SCIENTIFIC AMERICAN

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

Vol. XXI.—No. 8. { [NEW SERIES.] }   NEW YORK, AUGUST 21, 1869.   { $3 per Annum. [IN ADVANCE.] }

New Mode of Making Illuminating Gas from Light Hydrocarbon Oils.

The manufacture of illuminating gas on a small scale suitable for private dwellings, railway cars, locomotives, steamers, etc., has long engaged the attention of scientific men, but up to a recent date all attempts have failed to meet the wants of the community or the wishes of the inventors. Indeed, all the different machines have been made substantially on the same principle, viz., a machine for forcing or blowing air through or over some hydrocarbon or material saturated with hydrocarbon oil. Since Oliver P. Drake, of Boston, made his gas machine, twenty years ago, up to the present time, all improvements have been merely attempts to perfect the Drake plan, and were subject to the same difficulties, viz., the deterioration of the liquid, the variation of pressure, the change in density, the variable effects of the temperature, the great cost of the air-forcing apparatus, etc.

Mr. Hiram S. Maxim, of New York city, the inventor of this new mode, being long associated with the gas machine interest, both in Boston and New York, as draftsman and engineer, for over forty different machines, all on the old system, and knowing all the advantages of that system, has boldly deviated therefrom, and now presents to the public a gas machine, simple, compact, and reliable, operating every day in the year alike, and entirely different in principle and construction from any other heretofore made.

His first experiment on this new mode was made in the winter of 1866-7, and consisted of a two-light machine, holding two quarts of liquid, with a heating chamber underneath feeding its own flame, the size and heat of the flame being governed and controlled by the pressure of the gas generated.

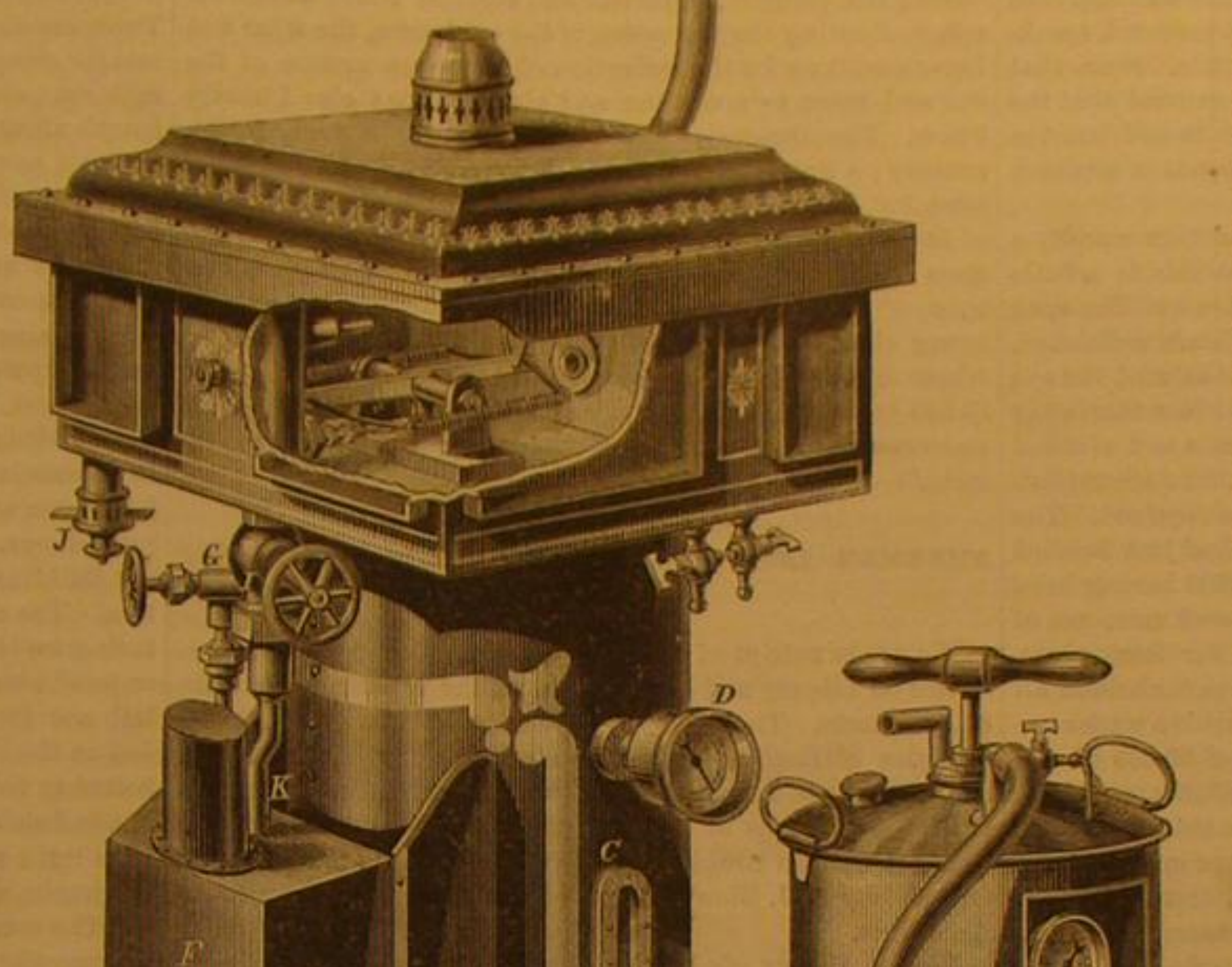
His next was a modification of this first, heated by steam, controlling the steam in the same manner that the flame was controlled on his first machine, and designed for and used as a locomotive head-light. It consisted of a horizontal cylindrical tank, placed under the reflector, and divided into two connected compartments filled with gasoline. Around one of these steam circulated, and in the other was a coil of steam pipe. Steam came direct from the locomotive boiler, passed through a gas superheater on top of the tank, and downward into a steam jacket surrounding a portion of the liquid contained in an elastic shell, then through the coil in the other compartment, and out. As the liquid became heated in the elastic shell, it evolved gas until a pressure was generated sufficient to expand the head of the shell, which operated on a steam valve and stopped its flow. When the pressure was relieved the shell collapsed and allowed a fresh supply of steam to flow. The vapor generated by the heat of the steam passed upward and through the superheater around the steam pipe, and into and through an argand burner. This was patented through the Scientific American Patent Agency, Nov. 26, 1867.

All attempts to burn the pure vapor with this machine were unsatisfactory, the flame being very sensitive; hence, in the spring of 1868, he discovered a mode of injecting air into the vapor before it reached the burner, and it was found that carbonated air made by this process was very far superior to that made in the ordinary way. This was patented for railroad cars through the Scientific American Patent Agency, June 2, 1868.

Another apparatus, having automatic valve gear for controlling the flow of vapor, and embracing the main features of the machine shown in the engraving, was also patented through the Scientific American Patent Agency, Sept. 8, 1868. In all these the whole body of liquid used was heated. The waste of liquid and the expense of heating the mass for a small number of burners, led to the invention of a mode of heating only a small portion at a time. A small heater connected with the tank containing the liquid, under a pressure of air was found to work admirably. An apparatus of this kind was patented by H. S. Maxim and James Radley, May 4, 1869, which is fully shown in the accompanying locomotive steam head-light and house-machine engravings.

The first head-light made under this patent had the tank containing the liquid in the corner of the head-light, the liquid and air being forced in by a special pump and can, used for both house-machine and head-light, and constructed to pump either liquid or air. This pump can is shown at the right of the large engraving, and is only attached while filling the tank. It was found, however, that by placing the tank on top of the head-light case the gravity of the liquid gave abundance of pressure, therefore the use of the compressed air in the steam-gas locomotive head-light was dispensed with.

The smaller engraving represents an improved steam gas locomotive head-light in perspective. A is the tank containing the liquid, from which a feed pipe runs down on the back side of the case, connecting with an evaporizing chamber immediately beneath the burner. Steam being introduced from the boiler of the locomotive on the opposite side of the case, circulates around the vaporizing chamber, converting the liquid into vapor, and passing up from the heater the hot air is injected, and the gas flows through the burner. The pipes for the inlet and outlet of steam are so arranged that but one hole is made in the case.



MAXIM'S PATENT GAS MACHINE.

The larger engraving is a perspective view of an improved apparatus equally applicable to dwelling houses, factories, churches, hotels, steamers, etc.

To operate the machine, gasoline is pumped in at the cock, B, until the liquid reaches the top of the gage, C, then air is forced in until a pressure of 25 lbs. is indicated on the gage, D A combined air and liquid pump can, E, goes with each machine, which, as above stated, is detached from the machine after charging with air and gasoline. The compressed air acts as an elastic spring on the gasoline, forcing it into a retort contained in the case, F, from the bottom of the tank. The gasoline is forced up through a small pipe inside of the tank and out through the cock, G, thence downward and into the bottom of the above-mentioned retort, with a force equal to the pressure of the air in the tank. Under the heater and inside of the heater case is a small cup surrounding the bottom of the burner, which, being filled with alcohol and ignited, heats the burner, and when nearly burned out, the heater cock, H, can be opened, and the apparatus will furnish its own heat. After ten minutes the cock, I, can be opened, and the machine is ready for use. The flame can be left burning all the time in the heater, all further attention being to fill the tank more or less often as the fluid is consumed.

In the density regulator, J, are holes to admit air, which, when wide open, makes the gas poor or thin. Being half closed, the gas will be, and will remain, at the right density, no matter what number of lights are used. By this regulator the quality of the gas can be changed at will, and permanently set to furnish gas of the required density. Gas made by this mode stands a more severe test, without any appreciable varying of the lights or the quality of the gas, than even the street gas. The heat is applied to the top part of the generating retort, leaving the lower end comparatively cool, so that a small quantity of gasoline remains at the bottom, while the top is filled with hot vapor. As the vapor is forced up through the pipe, K, the gasoline rises until it boils sufficiently to generate more vapor and fill the space.

The square top is a gasometer so arranged that, as the gas is drawn off the top falls and trips a small valve, which admits more of the hot vapor, and again rises.

As the vapor escapes from the retort with great velocity it draws a current of air through the density regulator, J, mixing it thoroughly with the gasoline vapor in the gasometer.

A machine three feet in hight and fourteen inches square is calculated to supply sixty burners, and the light given is as steady and agreeable to the eye as that of the illuminating gas now in use, while its cost is far less.

Having ourselves had much experience in the working of such machines we were inclined to discredit some of the statements made in regard to this one, particularly those made in regard to its performing good work in cold weather, where the gas requires to be conveyed through long pipes. On other machines the gas, under such circumstances, often becomes so impoverished by condensation that it fails to give a good light. We therefore took the trouble to personally inspect the working of this machine, and at our request the gas was passed through ten feet of lead pipe coiled and immersed in a freezing mixture of salt and pounded ice; and, that the test might be still more severe, only one burner was used, so that the gas was forced to pass very slowly through the refrigerating section of pipe. Under these circumstances there appeared to be no difficulty whatever in adjusting the density regulator so that the flame at the burner should remain undiminished.

Further information may be obtained by addressing Radley, McAlister & Co., 162 Greenwich street, New York.

The control of these inventions, so far as they relate to the lighting of buildings, has been transferred to M. H. Strong and Thos. E. Hastings, either of whom may be addressed at No. 19 Cliff street (Room No. 10), New York, where a machine may be seen in operation.

MR. FISK'S private office is only equaled in its gorgeous appointments by Mr. Jay Gould's, and both are unique. A restaurant is one of the appurtenances, and the whole building, which was once a theater, is now a palace. The Erie shareholders seem to have a good show for dividends.

THE GREAT CLOCK OF BEAUVAIS CATHEDRAL AND THE STRASBOURG CLOCK.

From the remotest periods man has felt his way towards measuring that impalpable agent, ceaselessly-progressing, never-resting time. He has measured it by torches of pitch which should burn regularly. He has invented the hour-glass and the clepsydra, where grains of sand or drops of water falling from one vessel into another indicated its passage. He has invented the sun dial. What has he not imagined, from the time when, having discovered the mariner's compass in 1303, he perceived and applied the principle of gravity as it exists in the pendulum. This was the great advance, the chief step forward which opened the door of discovery to the learned to the mysteries of astronomy. By the exact measurement of time some of the greatest natural problems had been solved. But that man who would ask of horology nothing more than the indication of the time for his repasts and his repose, is profoundly indifferent to its aim and object. However, an inventive genius constructed the clock of the cathedral of Strasbourg which indicates a mass of things unrecorded in the almanacs of the period. This was regarded with the veneration with which a saint was invested, speaking a dead language unknown to the multitude. Since that time, mechanical invention has become so general that the clock of Alsace has ceased to be a mystery to all but the learned, the possession of a time-keeper being now common to most of us.

Something novel was further desired, and this novelty a clock-maker of Beauvais has given us. But this is a little history. Do you know the cathedral of Beauvais? The span of its roof leaves a space of full 50 yards. This is unfinished, and for 200 years nothing but an ugly wall saluted the eye as a blemish on this colossal monument. To cover this defect the chief inhabitants (to the number of 10) met and clubbed together to place there an ornamental clock. To accomplish this purpose, money and an horologist were required. The clock-maker was at hand, a fellow townsman had just finished a splendid work for Besancon. A sum of £1,600 having been collected, the work was begun. Twenty workmen, ten of whom are clock-makers, have been at work for four years. The accomplishment of this great work leaves far behind all previous attempts in this direction. The result is a work composed of 14 different movements consisting of 90,000 pieces, weighing over 35,000 pounds, and costing £5,600, or £4,000 more than the sum first collected, but against this excess is to be reckoned a *chef d'œuvre* which future ages may well be debited with. The body of the clock is 36 feet high, it is made of sculptured oak in columns, and measures 16 feet in breadth by nearly nine in depth; the whole is finished in the Byzantine style of decoration. The figure of the Supreme Being from the summit of the clock, at every hour, by a solemn gesture, calls attention to the saints who are at their alcoves yielding attention to the sounds which accompany the crowing of a fine cock.

The main dial, there are 50 in all, is occupied by the figure of the Saviour enameled on copper, the largest work in enamel existing; it cost £130. Above their divine Master the 12 apostles, also in enamel, figure in a circle artistically expressive of devotion. Two hands of steel covered by platinum, move over this dial through twenty-four divisions; it is pierced, as are all the others, and shows the pendulum, weighing nearly one cwt., which renews its impulse from a steel ball weighing a gramme, or about the 32d part of an ounce. This impulse is thoroughly the product of mechanical inventiveness, and is, as it were, an allegory exhibiting the submission of brute force to intelligent direction. This movement impels the 14 others, and is wound up weekly, being driven by weights in the usual way The other dials indicate: The days of the week. The movements of the planetary bodies. Sun-rise. Sun-set. The seasons. The signs of the Zodiac. The duration of daylight. The duration of night. The equation of time. The dates. The saints' days. The months. The phases of the moon. The age of the moon. The time at the principal cities of the world. The solstices. The movable feasts. The age of the world. The year of the century. The bissextile years. The longitudes. The number of the century. This portion of the machinery exuibits no indication more than once in 100 years, but nothing more is required than to wind the machine every eighth day. Other dials show further: The tides. The eclipses for all the world, both total and partial. At the hour when the sun or moon is eclipsed in the heavens, to the minute even, the sun or moon suffers obscuration on the clock. To form a correct appreciation of the enormous work and calculation in this great machine, unequaled anywhere, which has its separate movement from that which shows seconds of time to those which indicate events occurring not oftener than once in 100 years, it must be remembered that three centuries out of four the last year leaps its bissextile. In these years the clock has to leap from February 29, and goes from the 28th to the 1st of March. Here is a movement occurring only in 400 years. What is left but to admire the inventive genius which has combined in one harmonious whole and subjected to a uniform direction 90,000 separate pieces, all united to measure and indicate the footsteps of time, showing the positions of the smaller and the greater heavenly bodies in both worlds; even those we see nothing of, which exist in the other hemisphere, and of which this clock faithfully records the rising and setting. The inhabitants of Beauvais possess a wonder of the world, and we are indebted to them for showing it at the Exhibition of Paris, where its modest inventor explained its operations, and who by a remarkable coincidence bears a name strictly in harmony with his devotion to exact science. His name is Verite.

Mr. Steckelburger, of Strasbourg, jealous for the honor of his native town, protests as follows against the assumption that the Beauvais clock is unequaled: "Mr. Mauremont says that the astronomical clock of Strasbourg has no longer any secrets for anybody. For a very good reason, indeed! He is speaking of that which was constructed in 1574 by Isaac Haberecht. How could this poor machine have any secrets for any one, since it was taken down 30 years ago, and the various parts placed in the religious establishment of Notre Dame, where it may still be seen. But this is not the clock we have to do with; the present clock dates from 1842; it is that constructed by Mr. Schwilgue.

"I could not suppress a smile at the catalogue of indications said to be shown by the Beauvais clock, for our cathedral clock shows all these and some besides. It shows all the wonderful things in the almanacs, and all the astronomical calculations possible and perpetual. It contains an ecclesiastical computator with all its indications; the golden number, the epacts, dominical letter; solar cycle, etc.; a perpetual calendar with the movable feasts, a planetarium on the Copernican system, showing all the mean equinoctial revolutions of every planet visible to the naked eye; the phases of the moon; the eclipses; apparent and sidereal time; a celestial sphere showing the precession of the equinoxes, the solar and lunar questions for the reduction of the mean motion of the sun and moon to true time and place. What else I hardly know. The Beauvais clock makes a change in every fourth century; a great merit! The precise indication is exhibited here, but ask an astronomer what is meant by the precession of the equinoxes. He will tell you it is a movement in the stars describing a complete revolution round the earth in the space of about 25,000 to 26,000 years. Well, Sir, in the Strasbourg clock is a sphere following exactly this motion, and whose rotation is of that kind as to ensure one revolution in 25,920 years. The thing can be measured and indicated; it is unnecessary to await its accomplishment: it would be too remote."—*Mechanics' Magazine.*

AMERICAN INSTITUTE OF ARCHITECTS.--FIRE-PROOF CONSTRUCTION.

We are in receipt of two pamphlets published by the Committee on Library and Publications of the American Institute of Architects. The first is a paper upon "The Architectural Societies of Europe," giving an account of their formation and methods of administration, with suggestions relating to the proper means of insuring the largest success of a National American Architectural Society, with its local dependencies. By A. J. Blow, Fellow of the American Institute of Architects.

We are always glad to notice the progress of scientific and mechanical associations, and we have always maintained in these columns their general utility. We cannot, however, notice at length this able paper, although its perusal has afforded, and will afford, all who attentively peruse it, both instruction and pleasure.

The second paper, however, entitled "Remarks on Fire-Proof Construction," is of such practical importance that we take pleasure in giving place to some of its valuable statements and suggestions, although we do not wish it inferred that we indorse all the conclusions of the author. The paper is from the pen of P. B. Wight, F. A. I. A.

Mr. Wight defines a fire-proof building as one which cannot burn, and which contains nothing that can burn.

"It is very seldom that any building is required for such use that only non-combustible material shall be placed in it; but it is still a fact that fire-proof buildings are often called for, and are needed, wherein large amounts of combustible materials are to be placed; not what the insurance companies call hazardous, but dry goods, books, and similar things, which will burn independently of the building in which they are contained. To supply such a demand is one of the most important problems offered to the architect for solution. Of such buildings are storage warehouses, and stores or shops, wholesale and retail, as well as buildings for certain kinds of manufacturing processes, such as sugar houses and carriage or furniture shops.

"Having devised a building of non-combustible material throughout, the question which next arises is how to keep a conflagration in one part from extending to all the contents of the building. The idea of making them only partially fire-proof is not to be considered for a moment, unless perhaps the material contained is so highly inflammable that it would destroy the material of the building, even if it is divided into fire-proof compartments, in which case it seems to be folly to go to the expense of fire-proof materials at all. When you know that no part of your building can burn of itself it is evident that every atom of it will offer some resistance to the enemy confined within. I believe, too, that it is impossible to smother or choke a fire once commenced, by the use of closed compartments. Accident or carelessness may leave some openings which will facilitate a draft in some unforeseen way. And even supposing that you have shut in your fire by some arrangement of closed compartments, can you give your compartment less air than a charcoal pit? Clos it as much as you will, your confined goods, if the barriers are not forced by the immense power generated by the heat, will at last be reduced to charcoal: for you cannot open a door or window upon such a smouldering fire but that it will instantly burst into flames.

"Storehouses are the only class of buildings which admit of division into air-tight compartments, and there is a practical objection to them in even buildings of this class: but few kinds of goods can be preserved without good ventilation. It seems, therefore, that the compartments should be open and accessible from without, but carefully divided from each other. If so, they afford good facilities to those employed in extinguishing fires; and I think that in a building thus arranged, there would be a more reasonable chance of a portion of its goods being saved."

The division of buildings into horizontal compartments, rather than vertical ones, is so much more desirable, where land is expensive, that inventors have almost exhausted their ingenuity in devising thoroughly fire-proof floors. It is obvious, however, that the division of a building by vertical fire-proof partitions, is a matter so easy of accomplishment, that it is questionable whether the horizontal division, so beset with practical difficulties, so expensive, and withal so much less to be depended upon, even when the best systems of construction are used, is ever economical, even where ground is expensive. Mr. Wight even questions whether it is of any use to build iron floors, or floors with iron supports, for buildings to contain goods; considering brick piers and groined arches as alone reliable.

"Several fires occurring recently in the Brooklyn warehouses have warned their owners to take extra precautions, even though none of these warehouses is fire-proof. One of the best is known as the Pierrepont Stores, near the Wall-street ferry, and the arrangement of them is well worthy of notice. These are about three hundred feet in length, and are divided into six compartments by fire-proof party walls; the width of each compartment is consequently about fifty feet, and the length about two hundred feet. The floors are of wood, and it would have been useless to make them of iron and brick; for the goods taken in them are mainly sugars, and it would be folly to attempt to arrest a fire of such combustible material in its ascending course, by any practicable device. But what is most interesting in these buildings is that each is fortified against its neighbor. Recently the party walls were carried up about six feet above the roofs and were pierced with embrasures, through which firemen can play from the roof of one building upon the flames in another, with perfect safety to themselves. Here is an instance wherein capital would have been wasted on the expensive materials required for fire-proof floors.

"Buildings for manufacturing purposes next demand attention. The extra cost of fire-proof construction in a manufacturing building is small when compared with that of a bank or public building. The walls and ceilings require neither lath nor furring, and the floors may be of flags or slate, bedded on the brick arches, or what is better, plates of cast iron bolted to the beams—which will presently be described. All inside finish may be discarded and iron doors, of No. 16 iron, with light wrought-iron frames, hung to stone templates in the jambs, are the only coverings required for the openings.

"The most extensive attempt to build a fire-proof building for manufacturing purposes was the enterprise of Harper & Brothers. This was one of the pioneer buildings of the new dispensation. The Harper girder is well known; it is an ornamented cast-iron beam, with a tie rod, and was the father of the truss beam, now so extensively used for supporting the rear walls of stores. It has been succeeded by the built-up beam, now generally used for girders, and the double rolled beam. It was eminently a constructive beam, using iron according to its best properties—cast iron for compression and wrought iron for tension."

Of banks and insurance buildings we certainly have a large number which are to all intents fire-proof, though but few are thoroughly so. It is generally admitted that such buildings are not in danger from their contents, and to this belief may be ascribed the fact that we already have so many of this class. Mr. Wight considers the Continental Bank, the American Exchange Bank, the Mutual Life Insurance Company's building, the Park Bank, and the City Bank building, in New York, as absolutely fire-proof. Nothing less than a bonfire of all the furniture, books, and paper, that could be collected together in any one room of any of these buildings, would endanger its destruction. They are safe from any ordinary casualty. But in all the rest there is enough woodwork to make the word "fire-proof," as applied to them, of very doubtful significance. In nearly all the so-called fire-proof bank buildings the rates of insurance are as high as in ordinary business buildings.

"And, first, how shall floors be constructed? Before the 'iron period,' when our Washington Capitol, our City Hall, our old Exchange and Custom House were built, the Roman and Medieval vaults only, were used—either of stone or of brick plastered. When the width of a room was too great for one span, granite columns or brick piers were used, as in our old Exchange, now the Custom House. The floors above the vaults were leveled up and paved with flags or marble tiles. As far as grace, strength, and absolute relief from the dangers of fire were concerned, this was a perfect system. But now space is demanded; there must be no more heavy piers and no great thickness of floors. We are therefore forced to use a material which, though not combustible of itself, will do little work if exposed to great heat; and in this is seen the great difference between our fire-proof buildings of the brick period and those of the iron period, and the inferior fire-proof qualities of the latter.

"The problem now is, to use the minimum of brick and the maximum of iron. The problem might be put thus: 'Given iron, make as nearly fire-proof buildings as possible out of it.' What then has been done with it thus far? For columns, we have used cast tubes of all shapes and sizes and the wrought-iron pillars of the Phenix Iron Company; for girders, we have used compound beams of cast iron with wrought ties—built-up beams of various forms of rolled and plate iron, bolted and riveted together—and common rolled beams, used double; for floor beams we first used deck beams for wide spans, and railroad iron for narrow spans; these have now been superseded by the I-beam of various sizes. The rolling mills now have on their circulars I-beams of great dimensions and suitable for girders, but refuse to fill any but large orders." Indeed Mr. Wight believes that only one mill has rollers for beams larger than thirteen inches, while the others will not put up machinery until they get large enough offers. " So we are thus far deprived of large smooth beams of one piece, for girders of long span—beams which no one would desire to hide from view, but which might honestly tell their use to every beholder. For supports between beams we have had Peter Cooper's *terra cotta* pots and the four-inch brick arches. The former are out of use, and the latter are almost universally employed. Corrugated iron—first used in the Columbian Insurance building by Mr. Diaper—has also gone out of use. The destruction of the Fulton Bank, a so-called fire-proof building, sealed its fate as far as floors are concerned. We have also had the experiment of stone floors in the American Exchange Bank, by Mr. Eidlitz, and repeated by another architect in the Mutual Benefit Life Insurance Building at Newark, N. J. The stone slabs, brick arches, and the Parisian floors—of plaster or concrete, bedded upon bar iron gratings inserted between the beams—are the only practical system of fire-proof floor construction now in use." The only attempt to lay the floor *on* the beams, of which Mr. Wight had knowledge, is in the sugar house above mentioned. This has suggested to him several methods of laying rigid floors upon beams at considerable spaces (three to five feet) from one another. Preliminary to so doing Mr. Wight suggests the revival of the deck beam, or the I-beam with a better form for the bottom flange, and the adoption of cast-iron shoes for the bearings.

(To be concluded next week.)

ON RIVETS AND RIVETING.

(Condensed from Van Nostrand's Magazine.)

BY MARTIN BALCKE.

The following remarks do not refer to riveting for the purpose of merely uniting two parts of machinery or two sheets of iron, but they apply to rivetings which require a higher degree of strength and solidity, as, for instance, for boilers and working parts of machines. It is a general rule for all constructions, especially for those in iron, to distribute the strain which has to be withstood by a certain part of a machine, as evenly as possible over the solid mass of the said part. This rule is also very important in the use and arrangement of rivets. The simplest and safest way to carry out this rule is to calculate directly the areas of the working sections, and to see that the strain which acts on any part of a section, does not exceed certain limits generally conceded to the respective materials. This is the way also to avoid the use of empirical formulæ, the most important coefficients of which are always dictated by the personal opinions and notions of their authors.

The force necessary to tear a wrought-iron bar of a certain section, is so nearly equal to that required for cutting or shearing the bar, that both may be considered as equal in calculations, for practical purposes. The limit of elasticity of soft wrought iron, as generally used for rivets, is at a pressure of about 18,000 lbs. on the square inch. With boilers the strain of tension per square inch of section of the material, ought not to reach 9,000 lbs.; because continued heating and long use weaken the material considerably.

In the construction of stationary boilers, one square inch of section, taken through the riveting, ought generally not to be strained above 12,000 lbs. But if a riveted part of a machine has to sustain a strain acting alternately in two different and opposite directions, this strain should never exceed 2,000 lbs. per square inch of section.

If a quite uniform distribution of the strain over all the sections cannot practically be obtained, at least the tension of the sections which are exposed to the highest strains ought to be kept within the above-mentioned limits.

The shape of the head of a rivet is dependent on the kind of strain to which the rivet is subjected. This strain can have the tendency of tearing or of shearing the rivet, or of both simultaneously. If a rivet has to withstand a tearing strain, the hight of its head must be such that the cylindrical surface which would make its appearance when the head of the rivet would be stripped off, is equal to the area of a cross-section through the rivet—that is, the hight of the head has to be one half of the radius, or one fourth of the diameter of the rivet.

