claim allowed in the letters patent.

CORN PLANTER.—Robert M. Bowman and William H. Bowman, London, O.—This invention has for its object to furnish an improved seed dropper for corn planters so constructed that it cannot clog or choke with chaff, at the same time simple in construction and easily worked. By the construction, it is claimed, the chaff can pass out freely, and cannot clog or impede the slide, which at the same time has no flanges or grooves for the chaff to get into and thus clog it.

CHURN.—Henry C. Bell, Edina, Mo.—This invention has for its object to furnish an improved attachment to ordinary churns, so constructed and arranged as to bring the butter quickly and with little expenditure of labor: and it consists in the construction and combination of the body of the churn, a cover, and a dasher handle, made hollow and closed at its lower end by a hard wood plug. To the side of the lower part of the tubular handle is attached the end of a curved pipe, which communicates with the interior of the said tubular handle through a hole in its side. To the rear or free end of the pipe is a hood made hopper shaped, attached to the end of the pipe by one or more cross bars, and with its smaller end toward the end of the pipe. When the tubular handle is revolved, the rear end of the pipe and the hood are carried rapidly through the milk, the form of the hood increasing the force of the current past the end of the pipe, causing a vacuum, and thus drawing the air through the handle and pipe and discharging it into the milk, and causing, in connection with the currents formed by the movement of the pipe and hood, a violent agitation in the milk. Detachable current breakers, in combination with the tubular handle, curved pipe hood, and churn body are other novel features in the invention.

SECTIONAL BOAT.—William H. Philip, Brooklyn, N. Y.—This invention consists in the construction of small row or sail boats in short transverse sections, for extending and shortening in the lengthwise direction in the manner of a telescope, the said sections being so tapered that in extending them to adjust the boat for use the inner ones bind in the outer ones, similarly to telescopic drinking cups, so as to make water tight joints. Besides so binding together, they may also be fastened by bolts to be taken out when the boat is to be shortened up. The object is to provide boats for sportsmen, travellers, army purposes, and the like, that can be readily shortened up into a compact package for economizing space in storage or transportation.

FILTER FOR CANE JUICE AND OTHER LIQUIDS.—Enos Tuttle, Jeanerette, La.—This invention consists of a reel similar to the reels of flour bolts, with a cover of flannel, wire or hair gauze, or other suitable filtering substance, arranged in a suitable case provided with a vat at the head, with a grate in it, into which the juice flows to retain the coarse matters—such as leaves, pieces of stalk, etc.,—where they can be removed from time to time by hand; thence the juice flows into the reel and percolates through the gauze to a vat below, while other foreign matters are discharged at the end of the reel.

BARREL MACHINERY.—M. T. Kennedy, New Brighton, Pa.—This invention relates to machinery for the manufacture of cooper work—barrels, kegs, etc.; and consists in a machine for squaring the end of the barrel or keg and cutting it to a given length, beveling the chime and cutting the croze. The operation of the machine commences after the staves of the keg or barrel have been put together and secured by truss hoops, which hoops are afterward removed and replaced by ordinary hoops. The barrel or keg trussed in this manner is placed in a revolving hollow cylinder, and adjusted centrally therewith and fastened, and the cylinder is revolved by means of a belt, and the machine levers for squaring, beveling and crozing are then applied.

CANAL BOAT.—Lewis Howard and Chas. Howard, Watkins, N. Y.—The invention consists in a bearing block (for propeller shafts) that slide up and down and is adjusted at any point in rigid perpendicular guides; whereby all motion of the shaft out of its proper axial line is prevented. The adjustable bearings that are pendent have been found to vibrate and cause the propeller shaft to lack that uniformity in its line of motion which is desirable to enable the propeller properly to perform its function. The invention also consists in a brass guard that swings under and slightly in advance of the propeller, to depress and remove from the wheel the growth of grass that springs up on the bottom of canals. The invention also consists in an adjustable bearing plate (on the inside of the boat) which will enable the propeller shaft to work as nearly as possible in a horizontal plane.

