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Improvement in Steam Hammers.

As the operations of the sword have been so carefully recorded by the historian, it would seem that the history of the hammer, one of the first implements ever used by man, and one which cannot be dispensed with today in beating out the tracks or roads of the world's progress, should be written.

Our time and space would fail us were we to attempt any such review or record, hence we will give a brief description of the improvements claimed for the one presented in the accompanying engraving, one of the latest inventions of the hammer builders.

The form of the frame is claimed by its builder, to be the best possible shape for the objects to be accomplished, namely, firmness of support, and resistance to the blows of the hammer upon the anvil.

The frame is cast in two parts, with flanges at the upper end to clasp the cylinder, A, and with guides to control the hammer head, B. The base of the frame is mounted in the usual manner upon a bed plate which surrounds the anvil block, C, and is capable of adjustment by keys in the brackets, as shown upon the bed plate. The anvil block is formed with flanges at the bottom which extend downwards and at right angles to each other, in such a manner as to receive the ends of four large timbers, which are arranged in a pit and in the form of a pyramid. These timbers are firmly fastened together by cross bolts and the pit is filled in firmly with sand and gravel stamped. This is one of the best foundations for such anvils, as has been proved by several years of experience.

The construction of the valves and valve gear, however, constitutes the prominent novelties and features of usefulness in this hammer, and their combination and arrangement are such that the blows are completely under the control of the operator, being instantly varied in length and intensity, or fixed to work at any point within the range of the length of the cylinder. The ports are also constructed so that the action of the steam upon the valves and upon the piston prevents them from wearing away their seats and cylinders more on one side than the other.

This will be easily understood by referring to the shape of the valves, which are simply cylinders working inside of chambers on the front side of the main cylinder, A, the center of which is in line with the valve stem at D. Openings are formed in this inner cylinder to communicate with the cylinder of the throttle at T, and all of these openings for the ports are made in the extreme ends of the cylinders, so that the steam enters completely around the valves as they pass their seats.

The throttle is operated by the lever, E, and connecting rod, F, and when the proper quantity of steam is admitted the valve is fastened by the set screw at E.

The steam valves receive motion from the connecting rod at D, and lever, G, one end of which lever is pivoted upon an eccentric shaft which receives motion by a worm gear at F, and which is operated by a crank at K, in close proximity to the throttle lever.

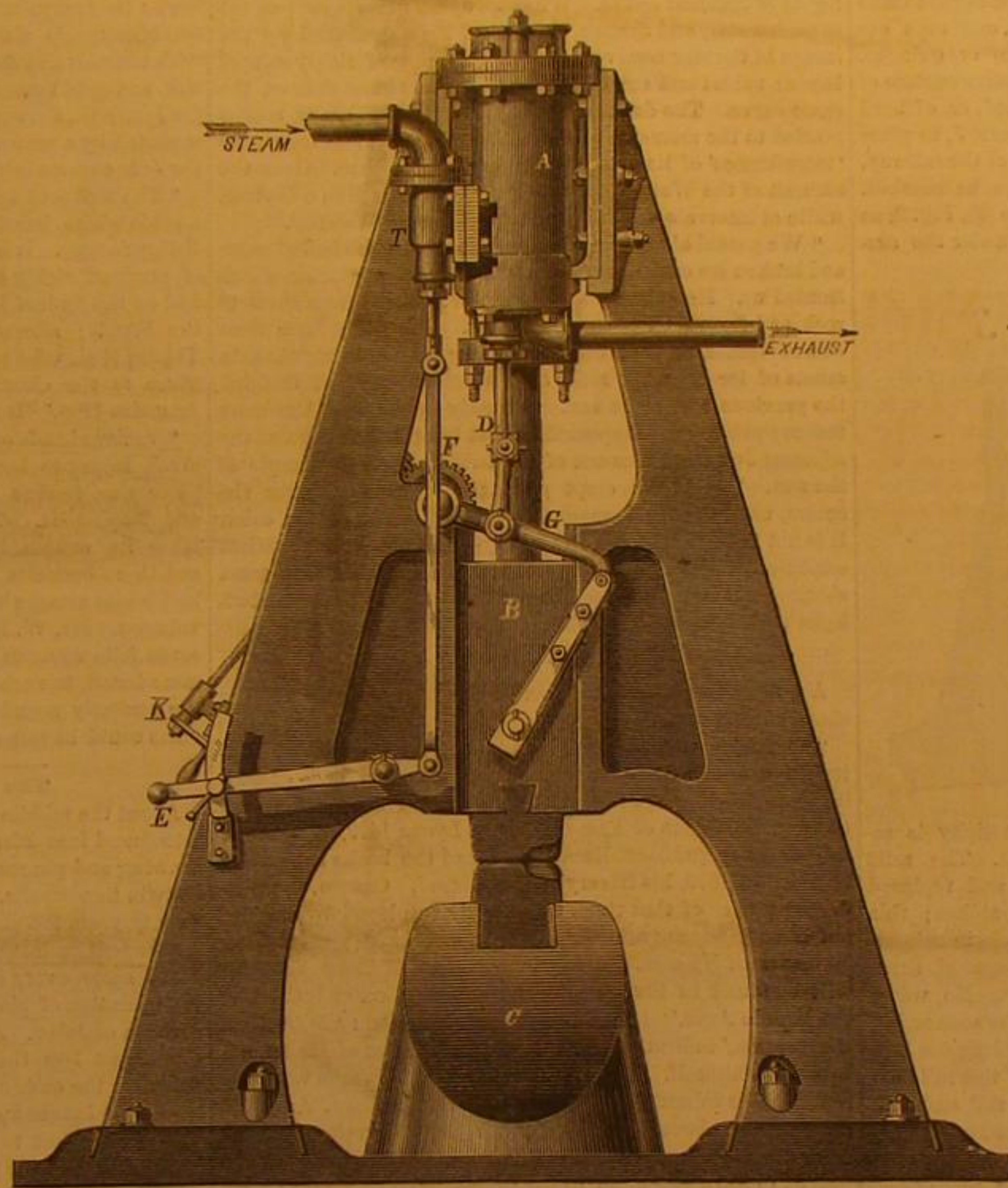
The other end of lever, G, is connected with the hammer head by a light bar of wood, which travels up and down with the strokes of the piston.

Motion being thus communicated to the valve stem, it is evident that by a change of the eccentric a change of the valves is easily produced, consequently the stroke of the piston may be quickly varied by simply operating the crank at K.

The piston and piston rod are forged in one piece, and the packing rings are of the simplest form, but by following the same principle of having the openings completely around the cylinder, there is so great a freedom to the exhaust that each distinct motion of the piston is clearly indicated by the escape steam as in an engine with the most approved cut-off.

As to the efficient working of such hammers, the manufacturer states that one with a cylinder of $6\frac{3}{4}$ inches diameter, and a hammer of 400 pound weight, will reduce a 3-inch ingot of steel in the same time that a Sheffield "Davy Bros." hammer of 9-inch cylinder and 600 pounds weight would do the work.

One of the latest improved of these hammers can be seen in operation at the steel works of William A. Sweet & Co., Syracuse, N. Y., to whom any application may be made for further information.



WILLIAM A. SWEET'S STEAM HAMMER.

Securing a Permanent Way.

Engineering talent, both in this country and in Europe, has been engaged for some years in attempts to reduce the expense of keeping railroads in repair and in saving the rolling stock from rapid deterioration In this attempt very great attention has been paid to the style and quality of the rails themselves; steel, or a combination of steel and iron, in their composition, being mainly the point to which these efforts have been directed. The supports of the rails, however, have not, we think, received the attention their importance demands. A certain degree of elasticity, of ability to recover from the depression and shock of the weight of a passing train, seems to be a desirable quality in the road bed and rails of a railway line. We remember, in the early days of railroading in this country, that stability, unyielding resistance, was thought and believed to be the desideratum for a railway. The Boston and Lowell road, one of the best built roads in the country, had granite sleepers instead of wooden ones; and we remember well repeatedly passing on foot over a portion of the road and noting the many cases of broken sleep-