Practical experiments on the strength of rivets have come to the same result, and have besides shown very distinctly that the rivet holes should never have sharp edges, and that the head of a rivet ought to be connected with the shaft by a conical part. Whenever this part is omitted, and when, consequently, the rivets have sharp corners below their heads and the rivet holes sharp edges, the rivets break close to the head, when subjected to a strain of tension and when the heads are strong enough not to be stripped off. When, on the contrary, the rivets have a conical connecting part between their heads and shafts, they extend considerably before they break, and the rupture finally occurs in the middle of the shafts. All experiments have given this result without exception.

Rivets subjected to a shearing strain only, would theoretically not require any head at all. But it is good also in this case to make the heads of the rivets as high as above determined, because generally a close contact af the riveted parts is desirable, and because the rivets, being set in red-hot, have to resist the strain of tension produced by their contraction in cooling.

If the heads of rivets have to be countersunk, their best shape is that of a truncated cone, the angle at the point of which cone would be of 75°.

The sectional area of the shaft of a rivet, expressed in square inches, is found by dividing the actual and total strain on the rivet, by the strain practically admissible on the square inch of the respective material.

We will now examine the riveting of simple round boilers. The shearing strain in pounds on every rivet in the length rows is equal to one half the diameter of the boiler in inches, multiplied by the rivet distance in inches, multiplied by the steam pressure in pounds less 15 pounds atmospheric pressure.

The strain upon every rivet distance in rows round the boiler expressed in pounds is equal to one fourth the diameter of the boiler in inches, multiplied by the distance between any two rivets in the same row round the boiler taken in inches, multiplied by the steam pressure per square inch in pounds, less 15 pounds atmospheric pressure.

Now, to obtain an even distribution of the total pressure in the boiler over all its sections, the sectional area of a rivet has to be equal to the sectional area of the plate between two rivet holes, and equal also to the double area of a section through the plate, from a rivet hole to the edge. That is, the sectional area of the rivet in square inches must equal the distance between any two rivets in a row round the boiler in inches minus the diameter of the rivet, multiplied by the thickness of the boiler plate in inches; or, conversely, the distance in inches between any two rivets in a row round the boiler must equal the sectional area of the rivet in square inches, divided by the thickness of the boiler plate in inches, plus the diameter of the rivet.

From this we conclude that the rivet distance is dependent on the diameter of the rivets, and, reciprocally, the diameter on the distance. To determine these, it is necessary to take into consideration the possibility of making and keeping the boiler tight, which possibility depends principally on the relation between the thickness of the plate and the rivet distance. Let us consider a special case to explain this more fully. We suppose a simple cylindrical boiler to have a diameter 42 inches; the thickness of the plate, 0·3 inches; the excess of the steam pressure over the atmospheric pressure, 42 lbs. Under these conditions the strain of tension per square inch of plate section, taken parallel to the axis of the boiler, is—

$$\frac{21 \times 42}{0{\cdot}3} = 2{,}940 \text{ lbs.}$$

In taking the areas of the rivet sections equal to those of the plate sections contained between two rivet holes, according to the above rule, and in calculating the following items for three different rivet diameters, for the sake of comparison, we find—

The rivet diameter being $\frac{5}{8}$ in., $\frac{3}{4}$ in., $\frac{7}{8}$ in.

Area of rivet section (sq. in.), 0·307, 0·442, 0·601.

Distance between rivets (inches), 1·648, 2·22, 2·878.

Shearing strain on a rivet (lbs.), 1,453, 1,959, 2,538.

Strain per square inch on a section through the plate, or through the rivets in the length rows of the boiler (lbs.), 4,730, 4,430, 4,220.

[The shearing strain on rivets and the strain per square inch of section in the rivet rows round the boiler, are one half of those in the length rows.]

The strength of the riveting compared to the strength of the simple plate is 0·62, 0·66, 0·70, for the three different rivet diameters.

The advantages and disadvantages of the one or other of the chosen rivet diameters are clearly shown by these figures. The $\frac{5}{8}$-in. rivets produce a very small comparative strength of the riveting (0·62). The $\frac{7}{8}$-in. riveting has a great comparative strength; but the distance between the rivets (2·878 in.) is too large in proportion to the thickness of the plate, to allow of a good and safe tightening of the joints. The $\frac{3}{4}$-in. rivets, not showing either of the two mentioned disadvantages in a considerable degree, are evidently the best in this special case.

ON THE TEMPERATURE OF COAL MINES.

A PAPER READ BEFORE THE MIDLAND SCIENTIFIC SOCIETY, ENGLAND, BY A. LUPTON, F.G.S.

In instituting the experiments, the result of which I propose to describe to the present meeting, and which extended over a period of a year and a half, I was actuated by a desire to ascertain the amount of truth in the often-repeated statements of practical men, that the temperature of deep mines that had been at work for some time, did not exceed the temperature of shallower mines, and to reconcile, if possible, those statements with the generally-accepted observations recorded by scientific men, which tended to prove a gradual increase in the earth's temperature in descending. Owing to the kindness of the engineer, I had the opportunity of ascertaining the temperature of two shafts as they were sunk; the method of observation was as follows: A bore-hole was made in the center of the shaft bottom, from 6 to 9 feet deep; a thermometer was let into the bore-hole by means of a wire, then the top of the hole was tightly plugged with hemp and clay, in order to prevent, as far as possible, the circulation of water in the hole. The thermometer was allowed to remain in the hole for 24 hours at a time. I used maximum registering thermometers, some by Negretti & Zambra, and some by Mr. Davis, of Derby. Owing to the presence of water in both the shafts, the value of these experiments is much diminished; and, in one shaft, which attained a depth of 906 feet, the rise in temperature, as recorded by the thermometers, was only 1° for every 120 feet; in the other shaft, where there was less water, and which attained a depth of 966 feet, the rise in temperature was 1° in 73 feet. I next had a series of holes bored horizontally in the shaft sides, into each of which I put a thermometer; the holes were tightly plugged, to hinder the circulation of air in them. The temperature of these holes remained the same, winter and summer, throughout great variations of temperature in the air of the shaft. In the drier of the two shafts above-named the rate of increase in temperature varied from 1° in 70 feet, to 1° in 60 feet. I then repeated similar experiments to these last at the Hucknall Colliery, in Nottinghamshire, through the kindness of Mr. Fowler, the engineer, and found a regular increase in the temperature of the works of 1° in 60 feet; the depth of the pit is 1,250 feet. Also, by the kind permission of Mr. E. Hedley, the engineer, I took the temperature of the coal at the bottom of the Annesley Colliery; the temperature was 73°, and the depth 1,425 feet, being an increase of 1° in 60 feet. By the kindness of Mr. Carrington, I was enabled to make similar observations at the Kineton Park Colliery; the pit is 1,200 feet deep, the temperature of the coal 71°, being an increase of 1° in 55 feet. The result of all my observations is, that the permanent temperature of the earth, at the depth of 50 feet, is 50°, and the regular rate of increase in temperature, below that depth, 1° in 60 feet. Observations made by others in the North of England and South Wales seem to prove the temperature of the mines depends on the depth below the surface of the ground, irrespective of the depth below the sea-level.

The next question is, given the above rate of increase in the earth's temperature, at what depths will it be practicable to get coal? I, therefore, made some experiments to ascertain what effect ventilation would have in cooling the mines. At the Hucknall Colliery the temperature of the coal, when first the pit was sunk was 70°; ten months afterward a hole was bored, 2 feet deep, into the side of a coal head, through which a current of air had passed, and the temperature of the coal was found to be 59½°. At the Annesley Colliery, the coal, when first cut, had a temperature of 73°, whilst a bore-hole in a head that had been driven six months, had a temperature of 64°. At Kineton Park, the coal, when first cut, had a temperature of 73°; and, after three months exposure to a current of cold air, the temperature of the coal in a hole 2 feet deep was 60°. Many other experiments, at other collieries, gave similar results. With a small sensitive thermometer I found the coal, in heads that had been driven some time, was, at a depth of only 6 inches from the surface, of the same temperature as the air circulating past. From the above experiments I came to the conclusion that the passages in a mine were soon cooled by a brisk current of air, coal being a bad conductor of heat. The internal heat of the pillars of coal could not be conveyed to the surface as quickly as it is carried away by the current of air. At a depth of 10,000 feet, the temperature of the coal would probably be about 212°. According to Pélet, 1 square foot of cast iron, at a temparature of 212°, in an atmosphere at a temperature of 79°, would give out a certain number of units of heat in a minute. Supposing, for the sake of argument, that 1 square foot of coal surface would give out the same number of units of heat, under similar circumstances, I have calculated that a mine of sufficient extent to produce 1,000 tuns of coal per diem, in a seam of average thickness, would raise from 1,300,000 to 1,500,000 cubic feet of air in a minute, from a temperature of 59° to 79°. In estimating the extent of the heating surface in the mine, I have taken the face of work at a temperature of 212°; and the gate-roads less than a year old have been reckoned as having, on the average, only half the heating power of freshly cut coal, and all the roads along which a current has been passing for more than a year, are supposed to be cooled down to a temperature of 60°. It is quite possible for men to work in a current of air no hotter than 79°, and it is also an engineering possibility to produce a current of air of the above-mentioned volume; and the expense of producing such a current would probably not be an insurmountable obstacle. Having considered the subject a great deal, I have come to the conclusion that, as far as the temperature of the earth is concerned, it will be possible to work coal at a depth of even 10,000 feet.

An Apparatus for Prognosticating the Weather.

The following is the description of an instrument devised by M. Bonneville, of Paris. The instrument is composed of the motor, which imparts motion to the index needle. The motor is composed of two wooden strips, or thin blades, stuck one upon the other, of different hygrometric capacities, one of which is called the positive, and the other the negative. These strips, or thin blades of wood, are curvilinear, and assume the form of an arc of a circle. One of the extremities of this arc is fixed to a square held by screws on to a brass disk; the other extremity is loose and movable. It is connected by a silken thread passing round one of the two grooves of a pulley, with an arbor forming the axis of the index needle. The force of the motor is opposed by a spring fixed upon the brass disk, and connected by another silken thread with the arbor, round the second groove of which it is wound. The expansion of the motor, or its contraction as shown by the index, indicates the presence of much moisture in the air or the opposite condition.

Improved Mariner's Compass.—The Earl of Caithness is the inventor of a new mode of suspending ships' compasses, which for efficiency and simplicity is said to surpass anything yet produced. Instead of the two concentric brass rings having their axles at right angles, known as gimbals, Lord Caithness employs a pendulum and ball, which ball works in a socket in the center of the bottom of the compass bowl. The compass works, therefore, on one bearing on the ball-and-socket principle, and thus maintains its parallelism with the horizon in the heaviest weather. If we may credit the published reports of the trials, the simplicity of this invention is not more striking than its efficiency. It is stated that it has already stood the most trying tests, and the oscillation of compasses to which it is applied, as compared with the oscillation of the gimbal compass is as degrees to points.

The "Sky Railway" in Running Order.

A visitor to the White Mountains describes Mount Washington Railway, which ascends the mountain in a tolerably straight course, following the general line of the old Fabyan bridle path. The depot is 2,685 feet above the level of the sea, or 1,117 feet above the White Mountain House. This leaves a grade of 3,600 feet to be ov come, as the hight of the mountain is 6,285 feet above th level of the sea. The length of the road is two miles and thirteen-sixteenths.

The heaviest grade is thirteen inches to the yard, and the very lightest one inch to the foot. A part of the course is over "Jacob's Ladder," the zig-zag portion of the old bridle path lying just above the point where the trees are left behind. The railroad takes a generally straight line, however, curving slightly, only to maintain a direct course. The rolling stock is in a much better condition than it was last year. There are two locomotives now in use, and a third is expected from the establishment of Mr. Walter Aiken, at Franklin, this week or next. These are more powerful than those in use last year. A new car has also been constructed.

The locomotive pushes the car before it up the incline, and both run upon three rails, the center one being a cog rail. The engine and car are kept upon the track by friction rollers under the side of the cog rail, and the appliances for stopping the descent are ample. By means of atmospheric brakes either the car or engine could be sent down alone at any given rate, fast or slow, and there are also hand brakes operating with equal directness upon the central wheels, together with other means of governing the machinery of locomotion. Every competent person who has examined the road and the running machinery, pronounce both as safe as they could possibly be made. The landing place at the top of the mountain is directly in the rear of the telegraph office, and but a few rods from the door of the Tip-Top House.

We this week present our readers with a portrait of the late John A. Roebling, whose obituary was published in our issue of Aug. 7th. It is well worth preserving as a souvenir of one of the most distinguished engineers of the age.

Improvement in Sadirons.

This invention consists, mainly, in so constructing a sadiron that it may be constantly and uniformly heated by a gas flame while in use. The engraving is a perspective view of the device with a portion of the sadiron broken away to show the internal arrangement of the burners employed. These are so plainly shown in the illustration that no further reference to them will be needful.

The sadiron has an interior chamber which may be called the combustion chamber, and an outer one completely surrounding the former, and inclosed by the exterior walls of the sadiron. Through these exterior walls are openings which admit air to feed the flame, and afford exit for the carbonic acid gas generated. The wall immediately surrounding the inner chamber, called the flame wall has, also openings communicating with the outer chamber, so that a fine flow of air can reach the burners, and the gases of combustion escape through the passage between the flame wall and the exterior walls of the sadiron.

The position of the burners is such as to uniformly heat the iron particularly the bottom or smoothing surface, and they are readily lighted from openings provided for the purpose.

The gas is conveyed from an ordinary bracket gas burner, having a suitable framework attached to the wall for the support of two pulleys, one fixed and the other movable, the movable one descending by its own weight; or if needful it may be weighted. A flexible tube passes over these pulleys, and the moving one takes up the slack or lets it out as wanted, to adjust the length of the tube to the motions of the hand in smoothing linen.

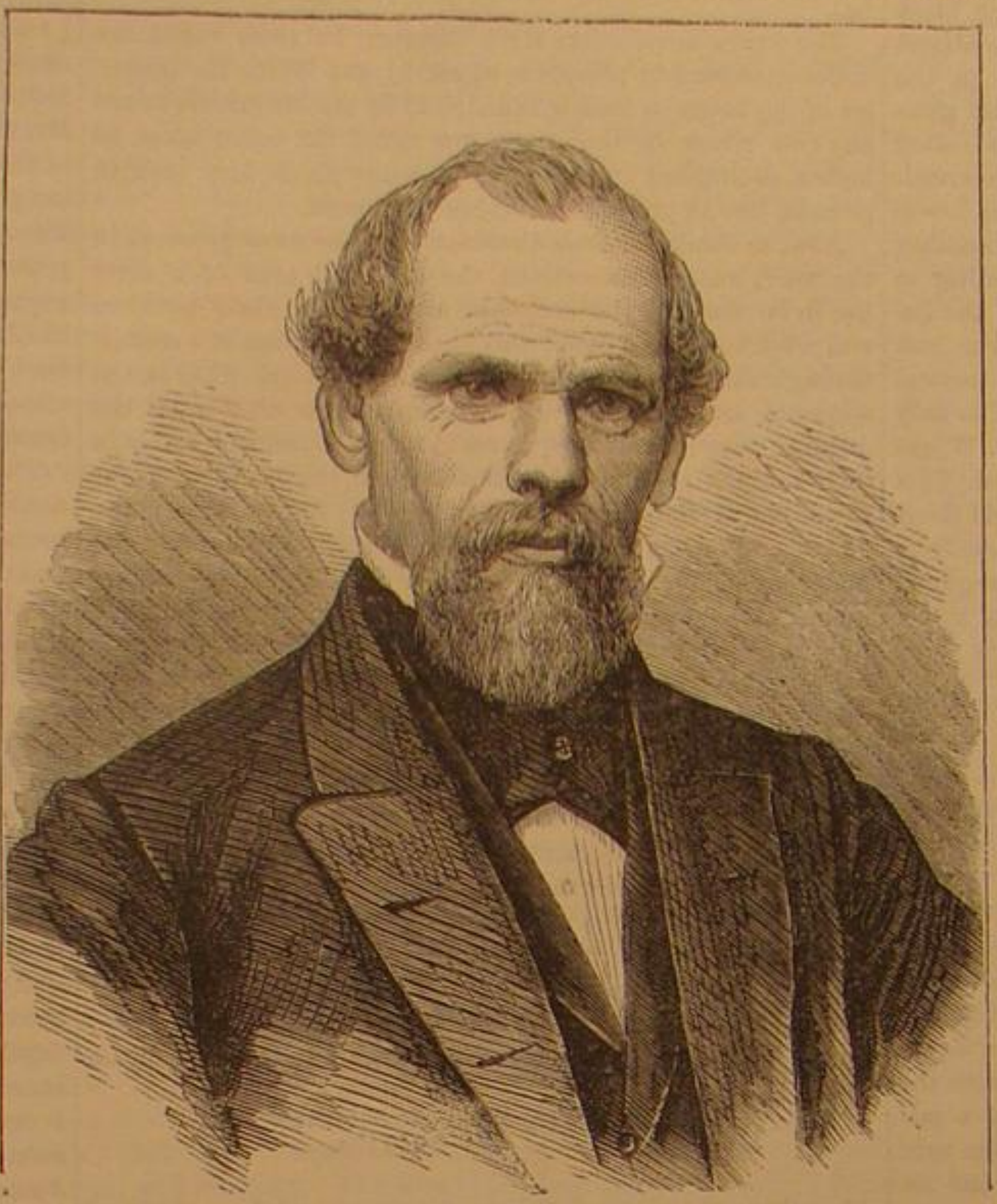
Patented, June 15, 1869, by Andrew J. Kennedy, of St. Louis, Mo. Address A. J. Kennedy, care of R. Radke, 515 Olive street, St. Louis, Mo.

The Hoosac Tunnel.

The new contractors on the Hoosac Tunnel are pushing the work ahead quite rapidly. During the month of June they drove the heading at the east end in 160 feet, and it is in now over a mile and an eighth. The first week in July they made 30 feet and the next week 40 feet. The first and second enlargements are also being pushed ahead vigorously. They are having new drills made to operate on the roof, which they hope to have in operation in September, and by which they expect to increase their progress very materially. They are also erecting buildings near the mouth of the tunnel for four additional compressors, so as to give them more power. They will be run by steam. They have now 200 men at work at the east end, divided in three gangs, who work night and day continuously, resting only from midnight Saturday to midnight Monday. The central shaft is down about 700 feet, and is sunk at the rate of more than a foot a day. At the west end they have just got fairly at work, and they expect to make over 100 feet a month.

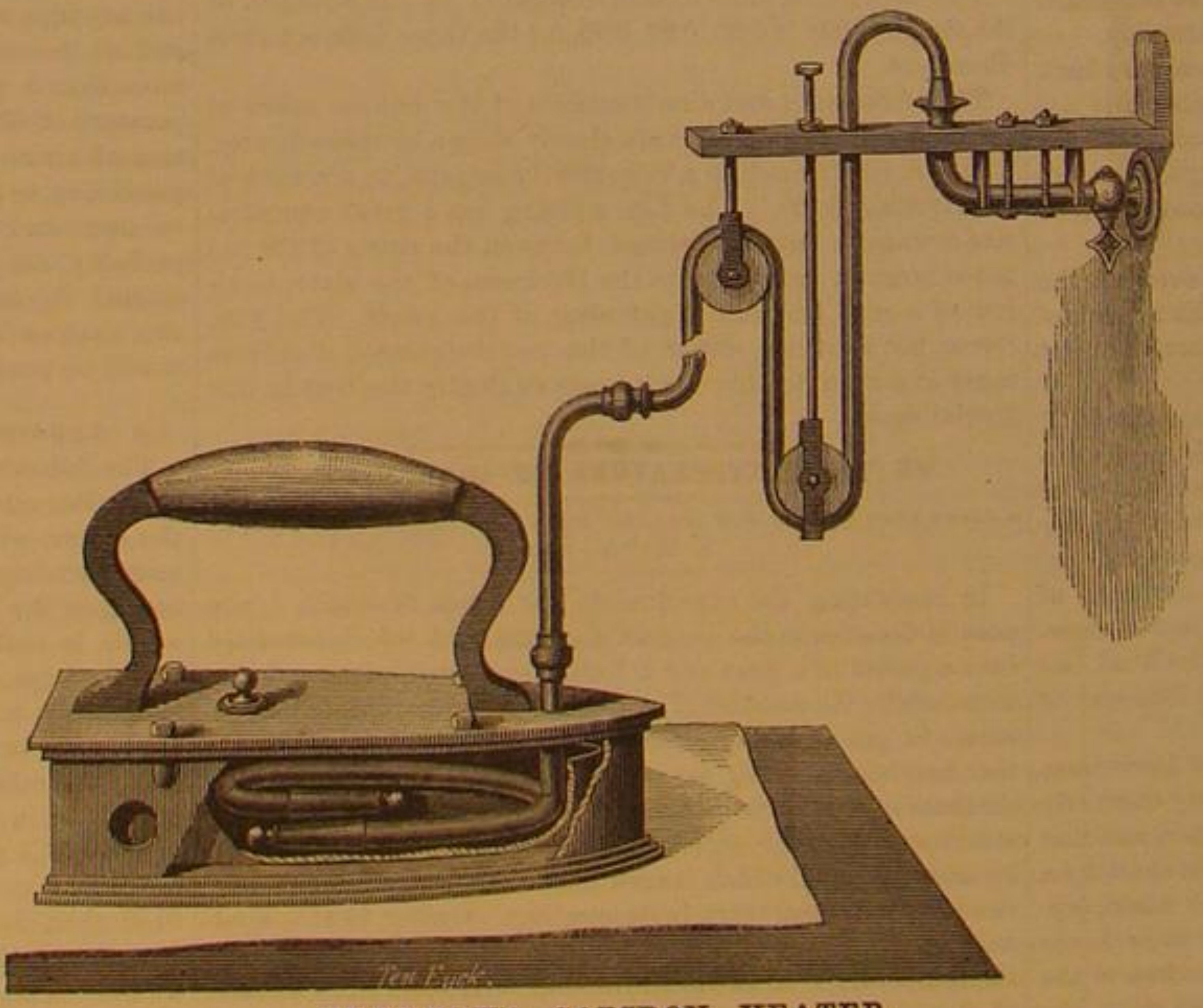
Black upon Cotton by Dyeing.

The old fast black upon cotton was obtained by giving a blue ground with indigo, then galling and working in sul-



PORTRAIT OF THE LATE JOHN A. ROEBLING.

phate of iron, sometimes with addition of logwood; alder bark, and other similar substances were also employed; and the goods usually finished in an emulsion of oil, to take off the harshness which iron mordants so generally communicate. Later on, what was called the Manchester black, was obtained by first steeping in galls or sumac, then working in the copperas vat, and afterward in logwood containing some verdigris, and repeating these operations until the desired shade was obtained. Galls are now scarcely ever used; sumac, which is cheaper, being employed in substitution; and the processes, though almost infinite in details, consist essentially of steeping in sumac, then working in an iron bath, and afterward raising in logwood.



KENNEDY'S SADIRON HEATER.

One method said to give good results, consists in steeping in sumac for twelve hours, then working through lime water and exposing to the air until the light green color at first produced passes to a dull heavy shade; the goods are then passed through a solution of green copperas, and exposed to the air until they appeared black while in the wet state; if dried they would be found to be only gray or slate color. To fill up the color the goods are passed into the logwood bath (some authorities say it is advisable to pass them through lime water first) for a sufficient time; lifted, some copperas added and the goods raised in it; for light goods this suffices to produce a black, heavier goods require a repetition of the processes. A rapid continuous method of dyeing black on light goods is practiced in Lancashire; the goods are passed through a decoction of catechu, then immediately into a solution of bichromate of potash, next into decoction of logwood, then into green copperas, and lastly through a decoction of some red wood, as camwood or Brazil wood. The order of these liquids may be changed within certain limits.

A simpler method of dyeing by means of bichromates is also given, which consists in steeping the goods in logwood, exposing them to the air and drying, then passing them into bichromate of potash neutralized by crystals of soda, by which the logwood is "struck" of an intense black, and fixed. Velveteens are dyed black by reiterated passages in logwood and green copperas until a dark brown is produced, then passed in sumac and sulphate of copper, with sometimes addition of peachwood or Brazil wood. Fustic is an ingredient in all dyes where a brownish or jet black is desired.

Black is one of the most difficult colors to dye, and no one but a practical man understands the difficulties of obtaining regular and good results, especially when first-class colors are aimed at. It is useless to give weights and quantities when these are really only inferior elements of success; a slight change in the quality of the sumac, some thing different in the "ageing" or "mastering" of the logwood, some slight modification in the temperature and pressure of the "stills" in which the liquors are made, and other causes not more conspicuous, have frequently in my experience put works almost to a stand still. And when I have been called in for advice, it has been evident that chemistry could only give conjectures as to what was wrong.

These failures in producing satisfactory colors would not be apparent to an unpracticed eye; the defects would only consist in those hues and reflections of shade being wanting which were most esteemed and usually produced. Though it is exceedingly difficult in most cases to trace the actual cause of inferior results, there have been in my practice very evident occasions in which a most trivial and apparently unimportant cause has produced very embarrassing effects; the closest attention on the part of a foreman or manager is most essential in order that these things may be avoided, or if they occur that their cause may be discovered.—*Dictionary of Dyeing and Calico Printing.*

Use of Gun-Cotton in Dentistry.

This statement appears absurd at first, as if dentists used gun-cotton as an explosive agent; but the fact is, that quite recently the collodion made of gun-cotton, hardened by evaporation, as a varnish, into thin sheets, has been used as a substitute for the objectionable vulcanized rubber, as a basis for support of false sets of teeth. For this purpose different sheets are softened by ether, and pressed together in the mold, which is made in a way similar to that in use for making the platinum or india-rubber sets.

One of the objections to the vulcanized rubber sets of teeth is the dark color, which can only be corrected by vermilion, which gives it a reddish color, somewhat similar to that of the gums. Vermilion, however, being a compound of mercury, seriously affects the health of some persons, whose peculiar constitution renders them very sensitive to the influences of this pernicious metal.

In drying, collodion contracts considerably, and the only additional trouble, in making objects of dry collodion, is to make the molds larger, by repeated castings and re-castings in plaster; the plaster expanding every time a little, the last mold obtained may be sufficiently enlarged to compensate for the shrinkage of the material. Sets of teeth made on collodion are much lighter and stronger than on any other material thus far employed for that purpose, and, no doubt, will soon come into general use in the United States, as the dentists of this country are among the most progressive in the world.—*Druggists' Circular.*

Tie-Spotting Machine.

This device is thus described by the *Chicago Railway Review*: "Our readers are aware that rails are generally laid level upon the ties, with the result of bringing the whole weight of the car upon the inside of the rail and the inclined rolling surface of the wheel. Mr. Jauriet conceived the idea of laying the rail so as to incline inwards on the same level as the surface of the wheel. The old hand process of doing this, with adze, is slow and unequal and costs more than it comes to. The tie-spotter, attached to a car and transported from place to place on the line, may be generally described as consisting of two vertical shafts, with knives attached, to which the ties are brought by means of a chain feed. The knives are adjustable so as to 'spot' at an angle, or in the ordinary manner. The machine is operated by the engine attached, and requires, besides the engineer, six men to operate it, who do the work of from fifteen to twenty. A recent experiment resulted in the spotting of seventy-six ties in fifteen minutes."

Telegrams from various points seem to indicate that at least a majority of the astronomers have been in luck in witnessing the eclipse. The weather was generally fine.

THE GREAT SOLAR ECLIPSE.

The morning of the 7th dawned clear but with some floating clouds at this point. Thousands of people were prepared with smoked glass, opera glasses, etc., etc., to observe the remarkable event, although at New York the eclipse was to be only partial, a fact which the press had made generally understood previously.

The scientific were anxious in regard to the news telegraphed from Chicago to the effect that the weather was not propitious, as although the eclipse would not be total at that point it was in sufficiently close proximity to the belt of totality to give fears that the clouds might extend to some of the most important points where observations were to be attempted. Up to the present writing, we have not the news from the different points of observation, and are therefore unable to state how much success has been achieved by different expeditions, but will give a summary of the results in our next.