ORE SEPARATOR.—David Gross, Maxatawny, Pa.—The object of this invention is to furnish an improved machine for cleaning ores of sand, more especially designed for iron ores, but not confined exclusively thereto; and it consists in an upper coarse sieve and in a lower fine sieve arranged parallel or nearly so in an inclined position, and suspended by links and pivoted at opposite ends, respectively, and connected with a double crank shaft by rods in such a manner as to be simultaneously vibrated in opposite directions. The advantage of having the screens vibrate in contrary directions is to largely relieve the frame work and operating mechanism of the jar and consequent wear and tear which obtains in machines in which the sieves vibrate simultaneously in the same direction.

FIRE PLACE.—Michael Haughey, St. Louis, Mo.—This invention has for its object to furnish an improved means for utilizing the heat wasted in heating a room with a grate, and which usually passes off through the chimney, so as to heat the room quicker and more thoroughly, and at the same time economize fuel; and it consists of an air chamber arranged in the back of the fire place from which the air heated by the fire rises to another enclosed space situated above the grate, thence passes to a spiral chamber winding around the flue, from the upper part of which it enters the room to be warmed through a register. Openings are also made in the side and back of the first mentioned air chamber, that in the former communicating with the apartment while the other leads into another room or into the open air. A trough of water designed to moisten the air and absorb the carbonic acid gas drawn from the atmosphere in the room is placed in the spiral chamber.

STEAM ENGINE GOVERNOR.—William C. Freeman, Louisiana, Mo.—This invention relates to a new steam engine governor in which the rotation of an eccentric within a chamber filled with a liquid, and having spring valves that bear against the eccentric, causes a movement of the surrounding vessel and a consequent adjustment of the steam valve.

POWDER PACKING APPARATUS.—Kendall F. Knowles, New York city.—This invention relates to a new apparatus for and method of filling, at one time, a large number of small bottles, boxes, or other vessels with insect powder or other powder, making the separate handling and filling of each bottle, box, or vessel unnecessary. The invention consists in the combination of a movable sieve, with a conveying hopper and with a receiving box, into which the powder is discharged, and which can be vibrated to even the powder contained in it. By this means a gross or several hundred of bottles or small vessels may be filled in a few minutes, where heretofore it took hours to fill the several bottles or small vessels singly.

BALE TIE.—Joseph L. Haigh, New York city.—This invention has for its object to furnish a simple, convenient, and reliable wire band for baling hay, straw, cotton, and other substances put up in bales. A wire band, upon one end of which is formed an eye by turning the end of the wire back upon itself, and twisting said end and the body of the wire together, has its other end doubled back upon itself to form a hook, and the said end from the base of the hook and the body of the wire are twisted together. The two piles of the wire at the base of the hook are spread apart, to form another eye of sufficient size to allow the first mentioned eye to pass through it. In using the band it is passed around the bale; the first eye is then passed through the second eye and over the hook. By this means the strain or spring of the bale upon the band will tend to draw the hook down toward the bale, so that, however great the strain may be, the hook cannot be straightened out, as it is liable to be when the first or only eye is hooked upon the hook in the ordinary manner.

CALCULATING MACHINE.—William Robjohn, New York city.—This invention is by one of New York's oldest and most distinguished inventors. It relates to a new adding machine, which is operated by means of numbered keys, and so arranged that mistakes cannot occur as long as the mechanism is in working order, as all keys are locked as long as any one is more or less depressed, and as the key depressed cannot be restored to its elevated position unless it has first been entirely pushed down. Errors that might arise from depressing some of the keys partly, and thus adding only fractions of the numbers which such keys represent, are thus entirely obviated, and rapid action, insuring absolute accuracy, can be performed. The invention consists, first, in combining with the shank of each key a toothed portion, which holds the key as long as it is only partly lowered; also in the use of a cam which serves to throw the toothed portion of the shank of the key out of contact with the catch as soon as the key has been entirely depressed, and thereby enables the key to ascend after having completed its stroke, though not before: also in the arrangement, under the several keys, of a pivoted L-shaped plate, which is turned under the non-depressed keys by the one descending, and prevents such other keys from being depressed until the descending key has again been elevated to its neutral position, when the L plate is swung out of the way of the other keys. Action on any key is thus automatically prevented until all keys are raised, while, as before stated, none can be raised until its downward stroke has first been completed.