Fig. 1

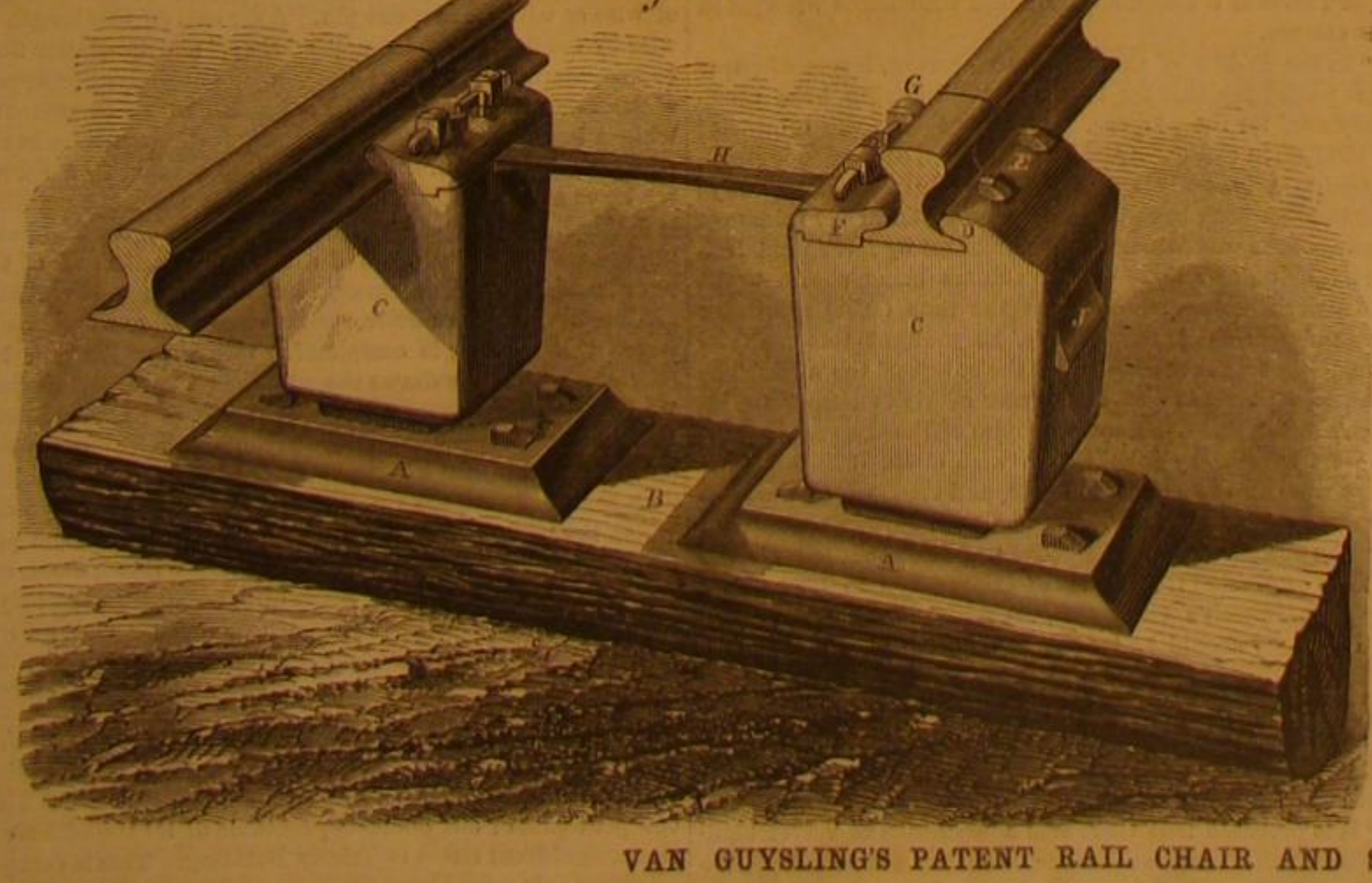
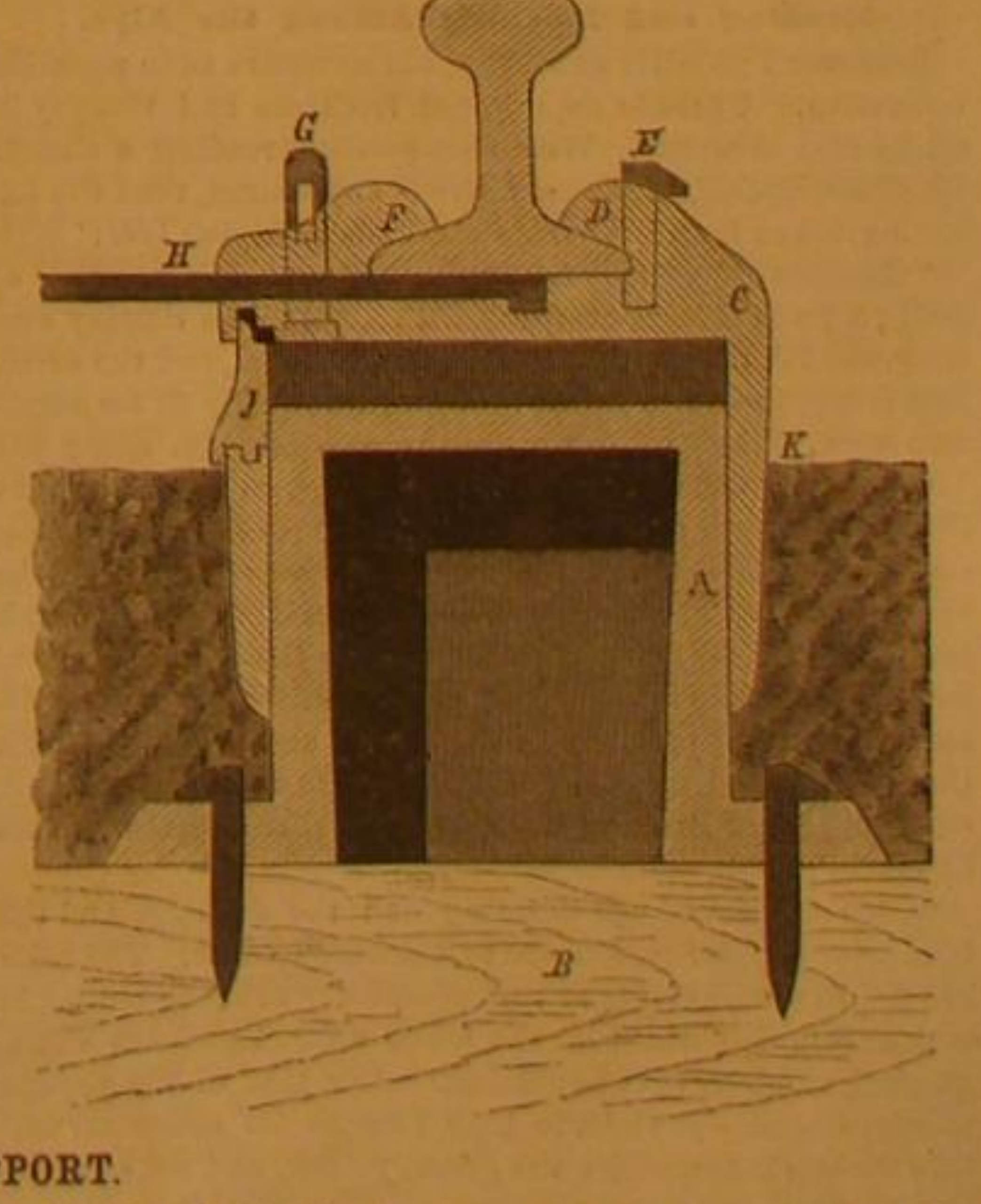


Fig. 2.



VAN GUYSLING'S PATENT RAIL CHAIR AND SUPPORT.

ers, and the continual work of placing shims of wood between the rail and sleeper, to receive, as cushions, the shock of passing trains. Some semi-elastic material seems to be absolutely necessary to the life of the roadway and the rolling stock, experience proving that a really unyielding roadway is not economical.

The device herewith represented is intended to secure a permanent way, to provide a secure means of fastening rails, give them a good support, provide for the requisite degree of elasticity, and afford a ready means of making repairs and adjusting the line of the rails. Fig. 1 is a perspective view of the device, Fig. 2 a section, and Fig. 3 an intermediate support to be placed between the joinings of the rails. A hollow standard, A, with an ample base, is spiked to the sleeper, B. This standard is an iron casting. Over it passes a box, C, having a lip, D, for receiving one edge of the rail, with keys, E, passing through the usual slots in the rails near their ends, and seated in the box, C. Another lip, F, removable at will, is held in place by means of split keys, or similar devices, passing through slotted bolts, G, seated in cored square holes in the top of the cap, C. The two standards and caps are held rigidly by the bar, H, which acts as a tie or stringer. Between the top of the standard, A, and the inner surface of the cap's top is inserted a diaphragm, I, of wood, or of hard rubber, which may be removed through the doors, J, to place a thinner or thicker gland under the rail to level the railway. Through this aperture, J, the bolts, G, may also be reached. The whole is buried in the earth to the line K, Fig. 2, so that the sleeper, B, is not less than six inches under the surface, thus assisting in its preservation.