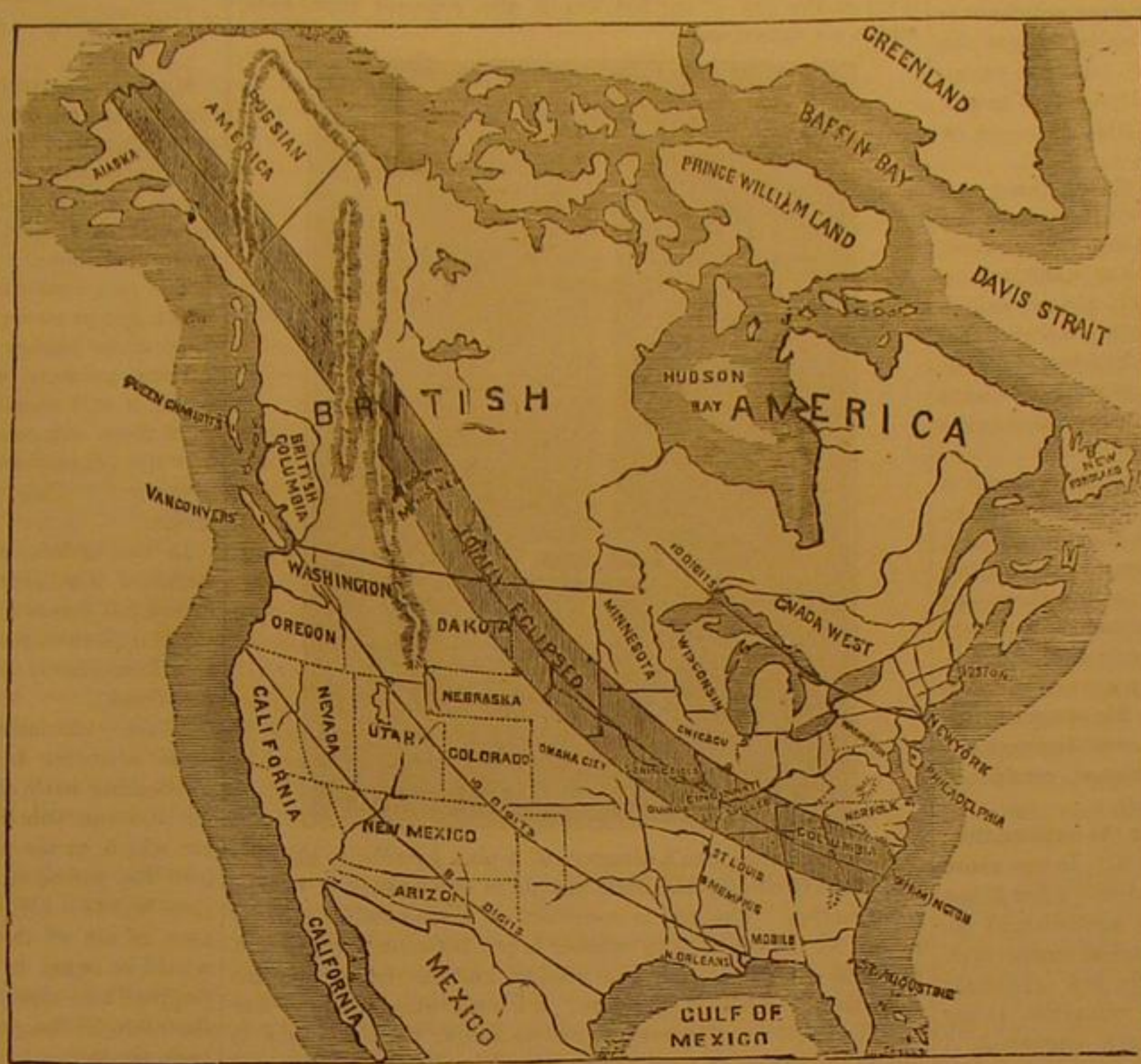
In all probability there will have been some disappointments. To those who were not in position to observe this eclipse the following facts, with the accompanying illustrations, will serve to give a pretty good conception of the features of the phenomenon, and its importance. The times of the beginning and ending of the eclipse at prominent points in the belt of totality have been already given in our issue of July 31st. We herewith give a map showing the belt of totality in the United States. This belt was 140 miles in width. The eclipse was also visible, but partially, far outside this belt.

The nearest lines drawn parallel to the belt show the limits between which ten digits of the sun's disk were covered, and the next the limits between which eight digits would be obscured. A digit is one twelfth of the sun's diameter.

In the diagram of the middle of the eclipse as it appeared in New York, the greatest obscuration, 10·6 digits, is shown.

The obscuration of the sun's disk began in the lower righthand quarter, and the shadow passed off at the upper lefthand.

We also give a diagram of the corona and the protuberances observable in the belt of totality, which will give our readers an approximate idea of these most remarkable appearances.



PATH OF THE ECLIPSE.

THE CORONA.

The following descriptions of the corona and protuberances are copied from an article published in the New York *Tribune* of the 6th inst.:

"In 1706, at Montpelier, the French astronomers saw the moon, when the sun was entirely hid, surrounded by a very white light, which formed a sort of corona or crown around its disk about three minutes of an arc in breadth, or one tenth the moon's apparent diameter. Within these limits the light preserved a uniform intensity, and beyond it, to the extent of about four degrees all around the moon, the light was seen gradually diminishing, till it was finally lost in the obscurity of the firmament.

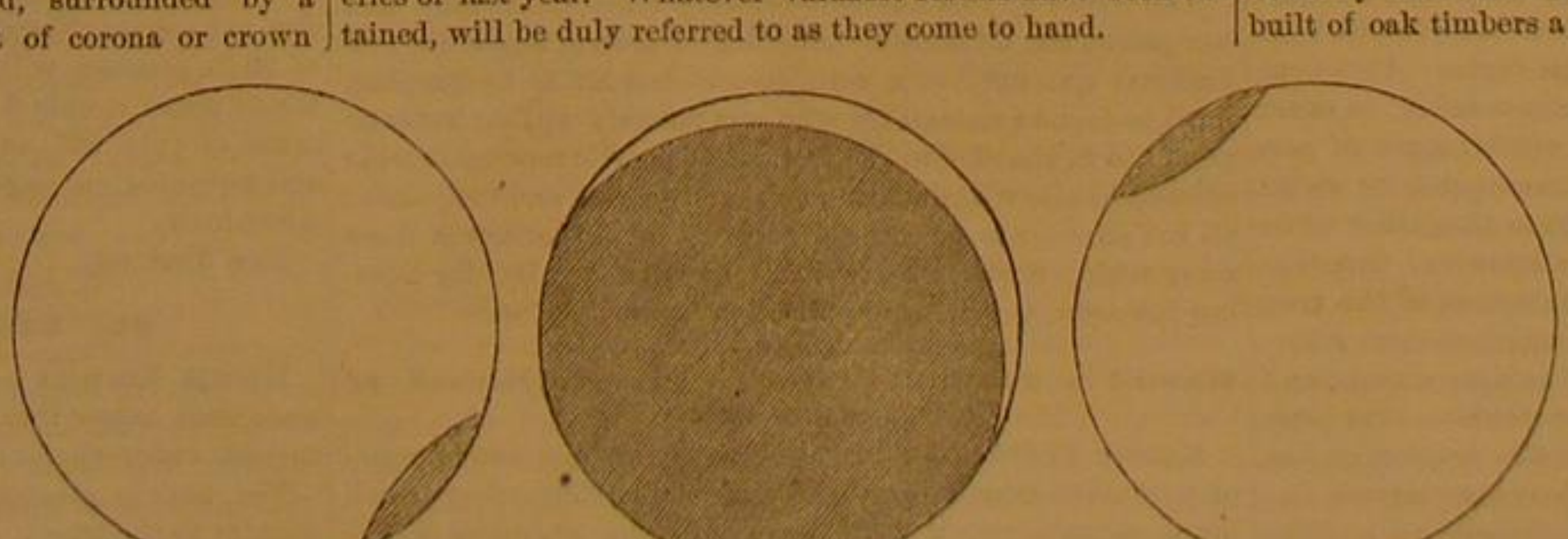
"During the total eclipse of 1715 at London, some seconds before the sun was completely hid, Halley saw a luminous ring around the moon, the breadth of which was one twelfth, or perhaps a tenth, of her diameter. To a French astronomer, who went to London for the purpose of observing this eclipse, the corona or ring around the moon appeared of a silver color. It was more luminous near the borders of the moon, and diminished gradually in intensity up to its exterior circumference. This circumference, although faint, was very well defined. The corona did not appear of equal intensity on every line radiating from its center. Dark spaces or interruptions were observed in it, which gave it still more the appearance of the glory around the heads of saints. This observer also saw at the innermost edge of the corona, a brilliant circle of red, which is probably the earliest notice of what we now call the red protuberances or projections. In 1724, Maraldi observed for the first time that the luminous corona was not concentric with the moon. These observations proved the corona to be concentric with the sun instead of with the moon, and that it is a phenomenon closely connected with the sun's physical constitution.

"THE ROSE-COLORED PROTUBERANCES."

"The red protuberances were first seen by Vassenius at Gottenburg, May 3, 1733, and they have been observed at every total solar eclipse since that time. These rose-colored prominences are of irregular form, sometimes rising nearly as high as the corona itself. These phenomena were variously seen and described in the eclipses of 1778 and 1806, and in 1842 Arago saw the corona both with his telescope and the naked eye. In the Sandwich Islands in 1850, and on the coasts of Sweden and Norway in 1851, these curious appearances were still the objects of study. It was not until the eclipse of 1860 that it was satisfactorily demonstrated that they belonged to the sun, and that the interposition of the moon merely enabled us to see them by cutting off the direct rays of the sun."

The Government parties, sent out to different stations along the line of the total eclipse, were provided with the means of taking, in large telescopes, photographic impressions of the phenomena at their various stages. These photographs can be studied at leisure, and, in connection with the impressions left on the memory of the observers, will serve to determine very important questions as to the constitution of the sun. Besides these usual means of observation, comparatively new instruments for detecting polarized light, and for determining the chemical composition of the sun, and of the corona and red protuberances, will be employed. The spectroscope is the important instrument for making this curious chemical analysis of a distant object.

Our readers having read the accounts of observations of the eclipse of 1868, as observed principally by European astronomers, will appreciate the zest with which American scientists seized this opportunity to add to the important discoveries of last year. Whatever valuable results have been obtained, will be duly referred to as they come to hand.



Beginning 5h. 12m. 30s. P. M. Middle, 6h. 8m. 39s. End, 7h. 0m. 46s.

THE ECLIPSE IN NEW YORK.

[The *left hand* diagram represents the sun five minutes after the commencement of the eclipse, when the moon has begun to make its appearance on the right. The middle diagram represents the sun midway between the beginning and end of the eclipse, when the obscuration is the greatest; and the right hand diagram represents the sun five minutes before the termination of the eclipse.]

NO GREAT achievement is possible without hard work.

The Use of Glycerin in Wine.

We translate from "Wagner's Iahresbericht" the following, which will be of interest to wine growers:

Glycerin has been used for some time for the improvement of wines. This process has been called Scheeleizing (from Scheele the discoverer of glycerin).

According to the investigations of Pasteur, Nessler, and Pohl, glycerin is a component part of wine. As is well known, glycerin differs from the sugar, inasmuch as it does not ferment nor take any part in the process of fermentation, actively or passively. These valuable properties have only recently been recognized and appreciated, and have given to glycerin, in addition to many other applications, a firm hold in the rational improvement of wine.

It is not our intention to undervalue the important part which grape sugar takes in pure wine, nor to supplant by glycerin this article, which cannot be dispensed with during the state of fermentation. As soon, however, as the wine has passed the fermentation, the valuable functions of glycerin commence; for only by its aid is it possible to impart to the wine any degree of sweetness that may be required without incurring the risk of spoiling the wine or producing future changes thereon. Nothing like that. Even the greatest addition of glycerin is unable to endang r the wine in any way, and a valuable remedy has thus been discovered to improve even wines that are ready for bottling, which, to this date, has been considered entirely impossible. An erroneous impression having gained ground that the glycerin could not be used for young or new wines, we can add that there is no reason why it should not be applied, with the same advantages stated above, to any wine as soon as it has become clear, and when it is necessary that it should not again ferment by an addition of sugar.

The sweetness and smoothness which glycerin imparts to wine will ever be apparent. Regarding the manner of using the glycerin, we can only say that it is so simple that it hardly requires a detailed description.

The first and greatest consideration is, to procure a quantity of glycerin that is chemically pure, which is especially essential when it enters into consumption, and here we would say that there is scarcely another article in the market which is liable to contain so many impurities, owing to an imperfect or incorrect manner of manufacturing, or intentional adulteration to produce a cheap article.

Under these circumstances it is best to buy only of parties who will guarantee the article to be pure.

According to experiments thus far made, the addition of glycerin to wine, according to the quality of the latter, should be from one to three per cent, or for one hundred gallons of wine from one to three gallons of glycerin.

It will be necessary to apportion the maximum quantity of glycerin to be used to the quantity of wine in process of preparation; add to the quantity of glycerin thus obtained the same measure of wine, and then impart enough of such mixture to the wine to give it the required taste. The barrel of wine thus improved by glycerin will at once be ready for bottling, provided the wine was clear before.

We repeat: an addition of glycerin will not effect on wine any other changes than such as the latter is predisposed to by virtue of its inherent properties.

SOME recent experiments made at the Woolwich Arsenal, near London, encourage the hope that gun-cotton can be successfully used as a most destructive agent. A palisade was built of oak timbers a foot thick, firmly fixed in the ground, and supported in the rear by strong trusses. Disks of gun-cotton were placed along the face of the palisade about a foot above the ground, and were fired by a battery in the usual way. The effect may be described as wonderful. The palisade was literally blown away amid a deafening report, as if the massive timbers offered no more resistance on one side of the gun-cotton than the atmosphere on the other. The disks require no fixing; merely laying them on is sufficient. Solid blocks of iron and stone can be shivered into fragments by firing a disk laid on the top. In future sieges, if some desperate fellow can but get to the gate or a thin part of the walls, and hang on a few disks of gun-cotton, a breach can be made by firing with a galvanic current from a long distance.

THE most insignificant of human transactions can only be performed in the best manner by those possessed of all the knowledge bearing upon them. Ignorance is always a dead weight, embarrassing him who carries it; on the contrary, "knowledge is power."

Correspondence.

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

Printers' Ink in the Sale of Patented Articles—An Important Suggestion.

MESSRS. EDITORS:—I want to make some complaint about the manner in which patented articles are introduced to the public, and to point out a remedy.

In the first place, nine tenths of all "the people" are totally incapable of understanding the principle of a machine, more complicated than a crow bar. That we cannot help. Our only remedy lies in presenting an article with a full explanation, and explicit directions for using, applying, etc. Retail hardware merchants sell a great many patented articles intended for domestic use. Now a hardware merchant is liable to be a natural mechanic and to be able to explain the uses of his goods, but he is a good deal more likely to be utterly wanting in these qualities and is usually content to sell a machine with as little comment and instruction as he would a nail rod.

He tells the purchaser "'They say' it's a tip-top thing and works nice. I don't exactly understand how it works, but I guess you'll have no trouble; any way if it don't work well, you can bring it back." So the customer takes it,and just for the want of a little printers' ink (which should always accompany an article of this kind, in the form of explicit directions) he fails to make it work, concludes it is a humbug, tells all his neighbors so, and takes it back to the merchant (who is selling on commission), and the fate of that invention is decided—in that community at least.

It has been my good fortune to save from disgrace many a really good article by explaining to its possessor its principle.

I was visiting a friend in the country a short time ago. He had just brought home a patent arrangement for holding the sickles of reapers and mowers while grinding them—an arrangement with four distinct motions to adjust the two bevels to the stone. We tried to apply it properly to the grindstone frame. We worked at it without the least real success for a long time and then searched through a file of agricultural papers to find the advertisement and get some instructions from that. Now I will tell you in the strictest confidence what I found, and you can imagine how I felt.

In plain type and good English, this was the explanation: "It is so simple that a child can understand it." In one sense that was true, but there should have been added—"after it has been explained to him." I also found in the agricultural paper one of those abominations by courtesy styled engravings. It represented the grindstone, complacently but evidently grinding off the point of the "section." I remarked to my friend "If this was a SCIENTIFIC AMERICAN engraving I could set your "grinder" without a word of explanation. He thought we had better let it go, and he would carry it back; but I was spunky and saw some good points about it. The result was that we conquered it,and he was delighted with its working.

Now I could tell anyone in a few words how to set that kind of a grinder; but better than that I could write it, and any printer could print it, and then if a copy was furnished with each grinder everyone would know how to use it. Wouldn't that be better than to send the machine out as a sort of Chinese puzzle? Wouldn't the inventor or manufacturer make more money, and wouldn't the public be benefited?

Of course we who read the SCIENTIFIC AMERICAN, know that an inventor cannot make half as good use of his money as to have his invention engraved and explained in your paper simply on account of the wide-spread advertisement which it gives his invention; but when we consider that he can have the engraving electrotyped, and can copy your explanation into his circulars, the benefits become immense, and I do not doubt but it would in thousands of instances quadruple the profits, to say nothing of the benefit which would accrue to users and consumers by thus having a good article presented in a good manner. M. S. BAXTER.

Aurora, Ill.

Variations of Chronometers.

MESSRS. EDITORS:—Traders on the west coast of Africa, and perhaps on the east coast, sometimes experience inconvenience, and sometimes loss, from the "loss of rate" of their chronometers in the tropics of that region. Occasionally good instruments that are perfectly reliable on other voyages, on approaching these tropics exhibit signs of perturbation, very marked, and hitherto unaccounted for so far as the writer knows. These variations cease altogether when that locality is left behind, and cases are known of variation of rate on that coast, with a precise resumption of the true one on approaching our own. Marine chronometers sometimes, and perhaps generally, have steel balance wheels, and the presence of these may account for the trouble—of at least some of the employés of the writer—in the temporary loss and often resumption of the "rate" of their instruments.

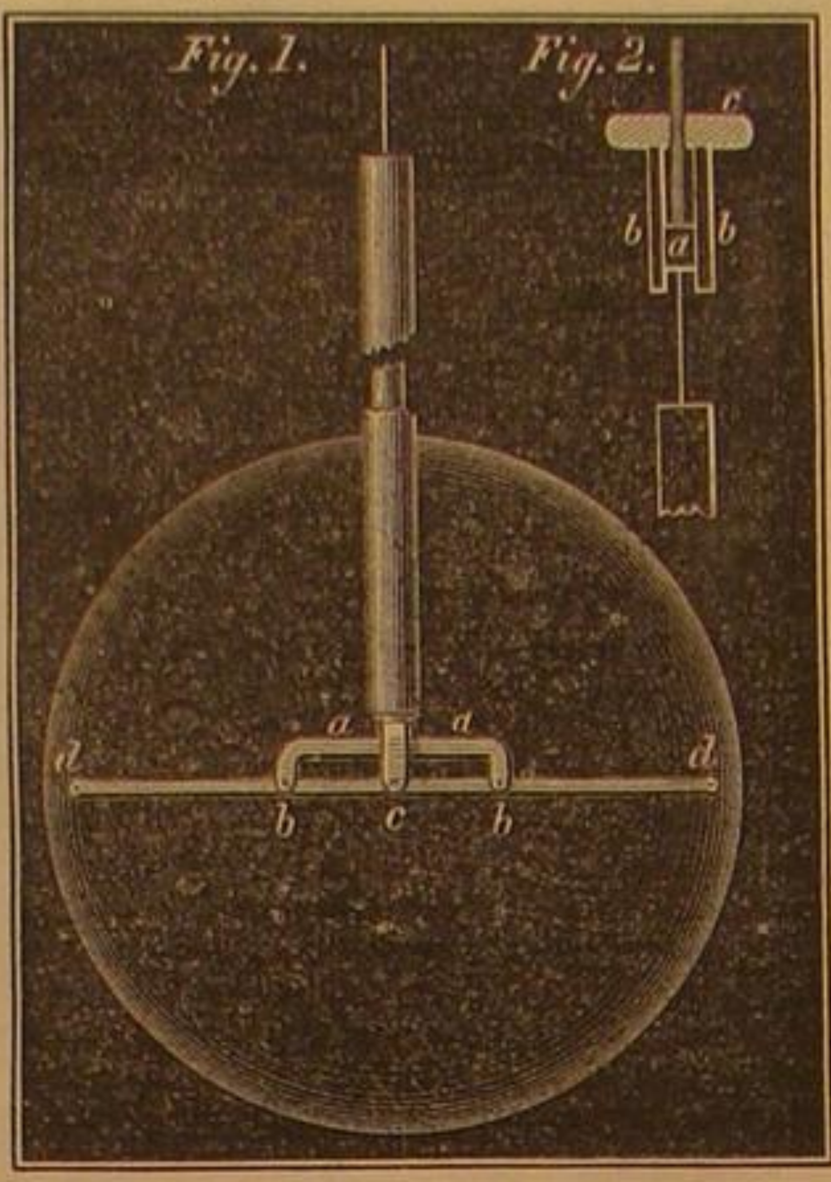
The magnetic *status* of central Africa is believed to differ from ours, and a magnetic power in the balance wheel would at once produce there a marked variation of "rate," and account for the occasional embarrassments hinted at. The proofs that this is so—assuming only a difference in magnetic conditions of the two coasts—are not wanting.

A fine old English watch with a steel balance recently discovered to be magnetic (a magnet) is in possession of the writer of this article, to the beats of which a delicate needle responds, when properly placed, with certainty and precision, swinging around half the circle and returning with the movement of the wheel.

A chronometer circumstanced like this watch would probably lose its "rate"—however good it might otherwise be—on any other magnetic meridian than that of its rating, and perhaps would do so in simply a change of position. The variation, however, would doubtless be influenced by the length and rapidity of the swing. It will be seen that if the north pole of this "swinging magnet" should be placed north, the vibrations would be shortened, and the instrument would gain time; if south, they would be prolonged, and time would be lost. Thus no true rating could exist. A.

A Simple Pendulum.

MESSRS. EDITORS:—The compensation pendulum rod you give in your issue of August 7th, is not new. I have had different arrangements of the lever to accomplish the end; one of which you give. I have an arrangement of a single lever at the top of the rod, but it also requires three rods, which are unnecessary



Inclosed I send you a diagram of a plan I prefer to all others. It is decidedly the most simple in appearance, if not in construction. The rod is composed of a steel rod in a brass tube. At the top a thin washer is put between the rod and the tube; the steel rod, the washer, and the brass tube are then firmly soldered together. *a a* are continuations of the steel rod; *c b d* are levers pivoted to *a* at *b*; the brass tube is pivoted to levers at *c*. The length of levers from *b* to *d*, and from *b* to *c*, are as the expansion of brass to steel. The bob rests on points, *d*. Fig. 2 shows a plan by which a clock can be regulated in the face and without stopping. *a* is a screw with a square head to which the rod is attached, and slides between the sides, *b*. At *c* is a nut resting on *b*, which projects a trifle through the dial to allow turning.

Philadelphia, Pa. DAVID SHIVE.

Treatment of Corns.

MESSRS. EDITORS:—The treatment you indorse for corns, perhaps, is well enough if you decide to retain them and nurse them. I cultivated them some twenty-five years, but came to the conclusion that they were neither profitable nor comfortable, and resolved to abandon them.

The way I did was to have a pair of lasts made which were the shape of my feet; thus instead of fitting my feet to the boots or shoes, the boots or shoes were made to fit my feet, thereby saving the misery of "breaking-in" a new pair.

The result has been, that for the last three years I have not found the least inconvenience from corns; in fact they have abandoned me with apparent disgust. No traces of them are left. F. W. B.

[Our correspondent is perfectly right. If people would begin sensibly, and wear only such shoes as fitted their feet, they would never be troubled with corns. Neglecting to do this, the disease penetrates so deeply that the slightest pressure brings on irritation and pain.

The writer of this has suffered very much from corns, and has patronized all sorts of remedies, even resorting to the professional quackery of a corn doctor—but all to no purpose, until he found a shoemaker who was not only willing but competent to fit the shoe to the foot. The shoe is now made wide enough to allow abundant room for the toes and toe joints; all the annoyance of corns, quackery, and specifics is done away with. Such is the writer's experience. But for nursing purposes, the lemon application is good.—EDS.

Wanted a Substitute for the Present Method of Branding Cattle.

MESSRS. EDITORS:—I will venture to ask that you or some of your able contributors, through the medium of your columns, recommend (if there be such) some chemical agent (safe and convenient for use by all classes) with which horses or cattle may be permanently and legibly "lettered," "numbered," or "branded," and whereby the barbarous style of burning the legal marks of ownership on or into them with red hot irons may be superseded.

Our grazing grounds extending from the Sabine to the Rio Grande, and from the Gulf of Mexico to Elpasso, are in common.—"The cattle of a thousand hills," roam without restraint. Hence the application of some indelible mark of recognition by which the property of different individuals may be distinguished is indispensable.

Yet it is a matter of great doubt whether the geographical munificence of our range or the "abundance" of our flocks, or herds warrants the maintenance of a system at once prodigal and inhuman.

The suffering of animals directly induced by this process of fire branding is often but a tithe of its future results. For the sore left by the burning iron serves both as an irritation and an initial point of operations for the murderous "screw horn"—the peculiar pest of our latitude—from the ravages of which thousands of stock of all classes die here annually.

In the hope that some means may be devised, or suggested, whereby the severities of the merciless necessity for branding can be mitigated, and its purposes as well otherwise subserved, I have written. N. L. NORTON.

Clinton, Texas.

On the Flow of Elastic Fluids through Orifices or Pipes.

MESSRS. EDITORS:—In the article under this head appearing on page 50, current volume, and taken from the London paper *Engineer*, appears a serious mistake in the reasonings and conclusions, and consequently in the result of the calculation, which it will be necessary to correct, as those investigating this subject may be led astray by the erroneous rule prescribed there.

The rule I refer to is, that in order to find the velocity with which gas or steam will flow from a vessel in which it is confined under higher pressure, into a vessel in which there is a lower pressure, we must calculate just the velocity with which it will escape from each vessel into a vacuum, subtract those velocities, and the difference between them will be "the velocity with which steam will flow into the lower pressure." This rule is entirely wrong, as I will demonstrate.

In the article referred to, is the following pneumatical standard law, nearly correctly stated, in italics: *Gases and vapors will flow into a vacuum with the same velocity that a body would acquire in freely falling through a space equal to the hight of a homogeneous volume of gas or vapor of the given pressure and density.*

When calculating this hight it is found that it is the same, whatever be the pressure and density of the gas we are dealing with, if only the temperature be the same. Let me illustrate this by an example: Suppose we have common air, which, at the pressure of $14\frac{1}{2}$ lbs. per square in. weighs 0·08 lbs. per cubic foot, its pressure on a square foot must then be $14\frac{1}{2} \times 144$, or 2,088 lbs.; the hight of a uniform volume of air of this weight and of one square foot section would be equal to 2,088 lbs., divided by 0·08, or 26,100 feet. Suppose now again we have air at four times this pressure, therefore 58 lbs. per square in., which, at the same temperature, according to Mariotte's law, will weigh 4×0.08, or 0·32 lbs.; its pressure on a square foot will be 58×144, or 8,352 lbs.; and to find the hight of the uniform volume of air of this weight we have this time to divide the 8,352 lbs. by 0·32, which also gives 26,100 feet. The hights being the same, bodies falling from these hights will acquire equal velocities, and we see then that it is a necessary consequence of the standard rule and of Mariotte's law, that the same gas will flow into a vacuum with the same velocity whatever be the pressure and density under which it is confined, other circumstances being equal. The simple cause being, that the increase in pressure is compensated by the exactly corresponding increase in density, which practically retards the flow. It is therefore clear that a substraction of the two velocities, first calculated separately, cannot be the correct rule, as it would lead to the absurd conclusion that there being in the above case no difference in the velocities it would not flow at all from a vessel in which it was confined under four atmospheres pressure (or any other pressure which we may suppose) into the atmosphere.

The true way of calculating is *to substract first the two pressures* before calculating anything else, and then *find the hight of a volume of homogeneous vapor or gas, exerting by its weight the same pressure on its base.* Applying this rule to the case referred to (page 50) of a steam cylinder with a pressure of 20 lbs. and a condenser of 5 lbs., we find the difference 15 lbs., and a homogeneous volume of steam of this pressure would be equal to very near 43,264 feet, and a body falling from this hight would acquire a final velocity of nearly 1,679 feet per second; therefore the true velocity with which steam of 20-lb. pressure will flow from a cylinder into a condenser where there is only 5 lb. pressure, is 1,679 feet per second in place of only 367 as calculated by the London *Engineer*, and reprinted on page 50 of this volume of the SCIENTIFIC AMERICAN. P. H. VANDER WEYDE, M. D.

New York city.

The Lowell Water-Wheel Test.

MESSRS. EDITORS:—Inclosed you will find a sample of the numerous letters that I daily receive in regard to the test of turbine water-wheels at this place.

The test is creating much interest from one end of the country to the other. I can not give the information required, because, at the beginning of the test, it was agreed not to publish or make public the results until all had been tested, as it might deter some from testing their wheels if the first gave good results. Only the Swain wheel has been tested, the others had to prepare after that was tested, as that was the opening of the test, and the conditions were not settled until that time. When the others commence all will probably be ready to take their turn. The Bodine Jonval will probably be the first and very soon.