BORING MACHINE.—Edward C. Cole, Pawling, N. Y.—This invention has for its object to furnish an improved machine for boring the hubs of carriage wheels which shall be simple, convenient, and effective, being so constructed as to bore the hub perfectly true with the rim, and to allow the wheel to be put on and taken off without removing any part of the machine except the rod.

WAGON SHEET AND TENT.—Milam M. Fitzgerald, Gonzales, Texas.—The invention consists in providing the ordinary wagon sheet or cover at the sides with pieces of canvas or other fabric, which can be let down and staked to the ground to form a tent around the wagon, and which, during daytime, or while the concern is in motion, can be rolled up and secured at the sides of the cover to be entirely out of the way. The tent sides are provided with lapels which form the ends of the tent when let down. No poles, rods, or bars of any kind need be carried, and the tent can be pitched in a very short time, and also rolled up quickly. It is a capital contrivance for emigrant wagons.

CAT HOOK AND STOPPER.—David H. Cousins, Surry, Maine, assignor to himself and James H. Knowles, of same place.—The object of this invention is to provide means for supporting anchors upon the side of a vessel, out of water, so as to leave the cable or chain free; and it consists in a cat stopper attached to the vessel, so constructed that it will take hold of the chain or anchor and support the anchor out of the water, and so that it may be made to "let go" and free the anchor instantly. This cat stopper consists of two main bars pivoted together. One bar has a mortise and loop at its end, by means of which loop the nipper is attached to the vessel. The other bar has a projecting hook or horn, which is made to engage with a link in the chain near the anchor, so as to support the anchor out of water, while leaving the chain free to be overhauled on the deck of the vessel. The second bar is held in position by means of a hook plate pivoted to the end of the bar and passed through the mortise, and it hooks onto the opposite side of the first bar. The plate is secured in this position by a key. When it is desired to let the anchor "go," the key is knocked out and the plate is raised in the mortise so as to unhook it, which releases the second bar, when the anchor drops. By this arrangement the chain is released, and may be overhauled at any time, and the anchor may be dropped without delay.

STALK CUTTER.—Robert F. M. Flack, Columbus City, Iowa.—This invention is an improvement in rotary stalk cutters, and consists in the manner of arranging the frame, cutter wheel, and hoisting device, so that when the wheel is out of action the frame in which the same is mounted may be elevated, whereby the hoisting rope may be relieved of strain and certain other advantageous results secured. Among other advantages claimed for the improvement the inventor states that the cutters are double edged, and they are fitted in slots in the ends of the arms and secured by bolts in such manner that they may be taken off and reversed readily when one edge has become dull.

MACHINE GUN.—William A. Miles, Salisbury, Conn.—This invention relates to a battery gun, which is provided with sliding barrels. The entire mechanism is rendered simple by the use of the sliding barrels, and all the intricate devices usually applied to battery guns dispensed with. The invention consists in the arrangement of reciprocating barrels, arranged side by side, and connected with rotary cams or levers, whereby they are successively or jointly moved back and forward. During their backward motion they close over the cartridges that have dropped behind them upon sliding supports. When quite moved back their motion is arrested and the cartridges are exploded. The barrels are next moved forward to allow the empty cartridge shells to drop down behind them. The invention also consists in the new loading mechanism, which is composed of reciprocating carriers that convey the cartridges from a receiver to the upper sides of the barrels, from which said cartridges are finally dropped upon the sliding supports. The firing mechanism is also quite novel, and the whole gun taken together exhibits very great ingenuity on the part of the inventor.