Fig. 3

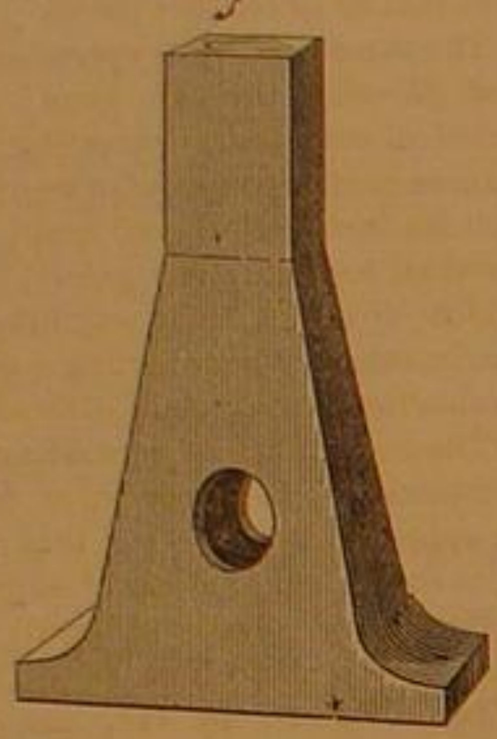


Fig. 3 is a hollow standard of cast iron intended for intermediate supports between the ends of the rail. It is furnished with cap, as is that shown in Figs. 1 and 2, which are more especially intended for the points of jointure between the ends of the rails. The inventor thinks that by covering the sleepers to the depth of six inches they will last much longer than when exposed to the weather; in wet weather there is a tendency to throw mud from under the sleepers and in dry weather the vibration of the sleepers raises a dust; both of which difficulties are obviated by this device. While sufficient elasticity is secured, the road is less liable to derangement. The rails may be taken out, and raised or lowered, and replaced without disturbing the sleepers or drawing spikes; this is a great advantage when adjusting the track in winter. The rails may be adjusted by this device a hight of three inches without interfering with the sleepers. No water can get between the chair and its support. The connecting bars are placed directly under the rail, thus affording the best means of preventing spreading. The spring of the rails under a heavy load will not cause the sleepers to roll and lift, as they now do when the rails are spiked directly to them, and they are continually following the spring and working the ballast out of place. When once settled in place these supports are expected to be permanent *in situ*. With a broad base they may be used, on a good foundation, without the support of wooden sleepers. The joint chair weighs about 100 lbs. and the intermediate about 70 lbs. The device has been approved by eminent railroad men.

Patented through the Scientific American Patent Agency, November 10, 1868. For further information address the patentee, Aaron Van Guysling, West Albany, N. Y.

Evening and Morning Among the Alps.

Professor Tyndall is as felicitous in narrative as in scientific discussion. There is an original freshness and vivacity in all he says or writes. We do not recollect reading a choicer bit of description, in the narrative of any tourist, than the following, taken from his "Odds and Ends of Alpine Life:"

"Grindelwald was my first halting place in the summer of 1867; I reached it, in company with a friend, on Sunday evening, the 7th of July. The air of the glaciers, and the excellent fare of the Adler Hotel, rendered me rapidly fit for mountain work. The first day we made an excursion along the lower glacier to the Kastenstein, crossing, in returning, the Strahleck branch of the glacier above the ice fall, and coming down by the Zasenberg. The second day was spent upon the upper glacier. The sunset covered the crest of the Eiger with indescribable glory that evening, causing the dinner table to be forsaken while it lasted. It gave definition to a vague desire which I had previously entertained, and I arranged with Christian Michel, a famous old roadster, to attempt the Eiger, engaging Peter Bauman, a strong and gallant climber, to act as second guide.

"This crimson of the morning and the evening, and the blue color of the sky, are due to a common cause. The color has not the same origin as that of ordinary coloring matter, in which certain portions of the white solar light are extinguished, the color of the substance being that of the portion which remains. A violet is blue because its molecular texture enables it to quench the green, yellow, and red constituents of white light, and to allow the blue free transmission. A geranium is red because its molecular texture is such as quenches all rays except the red. Such colors are called colors of absorption; but the hue of the sky is not of this character. The blue light of the sky is *reflected* light, and were there nothing in our atmosphere competent to reflect the solar rays, we should see no blue firmament, but should look into the darkness of infinite space. The reflection of the blue is effected by perfectly colorless particles. Smallness of size alone is requisite to insure the selection and reflection of this color. Of all the visual waves emitted by the sun, the shortest and smallest are those which correspond to the color blue. On such waves small particles have more power than upon large ones, hence the predominance of blue color in all light reflected from exceedingly small particles. The crimson glow of the Alps in the evening and in the morning, is due, on the other hand, to *transmitted* light; that is to say, to light which in its passage through great atmospheric distances, has had its blue constituents sifted out of it by repeated reflection.

"At half-past one o'clock on the morning of the 11th, we started from the Wengern Alp to attack the Eiger; no trace of cloud was visible in the heavens, which were sown broadcast with stars. Those low down twinkled with extraordinary vivacity, many of them flashing in quick succession lights of different colors. When an opera glass was pointed to such a star, and shaken, the line of light described by the image of the star resolved itself into a string of richly-colored beads; rubies and emeralds were hung thus together on the same curve. The dark intervals between the beads corresponded to the moments of extinction of the star through the 'interference' of its own rays in our atmosphere. Over the summit of the Wetterhorn the Pleiades hung like a diadem, while at intervals a solitary meteor shot across the sky.

"We passed along the Alp, and then over the balled snow and broken ice cast down from the end of a glacier which fronted us. Here the ascent began; we passed from snow to rock and from rock to snow by turns. The steep for a time was moderate, the only thing requiring caution being the thin crusts of ice upon the rocks over which water had trickled the previous day. The east gradually brightened, the stars became paler and disappeared, and at length the crown of the adjacent Jungfrau rose out of the twilight into the purple of the sun. The bloom crept gradually downwards over the snows, until the whole mountain-world partook of the color. It is not in the night nor in the day—it is not in any statical condition of the atmosphere—that the mountains look most sublime. It is during the few minutes of transition from twilight to full day through the splendors of the dawn."

Mediæval Bookbinding.

A writer, in the last number of *Chambers' Journal*, on the above subject says:

"The old stamped leather bindings of the fifteenth and sixteenth centuries are often beautifully executed, and exceedingly interesting. Jean Grolier, Viscount d'Aguisi, one of the four treasurers of France (born at Lyons 1479, died 1565), collected a magnificent library, and had the books splendidly bound. In 1675, his library was dispersed. Gascon, the celebrated binder of that time, was chiefly employed by Grolier, but the designs are said to have been composed by himself in moments of leisure. A woodcut of one of these bindings will be found in Shaw's 'Decorative Arts, Ecc. and Civil, of the Middle Ages.' It had the usual inscription: '*Io Grolierii et amicorum*,' indicating that it was for the use of his friends as well as himself. The collection of Mr. Edwards was very rich in these volumes, and large prices were realized. A colored plate of great beauty will be found in Shaw's work, of a book belonging to the same style and period, though it cannot be proved to have belonged to the Chevalier Jean Grolier. Aldus, the famous printer of Venice, printed the works of Machiavelli in 1540, in four volumes. Grolier had his copy bound in four different patterns, and one volume was sold at the Libri sale for one hundred and fifty pounds. At the same sale, two volumes, which formerly belonged to the library of Diana of Poitiers, beautifully bound, were sold for eighty and eighty-five pounds respectively. The celebrated artist, 'le petit Bernard,' is said to have been employed on them. At the Library at Treves is a manuscript studded with heads wrought in fine cameos.

"In the middle of the sixteenth century, leaves of paper were pasted together for bindings, wood having been previously used for the purpose. Mr. Thoms says the originator of binding in cloth was Mr. R. E. Lawson, of Stanhope street, Blackfriars, formerly in the employ of Mr. Charles Sully; and the first book bound in cloth was a manuscript volume of music, which was subsequently purchased by Mr. Alfred Herbert, the marine artist. On the volume being shown to the late Mr. Pickering, who was at the time (1823) printing a diamond edition of 'the classics,' he thought this material would be admirably adapted for the covers of the work. The cloth was purchased at the corner of Wilderness Row, St. John's street, and five hundred copies of the Diamond Classics were covered by Mr. Lawson with cloth. Shakespeare's plays were also issued in this form, and these works were the first books bound in cloth.

"The custom of chaining books to desks in churches is said to have originated from an act of Convocation in 1562, ordering that Nowell's Catechism, the Articles, and Bishop Jewell's Apology should be taught in universities and cathedral churches. But the custom has been traced back as far as Sir Thomas Lyttleton, who, by his will, dated 1481, ordered some of his works to be chained in different churches. St. Bernard, in 1153, in one of his sermons, actually alludes to some such custom.