When the test is completed a full report will be made up for the SCIENTIFIC AMERICAN, and published free to all, so far as I am concerned.

I have no knowledge that the report will be published in pamphlet form. I require no money for information that I can give ; correspondents will govern themselves accordingly.

JAMES EMERSON.

Lowell, Mass.

When Doctors Disagree Who Shall Decide?

MESSRS. EDITORS :—I have read your article headed "When Doctors Disagree Who shall Decide?" in the issue of August 14th, respecting Prof. Horsford's method of manufacturing acid phosphates so as to render them useful in the making of bread.

At the close of this article you say : "The celebrated Liebig has stated that the nutritive value of ordinary flour is increased ten per cent by the use of Prof. Horsford's phosphatic bread preparations."

We can truly say "when doctor's disagree who shall decide," for Prof. A. J. Bellows, late Professor of Chemistry at Harvard, in his book recently published in this city, entitled "How not to be Sick," and in the "Philosophy of Living," distinctly asserts that this same preparation of Prof. Horsford's is "poison!" that it is simply phosphorus disorganized, made from calcined bones, and, as such, as dangerous to use as any other poison, and should, of course, never be used. On the contrary, phosphorus as organized in our food as it grows (wheat unbolted, etc.), is the only form in which it can be taken with safety. "Who shall decide?"

B. H. J.

Boston, Mass.

Another Invention Wanted.

MESSRS. EDITORS :—Often during dry hot summers we have to witness the destruction of our corn by drought on the banks of streams, with water flowing by in waste, sufficient to make corn in abundance. We need machinery to raise the water out of the streams and apply it on the adjacent fields of corn. There are generally no falls in the streams to raise water by dams for irrigation. Here is a fine field for inventors to benefit a large farming interest and themselves also. The machinery must be light and of easy transportation, adapted to horse power for small farmers, and not too costly, as it may not be necessary to use it every year. On many of our rivers the lands are highest at the banks, with a gentle slope across the bottoms to the foot of the highlands, and water raised to the top of the banks would flow across the fields.

We hope inventors will take this subject into consideration and help us.

MANY FARMERS.

Indian Springs, Ga.

Importance of Smooth Edges on Cutting Tools.

MESSRS. EDITORS :—Allow me to say a few words more in regard to serrated, or rough-edged instruments, intended as cutting instruments. I am fully aware that some hold the idea that an absolutely smooth edge cannot be attained. It was not the intent of my former article, neither is it now my intent to discuss imaginary, or theoretical cutting edges ; but will state that if an edge cannot be attained smooth enough so that a saw edge will not appear, even under the most powerful microscope, then the theory that an absolute smooth edge cannot be attained is established. It is also established that the first series of notches has notches also, and so on infinitely.

The object of my former article was to do away with something that has become a public nuisance. The teeth of a saw are the same as the sections of a sickle ; not as the serrated teeth of the sickle edge. I never heard any one argue that the edge of saw teeth ought to be serrated. The teeth of saws are a series of cutting edges, not the whole saw one continuous cutting edge.

Now I wish to state one uncontrovertible fact ; all cutting edges should be made just as smooth as they can be, and have them practically profitable.

A. K. SMITH.

Nebraska, Ohio.

The Oxyhydrogen Light.

The oxyhydrogen light scheme has now taken a definite shape in Paris. A company has been formed, the capital necessary has been raised, and application has been made for permission to lay down pipes to carry oxygen and hydrogen over about a fourth of the city. It is not very likely the permission will be granted, and the promoters will have to confine themselves to supplying individuals with compressed gases, as was originally proposed. We have published the patented processes by which M. Tessié du Motay obtains the oxygen and hydrogen which he proposes to distribute over Paris, at a cost so low that the oxyhydrogen light is promised much cheaper than common gaslight ; but ingenious and relatively cheap as they undoubtedly are, it is impossible to believe that the service can be made so inexpensive as to supersede coal gas. The prospectus of the company enlarges upon the cheapness and purity of the light, the complete combustion, and the absence of all deleterious matters in the products of combustion ; but is quite silent as to the danger of introducing into a house two gases not possessing any smell, and which, consequently, may escape without observation, and the mixture of which forms an explosive compound of far greater power than any mixture of coal gas and air. To any danger of this kind, continental engineers appear to shut their eyes. We saw, a short time ago, a patent taken out in Belgium for making a mixture of coal gas and air, storing it in gasholders, and distributing it over the city of Brussels for heating purposes. The engineering details given showed a complete knowledge of the manufacture and distribution of gas, but there seemed to be no recognition of the risk, imminent enough, of blowing up the whole concern. A consideration of this kind, some years ago, stood in the way of a scheme of the kind projected for Birmingham, and will, no doubt, now prevent the Oxyhydrogen Light Company from getting permission to lay down their pipes over Paris.—*Mechanics' Magazine.*

THE THEORY OF BOILING—TOMLINSON'S EXPERIMENTS AND CONCLUSIONS.

We conclude our review of these interesting experiments from our last issue.

Mr. Tomlinson asserts that there is a kind of matter which when used for nuclei in boiling is not liable to the defects enumerated in our previous article, and which he has not been able to make inactive, either by the action of the strongest acids or caustic alkalies, or by repeated boiling in water, ether, alcohol, naphtha, etc. These bodies are such as charcoal, coke, pumice-stone, meerschaum, and a few other bodies. They act by means of the powerful force of capillarity. The same force which, according to Saussure, enables one volume of boxwood charcoal to absorb 90 volumes of ammoniacal gas, 85 of hydrochloric acid gas, 65 of sulphurous acid gas, and so on, enables these porous bodies to absorb vapor from boiling liquids, and, under the continued action of the heat, to give it out in never-ceasing jets, thus relieving the vessel of all tendency to bumping, making the boiling soft, gentle, and regular, and increasing the quantity of the distillate.

Charcoal, or some other porous body, is then the proper nucleus in the case of boiling liquids. It is quite remarkable to see how efficiently a lump of coke acts in a vessel of boiling water in giving off vapor, promoting tranquil boiling, and preventing the jumping of the vessel. Not the least important service of these porous nuclei is the fixity they confer on the boiling point. When a liquid is boiling in a clean vessel, and in the absence of nuclei, it may go on dissolving steam until the liquid becomes more and more highly saturated with it, and during this period the phenomena of boiling cease, and the temperature rises some degrees above the boiling point.

The formation of a steam in liquid is indicated by a rise, the bursting of a bubble by a fall. The most considerable rise and fall is when the boiling ceases and steam accumulates, and there is a sudden burst accompanied by a kicking of the vessel. This uneasy kind of action, so manifest on a small scale, must be a mighty force in a steam boiler, or a large still or retort.

The following series of experiments show clearly the value and superiority of porous nuclei :

1. A glass flask with a wide neck was filled about one third with distilled water ; it was boiled over a gas burner, weighed rapidly, and replaced over the burner. After boiling 20 minutes it was weighed again. The flask was once more filled to the original quantity, and some bits of coke were added ; it was boiled and weighed as before, the gas flame remaining unaltered all the time.

RESULTS.—Water boiled away in the first trial (water only) 995 grains; in the second trial (with coke) 1,130 grains.

Ratio of products, 100 : 113·6.

2. Water was made to distil freely from a still, and the quantity collected in 15 minutes was weighed. A few pieces of coke were then added to the water in the still, and the distillate collected again during 15 minutes.

RESULTS.—Distillate from water only 293 grains ; from water with coke 310 grains.

Ratio of products as 100 : 105·8.

3. A similar trial was made with common wood charcoal, but the vessel having been made much cleaner by the action of the first boiling, the water boiled irregularly, with bumping. The addition of the charcoal made the boiling tranquil and regular.

RESULTS.—Distillate from water only, 262 grains ; from water with charcoal, 334 grains.

Ratio of results as 100 : 127·4.

The following results are from my own experiments :

Methylated spirit was distilled in a glass retort at a fixed boiling point of 171° Fah. The distillate collected in 5 minutes was weighed, and found to amount to 244 grains. Three or four fragments of charcoal, partly from boxwood and partly from cocoa-nut sheel, weighing altogether 20 grains, were now added to the retort, and when the spirit was again fairly boiling, the distillate during 5 minutes was again collected and weighed. It was found to amount to 325 grains. The ratio of the results is as 100 : 132·2.

Instead of charcoal, 20 grains of fine ground pumice-stone in four fragments were used in the retort, when the ratio of results was as 100 : 121·7.

With 20 grains of meerschaum, as 100 : 112.

With 20 grains of coke, as 100 : 107·46.

These numerical results are, however, very much understated if compared with those obtained in a retort that is structurally free from nuclei, which was by no means the case with the retort actually employed.

Charcoal, coke, pumice, and other porous bodies are especially valuable in distilling those liquids that are of such a nature as to exert a powerful action in cleaning the inner surface of the retort or of the still. Such liquids as alcohol or spirits of wine, ether, naphtha, benzole, sulphuric acid, etc., act in this way, and the sides of the vessel no longer performing the useful functions of a nucleus, the adhesion of the liquid to the sides of the vessel is so strong that the vapor accumulates in it, and only escapes in explosive bursts, separated by almost quiet intervals. These porous nuclei render the boiling and the liberation of vapor quite easy. Even in thick sirup of sugar, boiling at 240° Fah., they are still active, and Mr. Tomlinson asserts that with their assistance he has, in the course of a few minutes, driven off so much water from a sirup boiling at 218°, that it soon reached 240°, and cooled down into a clear, semi-solid mass in a flask, into which a plug of cotton wool was inserted when the lamp was removed.

Charcoal from cocoa-nut shell is a good nucleus. It is very dense, and will occupy the bottom of the vessel that contains liquids somewhat denser than water. It is at the bottom, or near the bottom of the vessel, that the nucleus is most efficient, and for dense liquids the porous nucleus may be loaded with some heavy metal that the liquid does not act on. Coke, though a less powerful nucleus than charcoal, is convenient from its being always at hand, and presenting itself in lamps of any size. Mr. Tomlinson has no doubt it will be found of use in steam boilers, and may be used instead of the radicles of barley, the soap, the butter, and the paraffine, etc., noticed in our last.

He has already said that these porous nuclei act by the force of capillarity, and so powerful is this force alone that it can be applied in a variety of ways. Even a short bundle of fine capillary fibers, united like a faggot by a thread in the middle, is an active nucleus in liberating vapor. Such a bundle, weighing only ten grains, put into a retort from which methylated spirit was being distilled, raised the amount of distillate in the ratio of 100 : 110.

Where circumstances admit of it, we may apparently increase the nucleus power even of charcoal by first boiling it in a liquid of higher boiling point than that of the liquid to which it is to be transferred. Thus a piece of charcoal that has been used in boiling turpentine seemed to be more active than pure charcoal in liberating vapor from boiling water. The charcoal is not only porous, but unclean, and hence its activity.

What Mr. Tomlinson claims to have discovered is the action of nuclei in liberating gas, or salt, or vapor from solution, and the behavior and proper application of nuclei in various processes in the useful arts. Bodies have long been used for promoting vaporization, crystallization, etc., but how they acted and why they often suddenly ceased to act was not known. We have many theories about the "mysterious action of air," "catalytic action," "molecular change," etc., which have borne no fruit ; whereas, according to this view, supported as it is by hundreds of experiments, all the varied phenomena of nuclei may be explained by the varying force of adhesion and capillary action.

Signaling on Board the Cable Fleet.

The London *Gazette* gives the following interesting description of the manner of signaling through the cable on board the Great Eastern :

The method of signaling used between the ship and the land is that now universally adopted in working all long submarine lines—the reflecting galvanometer. The principle of this most delicate instrument was discovered a few years since by a German electrician, named Weber. It was then, however, a large machine, and the condensation of all its powers into the smallest and lightest form is due to the scientific research and skill of Sir William Thompson.

This instrument consists of a small mirror with a magnet on its back. That the two are very small indeed may be judged by the fact that both together weigh less than three eighths of a grain. This infinitesimally small reflector, which is intensely bright, is suspended by a silk thread as fine as a hair in the midst of a small circular coil of insulated copper wires. Directly a current is sent through this circular coil, no matter how slight, it induces another electric current within its circle, which acts in an opposite direction, and this causes the magnet at the back of the mirror to turn to the right or left, and, of course, to turn the little mirror with its reflecting ray of light with it. By a very simple arrangement, this fine ray of light is thrown upon a horizontal graduated scale, about three feet long and three feet distant from the mirror.

Thus when a current is sent through the little circular coil around the mirror, the magnet is acted upon, and turns the mirror with its ray of light, say on the left of the scale in front of it. When the current is reversed, and that is instantly done by pressing a little key in the speaking instrument, the current in the circular coil is reversed and sent in the opposite direction, and this in turn sends the ray of light from the mirror on to the opposite side of the scale to the right. When the ray of light rests stationary on any part of the scale, it means a dot ; when it moves rapidly to the right or left, it means so many dashes, according to the distance it goes. This reflecting galvanometer tells with unerring certainty whether or not the Great Eastern is steady.

The vessel now at the end of the cable is, with its coils of insulated wire and iron hull, a mere electro-magnet so to speak. The course of the Great Eastern is east and west, and therefore at right angles with the course of the magnetic current, which is north and south. Thus every time the ship rolls, either to port or starboard, a slight current, but still a current, is induced in her vast coils, and then transmitted through the cable to the shore end at Minou, where it acts upon the reflecting galvanometer, and turns its ray of light a little to the right or left of the center of the scale, and thus shows in a fraction of a second of time the precise degree and rapidity at which the vessel is rolling.

WE recently noticed the fact that a flying machine was soon to start from San Francisco on its aerial voyage to New York. It now turns out that we are to be disappointed, the thing being only a partial success. It will navigate the air in a calm, but the slightest breeze disconcerts its movements. The *Chronicle* thinks that if the inventor should ever start for New York, he would be quite as likely to bring up at Cape Horn or the North Pole.

Gin Saw Gummer.

The inventor of this instrument claims that whatever injury cotton sustains in its separation from the seed, is caused by the action of the saws in concert with the ribs of the cotton gin. While this will be generally admitted, there is a diversity of opinion in regard to the character of the teeth as to form and surface.

It has been the theory and practice of gin makers to make the gin saw teeth as round and smooth as possible, in order that they may go into the cotton and not cut the fiber, as they assert would be the case with a square tooth.

The inventor of the gin saw gummer shown in the engraving, who has had a long experience in the working of gins, affirms that neither round nor square teeth cut the cotton fiber, but both break it, and he affirms that square rough teeth will, on a fifty saw gin, pick a bale a day more than the round smooth teeth. He claims that the notion that a gin which picks rapidly must, of necessity, injure the fiber, is totally erroneous.

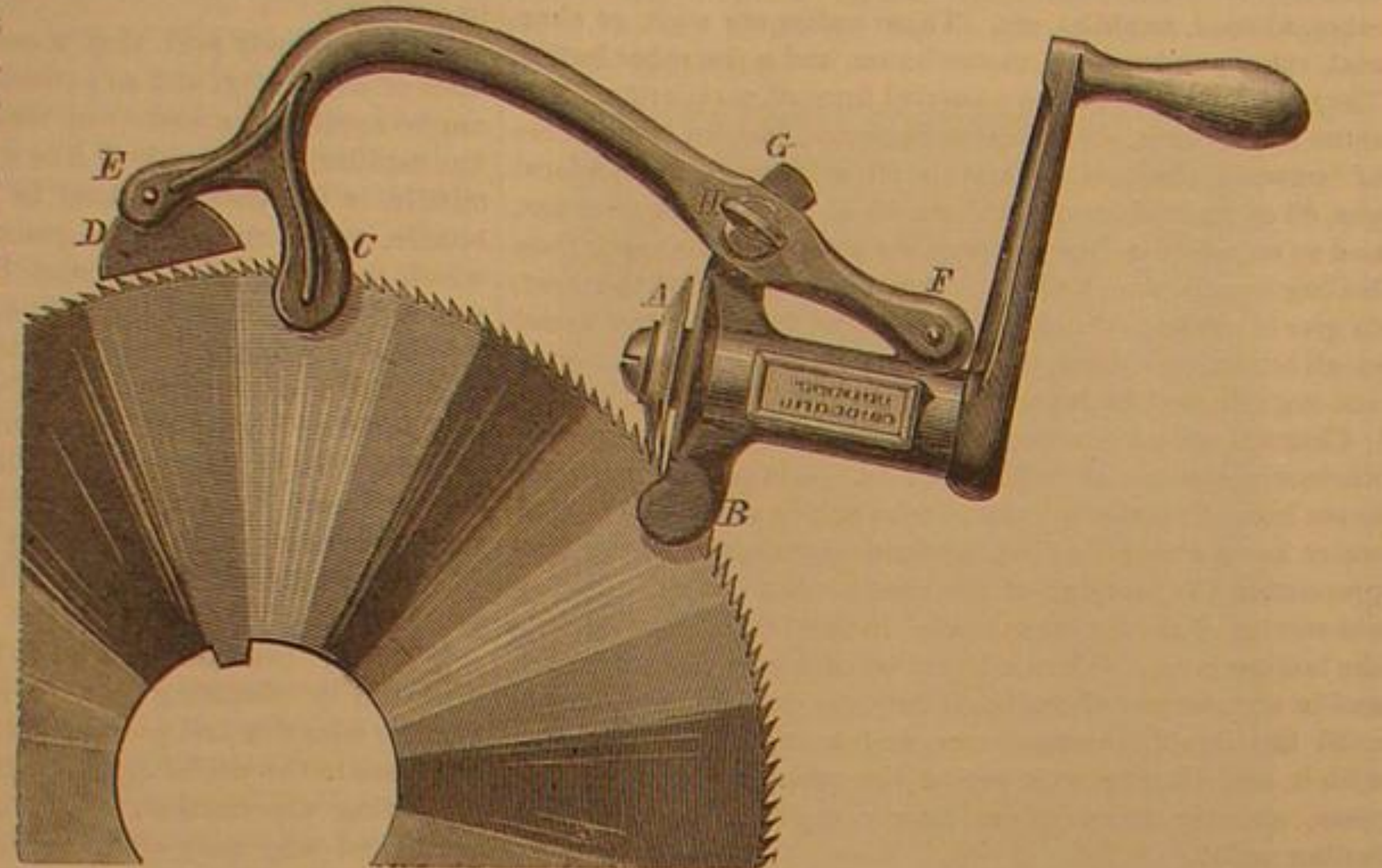
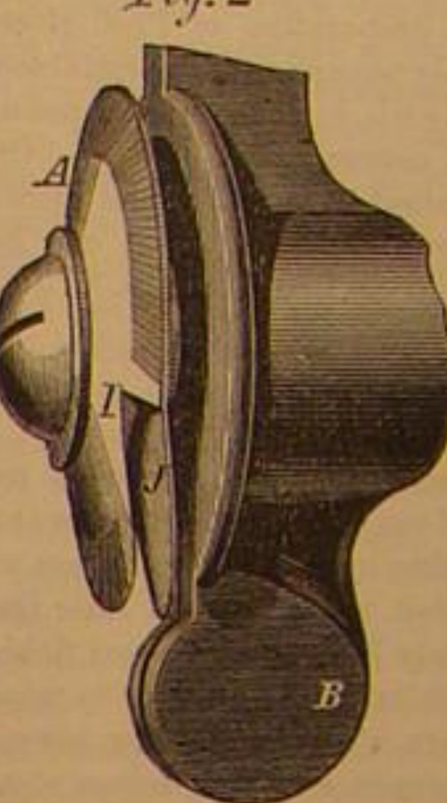


Fig. 2



BURDINE'S PATENT GIN SAW GUMMER.

The gin saw gummer is an instrument devised for the purpose of giving each tooth of a gin saw the proper roughness and form. We say proper roughness, because if the principles above stated are correct, it does not follow that any kind of roughness will answer the purpose.

It is claimed that the circular file of the form, and used in the manner shown, in the engraving, is the only tool that will secure the right kind of roughness in the tooth, or make a perfect gin saw tooth.

The device consists of a circular file, A, of the form shown, attached to an arbor revolved by means of a crank. The arbor, file, and crank, are supported in a cast-iron frame, the portion carrying the arbor being pivoted to the other portion at F. An upright arc, G, passes through the top part of the frame, and is held at the proper angle by a set screw, H. At B and C are slits sawed in the frame, of the right size to admit the saw when the instrument is in use, and which prevents lateral motion in the frame. The file has upon the back a spiral adjustable tongue,J,shown in the detail at the right of the engraving. The file also is cut away at I, to admit a tooth of the saw at each turn of the file. The adjustable tongue, J, thus acts like a screw to force the saw along one tooth at each turn of the file. The shape of the file is such that the teeth are constantly kept at the same length, a vital point in the proper working of a cotton gin.

A semi-circular block of cast iron, D, is pivoted to the frame at E, which serves as a gage in securing the proper position of the frame.

In operation the frame is grasped in the middle of the bow by the left hand, and the crank is turned by the right hand.

The inventor claims that this is the only way to give a correct finish to gin saw teeth, and to restore worn or shortened teeth to their original length and perfection of surface.

Patented, Sept. 14, 1868, by A. H. Burdine, Taylor's Depot, Miss. Further information may be obtained by addressing Israel F. Brown, New London, Conn., or the patentee, as above.

Improvement in Keyhole Guards.

This is one of those small inventions alluded to in our editorial of Aug. 7th, that can scarcely fail to prove remunerative unless through bad business management on the part of the inventor. Nothing could be more simple and subserve fully the purpose for which it is intended.

It is a well-known and common practice for burglars to thrust in a pair of strong and slender nippers from the outside, and, grasping the end of the key which protrudes through the lock, to turn it and throw back the bolt. With such ease and certainty can they do this on ordinary door locks, that it is even less trouble than to pick the lock were the key left out. With ordinary locks neither leaving the key in the lock nor taking it out, affords any security from pick locks. The inventor of this improvement justly believes that the place for a key, when people are locked up in a house, is in the lock, so that ready escape can be made in case of fire, and he has set himself to work to enable this to be done and at the same time to effectually foil the burglars.

The engraving well illustrates how this is done. Fig. 1 represents the lock with the key inserted on the inside, and Fig. 2 an opposite view of the same. The lock is provided with a front and also a back guard, or escutcheon, attached to a common pivot, and placed at angles with each other, so that when the inside escutcheon is pushed aside, the outside one covers the keyhole on that side, and *vice versa*. The inside one, A, is pushed aside by hand in the usual manner, the outside one, C, Fig. 2, then covering the hole so that a person outside the door cannot thrust in a key further than the guard, and cannot by any means move the bolt of the lock. Neither can he by any means push aside the guard when the key is left in the lock on the inside, as both the inside guard, A, Figs. 1 and 2, and the outside one, C, are countersunk to admit the end of the key, which thus prevents all lateral motion. The guard, A, has a curved edge at B, which fits into a groove turned in the shank of the key, so that the latter cannot be withdrawn from the inside without pushing aside the guard, nor be jarred out by opening and shutting the door.

A coiled spring is fixed upon the common pivot of the two guards, or escutcheons, which, when the key is taken out from the inside of the door, forces the guard, A, to cover the keyhole on the inside, at the same time throwing aside the guard, C, into the position shown by the dotted outline in Fig. 2, so that whenever the key is withdrawn from the inside it can be readily inserted from the outside.

The guard, A, is protected from being broken away through carelessness of servants, or other cause, by means of a staple riveted to the inside plate of the lock, as shown in Fig. 1, under which it can move laterally as far as required.

The features of the invention are, then, the attaching the opposite guards at angles with each other to a common pivot actuated by a spring, so that when the keyhole is uncovered on one side it is covered on the other; the device by which the key is prevented from falling, or being pulled out of the lock; the countersinking the under side of the guards to admit the end of the key; and the supporting the inner guard by the staple, as described.

Patented Aug. 11, 1868, by Alfred Huffnagle, No. 8, South Fifth street, Philadelphia, who may be addressed for a portion or the entire right for the United States.

Fig. 1. Fig. 2.

HUFFNAGLE'S KEYHOLE GUARD.

Iron Manufacture in the West.

We are glad to learn that the manufacture of iron is making progress in the West. The North Chicago, the Wyandotte, and the Milwaukee rolling companies are three distinct enterprises, which, the Chicago *Tribune* remarks, owe their existence and prosperity to the far-sightedness and energy of Captain E. B. Ward, who, when he first moved in the matter, was everywhere assured that he could not successfully contend against Eastern manufacturers, and found himself unable to get one dollar of the stock taken in Chicago or among the railroad companies of the West who were to be directly benefited by it. Recently, moneyed men of Boston, New Bedford, and other Eastern cities, such as Forbes, Brooks, Bartlett, and Thayer, have united in largely increasing the capital stock of these three companies, and a purchase has been made by them jointly of the Swedes iron mines, lying forty miles northwest of Milwaukee, where ore of peculiar richness and good qualities can be mined at a low cost.

One million and a half of dollars have been subscribed, of which eight hundred thousand are in the name of the North Chicago Mills, a company which already represented one million of dollars. As enlarged, this important corporation will employ one thousand six hundred men, including with their families a population of eight thousand persons. The three companies together will give work to three thousand operatives, supporting an aggregate population of fifteen thousand souls. The whole annual product of the three companies will be three and a half millions of dollars.

The Chicago *Tribune* says of these mills, before their recent enlargement, that of one hundred and fifty thousand tuns of iron rails which they had turned out since they began operations, not a single rail has proved defective and no accident has ever resulted from their use. Hereafter it is confidently expected that they will be equal to the manufacture annually of thirty-five thousand tuns of new rails, and fifty five thousand tuns of re-rolled iron.

The Swedes iron mines are geologically peculiar in the admixture of a large amount of fossil remains in the ore, superseding the employment of lime in fluxing. Few other deposits of this character are known to exist, and those only in Sweden. The ore is also mixed with manganese, which is said to impart to the iron manufactured from it a steel-like toughness of fiber admirably fitting it for rail heads, or the upper half of the longitudinal rail. The companies propose to use the Swedes iron chiefly for the rail heads, in the proportion of three fourths Swedes to one fourth Lake Superior iron, which they say will give a surface equal in hardness to the Bessemer steel; making the lower half or base of the rail of three fourths Lake Superior to one fourth Swedes, thus securing a rail that may be bent double without breaking. The advantage these iron rails will have over those of the Bessemer steel is, it is asserted, that when so worn as to be unfit for further use, they can be re-rolled, whereas the Bessemer steel rails when disintegrated or broken are worthless.

The *Evening Post*, in publishing the above facts, calls Capt. Ward "a fanatical protectionist." That is very possible, but of one thing we feel tolerably certain, viz., that Capt. Ward would not have risked his own capital in these great enterprises had he felt assured of the prevalence of the free trade notions of the *Evening Post*. The industry of the West is likely to be considerably benefited in consequence of the "fanatical" views of Capt. Ward.

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 horse-shoe magnet made, consisting of ten laminæ of perfectly homogeneous steel, each weighing 10 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 50 of Bunsen's elements, by which means the horse-shoe might be magnetized 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 horse-shoe 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 the contacts taken off than the horse-shoe returned to its usual permanent strength of 140 kilogrammes. This leads to show that magnetism may be condensed like electricity for a short period.

The commission of engineers on the East River Bridge, consisting of Allen, Latrobe, Serrell, McAlpine, Kirkwood, Adams, and Steele, met in this city on the 4th inst., and after a thorough examination of all the details of Mr. Roebling's plans, have approved them. The chairman recommended, as the successor of Mr. Roebling, his son, W.A.Roebling. He was accordingly elected

Scientific American.

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. S. H. WALES. A. E. BEACH.

☞ "The American News Company," Agents, 121 Nassau street, New York.

☞ "The New York News Company," 8 Spruce street.

☞ Messrs. Sampson, Low, Son & Marston, Crown Building, 188 Fleet st., Trübner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

VOL. XXI., No. 8...[NEW SERIES.]....*Twenty-fourth Year.*

NEW YORK, SATURDAY, AUGUST 21, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

EFFECT OF FORM UPON FRICTION.

The mechanic is often prone to regard friction only as the deadly enemy of mechanism; the monster that gnaws away at axles and bearings, consuming both machinery and power. It is true that friction produces the ill effects he attributes to it, but it is none the less true that its benefits are much greater than the evils which attend its action.

Of course we do not mean by this that reduction of friction is not an advantage on most kinds of machinery, or that if it could be reduced to nothing in special cases, a great gain would not be made. What we assert is that the general and total abolishment of the law of friction, would be just as disastrous, and fatal to man's existence as the destruction of the law of gravity.