PIANO STOOL.—Charles A. Schindler, West Hoboken, N. J.—This invention has for its object to furnish an improved back for piano stools, simple strong, durable, inexpensive, and ornamental. The seat of the stool is attached to a pedestal or feet, and upholstered in the ordinary manner. To the rear part of the seat of the stool are attached the lower ends of two iron rods. The lower ends of these rods are bent forward to cross the top flange of the seat frame and then bent downward across the inner edge of said rim, and are secured firmly in place by screws. The rods are bent into some graceful shape, and to their upper ends is attached a back rest, the forward side of the said back rest being upholstered in the same manner as the seat. In the space between the seat, rods, and back rest is placed an ornamental device or center piece which may be made in the form of a harp, and which is secured to the seat frame and back rest. The iron rods are designed to give strength to the back, and enable it to have the requisite strength, and at the same time to be made sufficiently light to avoid all appearance of clumsiness.

LARD AND BUTTER CUTTER.—William M. Bleakley, Verplanck, N. Y.—This invention relates to a new self cleaning stick for transferring lard, butter, tallow, tar, or other viscid or semi-liquid substance from one vessel to another. The invention consists in providing such stick with a slide, whereby it can be cleared without soiling the fingers of the person handling it. The shape and size of the stick can be varied at pleasure.

RAILWAY CAR SEAT AND COUCH.—This invention consists in a new mode of combining the seat back with sliding frames, and in the use of auxiliary backs to utilize as fully as possible the space within the car. Proper headrests may be removably applied to the ends of the couches. The outer part of the seat may be supported on a circular metallic track sunk into the floor of the car, and arranged with sockets or catches, or both, to lock the seat in any desired position.

BRICK KILN.—Francis Strayer, Clinton, Iowa.—The object of this invention is to economize fuel and lessen the amount of labor required in burning brick; and it consists in the arrangement of a kiln, constructed of masonry, of square, rectangular, or other form, and of any required size, in filling which a succession of arched apertures in which the coal or fuel is placed for burning the brick is formed. These apertures or pockets are distributed throughout the mass of brick, being made as the brick are packed in filling the kiln. The coal is introduced as the arches are made, or through the sides of the kiln, as may be most convenient. There are apertures through the sides of the kiln, for observing the condition during the process of burning. These apertures are closed with plugs which can be removed as required. To supply the requisite amount of oxygen for the consumption of the fuel, one or more bellows are employed. The blast of each bellows may be used separately and on opposite sides of the kiln, alternately, or the bellows may be used alternately. A fan blower or blowing cylinder may be used, as may be found advisable. The bricks are placed loosely in the kiln, so that the heat can circulate freely through it as in ordinary brick kilns.

CHILL PLATE AND FLASK.—Dennis Long and Samuel A. Miller, Louisville, Ky.—The invention consists in a flask having a flange provided with lugs, combined with a chill plate having a flange provided with notches, whereby the flask and chill plate are centered and held in a fixed relation to each other with great convenience and facility.

WALKING SEED PLANTER.—Luther C. Ives, Land of Promise, Va.—This invention relates to an improvement in walking seed planters, and consists chiefly in the method of imparting a continuous rotary motion to a seed distributing disk, through the medium of a combined transporting and covering wheel and a system of double crank shafts and connecting rods.

PAD CRIMP AND LAST FOR HARNESS.—Richard R. Calvert and William Michael, Mansfield, Ind.—This invention relates to a new device for stretching the leather for all kinds of harness pads, and also to a new sectional last for keeping the pads distended while being stitched in the stitching horse. It consists, also, in making the last, for holding the pad distended, of a series of blocks, which are made in sections, obliquely divided, to prevent displacement, but permit their ready removal from the stitched pad.

CIDER BITTERS.—Thomas P. Devor, Millerstown, Pa.—This invention has for its object to furnish improved cider bitters, to contain lactic acid but no acetic acid, producing a good drink for warm climates and seasons, and which shall be beneficial in bilious complaints and in many forms of dyspepsia; and it consists in preparing cider from apples, allowing it to ferment, after which apple twigs are boiled in a portion of this cider in the proportions of one pound of apple twigs to one gallon of cider. In this decoction, when cool, are dissolved the whites of eggs, in the proportion of six eggs to one quart of the decoction. One quart of this solution is poured into each barrel. Refined white sugar, birch bark, and wild cucumber (magnolia glauca) pods or bark are also put into each barrel in certain proportions.