"It is probable that there was no specimen of velvet binding before the fourteenth century. In the will of Lady Fitzhugh, c. 1427, several books are bequeathed: 'I wyl that my son Robert a Sautre covered with rede velvet, and my doghter Mariory a Primer cou'ed in rede, and my doghter Darcy a Sauter cou'ed in bleu, and my doghter Mal de Eure a Prim'r cou'ed in bleu.' Queen Elizabeth had a little volume of prayers bound in solid gold suspended by a chain at her side. The Countess of Wilton in her 'Art of Needlework,' says the earliest specimen of needlework binding remaining in the British Museum is Fichetus (Guil.) Rhetoricum, Libri tres (Impr. in Membranis), 4to, Paris ad Sorbonæ, 1471. It is covered with crimson satin, on which is wrought with the needle a coat of arms, a lion rampant in gold thread in a blue field, with a transverse badge in scarlet silk: the minor ornaments are all wrought in fine gold thread.

"The next in date in the same collection is a description of the Holy Land, in French, written in Henry VII.'s time. It is bound in rich maroon velvet, with the royal arms, the garter, and motto embroidered in blue; the ground crimson; and the fleurs-de-lis, leopards, and letters of the motto in gold thread. A coronet of gold thread is inwrought with pearls, the roses at the corners are in red silk and gold. In the Bodleian Library is a volume of the Epistles of St. Paul (black letter), the binding of which is embroidered by Queen Elizabeth; around the borders are Latin sentences, etc. Archbishop Parker's 'De Antiquitate Britannicæ Ecclesiæ' (1572), in the British Museum, is richly bound in green velvet, embroidered with animals and flowers, in green, crimson, lilac, and yellow silk, and gold thread. In the same collection is a Bible bound for James II., showing on the cover his initials, J. R., surmounted by a crown, and surrounded with borders of laurel, the four corners being filled with cherubim.

"The writer of this paper once saw at Broomfield, in Essex, a Bible which belonged to Charles I. (date 1527, Norton and Bell, printers). It is a folio, bound in purple velvet; the arms of England, richly embroidered in raised work on both sides, and on the fly-leaf is written: 'This Bible was King Charles the First's; afterwards it was my grandfather's, Patrick Young, Esq., who was library keeper to his Majesty; now given to the church at Broomfield by me, Sarah Attwood, Aug. 4th 1723.' It is a relic little known.

"Various kinds of insects, popularly called bookworms, do much injury to books. A mite (*Acarus eruditus*) eats the paste that fastens the paper over the edges of the binding and loosens it. The caterpillar of another little moth takes its station in damp old books, between the leaves, and there commits great ravages. The little boring wood beetle also attacks books, and will even pierce through several volumes. Mr. W. R. Tymms mentions an instance of twenty-seven folio volumes being perforated in a straight line by the same insect, in such a manner, that by passing a cord through the perfectly round hole made by it, the twenty-seven volumes could be raised at once."

The Manufacture of Pins.

About the middle of the last century, the Ryland family introduced into Birmingham the two new industries of wire drawing and pin making, which at that period were regarded as twin handicrafts. After a steady development of five and twenty years the pin trade was transferred to an ancestor of the present eminent firm of Thomas Phipson & Son. A few years since every schoolboy's manual contained a sketch of the operation of pin making as a remarkable instance of the division of labor. A single pin had to undergo the manipulation of not less than fourteen pairs of hands before it was ready for the cushion in a lady's boudoir. This forcible illustration no longer applies. Pin making like other industries, has been subject to the scientific progress and improvement of the age, and the process is now comparatively simple. An American engineer named Wright patented in 1824 a pin machine which during the revolution of a single wheel produced a perfect pin. Mr. Thomas Phipson thus describes Wright's machine, which, having undergone many improvements, is now in operation at the factory of the former, here: The principal shaft gives motion in its rotation to several sliders, levers, and wheels, which work the principal parts of the machine. A slider pushes forward pincers, which draw wire from a reel at every rotation of the shaft, and advance such a length of wire as will produce one pin. A die cuts off this length of wire by the descent of its upper "chap," and the latter then opens a carrier which takes on the wire to the pointing apparatus. Here it is received by a holder, which turns round while a bevel-edged file wheel, rapidly revolving, gives to the wire its rough point. It proceeds immediately by a second carrier to a second and finer file wheel, by which the pointing is finished. A third carrier transfers the pin to the first heading die, and by the advance of a steel punch one end of the pin wire is forced into a recess, whereby the head is partially produced. A fourth carrier removes the pin to a second die, where the heading is completed. When the heading bar retires a forked lever draws the pin from the die and drops it into a receptacle below. It is then ready to be "whitened" and "stuck." The whitening is performed in a copper vessel placed on a fire in which the pins are boiled in water along with grains of metallic tin and a little bitartrate of potash. When the boiling has continued for about one hour the pins and tin grains are removed, thoroughly washed, dried, and polished in bran. Various kinds of apparatus are employed for sticking the pins into sheets of fluted paper, and also in folding the paper for the wrappers.—*The Engineer*.

THE highest store rent paid in Broadway is that of E. S. Jaffray's dry-goods store, which brings $60,000. The highest hotel rent is that of the Fifth Avenue, which rates at $100,000 per annum; but the most profitable of all the edifices on that magnificent street is Trinity Building. This is occupied by offices. It cost about $200,000, and rents for nearly one half that sum annually.

IT is said that passing a red-hot iron over old putty will make it so soft that it may be readily removed.

BEET ROOT SUGAR.

No. VII.

TECHNOLOGY.—PART IV.

THE PERIER-POSSOZ METHOD OF DEFECATION AND CARBONATATION.

Some manufacturers of beet root sugar in Europe have adopted the new process of Perier-Possoz, which we shall here describe as concisely as we can possibly do it, consistently with clearness.

The milk of lime used has to be divided very finely, by being passed through a close-woven metallic sieve. It must contain 2 per cent of lime, and will then indicate 10° on Baumé's areometer.

Twenty five parts by measure (or a little more), of this solution are to be added to every 1,000 parts, by measure, of juice to be operated on, but gradually, or in eight or ten successive additions, during which the temperature of the juice is raised from 138° to 158° Fah.

At first a greenish albuminous scum is coagulated, but at a later period colorless substances are precipitated.

The "limed" juice is now submitted to the action of carbonic acid gas while it is being stirred, and while at the same time a small stream of milk of lime is allowed to continuously flow into it. This lime, as it is introduced into the juice, is rapidly dissolved in it, and precipitated, carrying along most of the coloring matters and impurities contained in the liquid.

The quantity of lime thus gradually added to the juice, varies from 2 to 8 parts in 1,000 for beets of good quality, and from 10 to 15 for beets of inferior quality.

The carbonatation is arrested at a moment when the juice contains only from 1 to 2 parts in 1,000 of unprecipitated lime. This is known by the rapid clearing of a trial sample, or, better, by mixing a small quantity of the juice to be tested with an equal volume of a solution of chloride of iron of a specific gravity of 1·0035, and of a temperature of 59° Fah., which solution will indicate about 1° on Baumé's areometer. If now a few drops of this mixture be dropped into a solution of ferro-cyanide of potassa, and *no* blue color be produced, it is a sign that the carbonatation must be further continued. If, on the contrary, a blue color is developed in the cyanide solution, then the first part of the operation is known to have been concluded satisfactorily.

The juice, after this point has been reached, is made to flow into decantators, where it is allowed to rest and settle for the space of from 15 to 20 minutes. From these it is run into a second set of defecating pans, where a new addition of lime is made, amounting to one part in one thousand of juice. This is half the quantity used during the first part of this mode of manufacture. Carbonic acid is again immediately admitted, and allowed to flow until complete saturation is effected, which is known by the same trial as above, with this simple difference, that the chloride of iron test solution must have been diluted with seven times its volume of water. As soon as the right degree of saturation has been attained, the juice is heated to the boiling point in order to drive out the excess of carbonic acid. The carbonatated juice is now run into a second set of decantators, where it is allowed to clear itself when it is ready to be conveyed to the bone-black filters for further treatment.

This process furnishes a larger amount of scums and of deposits than are obtained by the ordinary method, described by us in a previous article, and consequently the juice is of a better quality; but it is very doubtful, in our mind, whether in this country the extra expense for lime for the production of carbonic acid, for the lost time, and for the increased labor, will be compensated for by the saving in bone black effected by this Perrier-Possoz system of double defecation and of double carbonatation.

THE JELINEK PROCESS.

By this new process, defecation and carbonatation are simultaneous, and terminated in a single operation, instead of in two successive ones, as in the previous method.

The pans used are furnished with a carbonic acid coil pipe, and are deeper than the ordinary defecating pans. The juice admitted into them is comparatively cold, and must never exceed in temperature 140° Fah.

At least two per cent in weight of lime is added to the juice in the shape of milk of lime, and carbonic acid gas being admitted, the heat is gradually increased until precipitates rapidly form, and fall to the bottom. This process is based on the theory of acting on cold juice at first so as to produce a solution of saccharate of sugar, out of which the carbonic acid gas precipitates the lime as carbonate of lime, which carries along with it a certain amount of organic matter, freeing, at the same time, the sugar which recombines with a portion of lime, to be again freed by a second decomposition of the saccharate and consequent precipitation of carbonate of lime, and so on an indefinite number of times during the period of the *one* single operation.