Friction wears out clothes and shoes, but that is better than being unable to walk. We have all received practical illustrations of the uses of friction, when we have had our feet slip from under us on an icy sidewalk, and found ourselves seated without ceremony and with greater force than was agreeable. But there are many machines that would be totally useless without friction. Without it we should be unable to use belts and pulleys, screws, or friction pulleys. Without it the modern locomotive could never have existed. Without it the wedge, one of the most useful and simple of mechanical appliances, would be worthless.

Unlike gravity or cohesion it is, however, to a certain extent controllable by means the most of which are familiar to mechanics, and it is not our purpose to say anything in this article of the substances employed to reduce friction between bearing surfaces.

It is a well-established fact that friction is proportioned to pressure, and is independent of velocity and extent of surface. To illustrate the proposition by an example: A weight of ten pounds resting upon a surface of two square inches and moving one hundred feet in a minute, would have no greater friction than the same weight resting upon one square inch of surface and moving one hundred feet in two minutes.

There are some circumstances which slightly influence the exactness of the proposition but it is generally correct, and may be relied upon for all practical purposes.

It follows that so far as form diminishes the element of pressure it may be made to diminish friction. A simple illustration of this may be obtained by laying a flat weight upon an inclined plane—a piece of board or a book will answer for the inclined plane. The greater the inclination the less will be the pressure between the surfaces of the weight and plane, so that the weight becomes more influenced by gravity, and descends with greater rapidity, the nearer the perpendicular is approached. A screw is nothing but an inclined plane wound around a cylinder, and all who are accustomed to making large and powerful jacks, know that it will not do to give them too abrupt a pitch, as otherwise they will not support their weights without turning.

Here we have an illustration of the way in which form may influence pressure and through it friction. In a subsequent article we shall consider this truth in its relation to the construction of gearing.

MECHANICAL FAIRS AND EXHIBITIONS.

The season is approaching when it is customary to hold fairs and exhibitions. Such exhibitions are of great and diversified utility. They bring the minds of inventors in contact, post them in regard to the advance of improvement, and almost invariably suggest new and valuable ideas.

They also afford a means of displaying to the public at large the construction of new and old devices, and of widely and thoroughly advertising valuable improvements. They are generally attended with interest by large numbers of people, and are among the most influential of means employed to educate the people at large.

They have, moreover, the great advantage of being, when properly managed, self-supporting, and, in many cases, profitable enterprises. For ourselves, we never visit one of these exhibitions with impaired interest, and never come away without profit.

Let any critical observer attend one of them and he cannot fail to be impressed with the versatility of Yankee genius, and the wonderful march of intellect which characterizes the age. From the steam engine to the sewing machine he will find a heterogeneous collection of all sorts of queer contrivances, all of which are intended to assist man in ridding himself of the primal curse, or, rather, to transform the curse into a blessing.

It is curious enough to listen to the *impromptu* lectures delivered by exhibitors upon their respective inventions; to watch their faces, now lit up with enthusiasm, and anon flashing scorn at the puerile criticisms of some garrulous ignoramus; or to watch the countenances of bystanders, standing agape at the automatic performance of some triumph of constructive genius. In short, for both amusement and instruction, commend us to a well-arranged and conducted Mechanics' Fair, above all other places.

We have already noticed the announcement of the twenty-second annual exhibition of the Maryland Institute, to be opened October 13, 1869, and continue till the 10th of November, and of the exhibition of the American Institute, to held in this city during the coming autumn.

We are now in receipt of a circular of an exhibition to be held under the management of the Mechanics' Institute of Buffalo, to be called the International Industrial Exhibition, which will commence on Wednesday, the 6th of October. The circular sets forth the design and scope of the proposed exhibition in full, and pamphlets will be sent on application to the Acting Secretary of the International Exhibition, Buffalo, N. Y.

We shall be happy to receive and briefly notice all announcements of similar Mechanics' Exhibitions throughout the country, believing that they ought to be encouraged and sustained, and that our readers will be interested in the information imparted.

In conclusion, we urge upon inventors and manufacturers at large, the importance of availing themselves of the opportunities afforded by these fairs, especially in the introduction and display of new inventions and processes.

PORTLAND CEMENT.

The composition of Portland cement is argillo-calcareous; that is, it is formed of clay and limestone, generally containing some silica, the properties of which may vary without injury to the cement. The proportion of clay may also vary from 19 to 25 per cent without detriment.

It is found native at Boulogne, France, in the inferior cretaceous formation. The only necessary condition for the formation of a good artificial Portland cement, is an intimate and homogeneous mixture of carbonate of lime and clay, the proportion of clay being as above stated.

The materials are raised to a white heat in kilns of the proper form, so that they are almost vitrified. After the calcination all pulverulent and scorified portions are carefully picked out and thrown away. The remainder is then finely ground and becomes ready for use.

The amount of water which enters into combination with it in mixing is about 0·366 by weight. It sets slowly, from 12 to 18 hours being required.

Ordinary hydraulic or water cements set very quickly, some of them setting in three or four minutes under water at 65° Fah. The time of setting varies from this to four hours, according to the characters of the cements. They contain larger amounts of silica and alumina than any of the other limes, and also contain magnesia, which Portland cement does not. They will not slake after burning, nor shrink in hardening, like the fat limes, and may be used without sand, the latter being only used for economy.

The slow setting of Portland cement renders its use very convenient for many purposes, as a much larger quantity can be mixed at once than can be done with hydraulic cements. When properly made, and this can always be determined by proper tests, it is undoubtedly a durable and strong cement. It has been successfully applied to concrete building, road making, lining of iron pipes and cisterns, marine architecture, etc., etc.

It seems to be growing in favor, and its manufacture is on the increase. In England large quantities are made, chalk being the formation from which the carbonate of lime is obtained. It has been largely used in the construction of foundations for bridges, some of which have stood from 16 to 18 years, showing no symptom of failure. Extensive sea walls have been built with this material in the Mediterranean.

Mr. Hawkshaw, a well-known engineer of note, says he has used Portland cement in a tide-way and has met with no difficulty. Neither has he found any difficulty in using concrete blocks in similar situations. Many others testify to its good qualities, and there is no doubt in our minds that its use may be greatly extended with advantage.

BUSINESS MISTAKES OF INVENTORS.

Having completed an invention, and found it to answer all the anticipations entertained previous to its completion, inventors next turn their attention to securing a patent. If their application is allowed, they are in a position to realize solid returns for time and money expended.

In doing this they find that perfecting an invention, and making money out of it afterwards, are two very different things. However great may be their inventive talent, it avails nothing in the business management, which must be conducted wisely or financial success will not follow.

At this stage of their operations they are apt to suppose that they must in some way secure the aid of outside capital, and many are led to sacrifice a large share of a valuable monopoly, to secure a small sum of money, and the help of what they suppose to be an expert in business. Ten to one they fall into the hands of some shark, who devours the profits of their invention, secures final control of it, and leaves them out in the cold.

Few inventions are made that cannot be disposed of by the inventor as well as any one he can employ or take into partnership with him. If of a small and cheap kind, and the best way to make money is decided to be by manufacturing and selling the article rather than rights to make it, let the inventor be content to begin small, gradually increasing his business from his profits, until it by natural and healthy growth arrives at the point where large returns may be expected.

There are, however, some inventions that can only be worked profitably with large capital, and an inventor may be so placed that his only means of obtaining the necessary aid is to put in his patent against capital as stock in a joint-stock company. In making an arrangement of this kind, the inventor should act only under the counsel of a competent legal adviser. The money expended in obtaining such counsel will never be better expended. A joint stock company has ins and outs in its organization which are difficult for the uninitiated to comprehend; and many an inventor has been inveigled into an arrangement whereby he has been shorn of his rights, and has found out too late that he has been fleeced.

Were inventors to dispose of their property in improvements as carefully as they deal in real estate, and proceed as cautiously in the transaction of their business as they should, we should hear less about capitalists reaping where they have not sown, while the simple-minded man who has put the power to make money in their hands is neglected and unrewarded.

In the sale of rights an inventor will generally succeed better than any agent he can employ. He understands his invention, and what a man understands well, he can, as a rule, talk well. But in the sale of rights there is generally more or less barter, a Yankee way of dealing, which gives considerable scope for sharp practice, and an inventor who is not on the alert, is often sold himself while he thinks he is making a good bargain.

In this, a good judge of the value of all kinds of property has an advantage. Inventors, therefore, who propose to sell rights, should first post themselves in regard to the value of most kinds of property likely to be offered in exchange for rights, and where it can be most readily put into market and turned into money. All the time he spends in obtaining such knowledge, will largely repay him when he comes to apply his knowledge in selling his patent.

He should insist upon all agreements being made in legal form, and omit no technicality likely to secure him from trouble in the future. In short, he should be thorough and exact in all his transactions, and if he has really got a valuable improvement, he can scarcely fail to make money.

ARTIFICIAL BLUSHES—HOW THEY ARE PRODUCED.

In the provinces of Oaxaca, and Guaxaca, and other parts of Mexico, grows in greater profusion than anywhere else, the species of cactus called the *Cactus opuntia* or *nopal*, otherwise the *Opuntia cochinillifera*, one of the most important plants grown in that country. This plant is the home and pasture of a species of shield louse, an insect the properties of which have been known since the earlier part of the 16th century. It exists wild in the woods, or upon cultivated tracks of the *Cactus opuntia*, grown to afford a support for an insect the scientific name of which is *Coccus*, and the commercial name of which is cochineal. This insect furnishes a coloring matter of great importance in the arts, not excluding the fine art of painting in oils or water colors on canvas, drawing paper, or the cheeks of haggard belles, whose natural color has suffered damage from late hours, hot drinks, and pickle diet.

The little parasite, whose favorite home we have mentioned, furnishes the chief staple for these artificial blushes, or perhaps we should say blush, as it is, like the American Union, and unlike the beautiful tint which nature provides the young who do not defy her laws—"one and inseparable."

The cultivated insect furnishes the finest cochineal, but the wild, is less expensive to procure, and is therefore largely used. The insect as found in his native home, is shaped very much like a miniature turtle, its back being of an oval, shield-like form, and its belly flat. It has on its back a rather deep furrow running longitudinally, and cross furrows, which unite with the main central furrow. Only the female insect affords the coloring principle for which these insects are sought. The male has wings of which the female is destitute.

We remember seeing in a geography book, in our youth, a picture of people gathering cochineal, which, although we have since seen it repeated, gives a wholly erroneous idea of the operation. In this mendacious illustration the people were represented as shaking and pounding with poles a tree, very much resembling an old fashioned red-cherry tree, having sheets of cloth spread upon the ground to catch the cloud of insects which were represented as falling to the ground in great numbers; a good way to gather beechnuts, but one that would hardly avail to gather the cochineal.

The males are very much fewer than the females, only one of the former being found to one or two hundred of the latter. At the proper season for collecting them, the females attach themselves to the leaves and grow so fat and corpulent, that their snouts—of which they have at first an ample allowance—their antennæ, and legs almost totally disappear, and the insects look more like excrescences than anything having life.

They are now gathered by means of a blunt knife, a quill, or its equivalent, and killed, either by inclosing them in a bag and immersing them in boiling water, or by heating them in a stove. If boiling water is used they are subsequently dried in the sun. The wild variety yield, it is said, six crops, and the cultivated variety three crops annually. The insects after drying, are sifted, and the dust forms an inferior article of commerce called granillo.

The coloring matter which renders this insect valuable is very soluble in water, in cold alcohol, and still more in boiling alcohol, but insoluble in ether. It has been called by the chemists *cochinilin*, and more recently carminic acid, on account of its acid properties. According to De la Rue, it consists of carbon, hydrogen, and oxygen, in the proportions expressed by the formula $C_{28}H_{14}O_{16}$, or 168 parts of carbon, 14 parts, of hydrogen, and 128 parts of oxygen by weight.

It may be obtained by digesting the insects in ether to remove the fat, disolving the residue in water and adding acetate of lead, when a lead carmine lake will be precipitated. This is washed, dissolved, and decomposed by hydrosulphuric acid, which precipitates the lead as a sulphide leaving the carminic acid in solution, which is separated by evaporation. Carminic acid is a purple-brown friable mass, soluble in all proportions in alcohol and water, and unchangeable by the action of strong sulphuric or hydrochloric acid. It forms purple lakes with salts of copper zinc and silver; and with tin, a bright crimson. Very fine lakes are also prepared by its combination with fine gelatinous alumina.

When pure it is harmless but it is often shamefully adulterated with lead salts and vermilion, which are poisonous.

Cochineal is used largely in dying, in fine painting, in coloring confections, and in the perfumer's art, where it forms the basis of a number of the finest preparations called rouges. The following is one of the best recipes for the manufacture of this sort of pigment, and it can be easily prepared by any one. It is perfectly harmless to the skin.

Recipe.—Extract the coloring matter from cochineal (obtainable at any good druggist shop) by digestion with alcohol; filter the tincture, add a little solution of gum-arabic, and boil down to a thick liquor. The boiling should be done in an earthern vessel set in a pan of boiling water. When the liquid has become sufficiently thick it may be spread evenly over the inside of a saucer. Thus ladies may have it in their power to make themselves blush to any desirable extent, without the aid of the perfumer, and without fear of deleterious effects upon the skin from poisonous adulterations.

THE PROPERTIES OF RESINOUS TIMBER.

The fact that resinous timber will withstand the action of heat and moisture, where other kinds will soon decay, seems already to have been known by the ancients, for Pliny says, the more odoriferous wood is, the more durable it is. Indeed, the longer a tree has been used for pitch, the less enduring is the timber that it yields; and it may be asserted, that the wood of the Coniferæ, which is so useful for all kinds of carpenters' work, owes its usefulness greatly to the quantities of resin secreted in its tissues, they rendering it impermeable to water and making it thus capable to withstand its effects. The resin becomes concrete after death by the evaporation of the essential oils which held it in solution. Schacht, in his splendid work, "Der Baum" (the tree), relates several instances of the wonderful durability of resinous timber. This author examined the ruins of the castle Ehrenstein, near Remda, in Thuringia, one of the oldest extant in Germany, and found the wood (yellow pine), perfectly sound, and but little turned brown. The old wood of the Canarian pine is also nearly imperishable on account of the resin diffused in its tissue. Schacht relates that the pillars of the dwellings on Teneriffa and Gran Canaria are still as well preserved as if recently cut. They were driven into the ground at the time of the Conquista, in 1402.

William W. Bates, of Chicago, Ill., in a report on American ship timber, relates, also, numerous instances of the great durability of resinous timber, among which the following may find a place here. "The red and white pines of Oregon are largely used on the Pacific coast in the construction of the various parts of vessels. They are considered so well fitted for this purpose that vessels have been constructed entirely of the denser sorts of pine timber, both in Oregon and California The yellow, or long-leaved pine of Virginia and North Carolina is extensively used by Atlantic ship builders for planking, ceiling, stringers, beams, waterways, rails, keelsons, etc. It is very durable, and when a lighter, yet solid wood is required, it is preferred to oak of whatever kind." The white or northern pine, according to Bates, is found at the head of the list of the softer woods used in building vessels of every description. For the construction of river steamboats, it is invaluable, and is sometimes used in almost every part of the boat, except the frame, above light water mark. No wood is said to be better adapted to withstand the sun and weather, for, with proper seasoning and reasonable protection, after the work is finished, it retains its properties as long as the best kind of oak. The wood of the hackmatack or tamarack (the American larch), which is known for its density as well as for its gummy nature, is used for vessels in every part. The sap-wood should, of course, be excluded in this, as well as in all other instances, but the heart-wood requires no seasoning before use, the shrinkage in weight being less than two pounds per cubic foot. For lightness, strength, tenacity, and durability, it is unequaled. The red, or Norway pine, when deprived of its sap-wood, is found to be a first-class material for top timbers, beams, deck planks, bulwarks, and ceiling; it affords excellent timber for masts, when large enough, and for all kinds of small spars. The roots make very good knees and breast hooks.

Another proof of the unchangeability of resinous matter, is the amber, which, formerly, was considered as being of mineral origin, but is now decided upon to have been secreted, in a fluid state, from the Coniferæ of the upper tertiary and secondary strata. From the ordinary resins it differs in yielding a peculiar acid, the succinic acid, upon being treated with alkaline lyes. Goeppert succeeded in producing it artificially from Venetian turpentine, in digesting the same with twigs of the larch, for twelve months, in water of from 140° to 175° Fah.

THE MICROSCOPE IN SILKWORM CULTIVATION.

Our readers may not generally be aware that for several years the microscope has been employed in Europe for the purpose of scanning the eggs of the silk moth, with a view to separating the bad ones from the good. The result of this has been a decided improvement of the stock wherever the the method has been employed. A paper, from the pen of M. Comalia, published in the *Monthly Microscopical Journal*, contains the following extracts, which gives an account of a further extension of the use of the microscope to examination of the moths, thereby enabling the grower to withdraw such as are diseased from the general stock, a process which he claims to be more expeditious and efficient than the assorting of the eggs after they are deposited.

M. Comalia asserts that with a microscopic examination limited to the eggs, we make only a half experiment. The method is imperfect, and the success resulting from its employment may be attributed (excepting certain bad processes of culture) to examination for corpuscles in the eggs only, for every healthy egg does not necessarily produce a healthy moth. He says:

"These facts are evidenced by the fact that eggs attacked in the proportion of 4 per cent if proceeding from one of our families of moths, or 8 or 9 per cent if from one of the Japanese races, give very mediocre results. In fact, the corpuscles, which I have often insisted on, are the appreciable characters of the disease; but the eggs may be attacked by the original disease without having these microscopic features. In examing the eggs of a corpuscular female, in which they were disposed in chaplets in the ovaries, all the eggs were not found charged with corpuscles.

"In order, then, to make a definitive experiment to guarantee the healthiness of the eggs, there is nothing like examining the moths before or after they have deposited their ova, in order that we may reject all those eggs proceeding from tainted parents. This mode, the most rational, although the most difficult of execution, which M. Pasteur has suggested, and which I believe to be alone capable of regenerating our races of worms, was attempted last year at Milan with complete success.

"In the month of June, 1868, I received from Zara, a package of cocoons of the ancient Italian race, cultivated on the Dalmatian coast, not far from the shores of the Adriatic. These cocoons, about one kilogramme, contained three chrysalides alive. Some of these chrysalides, which I soon examined, and which were not yet perfect, exhibited no trace of the corpuscles. It was then that the idea occurred to me of applying M. Pasteur's method to the eggs obtained from healthy moths grown with every care.

"My friends, the Marquis Crivelli and M. Bellotti, undertook this experiment. The moths, when hatched out, had a most deceptive appearance, and, when examined by these gentlemen, were found to be free from corpuscles; here there was a perfectly healthy egg, the product of healthy parents, which gave promise, not only of a large produce in cocoons, but even of a healthy crop of moths and of eggs for the culture of the year 1869

"M. Crivelli selected Inverigo, in Brianza, to 'bring up' these eggs, in order to surround them with all the necessary care. He divided the eggs into three portions; one of these parcels was given to a peasant in the village, another was reared in his own garden, and the third was sent to a distant locality.

"It is necessary to state that the mode of 'education' adopted by the Marquis was an extremely careful one; general hygienic conditions being carefully attended to, and the locality, which had some time ago been used as a hospital for cholera patients, having been fumigated with chloride of lime. Within a radius of 500 meters no other silkworms were cultivated. Moreover, the locality abounded in mulberry trees—this fact being of importance—for had the leaves been imported from other localities they might have been tainted with corpuscles of diseased caterpillars.

"The cultivation of the three batches proceeded excellently, as on the estate of Inverigo, where the Marquis raised 210 ounces of eggs, of which no more than two per cent were diseased. From these 210 ounces he obtained 10,176 kilos. of cocooons, a mean of 48 kilos. to the ounce. The three batches of eggs from Zara did still better, for they produced a maximum of cocoons equal to 62 kilos. per ounce.

"As may be imagined, the Marquis set apart for the next year the eggs from the last mentioned quality, and he set to work with ardor, and with great hopes of excellent results, but all his exertions were not followed by equal success.

"The examination of the chrysalides responded exactly to what might have been predicted; that is to say, that all three batches were equally healthy. The microscopic examination of the moths, however, gave quite a different result. Those which had been reared in the village and those in the Marquis' garden were diseased; but those which had been sent to a distance and which were brought up in the isolated house were perfectly healthy. Not one of these last presented any corpuscles, neither in leaving the cocoon nor in depositing ova, nor in decay, nor after death.

"Here there is a decisive result; for the eggs were the same and the education of the three batches was alike, save in certain circumstances, on which it is important to insist. The peculiar circumstances relate only to the conditions of contagion—to the transport of corpuscles. In fact, the healthy moths were those which had been reared under circumstances of isolation, in places previously disinfected, and where the worms had been fed with leaves equally isolated.

"Here there is what is essential to obtain certain results. To the ordinary precautions of 'education,' conducted with all possible attention as to temperature, aeration, and abundance of food, it is necessary to add isolation of the chambers by a cordon of at least 500 meters radius, and healthy eggs, deposited by healthy moths, cultivated with particular care in isolated localities, disinfected with chlorine, and having a certain 'precocity,' in order to obtain isolation.

From the foregoing remarks and general experience, M. Comalia draws the following conclusions:

"1. An egg, apparently healthy as to its microscopic features, may proceed from very unhealthy parents.

"2. An egg, healthy as to its characters under a microscope, may and does give ordinarily a long produce in cocoons, but it may be incapable of giving healthy eggs.

"3. The absolute health of an egg proceeding from healthy moths (which present only about 4 or 5 per cent of diseased specimens) is an excellent indication of the capacity of an egg to produce healthy moths, which in their turn shall be capable of producing healthy eggs.

"4. To assure this result, it is necessary to maintain all those hygienic and other conditions before mentioned."

COAL—HOW IT MAY AND MUST BE CHEAPENED.

All agree that coal is absurdly, extortionately, cruelly high; but all do not agree as to the cause of present high prices, or as to how it may be cheapened.

The free traders say the high price is dependent on the present tariff, while some protectionists say it is owing to extortionate freights and high prices demanded by miners. We say it is a combination of all the causes assigned.

While we have been and still are protectionists within what we consider the legitimate meaning of that term, we say remove the tariff on coal, at least until such time as it may become apparent that it needs some protection. At present it is perfectly plain "the shoe is on the other foot." But when this is done only a small part is done. We need additional and competing lines of transit from the great beds of coal to the principal centers of trade, and we need more labor; the want of a proper labor supply being, in our opinion, one of the chief causes of trouble.

This labor can be found in abundance in Asia. It only waits to be properly invited. It is just the kind of labor wanted for the purpose, and the coal strikers may rest assured that if it be once called into request, public opinion will sustain it against all intrigue, and threatened or attempted outrage.

Cheap coal we may have, and *must* have, and all parties implicated in the present stringency had better take heed lest they carry things just beyond the limit of the proverbially elastic American patience.

We say to these people so long as you protect the public we go in heart and hand to protect your industry, but not one fraction of a moment longer. And we say the same to all other industries the people have been willing to aid by tariff on foreign importations. We are sorry to say it, but the present high prices of coal are doing more to build up the doctrines of free trade than all the writings of its advocates, or speeches of clergymen, college professors, and demagogues, upon the much misunderstood and abused subject of protection.

If only the coal trade would be likely to suffer by the reaction which the present state of things will cause, we should not grieve, but we fear that the prosperity of other important industries will be also imperiled. Many will be so illogical as to reason that if a tariff is not needed on coal it is not needed on anything. Now the only way to make such a conclusion tenable is to cheapen labor. Let people take their choice, but remember that labor cheapened by a supply adequate to the demand will not be likely to soon recover its present power.

Testing Opium.

Professor Schneider has proposed, in the sixth revised edition of the *Pharmacopœia Austriaca*, the following method for testing the goodness of opium: Ten grammes of previously dried and powered opium are treated with a mixture of 150 grammes of distilled water, to which 20 grammes of pure hydrochloric acid, sp. gr. 1·12, are added; the residue, after extraction, should not exceed 4·5 grammes weight; to the acid fluid 20 grammes of common salt are added, and the precipitate thereby caused is collected, after 24 hours, on a filter, and the latter washed with a solution of common salt; to the filtrate ammonia is added, and the fluid left standing again for 24 hours; the crystals which have separated are collected, redissolved in acetic acid, and precipitated with ammonia; the precipitate so obtained is washed, dried, and weighed; its weight should not be less than 1 gramme.

INVENTION.

From the New York Tribune.

The number of patented articles in our country is so great that no one man can have a knowledge of them all. When one invention comes into general use, a demand grows out of it for another which shall operate with what it produces, or in combination with what others produce; and we may say that the first invention of the human mind is comparable to the seed of fruit, since it contains within itself the nucleus of innumerable leaves and branches, and other fruit and seed which in the progress of outgrowth take on innumerable variations and developments. When a tree is planted the growth for a few seasons is slow, and it is a law that the more valuable and enduring the sort the more tardy is its progress; and when men first planted, no little energy was required, for the natural mind, being without a standard, could not look forward except by a dim light to the season of depending and fruitful branches. Casualties of the passing time—insects, winter with its snow, its cold, fierce winds, and frost, searching for the heart and the mainspring of life—seemed so direful in their effects that when spring showers and gentle sunshine came it was almost miraculous to behold the bare twigs become adorned with tender leaves, and the delicate bloom foreshadow the fruit that was to be. As ages passed, each gave a little to the preceding of culture and care, and finally minds, grown into harmony with familiar trees, dissociated themselves from the mass of men, and the pursuit of horticulture issued out of ages of poverty, plague, and pain.

Not dissimilar has been the progress of invention, and in like manner has the mind of man struggled with the adversities everywhere rushing in to avert, to overwhelm, and to destroy. It is almost miraculous to see how ideas have been preserved and matured amidst the darkness; and now those ideas spread out manifold, and triumph with foliage and fruit. We can see how the mind rises step by step—how, in gathering to itself comforts and riches, it uses the power which these give to grasp for still more, and changes arise, and what seemed established conditions pass away. Inventions must be introduced by degrees, and only as strength is acquired. If the inventions of the last thirty years could at once have been given to man in the age of Queen Elizabeth, they would have been useless, because society and mental development were not in condition to admit of their application. There can be no doubt that in ages past many things were invented, or at least conceived, which could neither be understood nor adopted, for they were before their time, and they floated back into the great, and, to us, unknown infinity of intelligence and mechanism.

We have, in our day, what would seem a singular condition regarding applied inventions. Notwithstanding the vast amount of labor which they save, and of wealth which they create, we are still as much in need of new inventions as were the people of any former age, and this evidently because the mind has enlarged, and new wants have been created. Perhaps the need for new inventions is felt nowhere so much as in the household, and a grievous burden rests upon at least one half of the race, which is more sensibly felt because in other industries and in the arts human ingenuity has brought automatic labor into successful operation, and it is demanded that the household shall enjoy corresponding results. In this we are not speaking of the higher, or of the wealthy, but of the great middle class. Upon investigating the claims of the household, it will be seen that the deficiency arises from a want of motive power to perform the labor now supplied by muscles unequal to the task. The work for inventors is the discovery of some power which shall be cheap, so compact that it will not be ungainly, and which can be used in all places. We need a philosophic and analytic history of inventions. It would show, we think, that progress commenced in the obvious, and that it has been gradually approaching to the abstract. The higher class of inventions demand deep research in every department of human study, that each may contribute something. The inventive and the creative powers are akin, and the more we investigate their relations the more will this part of the nature of man appear to partake of those attributes which called the world itself into existence. However much is to be expected from an individual during the extension of his existence, we ought not to look for one age to accomplish much. To the coming children, work and endeavor and great cares must be allotted, that they, too, may spread out branches, and that at no remote period of time they may, by superior powers, bring out of the invisible, despite unwilling nature, such things as elude our weaker grasp.

Testing Petroleum Oil.

There seems to be various opinions in regard to the true method of testing refined oil in this country, owing to the fact that refiners and inspectors do not confine themselves to a uniform standard and method of operation, and are inclined to advance each his own mode as the true and only one, and inspect his oil to the best advantage, so long as it suits individual interest. Hence the great difference in comparative fire test of inspection through the country, and the evil tends to furnish a basis for difference of opinion and contention, and, in many cases, throw discredit alike upon the dealer and inspector.

The true method of testing refined oil is by fractional distillation, to determine the proportions of benzine or gasoline and naphtha which they contain. As this is not generally understood by inspectors or refiners, and would occupy too much time for practical mercantile business, the next best method is of great importance.

The State law authorized the use of G. Talinbur's instrument, which is an inclosed vapor test, delicate and accurate, when understood. Another method in use is the open water bath, with a small flame suspended above the oil; and still another, an open water bath and testing by passing a light over the surface. The objection to the first is that any fluid or gas heavier than the atmosphere will rise by capillary attraction through a wick, or tube to the flame, and indicate a lower fire test; and the uncertainty of equal distance of the flame in the latter is an objection.