MACHINES FOR DOWELING FELLIES.—Joseph P. O'Brien, Kewanee, Ill.—The old mode of doweling fellies was to bore a hole in the end of each of the sections of the felly which were to form the joint and insert the dowel pin into one of the holes and then drive the two sections together. The latter and improved mode is to butt the two ends of the sections together and then make one or more slots or kerfs with a circular saw across the joint, and introduce a thin piece of metal into such slot, which the tire of the wheel holds in place. This machine is designed for the latter mode of doweling, and consists in a clamping device with one or more saws connected therewith for sawing the dowel plate slots, and a feeding lever in combination with the saw arbor.

FLOWER POT.—Matthias Ludlum, Middlebury, Vt.—This invention has for its object to improve the construction of a flower pot patented March 1, 1870, to the same inventor, so as to make it more convenient and satisfactory in use, and to adapt it to be removed from plants too bushy or brittle or twining to pass through it; and it consists in the combination of a saucer with a bottomless body, made in sections, which is intended to allow the body of the flower pot to be opened up and removed from the soil and roots of the plants when said plants are too large, bushy, or tender to pass through the pot, or when they are long or twining vines, so that they may be repotted or set in the ground without injuring them or even checking their growth.

SOD CARRIER.—Charles D. Meigs and Montgomery C. Meigs, Romney, Ind.—This invention has for its object to furnish an improved sod carrier, designed especially for use in carrying off the stiff prairie sod turned over by the plow in opening ditches, grading roads, etc. It is simple, convenient, and effective, enabling more work to be done in less time and with less labor for man and team than when the ordinary means are employed.

SKIRT ELEVATOR.—M. H. Bergen, Brooklyn, N. Y.—The inventor states that there is a necessity for a skirt elevator, to be attached to every dress for the convenience of a lady in case she should be overtaken in a storm, or when the streets are damp and muddy. She offers to the public an elevator in the use of which a trained dress can be converted, with one minute's adjustment, into a walking costume which cannot be recognized as a long dress. This gives the advantage of using the same dress either for an evening, toilet, or a walking dress. The invention consists of a tape with rings attached and a cord passing through them, and fastened with a ring to the waistband in the center of the back.

CHURN.—Nicholas Hospers, Pella, Iowa.—This invention relates to a machine which may be applied to the operation of any ordinary dasher churn. The churn is placed on a platform from which arises an upright frame. To the dasher handle is attached a guide rod which passes through holes in the upper part of the frame. A socket in the lower portion of the guide rod, to which is pivoted a forked connecting rod which communicates with a pin block detachably secured to a crank arm, connects the latter and the churn dasher, and gives to the dasher a combined reciprocating and rotary motion.

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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?

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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 on their New York correspondents.

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6,026.—CARPET.—T. Barclay, Lowell, Mass.
6,027 to 6,030.—CARPETS.—R. R. Campbell, Lowell, Mass.
6,031.—CARPET.—J. M. Christie, Brooklyn, N. Y.
6,032.—PUMP BARREL.—J. W. Douglas, Middletown, Conn.
6,033 to 6,037.—CARPETS.—J. Fisher, Enfield, Conn.
6,038 to 6,051.—CARPETS.—O. Heinigke, New York city.
6,052 to 6,057.—CARPETS.—H. Horan, Newark, N. J.
6,058.—CARPET.—C. S. Lilley, Lowell, Mass.
6,059.—CARPET.—D. McNair, Lowell, Mass.
6,060 to 6,063.—OIL CLOTH.—C. T. and V. E. Meyer, Lyon's Farms, N. J.
6,064 to 6,070.—CARPETS.—J. H. Smith, Enfield, Conn.
6,071.—MEDAL.—S. Van Campen, New York city.
6,072.—CARPET.—J. M. Christie, Brooklyn, N. Y.
6,073.—RUSTIC CROSS, ETC.—A. De E. Bloodgood, New York city.
6,074 and 6,075.—PRINTING TYPE.—H. Benburg, New York city.
6,076 to 6,089.—SHAWLS.—F. Wink, Philadelphia, Pa.

TRADE MARKS REGISTERED.