The carbonic acid is admitted in the pans when the temperature of the juice has reached from 133° to 144° Fah.; at first in small quantities only, but it is gradually increased in quantity in such a manner that the full extent of its production is utilized by the time the temperature of the juice has attained 175° Fah.

In many manufactories where Jelinek's method has been adopted, it has been modified in various ways, both as regards the quantity of lime used, the manner of introducing it into the juice (in one or more successive additions), as also in respect to the mode of admitting the carbonic acid gas, and as to the temperature at which the saturation is effected. We cannot possibly enter here into the detailed account of these various modifications of the original "Frey and Jelinek" process, which demands a much larger amount of lime and of carbonic acid gas, and produces a much larger quantity of scums and of deposits than the common mode of proceeding. It is, however, more simple, and appears to be as effective as the Perrier-Possoz process we have described above.

THE CHEMISTRY OF BEET ROOT SUGAR, JUICE, AND MOLASSES.

The manager of a beet root sugar factory must be acquainted with at least the rudiments of the science of chemistry, without which he cannot possibly understand the why and wherefore of the operations he is directing, and, consequently, must be also ignorant of the means placed at his disposal for overcoming many of the practical difficulties he is sure to encounter during the course of a sugar "campaign." For this reason we have thought that a few words on this very important subject would not be misplaced at this point of our purely practical technological exhibition of the art of extracting sugar from beets, as it may serve to render more comprehensible to others what we have heretofore written, and what further remains for us to say.

The sugar extracted from the beet is perfectly identical with cane sugar in every respect; its specific gravity being 1·623, water being represented by 1.

Its chemical composition is: Carbon, 72 parts; hydrogen, 11 parts, and oxygen 88 parts by weight.

Sugar forms with lime, two compounds known as saccharates. The first of these is produced in presence of an excess of lime; it is soluble in cold water, but nearly insoluble in boiling water, which consequently precipitates it from its cold-water solutions. When thus obtained, saccharate of lime may be washed in hot water without loss, and afterward be again dissolved in cold water. The chemical composition of this saccharate of lime is: Lime, 3 parts; sugar, 1 part.

The second compound of lime with sugar is formed when slaked lime is added to a concentrated solution of sugar, until nothing more is dissolved, and to which 85 per cent of alcohol is added. Its chemical composition is: Lime, 1 part; sugar, 1 part.

A solution of perfectly pure sugar in pure distilled water will not enter into spontaneous fermentation. This takes place, however, when other organic matter is present, or has been carried to it by the atmosphere, especially if this matter consists of the seeds, or *spores*, of cryptogamic plants (mildews).

During the process of ordinary fermentation, sugar is transformed into *carbonic acid* gas and into *alcohol*. If, however, a neutral solution of sugar be caused to enter into fermentation at a high temperature, *lactic acid* is also formed. In most cases of fermenting saccharine solutions, 100 parts of sugar are simultaneously converted into

Alcohol, 51·612 parts.
Carbonic acid, 49·240 parts.
Lactic acid, 3·948 parts.

If a solution of sugar be rich in nitrogenized matter, beside the above, *mannite* is also produced.

The most favorable temperature for fermentation varies between 54·5° and 99·5° of the Fahrenheit scale. The more dilute the solution, and the richer it is in albuminous substances, the more rapid will be the fermentation.

Beets grown in very fertile lands being richer in nitrogenized constituents than those grown in a poor soil, are also much more liable to produce juice subject to fermentation during their conversion into sugar.

The various substances contained in the juice of the beet, other than sugar and water, and which, when possible, must be eliminated before the final termination of the processes of manufacture are as follows:

1. *A yellow extract.* This is only accidentally met with, in badly-grown beets. We have no mode of ridding ourselves of it, as it passes unaltered through all the processes of defecation, carbonatation and filtration.

2. *Silicic acid.* This substance forms with lime an insoluble silicate of lime, which is eliminated during defecation, and the subsequent action of the bone black during filtration.

3. *Chlorine* exists only in a minute quantity in good beets. Its presence is very predjudicial, as it decomposes a certain amount of sugar, and cannot be got rid of by any means at our disposal.

4. *Phosphoric acid* exists in beet root juice, combined with alkalies, which it abandons, to unite with lime, as an insoluble phosphate, which defecation disposes of.

5. *Oxalic acid*, this also forms soluble compounds with the alkalies, which are decomposed by lime, and transformed into insoluble oxalate of lime.

6. *Citric acid* forms soluble combinations with alkalies and with lime, and cannot be eliminated during the process of manufacture.

7, 8, 9. The oxides of manganese, iron, and magnesium are mostly separated during defecation as insoluble compounds.

10. *Lime.* This substance, the value of which is inestimable to beet root sugar manufacturers is also found in the natural juice of the beet. It has the beneficial effect of arresting, to a certain extent, the fermentation of the juice, by its action on the nitrogenized substances contained in it. These last, if left unmolested, transform crystallizable sugar into non-crystallizable sugar (also known as glucose, or grape sugar), and thus, largely increase the proportion of molasses.

Lime is soluble in 725 parts of cold and 1,300 parts of hot water. It forms by combination with sugar both soluble and insoluble compounds or saccharates. Lime exists in the defecated beet root juice in three states: In solution in water, in combination with sugar, and in combination with acids.

A great portion of the lime in the defecated juice is separated by the subsequent process of carbonatation, during which carbonic acid gas combines with it, forming an insoluble precipitate of carbonate of lime. After ordinary carbonatation, a portion of lime, along with some soda and potash, still remains in the juice: this quantity does not, however, exceed 0·071 per cent, and is generally less.

11. *Soda* and *potash*, which constitute from 70 to to 80 per cent of the weight of the ash of the beet root, are freed from their combinations with acids during defecation, and are thus liberated in a caustic state, which is highly prejudicial, as it decomposes sugar and colors the liquids. Many plans have been proposed for the elimination of these alkalies from the juice (the best of which appears to be the use of phosphoric acid), but none have been generally adopted by manufacturers, and to this day nearly the whole of the soda and potash in the beet root are found again in the residual molasses, from which they can often profitably be extracted by a final technical operation.

12. *The albuminous*, or nitrogenized substances in beet juice, are coagulated by the action of heat; but as coagulated albumen is soluble in alkaline solutions, and also in solutions of saccharate of lime, a portion of it remains in the juice until the alkalies and the lime have been neutralized. This takes place during carbonatation, when the lime is precipitated along with that portion of the albuminous substances which have not previously found their way into the scums of defecation.

Albuminous substances, boiled in alkaline solutions, are partially decomposed, producing ammonia, which is easily recognized by its peculiar smell.

During defecation, ammonia is always disengaged.

13. *Pectine* can only exist in the juice in a solid state, as an abnormal substance, in the shape of minute fragments of beet root or as cellular tissue.

The three successive operations of *defecation, carbonatation*, and *filtration* through bone black, are at present our only practical means of eleminating most of the extraneous substances contained in the juice of the beet. Our processes are still far from perfect, and much remains yet to be done before we shall have it in our power, to isolate all the ingredients which now find their way into the molasses, or which act detrimentally by converting a considerable portion of crystallizable into non-crystallizable sugar.

The importance of separating the various soluble foreign compounds in beet root juice from its contained sugar, may be appreciated by the fact that each per cent of these left in it, is equivalent to a loss of sugar equal to its own weight.

Beet root molasses (dripped) contains from 16 to 19 per cent of water, and from 81 to 84 per cent of solid matter. When obtained by the use of centrifugals, however, it contains considerably more aqueous matter than here stated.

Beet root molasses can be perfectly dried only when mixed with some kind of finely-divided solid matter, such as sand.

The quantity of sugar contained in beet root molasses varies from 30 to over 50 per cent of the whole, or even more. This amount of sugar consists in a mixture of crystallizable and non-crystallizable sugar in various relative proportions. If the molasses reddens blue litmus paper, it contains none but crystallizable sugar.

The quantity of mineral salts in the molasses varies from 14 to 20 per cent of its weight; that of the organic matter, other than sugar, from 10 to 20 per cent. A fair average consists of 2·5 of water, 43 of sugar, and 32·5 of extraneous matter.

The quantities by weight of potash, soda, and lime in the ash of beet root molasses amount, respectively, to 51·72, 8, and 5 per cent, which exist mostly in combination with 25 parts of carbonic acid.

The flavor of beet root molasses is so unpleasantly salt and bitter, that it is not utilized in the raw state for human consumption, but is generally either distilled into brandy or alcohol, fed to farm stock, or even, in some cases, used as a fertilizer.

An allowance of 3 to 4 lbs. of molasses per day to a fattening ox, or 1 lb. to a wether, is found to be highly conducive to rapid increase in weight. When given to dairy cows in the proportion of 4 lbs. per day along with beet root pulp and other food, it renders them very productive at a season of the year when provender is scarce and costly.