We are inclined to believe that so long as fractional distillation is not known by the masses that the true commercial mode is that similar to Professors Roscoe, Penny, and Attfield, in use by the British board, and described in the British petroleum act.

A porcelain vessel is used—extra protection of an extra glass tube around the stem of the thermometer, which is placed one and one half inches below the surface of the oil. Great accuracy in filling the water in bath to an exact hight, and fresh water used for every test—great accuracy in filling oil to a certain prescribed hight—a small wire or guard is placed one quarter of an inch above the rim of the vessel, which is flat, with a raised edge, one quarter of an inch in hight—a screen is placed two thirds around the apparatus to protect it from uneven draft, and a few inches above the level of the vessel. Great care is used in not too rapidly heating, otherwise the test is unsatisfactory. When the thermometer indicates the desired heat, say 90 degrees Fahrenheit, a small flame is quickly passed across the wire over the surface of the oil. If no pale blue flicker or flash is produced, the test will be applied at every three degrees in thermometer above this, when flash point has been reached and noted. The test is repeated with a fresh sample of the oil and fresh water as before, withdrawing the source of heat from the outer vessel, when the temperature approaching that noted in the first experiment is reached.—*F. S. Pease's Oil Circular.*

Manufacture of Oil-Cloth.

The manner of making oil-cloth, or, as the vulgar sometimes term it, *oil-skin*, was at one period a mystery. The process is now well understood, and is equally simple and useful.

Dissolve some good resin or gum-lac over the fire in drying linseed oil, till the resin is dissolved, and the oil brought to the thickness of a balsam. If this be spread upon canvas, or any other linen cloth, so as fully to drench and entirely to glaze it over, the cloth, if then suffered to dry thoroughly, will be quite impenetrable to wet of every description.*

This varnish may either be worked by itself or with some color added to it: as verdigris for a green; umber for a hair color; white lead and lamp-black for a gray; indigo and white for a light blue, etc. To give the color, you have only to grind it with the last coat of varnish you lay on. You must be as careful as possible to lay on the varnish equally in all parts.

A better method, however, of preparing oil-cloth is first to cover the cloth or canvas with a liquid paste, made with drying oil in the following manner: Take Spanish white or tobacco-pipe clay which has been completely cleaned, by washing and sifting it from all impurities, and mix it up with boiled oil, to which a drying quality has been given by adding a dose of litharge one fourth the weight of the oil. This mixture, being brought to the consistence of thin paste, is spread over the cloth or canvas by means of an iron spatula equal in length to the breadth of the cloth. When the first coating is dry, a second is applied. The unevennesses occasioned by the coarseness of the cloth or the unequal application of the paste, are smoothed down with pumice stone reduced to powder, and rubbed over the cloth with a bit of soft serge or cork dipped in water. When the last coating is dry, the cloth must be well washed in water to clean it; and, after it is dried, a varnish composed of gum-lac dissolved in linseed oil boiled with turpentine, is applied to it, and the process is complete. The color of the varnished cloth thus produced is yellow; but different tints can be given to it in the manner already pointed out.

An improved description of this article, intended for figured and printed varnished cloths, is obtained by using a finer paste, and cloth of a more delicate texture.—*The Painter, Gilder, and Varnisher's Companion.*

An Oxygen Explosion.

The oxyhydrogen, or lime light, is now in use, with great success, in the theaters of this city, and is regarded as indispensable in the making up of all effective scenes. The best light is produced by the ignition of two jets—one of hydrogen and one of oxygen, which impinge against a piece of lime. In some cases the common street gas, which contains hydrogen, is substituted for hydrogen; but the light is better when the pure article is employed.

The oxygen is supplied to the theaters in portable cylinders of rolled iron, of convenient size for lifting by one man. The gas is condensed into the cylinders, under a pressure of from 100 to 150 lbs. per square inch, by steam power.

During a recent performance at Niblo's Garden Theater, in this city, one of these oxygen gas holders suddenly exploded, with a report equal to a cannon, causing the utmost consternation among the audience, and doing some damage to the theater. No cause is assigned for the explosion; but the cylinder probably was too weak to stand the pressure.

Japanese Matches.

Mr. R. Trevor Clarke has stated in the *Chemical News* that the Japanese matches are identical with the spur-fire of the Chinese. He gives the following form for making this beautiful little firework: Lampblack, 5; sulphur, 11; gunpowder from 26 to 30 parts, this last proportion varying with the quality of the powder. Grind very fine, and make the material into a paste with alcohol; form it into dice, with a knife or spatula, about a quarter of an inch square; let them dry rather gradually on a warm mantelpiece, not too near a fire. When dry, fix one of the little squares in a small cleft made at the end of a lavender stalk, or, what is better, the solid straw-like material of which housemaids' carpet-brooms are made (panicular stems of *Arundo Donax*). Light the material at a candle, hold the stem downward, and await the result. After the first blazing off, a ball of molten lava will form, from which the curious coruscations will soon appear.

*This preparation will likewise be found both useful and economical in securing timber from the effects of wet.

Power of the Wind.

The Vicksburg *Times*, says that recently a young lad at Lake Station, Mississippi, had a very large and beautiful kite presented to him, about six feet by four in size, which he attempted to raise, just as the wind was increasing and a storm was threatening. The wind drew the kite so heavily as to drag the boy along also. To prevent losing the favorite, he wound the cord around his body. At last the gust bore kite and boy along in the rapid air currents. The boy seemed to be about 100 feet above the earth, and the kite five times that distance. At last the young kite-flyer caught in the top of a tree, and was suspended 75 feet above the ground. A flood of rain came on, slackening the line, abating the wind, and allowing the little sufferer to be rescued. He was found to be unconscious, and so bruised and marred as to be scarcely recognized, but was restored the same evening, and is now doing well.

Editorial Summary.

MAGNETIC VARIATION.—The *Duluth Minnesotian*, says: The magnetic compass, on the north shore of Lake Superior and particularly in surveying around Duluth, is a very zig-zag kind of guide. The Assistant Surveyor in charge of the transit on our Town Site Survey during the past week experienced some of its wildest eccentricities of variation. In running and cutting out a transit line between sections on the mountain side, at a certain spot he noticed in a distance of fifty feet a change from 11 deg. east, to 17 deg. east; then in a hundred feet further, back to 12 deg. east; while five hundred feet further on from 12 degs. 30 min. east it whirled around to 30 degs. west (!) and kept at that for three hundred feet and then got back again to 11 degs. east. The Surveyor picked up a piece of rock of the granitic species, which seemed to prevail in the locality, and applied it near his compass, when the needle followed it around the same as it would a true loadstone. The general Government may well require the use of the solar compass in surveying lands in this region. The needle is but a blind guide.

WE are reminded, says the *American Builder*, that, during the past month, a letter came to us from a distant city in which the writer suggests a novel style of a dwelling, and asks us whether we think the plan patentable. Most assuredly we do, and we hail this request as an encouraging sign of the times. Why no patents are applied for on improvements in dwellings, has, to us, long been a mystery. We want something new. What are our inventors about? Millions of money expended annually in the construction of dwelling houses and no patent house. Start in, inventors. You will produce a sensation among the dry bones in the architects offices, that will be eminently amusing. We beg of you not to consult any books on architecture; but go at it in a muscular style and give us an original plan for a house. If the dead centuries, surfeited with architectural lore, see fit to laugh at you, do not be disturbed. An age that lays cables across an ocean, and railroads across a continent, can afford to be laughed at. Send on your plans.

THE Gateshead (Eng.) *Observer* says that the offering of prizes to pit lads in that district to induce them to search for fossil remains has been attended with unexpected results. Not only had the lads picked up from the refuse shale heaps large numbers of fish remains, and some remains of large reptiles, but what is really extraordinary, and will astonish palæontologists, one of the lads has found the lower jaw of a true mammal. The effect of this discovery will be to reduce the comparative ages of all hitherto known mammalia, and carry backward the mammalian life of the world to a much earlier period than that at present assigned to it.

TO INVENTORS.—We desire to call the attention of inventors to an article entitled "Invention," published in another column, and copied from the New York *Tribune*. This able article forcibly confirms the views we have always maintained in our paper, that there is no natural limit to invention any more than to the desires of individuals for new and improved articles, machines, and processes. We also advise all who have or expect to have patents or patented articles for sale to read attentively an able communication entitled, "Printers' Ink in the Sale of Patented Articles." It contains most valuable suggestions.

WM. M. HAYNIE, of Sacramento, who has a large number of silkworms, lost 500,000 in one night. He attempted to hatch them by artificial heat, and to economize the heat by running steam pipes through the building.

THE GUNPOWDER HAMMER, for driving piles, illustrated in our last issue was patented by Thomas Shaw, of Philadelphia. It is a very useful and ingenious machine, and the inventor's name should be associated with its introduction.

Nitro-Glycerin Explosion.

The Titusville (Pa.) *Herald* records a singular accident:

"One of the most extraordinary accidents it has been our province to chronicle, occurred at the 'Salt Well,' Scrubgrass, on Friday afternoon, July 30th, and resulted in the death of George W. Fetterman, and the seriously wounding of two other persons.

"The unfortunate man procured on Monday last, for the purpose of oiling engines, a quantity of thick fluid which, from the color, he supposed to be lard oil, but which, as the sequel proved, was really that dangerous explosive, nitro-glycerin. He used it as a lubricator on the engine at the 'Salt Well,' and also on another engine, from Monday until Friday afternoon. Strange as it may appear, the nature of the fluid was not suspected during all the time, although it was remarked by some one who was curious enough to taste it, that it was singularly sweet for lard oil. However, about 3 o'clock on Friday afternoon, as the man was oiling the gudgeon of the sand-pump pulley, which was revolving with great rapidity, a terrific explosion occurred. Fetterman was blown some distance and instantly killed. He was mutilated almost beyond recognition. The flesh was literally torn from his limbs, and one half of his head was blown off. His brother James and a man named D. McNally, who were standing near by, were thrown violently to the earth. They were both much bruised. The former was wounded in the chest, thigh, and groin by pieces of the can, in which the glycerin had been kept, and other splinters, and the latter was struck in the face by a piece of tin. Their injuries are not considered dangerous.

"The force of the explosion drove pieces of the can and splinters in all directions, and also blew three or four boards off the engine-house. One piece of tin was driven entirely through a four-inch post. At the time of the explosion there was very little glycerin in the can, probably not more than an ounce or two."

MANUFACTURING, MINING, AND RAILROAD ITEMS.

M. de Lesseps, the Suez Canal engineer, having sent some surveyors to examine the desert of Sahara, has, it is said, become convinced that the desert is at its nearest limit 27 meters below the level of the Red Sea, and that the depression continues increasing toward the interior. He therefore thinks that he can make the desert the bed of a large inland sea, by a canal of 75 miles in length, bringing the water from the Red sea. Besides climatic changes an easy method of intercourse with Central Africa would be effected if this project could be accomplished.

A correspondent of the New York *Times* writing from Helena, Montana, says: "The daily receipts of bullion and dust at the Helena Bank are over $50,000 per day. A seven pound nugget was taken out of 'Bilk Gulch' a few days ago, by G. W. Moore. The lucky miner had better rechristen that gulch. A nice little silver 'button,' weighing $2,800, was sent in from the Stapleton Silver Mines a few days ago, and last week the banking house of Bohm & Aub shipped the 'heftiest' gold brick yet made in Montana, although by no means the last. The value of this little auriferous pocket piece was $40,000."

The jury on the inquest in the case of a woman whose death was caused by an explosion of a kerosene lamp at 408 West Twenty-sixth street, this city, on the 29th ult., added to the verdict that deceased came to her death by burns inflicted by an oil proved to be highly explosive, a recommendation to the Board of Health, Fire Commissioners, or any authority having power to do so, to enact an ordinance making it a punishable offense to manufacture and offer for sale an oil that shall evaporate at less than 100 degrees Fah., and burn at less than 110 degrees.

The Monson, Mass., quarrymen have split out a granite slab 350 feet long, 11 wide, and 4 thick, containing 15,400 cubic feet, and weighing twelve hundred and eighty-three and one third tuns. To cut it from the rocks 1,104 holes were drilled on a line parallel with the front edge. This ponderous piece of granite will be cut up and sent to Albany to be used in the construction of the new capitol.

On the 19th July the Thames Tunnel was finally closed as a public footway. The tunnel was commenced by Brunel in 1824, and was finished in March, 1843. The total cost of the tunnel was about $3,500,000, but the East London Railway Company recently purchased it for a little over a third of that sum. The company will run their trains through the tunnel, their line bringing the inhabitants of Wrapping, Shadwell, etc., within easy distance of Southwark Park.

Nameless County, Nebraska, has voted to donate $250,000 to the St. Louis Trunk, and the Brownsville, Fort Kearney, and Pacific Railroads. Both roads will be built through the county next year. The latter is an extension of the Quincy and Brownsville Railroad. The work is progressing on both lines.

A convention was concluded on the 16th day of April, and proclaimed on the 6th of July last, between the United States and the Emperor of the French, to secure in their respective territories a guarantee of property in trade marks. A similar arrangement has been made with Russia.

At a workingmen's convention held at Virginia City, Nevada, resolutions were passed declaring that "the importation of Asiatics and their employment in the mines, or other fields of labor, must be discontinued, or it will bring on an 'irrepressible conflict' likely to end in bloodshed and ruin."

The British Board of Trade return of the number and nature of railroad accidents during the year 1868 has been published. In England 150 persons were killed and 528 injured. In Scotland the numbers were respectively 47 and 89, and in Ireland 15 and 33. Of the 150 persons killed in England by train accidents 31 perished at Abergele.

The statistics of immigration at New York for the month of July show the total number of arrivals to have been 25,017, against 26,111 last year, a falling off of 1,094. The greatest number came from England and Ireland, 11,694, Germany being represensed by 8,149, and the Scandinavian countries by 3,401.

A ship canal is to be constructed through Schleswig-Holstein to connect the Baltic and the North Seas. The preliminary surveys have been completed. It is thought the Prussian Government will undertake the work of building.

The Exhibition Commissioners at London, England, have decided to hold a series of annual international exhibitions of select works of fine and industrial art and scientific inventions at Kensington. The first exhibition is fixed for 1871.

The International Exhibition of Art and Industry just opened at Munich is said to surpass in attractiveness the similar exhibition of 1858. The pictures number over two thousand.

A telegram from Ketch announces that the Black Sea cable belonging to he Indo-European Company has been successfully submerged.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,067.—Reaping and Mowing Machine.—James Thayer, New York city. July 8, 1869.

2,058.—Shaving Mug.—F. M. Keeler, Boston, Mass. July 8, 1869.

2,087.—Producing Marquetry and other Divers Colored Wood-Work. Joseph Dill, Grand Rapids, Mich. July 10, 1869.

2,088.—Machine for Manufacturing Horseshoes.—O. A. Howe, Jersey City, N. J. July 10, 1869.

2,090.—Wood-Working Machine.—Joseph Dill, Grand Rapids, Mich. July 10, 1869.

2,102.—Manufacture of White Lead.—Geo. T. Lewis, Philadelphia, Pa. July 12, 1869.

2,112.—Mowing and Reaping Machine.—James Green, Boston, Mass. July 13, 1869.

2,118.—Pianoforte Hammer.—C. W. Brewster, Racine, Wis. July 14, 1869.

2,119.—Pianoforte Bridge.—C. W. Brewer, Racine, Wis. July 14, 1869.

2,179.—Blotter.—C. C. Moore, New York city. July 19, 1869.

Business and Personal.

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

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

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 advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

H. A., of N. J.—If an upright cylindrical vessel be filled with water, the pressure against each point of the walls varies from nothing at the top to a quantity proportional to its depth at the bottom. It will be upon each square inch of area equal to a column of water of a hight found by measuring from the center of the area to the surface of the water, and having for its base one square inch. If now the top be closed and pressure be applied through a tube or other means, this pressure will be transmitted equally in all directions. That is, suppose the pressure at the top to be nothing previous to applying pressure, and at the bottom to be ten pounds per square inch, then if ten pounds additional pressure to the square inch were applied, the pressure on the top would become ten pounds to each square inch and at the bottom twenty pounds. And if the pressure were sufficiently increased the cylinder being of uniform thickness and strength throughout would burst first at the bottom. In a vertical boiler 17 feet high the difference in pressure against the walls at the top and at the bottom would be equal to about seven and one half pounds per square inch.

B. D. M., of N. Y.—All kinds of bricks are more or less conductors of heat, and though you should cover your boiler with a mountain of masonry you cannot avoid some loss. Nevertheless there is great economy in such a covering. The man who will first discover a means whereby the heat of boilers, steam pipes, and cylinders, can be wholly confined, will immortalize his name, and secure the means of obtaining the largest fortune ever yet made, but we don't think he is born yet.

S. T., of Mass.—It has been claimed by some engineers that the heat expanded in producing a proper draft by means of a chimney will produce a still better draft by means of a blower. A practical test of this statement would be of value.

R. H., of N. H.—The oscillations of the common pendulum only take place in equal times within a certain amplitude of arc. This amplitude ought not to exceed five degrees. The varying density of the atmosphere making unequal resistances to the oscillations of the pendulum, is a constant source of irregularity, as well as the variation in the length of the pendulum rod.

C. P., of Ala.—No more heat can be theoretically obtained by the conversion of mass motion into heat, than the heat required to produce the mass motion. Practically not so much. Could more be obtained the problem of a perpetual motion would be solved.

S. W. G., of——The length of a telescope is adjusted to the focal distance of the lenses. The magnifying power depends entirely upon the latter, and the relation between the power of telescope and its length is only an indirect one. The power of a telescope depends upon the focal distances of the lenses and the illuminating power of the object glass. The latter increases with the size of the object glass.

H. R. S., of Vt.—A great many machines for cutting stone for architectural work have been tried. We do not think any of them have been found adapted to general use, or have attained much success. We do not know that the carbon tool point has been specially applied to this purpose.

N. O., of Ky.—All springs lose their power by overtaxing them. The load should always be less than that required to produce a permanent set. You will also find that brass wire will vary very much in elasticity throughout a coil. The only safe way is to keep within the inferior limit.

R. C., of La.—The action of an air-pump will cease to extract air from a receiver as soon as the expansive force of the residual air or gas becomes too weak to raise the valves. The best pumps leave about one thousandth of the air unexhausted.

L. M. V., of N. Y.—You can fasten rubber hose to a coupling so as to be water-tight by winding it with annealed brass wire. You will find no trouble in accomplishing it.

L. C., of Kansas.—The substance of which you make inquiry is mostly gum dextrine. You will find a process of making this gum in Dr. Ure's "Dictionary of Arts and Manufactures," or you can purchase it ready made, of dealers. It dissolves readily in water, and is very adhesive.

G. O., of——In your case capillary attraction is as you suppose, overcome by centrifugal force. The oiler you employ is in our opinion not adapted to a fast running pulley.

APPLICATIONS FOR EXTENSION OF PATENTS.

Loom.—James O. Leach, of Ballston Spa, N. Y., has applied for an extension of the above patent. Day of hearing October 11, 1869.

Sugar Filterer.—C. E. Bertrand, of New York city, has petitioned for an extension of the above patent. Day of hearing, October 11, 1869.

Sewing Machine.—L. W. Langdon, of Northampton, Mass., has petitioned for the extension of the above patent. Day of hearing, October 11, 1869.

Sewing Machines.—(Numbered 13,768).—Isaac M. Singer, New York city, has petitioned for an extension of the above patent. Day of hearing, Oct 18, 1869.

Process for Making Zinc White.—Samuel Wetherill, of Baltimore, Md. has petitioned for the extension of the above patent. Day of hearing, Oct. 25, 1869.

Mills for Grinding Coffee, etc.—Cornelius W. Van Vliet, of Fishkill Landing, N. Y., has applied for an extension of the above patent. Day of hearing, Nov. 1, 1869.

Knitting Machine.—Timothy Bailey, of Ballston Spa, N. Y., has applied for an extension of the above patent. Day of hearing Nov. 1, 1869.

Making Gum Elastic Cloth.—Henry G. Tyer, of Andover, Mass., and John Helm, of New Brunswick, N. J., have applied for an extension of the above patent. Day of hearing December 20, 1869.

Recent American and Foreign Patents.

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

Sheave Pulley.—J. B. Valnan, and N. P. Cramer, Carbondale, Pa.—This invention relates to improvements in casting grooved sheave pulleys, the object of which is to provide sheave pulleys with a chilled portion of the surface of the groove.

Construction of Buildings.—Joseph Potts, Harrisburg, Pa.—This invention relates to improvements in the construction of buildings intended to provide a combined arrangement of brick and wood walls, and framing calculated to so strengthen the brick portion thereby, so as to produce walls of the desired strength, with fewer bricks than as now constructed.

Steam Generator.—H. B. Smith, and J. V. Stevens, Pomeroy, Ohio.—The object of this invention is to provide an improved arrangement of steam-generating apparatus, calculated to simplify the construction and to facilitate the generation of steam economically, also to admit of changing the position of the tubes from time to time, placing the bottom sides upward so that the scale previously formed will be thrown off.

Combined Wagon and Sleigh—John S. Drake, New York city.—The invention consists in so attaching a pair of "bob" runners to each axle, that, by a simple movement of a hand lever, they may be turned down to the ground and the wheels drawn therefrom, or by the reverse movement where the wagon is being backed up, the said runners may be raised up in front of the wheels out of action, where they may be secured.

Throtle Valve Gear.—Samuel Moore, Providence, R. I.—This invention consists in the application of affixed toothed or friction segment to the valve stem and a friction pinion on the lever, so arranged that the movement of the lever causes the pinion to revolve, which being controlled by a friction clamp, will resist any tendency of the lever to move, and thereby hold it as set by the attendant. A pivoted handle for the friction clamp is provided and so arranged as to be grasped and the friction released, when the lever is grasped for moving it.

Tinners' Bending Machine.—Isaac Grim, Polo, Ill.—This invention relates to improvements in machines for bending the edges of square sheet metal pans for wiring them, and the object is to provide a simple and cheap machine adapted for pans of various sizes.

Lamp.—John Phelps, Owego, N. Y.—The object of this invention is to provide a simple and efficient arrangement whereby the filling orifices through the necks of kerosene, and other lamps, may be readily opened for filling and immediately closed on the withdrawal of the nozzle of the can by a self-closing device, which will keep the passage closed sufficiently tight to prevent danger, and which will not work loose or get out of order.

Fence.—Wm. F. Auxier, Mason City, Ill.—This invention relates to improvements in fences for river bottoms liable to be overflowed in times of high water, the object of which is to provide a fence which may be readily turned down so as to make less resistance to the water, and which will be so secured to the ground as not to float away. The foundation is such that the posts cannot be undermined by gullies formed around their base by the water.

Fanning Mill Attachment.—Pardon Austin, Medina, Wis.—The object of this invention is to provide an improved arrangement of elevating apparatus for fanning mills for receiving the grain from the discharge apron of the mill and delivering it into bags or other receptacles. The invention consists in the arrangement of the attaching and operating apparatus to adapt the elevators for attachment to any mill.

WASHING MACHINE.—J. M. Starr, Jr., Fond du Lac, Wis.—This invention consists in a wash tub, of rectangular form at the top, with a bottom curved in the direction of its length, and provided with curved ribs in the same direction, and the combination therewith of a series of horizontal notched beaters or agitators suspended upon levers pivoted at the center from which the curvature of the bottom is struck, and projecting upward to receive oscillatory motion from a crank shaft.

MANUFACTURE OF PLOWS.—Henry Barnes, Franklin, Iowa.—This invention consists in the construction of the blanks for the moldboards and share plates, by first rolling the plates from which they are to be cut into such form that the blanks may be puched therefrom without material waste of metal, and the "shins," or parts thereof subjected to the greatest amount of wear, may be formed with the increased thickness required to withstand the wear.

CORN PLANTER.—Peter Shellenberger, Millerstown, Pa.—This invention has for its object to furnish an improved corn planter, which shall be so constructed and arranged as to plant the corn at a uniform depth.

APPARATUS FOR EMPTYING THE COOLING TUBES OF FILTERING FURNACES.—Eugen Langen, Cologne, Prussia.—This invention has for its object to remove the re-burnt animal charcoal from the vertical cooling tubes of filtering furnaces, used in the production of sugar, in an automatic and uniform manner.

CHURN.—Robert Wilson, Rees Corners, Md.—This invention has for its object to furnish an improved churn, simple in construction, convenient, efficient, durable, and not liable to get out of order, and which may be manufactured at comparatively small cost.

PIPE TONGS.—R. Crain, Shaffer Farm (Dennison P. O.), Pa.—This invention has for its object to furnish a simple, convenient, and effective pipe tongs, which will securely clasp and firmly hold pipes, tubes, or other cylindrical bodies, and at the same time will not injure the articles grasped.

HORSE BONNET.—J. L. McIntosh, Brooklyn, N. Y.—This invention has for its object to furnish an improved bonnet for protecting the horse from sun-stroke, by keeping his head cool and protecting it from the heat of the sun.

COMBINED PLOW AND CULTIVATOR.—Samuel Huber, Danville, Pa.—This invention has for its object an improved plow, which shall be so constructed and arranged that it may be easily adjusted for use as a furrowing plow coverer, cultivator, or potato digger, and which shall at the same time be simple in construction, easily adjusted, and effective in operation in whatever way it may be used.

LOCK NUT.—Almon Roff, Southport, Conn.—This invention relates to a new device for preventing nuts on bolts from working loose, and consists in the application of a left-hand screw, fitted into the end of the bolt, so that its head will partly cover the end of the nut, to prevent the same from being unscrewed.

ALARM BELL.—L. F. Bruce, Bridgeport, Conn.—This invention relates to a new attachment to doors and windows, by means of which, should an attempt be made to open such doors and windows, a loud and continuous alarm will be given.

APPARATUS FOR OPENING PACKING CASES.—C. M. O'Hara, New York city.—The object of this invention is to provide a simple and effective apparatus for opening packing cases, whereby the cover of the case may be readily separated from the body of the same, without splitting the cover or marring the edges of the case.

ORGAN.—Wm. Robjohn, New York city.—This invention relates to certain improvements on the organ, improvements for which letters patent No. 54,603 were granted to the same inventor on the eighth day of May, 1866. The present invention has for its object to simplify the devices on the composition board, referred to in the aforesaid letters patent, as well as the pneumatic lever, and to provide a reliable and practicable tremulated pneumatic lever and a reversible coupler for the keyboards.

GLOBE LANTERN.—William Porter, Sr., and William Porter, Jr., New York city.—This invention relates to a new manner of constructing lanterns with a view of making the globe removable from the top.

COMBINED LAMP AND CANDLESTICK.—F. C. Richer, Gilmer, Texas.—This invention has for its object to provide a new and useful device, by means of which a lamp can be converted into a candlestick, and *vice versa*, while on the other hand the lamp burner may be used on any kind of oil reservoir.

MILLING AND REAMING TOOL.—Albert J. Lutz and H. Reiss, New York city.—This invention relates to a new manner of arranging the cutting edges of milling tools and reamers with the object of preventing their becoming blocked with shavings.

HEAD BLOCK FOR CARRIAGES.—J. C. Bates, Warrensburgh, Mo.—This invention relates to certain improvements in the head blocks of carriages and buggies, and the devices with which they are directly or indirectly connected.

COFFEE ROASTER.—F. W. Zochert, Watertown, Wis.—This invention relates to a new coffee roaster, or rather to a new case for containing the same, and consists in the use of a cap which covers the roasting cylinder, and which is provided with double folding doors through which the cylinder may be removed to be filled and emptied. When the doors are closed, the heat is all confined in the cap, and is brought above as well as below the cylinder to equalize the roasting process.

FLOORING CLAMP.—David Nevin, Boulder City, Colorado Territory.—This invention relates to improvements in clamps to be used for clamping the boards of flooring tightly together, previously to nailing, when laying the floors of buildings.

RAILROAD CHAIR.—D. B. Skelly, Lockport, N. Y.—This invention consists in a peculiar arrangement in recesses in the outer sides of cast metal chairs upon elastic beds of blocks to secure the rails and receive the wheels and support them while passing the joints at the ends of the rails.

SAFETY WATCH POCKET.—William O. Sumner, Brooklyn, E. D., N. Y.—The nature of this invention relates to improvements in pocket watch safes, which are designed for the protection of watches, against the efforts of pickpockets to abstract them from the pocket. It consists in the manner of arranging the parts of a pocket safe, designed for being secured to the interior of the pocket, whereby they may be readily opened to receive or deliver the watch, and be secured together while holding the same.