956 to 966.—LEAD PENCILS.—O. Cleveland, Jersey City, N. J.
967.—CARRIAGE BOLT.—Plumb & Burdict, Buffalo, N. Y.
968.—LETTER PAPER.—Schmidt & Curtiss, New York city.

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:

22,133.—BUSTLE.—G. V. and E. A. Pierce. Nov. 6, 1872.
22,152.—KETTLE FOR TRYING OIL.—J. L. Alberger. Nov. 13, 1872.
22,165.—PUMP.—A. Cooley. Nov. 13, 1872.
22,174.—PREVENTING INJURY TO WATCH SPRINGS.—D. B. Fitts. Nov. 13, 1872.
22,216.—HAY AND COTTON PRESS.—H. Barnes. Nov. 13, 1872.
22,668.—COLORING AND CURING TOBACCO STEMS.—B. Payne. Jan. 2, 1872.

EXTENSIONS GRANTED.

15,693.—HORSE POWER.—A. W. Gray.
21,340.—LATHE FOR BEADED WORK.—F. Baldwin.
21,268.—HORSE RAKE.—M. Morgan.
21,272.—METALLIC BALE TIE.—I. C. Plant.
21,275.—ICE STAND.—H. A. Roberts.
21,286.—TEMPERING WIRE.—H. Waterman.

DISCLAIMER.

21,268.—HORSE RAKE.—M. Morgan. Filed August 20, 1872.

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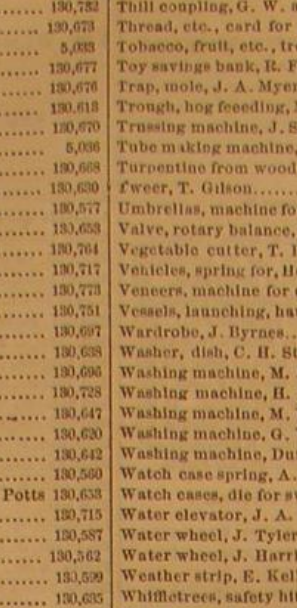
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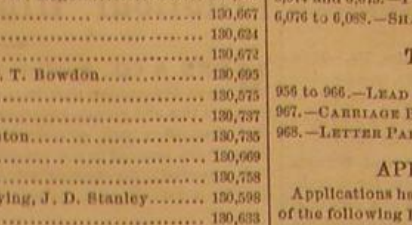
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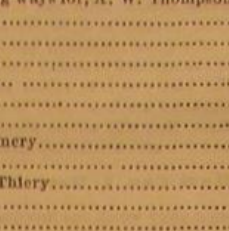
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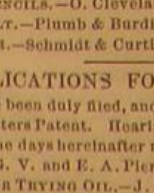
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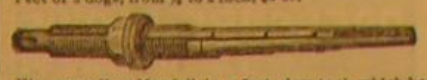
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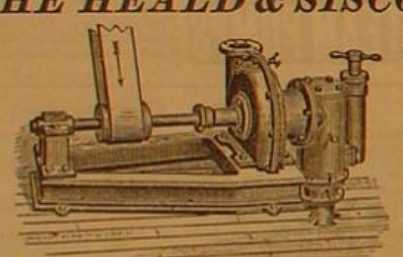
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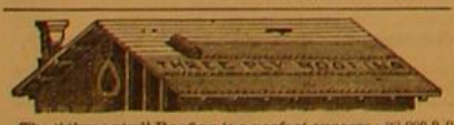
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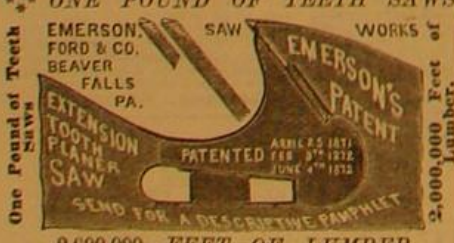
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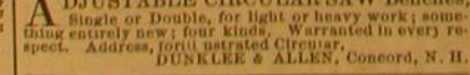
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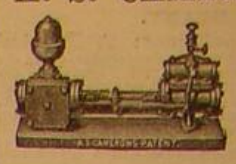
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