No satisfactory practical method has yet been discovered for separating, on a large scale, the molasses from its accompanying impurities, although it is known that a considerable portion of these may be removed by the tedious and expensive process of dialysis, for details of which we must refer the reader to the labors of Graham, Tilloy, Walkhoff, Stammer, and Dubrunfaut.

The quantity of mineral salts in molasses may be determined directly, if desired, by Dr. Wieler's *halometer*.

All experiments made in regard to isolating the sugar in molasses, in an insoluble form, have failed so far, in an economical point of view, but as sugar combines with barytes, stronthia, lime, and other bodies forming compounds, which are insoluble at the boiling heat of water, and which subsequently can be made to free their sugar by the action of carbonic acid gas, we have good reason for hoping that ere long this desirable result will have been attained.

It is well known, that if hydrate of barytes be mixed with sugar in solution, a solid granular saccharate is produced, which precipitates by boiling, and may be washed clean in hot water. If this saccharate of barytes be dissolved in cold water, and a current of carbonic acid gas introduced in the solution in a carbonatation pan, an insoluble carbonate of barytes is formed and precipitated, and the sugar is set free.

This process would be admissible if the barytes, which is highly poisonous, could subsequently be entirely got rid of, which, unfortunately, cannot be done in our daily practice.

Stronthia and lime have been used in the same manner as barytes, the sugar being subsequently washed with alcohol to clear it of extraneous matter. For this purpose 300 lbs. of molasses, 110 lbs. of lime, and 360 quarts of alcohol of 82 to 85 per cent are stirred together from half to one hour. The saccharate of lime formed is then pressed, and the alcohol, after being run off, is filtered and kept for use again during repetitions of the same operation.

The saccharate is dissolved in cold water, submitted to the action of carbonic acid gas, and the remaing solution filtered, boiled down, and crystallized. About 25 per cent of the sugar contained in the molasses may thus be recovered. When the price of sugar is high, this process may often be profitably practiced.

The disagreeable taste of the beet root molasses may be removed to the extent of rendering it palatable, and even very marketable, by simply boiling it carefully with a minute quantity of sulphuric acid, and neutralizing the excess of acid by means of powdered chalk, or limestone. Phosphoric acid has also been used for this purpose, as also for getting rid of the lime, in the shape of a phosphate.

The relative quantities of crystallizable and non-crystallizable sugar remaining in the molasses, are, in general, rapidly determined by the manufacturer and sugar dealer by means of optical polarization instruments, of which the best are Mitcherlich's and Bentzke-Soleil's. Full instructions for their use is furnished along with them to purchasers, for which reason we shall here dispense with a description of these valuable saccharometers.

A comparatively exact chemical method for determining the amount of non-crystallizable sugar in sirups and molasses is given by Freiling, as follows:

1. Dissolve 40 grammes of pure sulphate of copper in 160 grammes of water.

2. Put 200 grammes of tartar (*Tartarus natronatus* of druggists) into a small quantity of water, and add 750 grammes of a caustic soda solution of specific gravity 1·2.

3. Mix the two above solutions.

4. Add water until the bulk is equal to 1154·5 cubic centimeters.

5. This forms a blue standard solution, in which 10 cubic centimeters contains oxide of copper sufficient for the reduction of 0·05 gramme of uncrystallizable sugar.

5. Put 10 cubic centimeters of the above in a clean vessel, and add 40 cubic centimeters of water.

6. Heat to boiling point.

7. Add, drop by drop, a solution of the sugar or molasses containing not more than 0·5 gramme of sugar to 100 cubic centimeters of water, until complete decoloration has taken place, or all trace of a blue tint has disappeared.

A very simple calculation then furnishes, as will be seen, the quantity of non-crystallizable sugar in the sample under examination.

Let us conclude this dissertation on the chemistry of beet root sugar by remarking that strong acids, such as sulphuric or muriatic, introduced into saccharine solutions of cane or beet sugar, and heated to from 156° to 166° Fah., have the property of converting the whole of the crystallizable into non-crystallizable sugar.

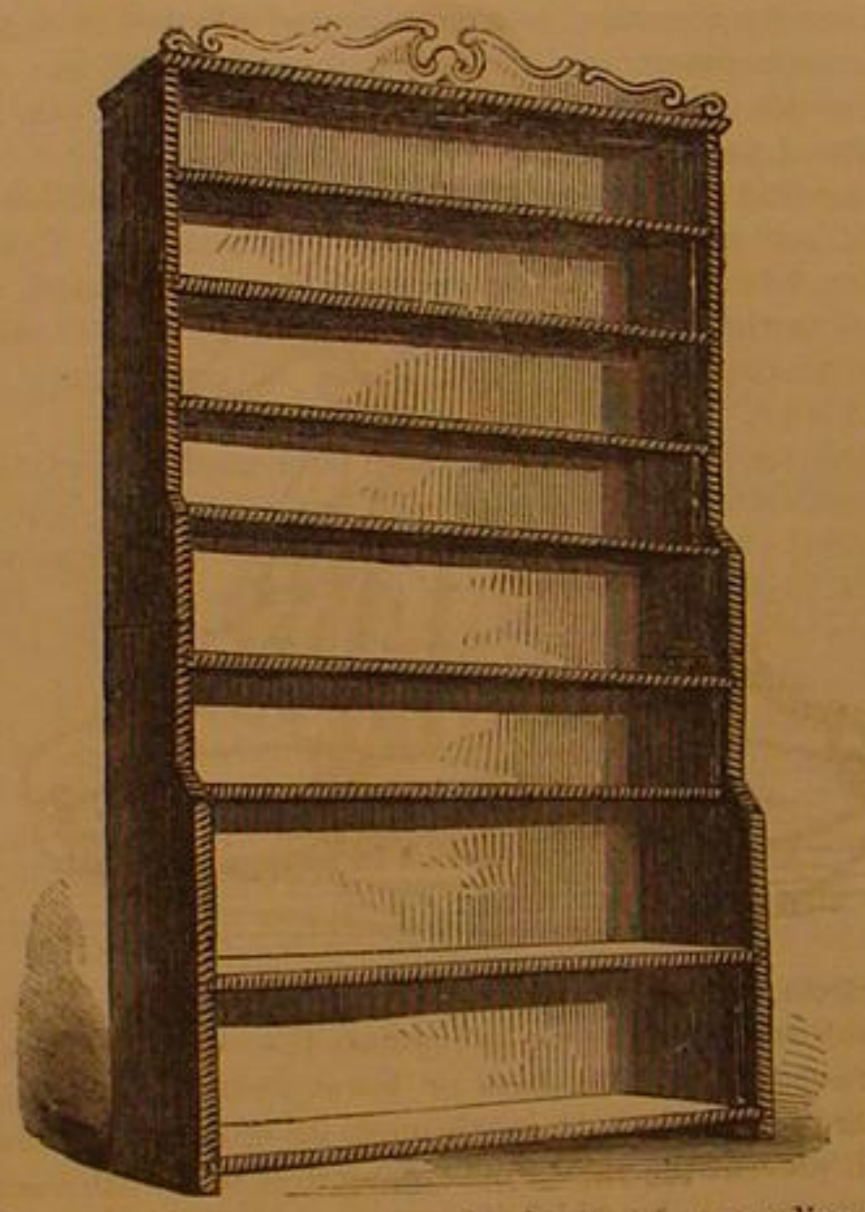
In our next article, we shall proceed with the further practical treatment of the juice of the beet root after its carbonatation has been effected.

Heat of the Stars.