SUBSOIL PLOW.—J. W. Murfee, Havana, Ala.—This invention consists in an arrangement of a horizontal wedge-shaped share, for plowing and pulverizing the earth. This wedge is driven horizontally through the ground by being attached to an inclined and wedge-edged cutting coulter, which coulter is attached to the beam of the plow. The coulter is set as acutely with the horizon as practicable, so as to approach the line of the axis of the plow or hoe as near as may be, and the power is applied thereby as nearly in the direction of the axis of the wedge as possible. The standard of the frame is a continuation of the line of the coulter shank, and the angle which the handles make with the horizon, or base of the plow point, should be a mean of the angles which the top of the point and front edge of the coulter shank make with the horizon, so that any power employed in the direction of the handles by the plowman will have the greatest effect on the point and shank.

FENCE.—Isaac J. Morrow, Everton, Ind.—The object of this invention is to provide a fence for farm, and other purposes, which can be easily and cheaply made, with portable panels and of a durable character.

STEAM ENGINE.—W. H. Hull, Warren, Ohio.—This invention relates to a new and useful improvement in steam chests and valves for steam engines.

EXTENSION HAME.—F. M. Schaeffer, Blooming Grove, Kansas.—This invention relates to a new and useful improvement in hames for horses' harness, and consists in so constructing them that they may be extended and thereby made to fit different-sized horses, and also so as to change the place of draft or strain.

CONVERTIBLE LADDER.—Henry B. Malbone, Geneva, N. Y.—This invention relates to a new and useful improvement in ladders, whereby they are made convertible to various purposes.

MILK CAN STOPPER.—John M. Burghardt, Great Barrington, Mass.—This invention relates to a new and useful improvement in stoppers to milk cans, whereby all motion in the milk is prevented.

GAS BURNER.—Isaac R. Fisher, Reading, Pa.—This invention relates to a new and useful improvement in gas burners, having special reference to horizontal burners, and consists in a device for protecting the flame of the lighted gas from lateral currents of air.

PRINTERS' GALLEY REST.—John M. Murphy, Olympia, Washington Ter.—This invention relates to a new and useful improvement in the method of holding or supporting the proof-correcting galley in printing offices.

WATER FILTER.—J. D. Parrot, Morristown, N. J.—This invention relates to a useful improvement in apparatus for filtering water.

HARROW.—John Jay and Joel Coppock, Jonesboro', Ind.—This invention relates to a new and useful improvement in harrows, whereby they are made much more useful than harrows of ordinary construction, and it consists in the means applied for raising the harrow teeth from the ground, either in whole or in part.

TILTING BARRELS.—John C. Curran, Philadelphia, Pa.—This invention relates to an improvement in the mode of adjusting barrels.

SEWING MACHINE ATTACHMENT.—J. W. Gillam, Newton, N. J.—This invention relates to a new and useful improvement, whereby the sewing machine is rendered more useful and efficient than it has hitherto been.

MACHINE FOR TWISTING CORD.—George T. Wright, New Preston, Conn.—This invention relates to new and important improvements in machines for twisting or "laying" cord and twine, having more particular reference to hard twisted cord, twine, or rope.

CHURNING BUTTER.—William Kegg, Lassellsville, N. Y.—This invention relates to new and useful improvements in churning butter, and consists in the peculiar form and construction of the dasher, in the method of aerating or supplying atmospheric air to the cream and regulating the temperature thereof.

BLASTING WEDGE.—G. Werlich, Watertown, Wis.—The object of this invention is to provide a blasting wedge or packing device, for confining the blasting charges in the drill holes, so shaped that when the explosion takes place, the force will be delivered wholly, or nearly so, upon the walls of the holes, in the manner best calculated to separate the rocks.

ELECTRO-MAGNETIC LOCK.—John C. Smith, Brooklyn, N. Y.—This invention relates to a new and important improvement in locks, designed more especially for outside doors of dwellings, public buildings, banks, vaults, and safes, but applicable to locks for all ordinary purposes, and consists in controlling the movement of the bolt of the lock by means of electro-magnetism.

PLOW.—J. W. Gilliam, Elkton, Ky.—The object of this invention is to provide an adjustable double plow, capable of turning two furrows either right or left simultaneously, or in opposite directions or towards each other, whereby the said plow may be adapted for various kinds of work.

COMPOUND FOR CUTTING AND POLISHING.—James P. Hall, New York city.—The present invention relates to a new and useful compound, combining both cutting and polishing qualities. The object of this compound is to offer a good and cheap article, which will act as a substitute for emery, rotten stone, and such other articles which cut and do not polish, or which polish without cutting.

MODE OF PRESERVING AND CONSERVING FRUIT, PRODUCE, ETC.—R. d'Heureuse, New York city.—This invention relates to improvements in means for preserving fruits, vegetable products, and other organic substances containing nitrogen, from putrefaction, mold, and decay, when stored in confined spaces either in bulk or in packages.

WRINGING MACHINE.—Edward L. Perry and Charles Manheim, New York city.—This invention relates to improvements in clothes-wringing machines, whereby it is designed to provide a more simple and effective machine than any now in use. It consists of an improved arrangement of the adjusting supports of the adjustable roller. Also, of improvements in the arrangement of the supporting brackets for connection with the roller supports.

BEEHIVE.—Richmond Pearson, Appleton, Wis.—This invention consists in forming a skeleton frame of wire, shaped like an egg, and suspended from the under surface of a honey board, and covered with paper in a peculiar way, the honey board being provided with transverse strips for the attachment of the bee comb, and with passages through it for the bees to have access to boxes above for the honey.

FARM LOCOMOTIVE.—Daniel F. Leach, Forsyth, Ill.—The object of this invention is to improve the construction and arrangement of the device which supports and guides the forward wheels, and to improve the construction of the traction wheels of locomotives employed for farm work.

CIRCULATING BOILER.—John Wells, Baltimore, Md.—The object of this invention is to construct the boiler in such a manner that it will effectually separate the dry steam from the wet, condensing the latter and returning the water of condensation to the water space, while, at the same time, the water is caused to circulate more freely, than heretofore, among the heating pipes, whereby the heat is thoroughly utilized.

SULKY PLOW.—Benjamin Slusser, Sidney, Ohio.—This invention relates to that class of plows denominated sulky plows, (plows supported upon wheels and provided with a seat for the driver); and it consists in a new and improved mode of attaching the plow to the carriage, an improved mode of adjusting the draft of the plow, and an improvement in the means for raising and lowering the plow for any purpose.

TOBACCO AND GRAIN CURER AND ARTIFICIAL SEASON PRODUCER.—Henry R. Robbins, Baltimore, Md.—The object of this invention is to construct an apparatus by which tobacco or grain can be artificially cured in an exceedingly short time, not only without impairing its good qualities, but in such a manner as to produce, with certainty and uniformity, an article of cured tobacco superior in appearance, fragrance, and taste, to that cured from the same material by any other known process.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING AUG. 3, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from .... $1 *upward, but usually at the price above-named.*

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them .... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York.

93,156.—FLYER FOR SPINNING.—S. A. B. Abbott, Boston, Mass. and E. F. Fields, Lewiston, Me.

93,157.—ELECTRO DEPOSITION OF NICKEL.—Isaac Adams, Jr., Boston, Mass.

93,158.—HYDROSTATIC SCALE FOR TUNNAGE OF VESSELS.—Ira R. Amsden, Buffalo, N. Y.

93,159.—VELOCIPEDE.—J. A. Aspinwall and C. M. Perry, New Utrecht, N. Y.

93,160.—FANNING-MILL ATTACHMENT.—Pardon Austin, Medina, Wis.

93,161.—FLOOD FENCE.—W. F. Auxier, Mason City, Ill.

93,162.—PLATE FOR MAKING BLANKS FOR MOLDBOARDS AND SHARES FOR PLOWS.—Henry Barnes, Franklin township, Iowa.

93,163.—HEAD BLOCK FOR CARRIAGES.—J. C. Bates, Warrensburg, Mo.

93,164.—WASHING MACHINE.—Barzillai B. Beckwith, Rockville, Conn.

93,165.—GRAIN BINDER.—Jacob Behel, Rockford, Ill.

93,166.—RAILWAY CAR BRAKE.—Norborne Berkeley, Aldie, Va.

93,167.—SCREW PRESS.—H. C. Bowen, New York city.

93,168.—ALARM BELL.—L. F. Bruce, Bridgeport, Conn.

93,169.—WHIFFLETREE.—Henry Buck, Chardon, Ohio.

93,170.—APPARATUS FOR MAKING PIG BLOOMS IN THE MANUFACTURE OF IRON.—J. A. Burden, Troy, N. Y.

93,171.—MILK-CAN STOPPER.—J. M. Burghardt, Great Barrington, Mass.

93,172.—COMBINED CORN PLANTER AND CULTIVATOR.—John Campbell, London, Ohio.

93,173.—WASHING MACHINE.—Heman Carter, Greene, N. Y.

93,174.—CHURN.—W. C. Chamberlain, Dubuque, Iowa.

93,175.—TURBINE WATER WHEEL.—John Chase, Paterson, N. J.

93,176.—STEAM GENERATOR.—Robert A. Chesebrough, New York city.

93,177.—SAFETY SWITCH FOR RAILWAYS.—Anthony Conarro and Zak. Gemmill, Warren, Pa.

93,178.—METHOD OF PRODUCING CALCIUM LIGHT.—Chas. L. Coombs, Washington, D. C., and J. A. Bassett, Salem, Mass., assignors to J. J. Coombs, Washington, D. C.

93,179.—PIPE TONGS.—R. Crain, Shaffer Farm, Dennison Post office, Pa.

93,180.—DEVICE FOR TILTING BARRELS.—J. C. Curran, Philadelphia, Pa.

93,181.—MACHINE FOR CURVING AND SHAPING SHEET METAL.—Daniel Cushing, Lowell, Mass., assignor to himself, G. W. Smith, and Franklin Smith.

93,182.—MODE OF PRESERVING LIQUID AND OTHER SUBSTANCES.—R. D'Heureuse, New York city.

93,183.—PRESERVING MEATS, POULTRY, FISH, ETC.—J. E. Dotch, Washington, D. C. Antedated Feb. 3, 1869.

93,184.—CARRIAGE AND SLEIGH COMBINED.—J. S. Drake (assignor tor himself and W. H. Burton), New York city.

93,185.—ANIMAL TRAP.—Melvin W. Drake, Owasso, Mich.

93,186.—BEDSTEAD FASTENING.—William H. Elliott, New York city.

93,187.—HARROW AND CULTIVATOR.—W. A. Estes, China, assignor to R. M. Mansur, Augusta, Me.

93,188.—CLOTHES WRINGER.—Peter Falardo, Danbury, Conn.

93,189.—GAS BURNER.—I. R. Fisher, Reading, Pa.

93,190.—SLED BRAKE.—W. F. Foley, Albany, N. Y.

93,191.—WHITE LEAD AND PACKING CANS.—Charles J. Fortin and D. H. Drake, Cincinnati, Ohio, assignors to Eagle White Lead Co.

93,192.—STUMP EXTRACTOR.—D. C. Frazeur and Peter Ginter, Siddonsburg, Pa.

93,193.—BRAID GUIDE FOR SEWING MACHINE.—J. W. Gillam, Newton, N. J.

93,194.—TINNERS' BENDING MACHINE.—Isaac Grim (assignor to himself and William Gregory), Polo, Ill.

93,195.—LIFE-PRESERVING MATTRESS.—David E. Hall, Detroit, Mich.

93,196.—BLACKING-BOX HOLDER.—Heman B. Hammon, Bristolville, Ohio.

93,197.—STEAM BLOWER.—J. T. Hancock, Jamaica Plain, Mass. Antedated July 22, 1869.

93,198.—FENCE.—Thomas Harrison, La Fayette, Wis.

93,199.—STEAM ENGINE.—Andrew Hartupee, Pittsburgh, Pa.

93,200.—STIFFENING CORD FOR SKIRTS.—Henry Hayward, New York city.

93,201.—TRACE SUPPORT AND BUCKLE.—J. H. Hill and H. C Hill, Clinton, Ill.

93,202.—BINDING GUIDE FOR SEWING MACHINES.—W. S. Hotchkiss, Bridgeport, Conn., assignor to Howe Machine Company.

93,203.—COMBINED PLOW AND CULTIVATOR.—Samuel Huber, Danville, Pa.

93,204.—STEAM VALVE DEVICE.—W. H. Hull, Warren, Ohio.

93,205.—WAGON.—Reuben Hurd, Morrison, Ill.

93,206.—HOG CHOLERA REMEDY.—A. M. Johnston and H. H. Avrit, Clarksville, Tenn.

93,207.—CHURN DASHER.—William Kegg, Lassellsville, N.Y

93,208.—APPARATUS FOR EMPTYING THE COOLING TUBES OF BONEBLACK FURNACES.—Eugen Langen, Cologne, Prussia.

93,209.—MEDICAL COMPOUND OR "BITTERS."—Joseph Llado, New Orleans, La.

93,210.—IMPLEMENT FOR TAMING AND MARKING HOGS.—Samuel Long, Ogle county, Ill.

93,211.—YOKE FOR STANDARDS FOR STOVE SHELF.—Luther Longley, Leominster, Mass.

93,212.—MILLING TOOL.—Albert J. Lutz and H. Reiss, New York city.

93,213.—MACHINE FOR MAKING CHAIN.—Wesley Malick, Erie, Pa.

93,214.—MECHANISM FOR DRIVING SEWING MACHINES.—G W. Manson (assignor to himself, John A. Knoeller, and Michael Rowe), Jersey City, N. J.

93,215.—DIE HOLDER FOR SCREW PRESSES.—J. McWilliams, Providence, R. I.

93,216.—PRINTERS' GALLEY REST.—J. M. Murphy, Olympia, Washington Territory.

93,217.—FLOORING CLAMP.—David Nevin, Boulder City, Colorado Territory.

93,218.—TRANSPORTATION CASE.—Edwin Norton, Toledo Ohio, assignor to himself, O. W. Norton, and A. H. Fancher.

93,219.—CHURN.—T. S. Nutter, Harrisburgh, Ohio.

93,220.—FISHING-LINE SINKER.—R. T. Osgood, Orland, Me.

93,221.—STEAM VALVE DEVICES.—Joseph E. Outridge, Newport, England. Patented in England, Aug. 1, 1868.

93,222.—FAUCET.—S. W. Palmer and J. F. Palmer, Auburn

N. Y., assignors to "The Metropolitan Washing Machine Co.," Middlefield, Conn.

93,223.—Wringing Machine.—E. L. Perry and C. Manheim, New York city.

93,224.—Lamp.—John Phelps (assignor to himself and C. W. Merchant), Owego, N. Y.

93,225.—Dovetailing Machine.—John Phillips, Jr., Chicago, Ill.

93,226.—Lantern.—Wm. Porter, Sr., and Wm. Porter, Jr., New York city.

93,227.—Buildings.—Joseph Potts, Harrisburgh, Pa.

93,228.—Lamp.—F. C. Richer, Gilmer, Texas.

93,229.—Lock Nut.—Almon Roff, Southport, Conn.

93,230.—Lock Nut.—Henry Rosamyer, Rochester, Pa.

93,231.—Grain Measure.—J. A. Rosbeck, Herman, N. Y.

93,232.—Steam Generator.—Silas C. Salisbury, New York city.

93,233.—Extension Hame.—F. M. Schaeffer, Blooming Grove, Kansas.

93,234.—Feeding Door for Animal Pens.—B. C. Scott, Paxton, Ill.

93,235.—Straw Cutter.—L. Sears, Perrysville, Ohio.

93,236.—Hay Elevator.—S. B. Secrist and Isaac Seyster, Ogle county, Ill.

93,237.—Corn Planter.—Peter Shellenberger, Millerstown, Pa.

93,238.—Rotary Spade.—B. E. Siversten, Pittsburgh, Pa.

93,239.—Railway Chair.—D. B. Skelly, Lockport, N. Y.

93,240.—Steam Generator.—H. B. Smith and J. V. Stevens, Pomeroy, Ohio.

93,241.—Clamp for Planking Ships.—P. Staples, Stockton, Me.

93,242.—Washing Machine.—J. M. Starr, Jr. (assignor to himself and G. D. Trombly), Fond du Lac, Wis.

93,243.—Balancing the Keys of Pianos, etc.—Frank J. Steinhauser, Lancaster, Pa.

93,244.—Water Heating Device.—E. R. Stilwell, Dayton, Ohio.

93,245.—Composition for Roofing.—L. S. Stimson (assignor to himself and N. F. Libby), Lowell, Mass.

93,246.—Safety Watch-Pocket.—W. O. Sumner, Brooklyn, E. D., N. Y.

93,247.—Grapple.—J. F. Thomas, Ilion, N. Y.

93,248.—Base Burner.—W. B. Treadwell, Albany, N. Y.

93,249.—Toy Ball.—Henry Trebe, Indianapolis, Ind., assignor to himself and Frederick Klare.

93,250.—Hedge Planter.—J. J. Tucker, Albia, Iowa.

93,251.—Hat.—P. W. Vail, Newark, N. J.

93,252.—Sheave Pulley.—J. B. Vannan and N. P. Cramer, Carbondale, Pa.

93,253.—Machine for Cutting and Slicing Vegetables.—C. H. Van Orstrand, New York city.

93,254.—Machine for Spooling Thread.—Asel M. Wade, Lawrence, Mass.

93,255.—Washing Machine.—C. F. Walker, Benford's Store Post Office, Pa.

93,256.—Straightening Machine.—J. C. Warr, Wareham, Mass.

93,257.—Casting Hollow Metal Rollers with Shafts.—Zadock Washburn, Hopedale, Mass.

93,258.—Grease Trap. — Edward Whiteley, Cambridge, Mass.

93,259.—Carriage Hub.—J. M. Whiting, Providence, R. I.

93,260.—Harvester Rake.—Julius Wilcke, Chicago, Ill. Antedated July 23, 1869.

93,261.—Fifth Wheel for Carriages.—Darius Wilcox, Birmingham, assignor to himself and Warren Wilcox, Ansonia, Conn.

93,262.—Horse Collar and Hames.—Ezra Wilder, South Hingham, Mass.

93,263.—Washing Machine.—Robert Wilson, Burdett, N.Y.

93,264.—Churn.—Robert Wilson, Rees Corners, Md.

93,265.—Cord-Making Machine.—G. T. Wright (assignor to himself and Walter Burnham), New Preston, Conn.

93,266.—Embroidering Attachment for Sewing Machine.—H. C. Young, Bridgeport, Conn., assignor to Howe Machine Company.

93,267.—Apparatus for Carbureting Air.—J. F. Barker, Springfield, Mass., and C. N. Gilbert, New York city.

93,268.—Apparatus for Carbureting Air.—J. F. Barker, Springfield, Mass., and C. N. Gilbert, New York city.

93,269.—Hop-Pole Sharpener.—S. V. Barns, Triangle, N.Y.

93,270.—Receivers or Carboys for the Manufacture of Muriatic and other Acids.—Alfred Baumgarten (assignor to himself and C. W. Walter), New York city. Antedated Aug. 2, 1869.

93,271.—Corn Popper.—J. H. Bigelow, Worcester, Mass.

93,272.—Mode of Constructing Billiard and other Game Tables.—W. E. Bond, Cleveland, Ohio.

93,273.—Piston Spring.—W. R. Brown, Bath, N. Y.

93,274.—Sash Fastener.—Daniel Bull, Amboy, Ill.

93,275.—Self-Recording Pressure Gage.—G. P. Clarke, M. B. Edson, and J. B. Edson (assignors to the Recording Steam Gage Co.), New York city.

93,276.—Steam Generator.—L. H. Colborne, Albion, N. Y.

93,277.—Garden Plow.—G. W. Cole, Farmington, Ill.

93,278.—Railway Switch.—J. B. Cox, James O'Conner, and Michael Cahalan, Columbus, Ga.

93,279.—Photographic Head Rest.—Gustav Cramer and Julius Gross, St. Louis, Mo.

93,280.—Composition Pavement.—H. L. Cranford, Brooklyn, N. Y.

93,281.—Earth Scraper.—J. H. Dalbey, Springfield, Ohio.

93,282.—Street-Car Starter.—A. B. Davis, Catahoula parish, La.

93,283.—Car Starter.—A. B. Davis, Catahoula parish, La.

93,284.—Plow.—A. B. Davis, Catahoula parish, La.

93,285.—Churn.—A. B. Dean, Louisville, Ky.

93,286.—Apparatus for Purifying Whiskey and other Alcoholic Spirits.—L. A. De Lime, St. Louis, Mo.

93,287.—Portable Clamp for School Books.—T. H. Denison, Baltimore, Md.

93,288.—Gas Carbureter.—G. B. Dyer, New York city.

93,289.—Carriage Jack.—D. Elliot and E. Seely, New York city, assignors to themselves, and John A. Holmes.

93,290.—Seed-Planter, Fertilizer, and Plow Combined. H. C. Eves, Orangeville, Pa.

93,291.—Machine for Mortising Blind Stiles.—C. A. Fenn, E. P. Fenn, and Isaac Cook, St. Louis, Mo., assignors to C. A. Fenn.

93,292.—Caster.—F. G. Ford, New York city.

93,293.—Decoy Duck.—Jacob Foster, Philadelphia, Pa.

93,294.—Exhaust Nozzle for Steam-Engine.—C. H. Frisbie, Chicago, Ill.

93,295.—Capstan.—John Gardner, New York city.

93,296.—Bottle-Stopper.—W. H. Gibbs, Cincinnati, Ohio.

93,297.—Flour Cooler.—W. W. Goff, Avoca, N. Y.

93,298.—Railway-Switch.—Chas. Greenman, Scott township, Pa.

93,299.—Drawer-Knob Label.—Fred. Hale and Wm. Manley, Philadelphia, Pa.

93,300.—Eye Sirup.—W. C. Hall and Colatres Moore, California, Mo.

93,301.—Slate and Metal Roofing.—S. R. Hathorn, Worcester, Mass.

93,302.—Water Cooler and Refrigerator.—Jos. Hindemyer and Chas. C. Savery, Philadelphia, Pa.

93,303.—Anti-Friction Mast-Hoop.—B. H. Hussey, Portsmouth, N. H.

93,304.—Composition for Roofing and Paint.—C. B. Hutchins, Ann Arbor, Mich.

93,305.—Bedstead.—Hanford Ingraham, Naples, N. Y.

93,306.—Harrow.—John Jay and Joel Coppock, Jonesborborough, Ind.

93,307.—Potato Digger and Cultivator Combined.—M. Johnson, Three Rivers, Mich.

93,308.—Washing Machine.—Josee Johnson (assignor to himself and Wm. H. Johnson), New York city.

93,309.—Washing Machine.—Josee Johnson (assignor to himself, and Wm. H. Johnson), New York city.

93,310.—Gas Burner.—Wesley L. Jukes (assignor to himself Frederick McLewee, P. H. Putnam, and Johnson Murray), New York city.

93,311.—Corn Harvester and Shocker.—Wm. H. Karicofe Harrisonburg, Va.

93,312.—Slaw Cutter.—Michael Keefer, Washington county, Md.

93,313.—Hay Spreader.—W. G. Kenyon, Wakefield, R. I.

93,314.—Knitted Fabric.—Martin Landenberger, Jr., Philadelphia, Pa. assignor to Martin Landenberger & Co.

93,315.—Wagon Brake.—Jay Lathrop, Lapeer, N. Y.

93,316.—Farm Locomotive.—D. F. Leach, Forsyth, Ill.

93,317.—Coffee-Pot.—J. E. Lewis, Kittery, Me.

93,318.—Gang Plow.—J. J. Lindly, Lebanon, Ill.

93,319.—Harvester Cutter.—H. A. Link, Columbus, Ohio.

93,320.—Flanging Machine.—Seth Lowen, Temperanceville, Pa., assignor to himself, and O. D. Lewis.

93,321.—Portable Summer Furnace.—J. H. Lyon, W. Ager, Daniel Breed, and W. H. Seaman, Washington, D. C.

93,322.—Street Car.—J. F. Madison and Henry McLaughlin, St. Louis, Mo.

93,323.—Convertible Ladder.—Henry B. Malbone, Geneva, N. Y., assignor to himself, D. E. Moore, and W. J. Morse.

93,324.—Door Latch.—Emmons Manley, Marion, N. Y.

93,325.—Sun-Shade for Horses.—J. L. McIntosh, Brooklyn, N. Y.

93,326.—Wire Fence.—A. H. Mendell (assignor to himself and Wm. H. H. Taylor), Adams, N. Y.

93,327.—Seed Drill.—Solomon Mickley, Dover township, and Samuel Leathery, Warrington township, Pa.

93,328.—Corn Sheller.—Wm. Miller, Bloomington, Ind.

93,329.—Fly Trap.—A. C. Mills, Oaktown, Ind.

93,330.—Breech-Loading Firearm.—Wm. Morgenstern, New York city, assignor to himself and Herman Funke.

93,331.—Printers' Rule.—C. N. Morris, Cincinnati, Ohio. Antedated July 20, 1869.

93,332.—Fence.—I. J. Morrow, Everton, Ind.

93,333.—Roofing Composition.—F. Neidhardt, East Saginaw, Mich.

93,334.—Lunch Box.—Addison Norman, Rochester, N. Y.

93,335.—Apparatus for Opening Boxes.—C. M. O'Hara, New York city. Antedated July 30, 1869.

93,336.—Coal Scoop.—H. A. Palmer, Rochester, N. Y.

93,337.—Propelling Apparatus.—Joseph Paradis, Brooklyn, N. Y.

93,338.—Fruit Picker.—G. H. Parham, Harrodsburg, Ind.

93,339.—Filter.—J. D. Parrot (assignor to himself and Henry McCauley), Morristown, N. J. Antedated July 30, 1869.

93,340.—Beehive.—Richmond Pearson, Appleton, Wis.

93,341.—Switch Holder.—A. C. Penny and Minor Spicer, Unadilla Forks, N. Y.

93,342.—Electrical Railroad Signal.—George M. Phelps, Brooklyn, N. Y., and Robert Stewart, Bordentown, N. J.

93,343.—Carriage Jack.—C. J. Philleo, Kenyonville, N. Y.

93,344.—Safety Attachment for Watch Chain.—Morris Pollak, New York city.

93,345.—Hand Stamp.—J. A. A. Post, New York city.

93,346.—Washing Machine.—John Ringen, St. Louis, Mo.

93,347.—Tobacco and Grain Curer.—H. R. Robbins (assignor to himself and J. J. Moran), Baltimore, Md.

93,348.—Railway Car Axle Journal and Box.—Oby Robirds, St. Louis, Mo.

93 349.—Organ.—Wm. Robjohn, New York city.

93,350.—Adding Machine.—Thos. Rossiter (assignor of one half interest to Rufus H. Sandford and Frank Prescott), New Haven, Conn.

93,351.—Hot-Air Furnace.—S. C. Salisbury, New York city.

93,352.—Grain Bin.—W. S. Sampson, New York city.

93,353.—Eyeleting Machine.—J. F. Sargent, Melrose, assignor to Elmer Townsend, Boston, Mass.

93,354.—Kettle-Spout Attachment.—Moritz Saulson, Troy, N. Y.

93,355.—Wire Ear for Metal Buckets.—Joseph M. Shank, Dayton Ohio.

93,356.—Apparatus for Chalking Billiard Cues.—D. P. Shaw, Elkhart, Ind.

93,357.—Carriage Wheel.—Samuel S. Sherman and Silas D. Piper, West Eau Claire, Wis.

93,358.—Sulky Plow.—Benjamin Slusser, Sidney, Ohio.

93,359.—Door Spring.—Patrick Smith, Newport, Ky.

93,360.—Vapor Burner.—Willard H. Smith, New York city.

93,361.—Street Railway.—Wm. M. Smith, Augusta, Ga.

93,362.—Plow Gage.—Hugh B. Spedden (assignor to himself Wm. H. Baltzel, and G. A. Moore) Baltimore, Md.

93,363.—Soda Fountain.—B. E. Sperry, Aurora, Ill.

93,364.—Driving Belt and Band of Rubber and Metal.—Louis Sterne, London, England. Patented in England, June 2, 1868.

93,365.—Seam-puttying Machine.—Alfred Stevens, Georgetown, assignor to Josiah Starling, Manheigan, Me.

93,366.—Hot Blast Pressure Gage.—John Storer, New York city.

93,367.—Railway Rail Chair.—John H. Teahl, Eberly's Mill, Pa.

93,368.—Machine for Distributing Fertilizers.—John H. Thomas and Phineas P. Mast, Springfield, Ohio.

93,369.—Grain Drill.—John H. Thomas, Phineas P. Mast, and Charles O. Gardiner, Springfield, Ohio, assignors to John H. Thomas and Phineas P. Mast.

93,370.—Grain Drill.—John H. Thomas, Phineas P. Mast, and Charles O. Gardiner, Springfield, Ohio, assignors to John H. Thomas and Phineas P. Mast.

93,371.—Seal Lock.—James E. Thompson and James Tillinghast, Buffalo, N. Y.

93,372.—Beehive.—Ruggles S. Torrey, Bangor, Me.

93,373.—Water Elevator.—Pieter van Dyk, The Hague, Holland.

93,374.—Cultivator.—Henry Wadsworth, Duxbury, Mass.

93,375.—Railway Car Coupling.— William V. Wallace, New York city.

93,376.—Fifth-wheel for Carriages.—Daniel Weaver, Dayton, Ohio.

93,377.—Steam Generator.—John Wells, Baltimore, Md.

93,378.—Railway Car Coupling.—Richard Wells, Bloomington, Ill.

93,379.—Blasting Charge.—Gustavus Werlich, Watertown, Wis.

93,380.—Portable Steam Apparatus for Greenhouses. Edward Whiteley, Cambridge, Mass.

93,381.—Railway Car Coupling.—Orin M. Whitman, North Haverhill, N. H.

93,382.—Washing Machine.—Aretus A. Wilder and John Wilder, Detroit, Mich.

93,383.—Steam Engine.—James D. Willoughby, Shippensburg, Pa.

93,384.—Propelling Apparatus.—Charles Wolff, Washington, D. C.

93,385.—Low Grade Steel for Axles, Tires, etc.—Henry Brook Woodcock, Low Moor, England.

93,386.—Railroad Car Wheel.— George W. N. Yost, Corry, Pa.

93,387.—Pessary.—David D. Young, Dayton, Ohio.

93,388.—Ash Hopper.—Peter Zimmerman, Sylvan, Pa.

93,389.—Coffee Roaster.— F. W. Zochert, Watertown, Wis.

93,390.—Ladies Chemise.—R. L. Jones, Sacramento City, Cal.

93,391.—Revenue Stamp for Barrels.—Edward A. Locke, Boston, Mass.

93,392.—Tide Water Wheel.—P. W. Yarrell, Littleton, N. C.

REISSUES.

82,475.—Steam Pumping Engine.—Dated September 29, 1868; re-issue 3,573.—Robert Allison, Port Carbon, Pa.

22,379.—Boring Machine.—Dated December 21, 1858; reissue 3,574.—Emory L. Bates (assignee of George F. Rice) Fiskedale, Mass.

39,616.—Soldering Sheet-metal Cans.—Dated August 18, 1863; reissue 3,575.—Devoe Manufacturing Company, Long Island City, N. Y., assignees, by mesne assignments, of Herman Miller.

41,887.—Composition of Matter.—Dated March 8, 1864; reissue 1,772, dated September 24, 1864; reissue 1,886, dated February 28, 1865; reissue 3,576.—Lewis Francis and Cyrus H. Loutrel, New York city, assignees of Lewis Francis.

30,400.—Socket Coupling.—Dated October 16, 1860; reissue 3,577.—Elliott P. Gleason, Providence, R. I.

64,571.—Reversible Knob Latch.—Dated May 7, 1867; reissue 3,578.—M. Greenwood and Company, Cincinnati, Ohio, assignees of Henry M. Ritter.

54,554.—Manufacture of Elastic Packing.—Dated May 8, 1866; reissue 3,579.—Nathaniel Jenkins, Boston, Mass.

17,798.—Harvester.—Dated July 14, 1857; reissue 3,580.—Division A.—John P. Manny, Rockford, Ill.

17,798.—Harvester.—Dated July 14, 1857; reissue 3,581.—Division B.—John P. Manny, Rockford, Ill.

66,038.—Gymnastic Swing.—Dated June 25, 1867; reissue 3,582.—Alonzo P. Payson, San Francisco, Cal.

45,198.—Manufacture of Sheep Shears.—Dated November 22, 1864; reissue 3,583.—Henry Seymour, New York city, assignee of Herman Wendt and Henry Seymour.

76,365.—Railway Frog.—Dated April 7, 1868; reissue 3,584.—George Westinghouse, Jr., Pittsburgh, Pa.

DESIGNS.

3,593.—Trade Mark.—Henry Ashbury (assignor to Enterprise Manufacturing Company), Philadelphia, Pa.

3,594.—Arm End of a Settee.—Jacob Beesley, Philadelphia, Pa., assignor to Thomas J. Close.

3,595.—Trade Mark.—James L. Brickey, Hannibal, Mo.

3,596.—Trunk Clasp Caster.—J. H. Burnett, Williamstown, N. Y.

3,597.—Furniture Leg.—G. L. Chapman, Maumee, Ohio.

3,598.—Cook Range.—John I. Hess, Philadelphia, Pa.

3,599.—Trade Mark.—Henry Roundy (assignor to California Marine Metallic Paint Company), San Francisco, Cal.

3,600.—Cook Range.—John Clifford Shoch, Philadelphia, Pa.

3,601.—Boot Leg Top.—J. H. Walker, Worcester, Mass.

3,602.—Show Case.—Gerhard Winter, New York city.

3,603.—Grinding Machine.—Thomas H. Worrall (assignor to the American Twist Drill Company, East Blackstone, Mass.

EXTENSIONS.

Bridle Rein.—Kingston Goddard, Richmond county, N. Y.—Letters Patent No. 13,306, dated July 24, 1855.

Candle-Mold Apparatus.—Wellis Humiston, Troy, N. Y.—Letters Patent No. 13,334, dated July 24, 1855; reissue No. 1,131, dated January 22, 1861; reissue No. 2,108, dated November 14, 1865.

How to Get Patents Extended.

Patents granted in 1855 can be extended, for seven years, under the genera law, but it is requisite that the petition for extension should be filed with the Commissioner of Patents, at least ninety days before the date on which the patent expires. Many patents are now allowed to expire which could be made profitable under an extended term. Applications for extensions can only be made by the patentee, or, in the event of his death, by his legal representative. Parties interested in patents about to expire, can obtain all necessary instructions how to proceed, free of charge, by writing to

MUNN & CO., 37 Park Row, New York.

City Subscribers.—The Scientific American will be delivered in every part of the city at $3·50 a year. Single copies for sale at all the News Stands in this city, Brooklyn, Jersey City and Williamsburg, and by most of the News Dealers in the United States.

Subscribers—who wish to have their volumes bound, can send them to this office. The charge for binding is $1.50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Receipts.—When money is paid at the office for subscriptions, a receipt for it will be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgment of their funds.

Advertisements.

The value of the Scientific American as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2·50 per line to advertise in one of thirty thousand.

RATES OF ADVERTISING.

Back Page..........$1·00 a line.
Inside Page..........75 cents a line.
Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

100 Confidential Agents wanted to dispose of a good paying article. An energetic and trustworthy man can make $6,000 in two months. Particulars free. Call on or address Dailey & Co., 208 Broadway, N.Y.

IMPORTANT TO MANUFACTURERS.—Steere's Patent Self-Lubricating Spindle Bolster. Over 500,000 now in use. They pay for themselves in a short time. For circulars, giving full particulars, address ERASTUS N. STEERE, No. 10 Market Square, Providence, R. I.

PATENT RIGHTS SOLD ON COMMISSION, and Valuable Inventions introduced by the most experienced Patent Salesmen in the Union. Can refer to over one hundred inventors for whom we have acted. E. E. ROBERTS & CO., Consulting Engineers, 15 Wall st., New York.

HINKLEY KNITTING MACHINE

FOR Family use—simple, cheap, reliable. Knits everything. AGENTS WANTED. Circular and sample stocking FREE. Address HINKLEY KNITTING MACHINE CO., Bath, Me.

ECONOMY, SPEED, SAFETY.—Sanders' Patent Sawing and Planing Mitering Machine, with new method of fixing cutters, can be applied to any tenoning or grooving machine, and all hand-planes. See Scientific American of Oct. 7, 1868. Rights for Sale. Illustrated Circular free. JOHN J. SANDERS, Jr., 257 Hudson st., New York.

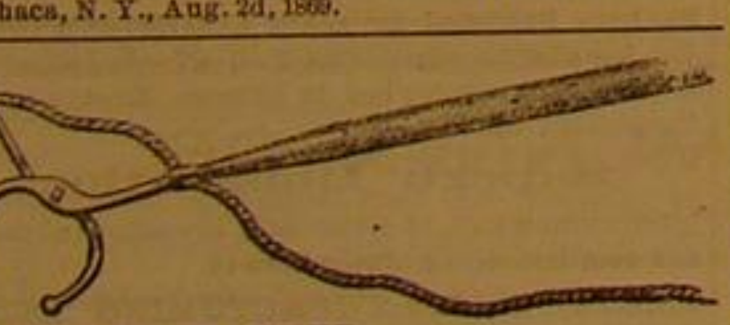
$2,000 A YEAR AND EXPENSES

To agents to sell the celebrated WILSON SEWING MACHINES. The best machine in the world. Stitch alike on both sides. First machine on trial. For further particulars address THE WILSON SEWING MACHINE CO., Cleveland, Ohio, Boston, Mass., or St. Louis, Mo.

THE MOST DURABLE AND RELIABLE Grate Bar now in use. Send for circular. HUTCHINSON, LAURENCE & CO., 38 Courtland st., New York.

The Cornell University.

INSTRUCTION IN THE DEPARTMENTS of Agriculture and Veterinary Surgery, Chemistry and Natural Science, and Civil and Mechanical Engineering, together with the other general and special courses, will commence on Wednesday, Sept. 15. Candidates for admission are requested to present themselves on Monday and Tuesday, Sept. 13 and 14. The University Register, giving detailed information will be sent to any person applying. ANDREW D. WHITE, President. Ithaca, N. Y., Aug. 2d, 1869.



AGENTS WANTED—To sell H. V. VAN ETTEN'S Patent Device for Catching and Holding Domestic Animals. It takes a hog or sheep by the leg, and cattle in the nose. It is a sure thing, and no humbug. County and State Rights for sale by H. V. VAN ETTEN, Box 716, Auburn, N.Y. Samples $1.

WATSON'S MANUAL OF THE

HAND LATHE.

A Manual of the Hand Lathe: Comprising Concise Directions for working metals of all kinds, Ivory, Bone, and Precious Woods; Dyeing, Coloring, and French Polishing; Inlaying by Veneers, and various methods practiced to produce Elaborate work with Dispatch, and at Small Expense. By Egbert P. Watson, late of "The Scientific American," author of "The Modern Practice of American Machinists and Engineers." Illustrated by Seventy-eight Engravings. Price, by mail, free of postage........$1 50

CONTENTS.

Chapter I.—The Foot Lathe. II.—Tools. III.—Scrapers. IV.—Chasers, etc. V.—Chucking. VI.—Metal Spinning. VII.—Ornamental Cutting. VIII.—Centers. IX.—Fancy Turning. X.—Ornamental Woods. XI.—Wood Turning. XII.—Tools for Wood Turning. XIII.—Tool Tempering, etc. XIV.—Artistic Wood Turning. XV.—Stamp Inlaying. XVI.—Designs in Mosaic. XVII.—Finishing the Outside. XVIII.—Inlaying—continued. XIX.—Ornamental Designs for Inlaying. XX.—General Summary—Lacquers, Soldering, Varnishing, and Polishing, Brushes, Pearl, Miscellaneous Tools, Curving Veneers, Cutting Miscellaneous Materials.

☞ The above or any of my Books sent by mail, free of postage, at the publication prices. My new revised and enlarged Catalogue of Practical and Scientific Books, 72 pp. 8vo, now ready, complete to June 1, 1869, will be sent, free of postage, to any one who will favor me with his address.

HENRY CAREY BAIRD, Industrial Publisher, 406 Walnut st., Philadelphia, Pa.

A NEW INVENTION.—Adding, Subtracting, Multiplying, Dividing. Everybody should have this ingenious invention. Mailed for 25c. each; 90c. per set; discount to Agents. Address FRANK C. JOHNSON, Box 811, Saco, Me.

MAYS & BLISS,

MANUFACTURERS of PATENT SCREW and Lever Presses, Power Presses, Double-acting Presses, Cutting and Stamping Dies,

Machinery for Petroleum Cans.

Tinner's Tools made to Order. Plymouth st., near Catharine Ferry, Brooklyn, N. Y.

WROUGHT IRON

Beams and Girders.

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided. We are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address the Union Iron Mills, Pittsburgh, Pa. 21 tf

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK, P. O. Box 1,057, Boston, Mass.

N. B.—This detector is covered by two U. S. patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

PARKER'S POWER PRESSES.

THESE PRESSES are what are universally known as the "Fowler Press," improved, and are *without a rival* as regards strength and durability, combined with delicacy of adjustment of the Punch. We have just received

A GOLD MEDAL

From the New Hampshire Art and Mechanics' Association, it being the First Premium awarded on Presses and was given us over STILES' POWER PRESS.

☞ Notice is hereby given that all Presses having an Eccentric Disk on the Crank Shaft, are direct infringements of our Patent, April 13, 1858, reissued Feb. 9th, 1869, and all parties are hereby cautioned against buying or using said Presses without our permission. PARKER BROTHERS, West Meriden, Conn. 11 26*

THE

Whitlock Exposition,

Nos. 35 and 37 Park Place, NEW YORK. This consists of a *Perpetual Fair* Of New Inventions and Manufactured Articles of every description. For terms, etc., see The Whitlock Exposition Recorder (specimen copy sent free) a Semi-Monthly Journal, $1 per annum. Agents wanted.

SHINGLE AND HEADING MACHINE—Law's Patent. The simplest and best in use. Shingle Heading and Stave Joiners, Stave Cutters, Equalizers Heading Turners, Planers, etc. Address TREVOR & CO., Lockport, N.Y.

$9 A Day for all. Address A. J. Fullam, N.Y.

STOCKS, DIES, AND SCREW PLATES Horton's and other Chucks. JOHN ASHCROFT, 50 John st., New York. 16 tf

A BOOK THAT EVERYBODY SHOULD HAVE.

WELLS' EVERY MAN HIS OWN LAWYER, AND BUSINESS FORM BOOK, Is a complete and reliable guide in all matters of law and business transactions for EVERY STATE IN THE UNION.

THE ENTIRE LEADING PRESS OF THE COUNTRY unqualifiedly indorse the work. We make a few short extracts from the press:

"As a legal adviser, always at hand to instruct the reader how to proceed in suits and business transactions of every and all kinds; as a form book to enable the least learned to draw up deeds, mortgages, agreements, leases, orders, wills, etc.; as a guide with regard to the laws of the various States concerning exemptions, liens, limitation of actions, collection of debts, usury, and so on, this volume is certainly invaluable to men of business, and it is not surprising that a hundred thousand copies have so soon found their way into the homes and country houses of the multitude. In addition, the work contains a full digest of the action of the Government relative to reconstruction and the freedmen, the General Bankrupt Law, the Patent Laws, Pension Laws, the Homestead Laws, the Internal Revenue Laws, etc. The publisher has determined to make this work complete, and, to our thinking, he has succeeded. No business man or woman can with safety be without it."—New York Times.

"This work is one of the most valuable issues of the press of this country. It contains so much that every man in business should know, but which none have the time to acquire from voluminous works, that it is truly indispensable."—New York Dispatch.

"Such a useful book cannot be too highly commended. A more comprehensive digest could not be desired."—New York Weekly Tribune.

"There should be a copy of it in every family."—New York Weekly.

"The most implicit confidence can be placed upon the work as authority on all the subjects of which it treats."—Philadelphia Age.

"You can purchase in this book what may be worth hundreds of dollars to you."—St. Louis Dispatch.

"It contains just the kind of information every business man stands most in need of."—Sunday Mercury.

"Every man, no matter what his business may be, should have a copy."—Pittsburgh Dispatch.

"There is no better book of reference."—Phrenological Journal.

"The book is prepared to meet all the ordinary contingencies of business life, and it meets them clearly, distinctly, and well."—Round Table.

"It contains a vast amount of just such matter as every one ought to be acquainted with in the prosecution of all ordinary business."—N. Y. Christian Advocate.

"It is the best business guide ever published."—De Bow's Journal, St. Louis.

"Every one should have a copy."—N. Y. Eve. Post.

"It is invaluable."—Cincinnati Enquirer.

"Indispensable to every household."—Cincinnati Commercial.

"This work is worthy of the popularity it has acquired as a convenient and reliable manual."—N. Y. Herald.

The work is published 12mo size, 650 pages. Price in full leather binding $2·50; in half library, $2. Sent post paid on receipt of price.

Good reliable agents wanted everywhere. They will find this the best selling book published. Liberal inducements given. Address JOHN G. WELLS, Publisher, 432 Broome street, New York

LATHE CHUCKS—HORTON'S PATENT—from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks, Conn.

WROUGHT-Iron Pipe for Steam, Gas, and Water; Brass Globe Valves and Stop Cocks, Iron Fittings, etc. JOHN ASHCROFT, 50 John St., N. Y.

BOILER FELTING SAVES TWENTY-five per cent of Fuel. JOHN ASHCROFT, 50 John st. New York. 16 tf

FOR STEAM ENGINES, BOILERS, SAW Mills, Cotton Gins, address the ALBERTSON AND DOUGLASS MACHINE CO., New London, Conn. 14 tf

CAMDEN

Tool and Tube Works,

Camden, N. J. Manufacturers of Wrought Iron Tube, Brass Work and Fittings, and all the most improved TOOLS for Screwing, Cutting, and Fitting Pipe. Screwing Machines for Pipe, of five different sizes. Pipe Tongs, Common and Adjustable; Pipe Cutters, Pipe Vises, Taps, Reamers, Drills, Screwing Stocks, and Solid Dies. Peace's Patent Screwing Stocks, with dies. No. 1 Screws ¼, ⅜, ½, ¾ Pipe. Price complete, $10. No. 2 Screws, 1, 1¼, 1½, 2 Pipe, $20. No. 3 both screws and cuts off, 2½, 3, 3½, 4, $65.

BENT, GOODNOW & CO., Boston, Mass., Agents for the sale of Patents. FOR SALE—A variety of very valuable "Rights." Send stamp for THE PATENT STAR, Containing descriptions of each.

CATALOGUES SENT FREE.

MATHEMATICAL INSTRUMENTS, 112 pages.
OPTICAL INSTRUMENTS, 72 pages.
MAGIC LANTERNS and STEREOPTICONS, 100pp.
PHILOSOPHICAL INSTRUMENTS, 84 pages.
JAMES W. QUEEN & CO., 924 Chestnut st., Philadelphia, Pa.

POWER LOOMS.

Improved Drop Box. Spooling, Winding, Beaming, Dyeing, and Sizing Machines. Self-Acting, Wool-Scouring Machines, Hydra Extractors. Also, Shafting, Pulleys, and Self-Oiling Adjustable Hangers, manuf'd by THOS. WOOD, 2106 Wood st., Philad'a, Pa.

WOODBURY'S PATENT

Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery. S. A. WOODS, 91 Liberty street, N. Y.; Send for Circulars. 67 Sudbury street, Boston.

THE

Tanite Emery Wheel.

THIS WHEEL CUTS FAST AND DOES not glaze, gum, heat or smell. For circulars address THE TANITE CO., Stroudsburg, Monroe Co., Pa.

General Agents:—Hart Manufacturing Co., 243 Pearl st., New York. Post & Goddard, 117 Liberty st., New York. Bloomfield, Myers & Co., 11 Dey st., New York. Charles M. Ghriskey, 508 Commerce st., Philadelphia. American Twist Drill Co., Woonsocket, R. I. Thomas Flint & CO., 29 Federal st., Boston. A. Reuter & Son, 15 North Howard st., Baltimore, Md.

Special Agent:—D. D. Elston, 189 Duane st., N. Y.

SPECIAL NOTICE.—Every Tanite Emery Wheel is carefully tested, before being sent from the factory, at a speed about double that at which it is guaranteed to run. Customers can rely, with confidence, on the safety as well as upon the cutting properties of these wheels.

Sault's Patent

FRICTIONLESS LOCOMOTIVE VALVES, easily applied; require no changes. M. & T. SAULT COMPANY, New Haven, Conn. 12 tf

WOOD WORKING MACHINES.

Smith's Improved Woodworth Planer & Matcher, Sash and Door, Molding, Mortising, and Tenoning Machines, Scroll Saws, Saw Mills, etc., at reduced prices. Address CHARLES H. SMITH, 135 North 3d st., Philadelphia, Pa.

For Machinists' Tools,

OF SUPERIOR QUALITY, WITH ALL Modern Improvements. Also, Improved Nut and Bolt Machinery. Address R. A. BELDEN & CO., New Haven, Conn.

R. BALL & CO., Worcester, Mass., Manufacturers of Woodworth's, Daniel's, and Dimension Planers; Molding, Matching, Tenoning, Mortising, Shaping, and Boring Machines; Scroll Saws, Re-Sawing, Hand Boring, Wood Turning Lathes and a variety of other Machines for Working Wood. Also, the best Patent Door, Hub, and Rail Car Mortising Machines in the world. ☞ Send for our Illustrated Catalogue. RICHARD BALL. E. P. HALSTED.

Lucius W. Pond,

MANUFACTURER OF

MACHINISTS' TOOLS,

NEW AND IMPROVED PATTERNS OF Lathes, Planers, Drills, Milling Machines, Boring Mills, Slotting Machines, Gear and Bolt Cutters, and Punching and Shearing Machines. Dealer in

IRON & WOOD-WORKING MACHINERY.

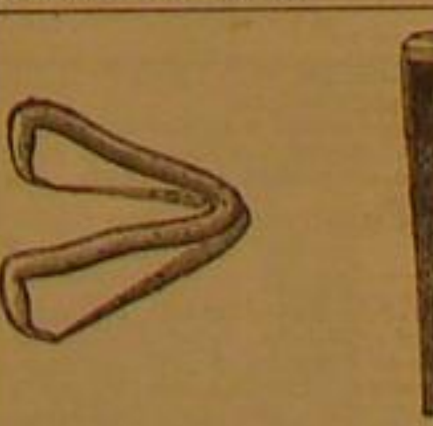
Works at Worcester, Mass. Office, 98 Liberty st., N. Y. S. N. HARTWELL, General Agent.

Bridesburg Manf'g Co.,

OFFICE No. 65 NORTH FRONT STREET, PHILADELPHIA, PA.,

Manufacture all kinds of Cotton and Woolen Machinery including their new *SELF-ACTING MULES AND LOOMS*, Of the most approved style. Plans drawn and estimates furnished for factories of any size. Shafting and mill gearing made to order.

IRON STEAMERS, HULLS, & LIGHTERS. Estimates & Specifications furnished on application. HENRY J. DAVISON, 77 Liberty st., New York, Agent for Pusey, Jones & Co. 21 tf



WEAVER'S Patent Carpet Stretchers and Fasteners (Illustrated in Scientific Am. June 26). Orders for Stretchers and Fasteners will receive prompt attention. Special inducements to Jobbers. Send for Circulars. WILLIS WEAVER, Salem, Ohio.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st., New York. 17 tf

L. D. FAY, Manufacturer and Dealer in Machinists' Tools and Woodworking Machinery. Manufactory, Worcester, Mass. Warehouse and Salesroom, St. Louis, Mo. Large variety of Lathes, Lathe Chucks, Engines, Sawmills, etc. Enclose stamp for catalogue. 30 cow

THE ABOVE CUT REPRESENTS OUR patent circular saw with movable or inserted teeth, for which we claim the following advantages over all others:—

The shanks of our saw teeth are elastic, and exert a uniform distension in the sockets. The stability of the plate is in no way affected by inserting new sets of teeth.

Each tooth may be independently adjusted to the cutting line.

No rivets, keys, or other objectionable appliances are employed in connection with the teeth; they are as simple in construction as a nut for a bolt, and as easily applied.

In short all the difficulties heretofore experienced in the use of movable teeth for saws, are fully met and obviated by this invention.

The Subscribers manufacture the "W. G. TUTTLE'S Patent Cross Cut Saws," J. H. TUTTLE'S Patent Double Hook Tooth Saws;" also, Cast steel Circular and Long Saws. Single and Double Cylinder and other Power and Hand Printing Machinery.

☞ Our Illustrated Catalogues sent free to all, who will please address us.

R. HOE & CO., Manufacturers, 29 and 31 Gold st., New York. 26 tf

ASHCROFT'S LOW-WATER DETECTOR will insure your Boiler against explosion. JOHN ASHCROFT, 50 John st., New York. 16 tf

ALCOTT'S CONCENTRIC LATHES,—For Broom, Hoe, and Rake Handles, Chair Rounds, etc., and all other kinds of Wood-working Machinery, for sale by S. C. HILLS, 12 Platt st., New York. 1 tf a

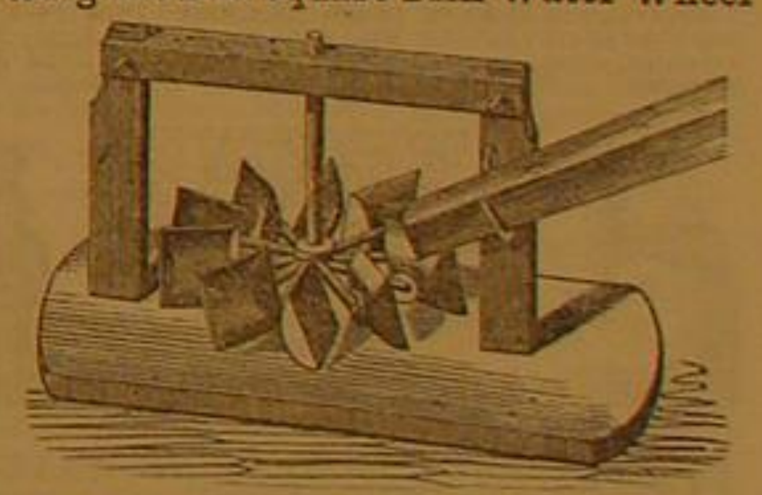
Glue & Sand Paper,

EMERY Paper, and Emery Cloth, Curled Hair, Ground Flint, and Emery, Neat's-Foot Oil, Felting for Covering Pipes and Boilers. Raw Hide cut to any shape. For Sale by the Manufacturers, BAEDER, ADAMSON & CO., Philadelphia: 730 Market st. New York, 67 Beekman st. Boston: 18 Blackstone st. Chicago: 45 S. La Salle st.

MERRICK & SONS,
Southwark Foundery,

No. 430 Washington Avenue, Philadelphia.
William Wright's Patent
VARIABLE CUT-OFF STEAM ENGINE,
Regulated by the Governor.
Merrick's SAFETY HOISTING MACHINE,
Patented June, 1868. DAVID JOY'S PATENT
VALVELESS STEAM HAMMER.
D. M. Weston's Patent
Self-Centering, Self-Balancing Centrifugal Sugar-Draining Machine.
AND
HYDRO EXTRACTOR
For Cotton and Woolen Manufacturers.
New York Office, 62 Broadway

Wright's Pat. Square Dish Water Wheel



This Wheel is second to none. It utilizes all the water applied, be it more or less; is cheap, simple, powerful, easily transported, and can be put in running order at small expense. For circulars or further particulars, address E. H. PECKHAM & CO., Box 6711, Postoffice, New York.

IMPROVED ALUMINUM BRONZE

Hunting Case Watches.

From the Scientific American of April 11, 1868.

"The color of the metal closely resembles that of 18c. gold, is more grateful to the eye and its luster brilliant," etc.

When desired these watches will be sent to any express office, and permission of examination granted upon payment of freight charges.

Description of goods and metal sent free upon application. An inspection of my goods is earnestly solicited.

J. D. HUGUENIN VUILLEMIN, No. 44 Nassau st., New Y

For sale by all respectable dealer

$15.00

$20.00

THE COLLINS METAL WATCH FACTORY.—Full Jeweled Hunting Levers—Gents and Ladies' sizes.

The $15 Watches, in appearance, and for time, are equal to gold ones costing $150. Those of extra fine finish, at $20, are not surpassed by $200 gold watches. For TIME, ELEGANCE, FINISH, and DURABILITY, no imitation of gold can begin to compare with the Collins Metal. Excepting the intrinsic value, it is equal to gold.

Chains from $2 to $8.

JEWELRY.—We are manufacturing all kinds of Jewelry of the Collins Metal, Pins, Earrings, Sleeve Buttons, Lockets, Studs, Finger Rings, Bracelets, Charms, Odd Fellow and Masonic Pins, etc., all of the latest and most elegant styles, and fully equal to gold in appearance and wear.

TO CLUBS.—Where six Watches are ordered at one time, we will send one extra Watch free of charge.

Goods sent to any part of the United States by express, to be paid for on delivery. Money need not be sent with the order, as bills can be paid when goods are taken from the express office. Customers must pay all express charges. We employ no Agents; orders, therefore, must be sent directly to us. In ordering, write plainly the name, town, county, and State. Customers in the city will remember that our only office is No. 335 Broadway, cor. Worth st., (up stairs), New York. C. E. COLLINS & CO.