The London *News*, in speaking of the heat of the stars, says: "It would scarcely be thought by most persons that the stars supply the earth with an appreciable amount of heat. Even on the darkest and clearest night, when the whole heavens seem lit up by a multitude of sparkling orbs, the idea of heat is not suggested by their splendor. It will, therefore, seem surprising to many that men of science should assign no inconsiderable portion of our terrestrial heat supply to those distant twinkling lamps. It is not many years since Professor Hopkins, of Cambridge, went even further, and expressed his belief that if the earth's atmosphere were but increased some 13,000 yards in hight, so as to have an increased power of retaining the warmth poured upon it from outer space, we might do without the sun altogether, so far as our heat supply is concerned. As a glass house collects the sun's heat and renders it available during the time that the sun is below the horizon, so he held that the additional layer of air would serve to garner the warmth of the stars in quantities sufficient for all our requirements. But until lately all these views, however plausible they might have seemed, had not been founded upon facts actually observed. It has been reserved for these days in which discoveries of the most unexpected kind are daily rewarding the labors of our physicists to see that established as a certainty which had before been founded merely upon considerations of probability. Mr. Huggins, the physicist and astronomer, has just published the results of a series of inquiries addressed to the actual measurement of the heat which we receive from the leading brilliants of the nocturnal sky. The instrument called the galvanometer, which has been made more or less familiar to many of us by the researches and lectures of Mr. Tyndall, was made use of by Mr. Huggins in these investigations. The instrument was fixed by Mr. Huggins' large refractor, so that the image of a star formed by the eight-inch object glass might fall upon the surface of the thermopile. It will give some token of the care required in researches of this sort to mention that the apparatus had to be left attached to the telescope for hours, sometimes for days, until the needle, whose motion marks the action of heat, had come to perfect rest. When the time came for making an observation, the shutter of the dome, which covers the telescope, was opened, and the telescope was turned upon a part of the sky near to some bright star, but not actually under the star. Then the needle was watched to determine whether the change of position had produced any effect. If, in four or five minutes, no signs of change were shown, the telescope was moved over the small distance necessary to bring the image of the star directly on the face of the pole. Almost always the needle began to move as soon as the image of the star fell upon it. The telescope was then moved slightly away again from the star; the needle was then seen to return to its place. In this way from twelve to twenty observations would be made upon the same star, so that no doubt might remain as to the motion of the needle being really due to the star's heat. In this way, it was found that the bright Arcturus moved the needle three degrees in about a quarter of an hour. So did Regulus, the leading brilliant of Leo, the constellation at present adorned by the splendor of ruddy Mars. Pollux gave a deflection of one and a half degrees; but, singularly enough, his twin brother, Castor, produced no effect at all upon the needle. The splendid Sirius gave deflection of only two degrees; but as this star is always low down, and so shines through a greater proportion of the denser atmospheric strata, it is not surprising that its heat should not be proportioned to its brilliancy."

HASKELL'S PORTABLE BOOKCASE.

"Three removes are as bad as a fire," says Poor Richard, and in no sense are the cost and annoyance of a removal more severely felt than in the unavoidable injury to furniture, and the difficulty of adapting the old articles of furniture to the requirements of the new abode. Peculiarly is this the case with regard to the depository for books. If the victim is of a literary turn, and therefore has accumulated a store of books, he knows the advantage of having a bookcase familiar to his touch as well as his sight, from which he may select a volume without the time and annoyance demanded by undirected search. So a bookcase in which every volume may be found at will is a valuable article of furniture, and if it has the advantage of portability its value is greatly enhanced.



The engraving represents a bookcase of a peculiar style, patented by Ezra Haskell, of Dover, N. H. It may be built of any size, and of any kind of wood. One in our office is of black walnut, eight feet by four, surmounted with an ornamental scroll and holding eight shelves, sufficient to accommodate 250 volumes, of the sizes usually found in a miscellaneous library. Each shelf is hinged to a board forming the back, to allow it to be folded together when the shelf is taken from the upright sides. These sides are grooved to receive the ends of the shelves, which have a projecting iron that engages in a saw scarf in the upper side of the groove, by which contrivance the parts of the case are held firmly together. The sides of the case are hinged at the middle of their length so they can be folded when the case is to be removed. The whole case may be contained in a box 14 by 16 inches and 4 feet long. No tools, screws, nails, etc., are required in taking down or putting up, and when in place the case is an elegant as well as compact piece of furniture. Rights to manufacture or the bookcase may be had of Howard Gannett, 40 Winter st., Boston, Mass.

FREE TRADE AND PROTECTION.

Free trade in its unlimited sense, such free trade as is preached by the most vociferous of its advocates, means dependence upon foreign sources for everything that can be produced abroad cheaper that it can be made at home. It means death to the manufacturing and mechanical interests of the country, and the conversion of the enterprising mechanics, who now add so much to the industrial wealth of the nation, into agriculturists. It means a glut in the market of all agricultural products, and consequent low prices and discouragement to those engaged in agriculture. It means exposure to sudden deprivation of those necessaries of life for which we rely upon foreign sources, at any time our foreign relations become disturbed, consequent and large advance in their price, and distress resulting from diminished supply.

Protection, on the contrary, does not imply prohibition, as it opponents, many of them, unfairly claim. It means only the proper adjustment of tariffs so that we can compete with foreign producers in all those industries, which may, with moderate encouragement, thrive here, and for which we possess equal natural advantages with foreign competitors. It means protection to labor against forced competition with the cheap labor of Europe. It means opportunity for those whose natural genius leads them into other fields of industry than agriculture, to develop that genius and thus add to the mental wealth of the country as well as to its material resources.

All cannot be successful farmers or merchants, and any policy which tends to confine the abilities of men to any one channel, however broad that channel may be, is a bad policy.

We hear a great deal about the distinction between a revenue tariff and a protective tariff, as though these were and ought to be considered separately; we do not believe in this distinction. We hold that the best revenue tariff will be the one that protects the industries of a commonwealth—the sources from which all revenue must come, notwithstanding the sophistry by which it is attempted to disguise this important and fundamental truth.

No more fatal error has ever found adherents in the political history of our country than the doctrine of "free trade." When mankind become one nation, one brotherhood; when all produce equally, not alone for self but for the good of the whole; when ignorance, and greed, and lust of power no longer exist; when the millennium has come, free trade will be the thing. Meanwhile we seem to live in an epoch some thousands of years too early for that blissful consummation.

The truth of the above proposition is found not only in logical conclusions from well-established premises, but in the history of the United States for the last half century. The tariff of 1833 produced its legitimate results in the ruin of 1837, and the country recovered only under the protective tariff of 1842. The subsequent adoption of a free trade policy in 1846, brought us to the very verge of disaster in 1849, which was staved off for a few years by the gold production of California. But 1857 brought the climax of distress upon the country, and there are many young men who can remember that bitter lesson. To use the words of Henry C. Carey—"Once again do we find the country driven to protection, and the public credit by its means so well established as to enable the treasury with little difficulty to obtain the means of carrying on a war whose annual cost was more than the total public expenditures of half a century, including the war with Great Britain 1812. Thrice thus, with the tariffs of 1828, 1842, and 1860, has protection redeemed the country from almost ruin. Thrice thus, under the revenue tariffs of 1817, 1834, and 1849, has it been sunk so low that none could be found 'so poor as to do it reverence.' Such having been our experience through half a century, it might have been supposed that the question would be regarded now as settled, yet do we find among us men in office and out of office, secretaries and senators, owners of ships and railroads, farmers, and laborers, denouncing the system under which, at every period of its existence, and more especially in that of the recent war, they had so largely prospered—thereby proving how accurate has been the description of them by an eminent foreigner as 'the people who soonest forget yesterday.'"

These are well known and often asserted facts, yet blind to their teachings, the preachers of free trade are urging their views upon the public, and enlisting in their behalf even the services of eminent divines and college professors, in order to win by clap-trap a certain class who are led by distinguished names and high-sounding titles. Such men, distinguished for their want of financial ability almost as much as for their great acquirements in letters and theology, are the men who are to instruct the country upon political economy

None are more likely to be deceived by their special pleading than farmers, and no class would be more seriously injured by the adoption of a free trade policy. Far removed from commercial centers, and not conversant with the details of trade, it seems difficult for them to comprehend how cheapening iron and cotton goods should not be beneficial to them. They do not see the connection between the prices of manufactured goods, and the prices of their products, and the value of land. The best way to convince them is to point them to the indisputable fact that when such goods have hitherto advanced in price under the genial influence of protection, their ability to purchase has always advanced in a greater ratio from the consequent increase in the value of farm products. We trust farmers will not permit themselves to be deceived in this matter. Let them judge of the present and the future by the past, which sheds a clear and unmistakable light upon this subject, and in the history of which stand yoked together, invariably, protection and prosperity, free trade and disaster.

The Manufacture of Mustard.

In the preparation of mustard, the seed is first crushed between iron rollers, and then pounded in smooth iron mortars, each about one foot in diameter. These mortars are arranged in a single row, near the walls of some of the rooms, and the crushed seed is pounded in them by large iron bulbs, which are worked by machinery. Each bulb is attached to a long wooden rod, which is raised a few inches by an arm projecting from a rotating shaft, and then falls by its own weight. Several scores of these automatic pestles and mortars soon reduce the crushed seed to the condition of flour and bran, of a dark, dirty color, in consequence of the non-seperation of the seed. The flour and bran are then seperated from each other by means of silk sieves. Eight of these sieves are placed loosely inside a large square horizontal frame of wood, suspended by chains at each of its four corners. Violent eccentric motion is given to the wooden frame, by means of an iron rod passing down its centre, and the sieves have an additional motion of their own in consequence of their being loosely fitted in the frame. In one room alone there are nine of these frames at work, carrying altogether seventy-two sieves of various degrees of fineness. The finer the sieve, the more does the mustard improve in color, and the husk is thrown aside to be made into manure cake for the land; two kinds of seed are thus treated, the brown and the white; the former being much more pungent than the latter, and the two descriptions being mixed to suit the public taste.

PRACTICAL SUGGESTIONS ON TANNING LEATHER.

BY C. GILPIN.

(Continued from page 280.)

UNIFORM TEMPERATURE OF LIQUORS AND DISINTEGRATION OF BARK.

It is generally conceded that the process of tanning is much more rapid during the summer months than through the colder seasons of the year. In other words, the tannin penetrates the hide much more readily during the months of May, June, July, August, and September, than during the other seven months of the year. Those who have given this subject any attention, have doubtless observed that during the summer months the liquor ranged from 70° to 80° Fahrenheit, and fell as low as 35° and 40° during the colder seasons in this climate, and perhaps lower in more northerly latitudes. What the difference in time required, to tan out a stock handled regularly in the liquors of the temperatures named, might be, I regret that I have no exact means of presenting to the trade, at this time, but shall endeavor to possess the information at no distant day, when I will make it public. One fact all are aware of, that it takes considerable less bark to maintain the liquors up to a certain degree of strength in cold than it does in warm weather; the tanning principle not being so rapidly absorbed by the hide, less bark is ground during the winter months.

I can well recollect when it was the custom among tanners to lay away their stock in very heavy layers during the month of October, after sending off all that was ready for market, and letting it lie until the frost was entirely out of the ground, when it would be drawn, and, as a consequence, was found to be but little advanced during that period.

It may be asked upon what principle can this be accounted for, and what is proposed as a remedy. The causes appear obvious, upon the well-settled principle that all matter animate, as well as inanimate, is influenced by the elements, heat and cold, throughout all nature, to a greater or less degree, contracting and expanding the most solid metals, as well as the most delicate animal and vegetable formations; hence, when the liquors are below the expanding temperature, the hide contracts and the pores necessarily become more or less closed, and, when at that point, cause the hide to expand and the pores to open, just in proportion as the temperature is raised, until the whole mass may be disintegrated and a chemical change produced, which alters the entire organic structure of the material operated upon; thus it is clear that when the temperature of the liquors is allowed to fall below the expanding degree, the capillaries, by contraction, present an obstacle to the free passage of the tannin, and it cannot be taken up so rapidly; hence a much longer time is required to accomplish the object.

Having endeavored to define the cause, we will suggest a remedy, which will be to introduce, into every department of the yard, a regular temperature of liquor; and the facility with which the liquors can always be kept at a certain temperature, is the best reason why the manufacturer should lose no time in adopting it, particularly when, as a general thing, they have the facilities for supplying themselves with all the heat that may be necessary for this purpose; and, as a further auxiliary, all the operations of the tannery should be housed in good comfortable buildings, with steam pipes running through them, that would keep them at summer heat, or as warm as experience found necessary, then the junk through which all the liquor passes, should, by means of steam pipes, have sufficient heat thrown into it to insure the desired temperature throughout the entire yard at all times.

Thus, the liquor, passing from the vats to the junk, thence upon the leaches, with the entire establishment kept at a mild temperature, would, it is believed, accomplish all that is deemed necessary to overcome the loss sustained by the inaction produced by cold and freezing weather upon the operations of tanning.

The expense of putting in pipes for the purpose of generating heat sufficient to warm the building, should be no obstacle, when we consider the cost as compared with the advantages gained. Mr. James Calley, of Pittsburgh, informed me that the cost of putting in twelve hundred feet of three-quarter pipe, was two hundred dollars; this included all expenses; and from information received through well-informed sources, it is believed that the whole cost of fitting up a first-class tannery, with the necessary apparatus in the way of pipes, to accomplish our object, would not exceed twelve to fifteen hundred dollars, while the actual amount saved in time and labor in handling the stock, would, it is believed, fully equal one-half of the cost annually, to say nothing of making the workmen more comfortable, and thereby saving time that is always lost in warming feet and hands, in cold, frosty weather, which is the necessary consequence in all yards exposed to the frosts of winter, particularly in northern latitudes.

In communicating with the manufacturers upon the subject of having the bark thoroughly disintegrated before leaching, they pronounced, with one accord, that this was a great desideratum, if not the greatest want, in the operations of tanning. Now, that we have a system of leaching upon the upward hydraulic pressure, by which the liquid can be forced through any density that bark might acquire by being ground never so fine; believing, as most of them do, that under the present imperfect systems of preparing the bark, a considerable portion of the tanning principle is not, and cannot be extracted, under the methods of leaching in general use, without the application of steam and boiling, or very hot liquids, which, it has been repeatedly shown, are generators of impurities, that have an injurious influence upon the leather, what we want is a machine that will thoroughly separate the bark, and discharge it into the leach in the form of saw-dust or shreds, allowing no part of it to escape without being brought to this condition. The best prepared bark that ever came under my notice, was prepared with stones arranged upon the plan of mill stones. It was thoroughly pulverized, or, perhaps, I might more properly say, ground into shreds. Under this method of grinding, no lumps or thick pieces could escape, as is the case now with the most approved mills in use. It would appear, from the past history of the world, in all ages and in all professions, that human nature has been averse to changing old methods for new ones, and the most useful as well as the most profitable improvements, have, too frequently, lingered longer in the murky and almost impenetrable atmosphere of prejudice, and those inveterate old fogies, custom and habit, than the advancement and interests of the great industrial pursuits of life would seem to demand. Yet, however much we dislike change in our systems of doing business, it is among the inevitable consequences, that necessity moves more individuals to adopt improvements than a desire to promote and encourage progress.

PALLISSARD'S WALKING SUPPORT FOR INFANTS.

The device herewith represented is intended to aid infants learning to walk, to prevent them from getting into danger and receiving hurts, and to relieve the mother, nurse, or attendant, from constant care and anxiety. Around the infant's body is secured a cushioned ring made to open on a hinge and properly fastened. It may have straps, if necessary, passing under the child's thighs for support. It is connected to a

lower circle, or ring, of metal by four ornamental bars having adjustable screws at the top to regulate the hight and adapt it to the occupant. The base or lower circle is of such a diameter that it will not pass through an ordinary doorway, and will prevent the child from coming in contact with chairs, tables, stoves, etc., by which it may receive injury. The base is supported on easily-working casters that allow the contrivance to turn or move in any direction over the floor, as the child may incline its body or direct its feet. Its great diameter precludes the possibility of overturning. A little shelf may be affixed to the supporting ring, on which articles of food, or toys, may be placed for the amusement of the infantile occupant.

Patented through the Scientific American Patent Agency, June 12, 1866, by P. Pallissard, who may be addressed at Kankakee City, Ill.

A NEW PROCESS FOR DETERMINING THE COMPARATIVE VALUE OF WHITE LEAD.

BY PROF. C. F. CHANDLER.

To determine the comparative value of different samples of white lead, it has generally been considered necessary to submit them to chemical analysis; an operation which can only be performed by a skillful chemist, and which, if carefully executed, requires much time, and involves, consequently, considerable expense.

It is therefore extremely important that a simple test should be devised, one so easy of execution that it may be applied by all persons interested in paints. Such a test was recently suggested to me by a person who has had many years of experience in the white lead industry, and who desired me to submit his plan to a careful examination to test its reliability. This I have done, and the results are so satisfactory that I desire to place them before your readers, that those interested in the purchase and use of white lead may avail themselves of the test.

PROPERTIES OF WHITE LEAD.

The great value of white lead as a pigment depends upon its opacity, or as painters express it, its "body," or "covering power." Pure white lead differs in opacity to a limited extent, according to the process by which it is made; that prepared by the Dutch method having the greatest covering power. The commercial varieties of white lead differ, however, to a far greater extent, owing to the extensive adulteration which is now practiced; sulphate of baryta, or barytes, a very heavy mineral, much cheaper than white lead, being the chief adulterant employed. The objection to the barytes is its transparency or want of body; it is not opaque, and consequently it does not cover well. A much larger quantity of the adulterated paint is required to produce the desired effect.

There is another objection to barytes, it has no affinity for the oil, and, consequently, when the adulterated paint is applied to surfaces which are exposed to the weather, as on the outside of houses, the oil quickly disappears, leaving the pigment loosely attached, and ready to be washed off by the rain.

Such paint rubs off readily upon our clothes when we come in contact with it.

White lead is a compound of carbonate and hydrated oxide of lead, which unites with the oil to some extent, producing a hard surface, which resists for a much longer time the action of the elements. Oxide of zinc has a similar property.

From these statements the importance of a simple test of the quality of white lead will be readily seen.

THE TEST.

The value of white lead depends upon its opacity; the more opaque it is, the more completely will it conceal a dark color. The test consists, therefore, in mixing a definite quantity of a dark pigment with a definite quantity of the white lead, spreading the mixture on a suitable surface, and noting the tint produced. In my experiments 100 grains of the pigment white lead, ground in oil, as it comes from the mill, were mixed with one-half grain of Eddy's best lampblack, and four drops of boiled linseed oil. These substances were thoroughly incorporated, and then spread upon sheets of window glass, 6 by 12 inches, with a steel spatula. A few of my experiments will best illustrate the test. Pure carbonate of lead and pure sulphate of baryta, both ground in oil, were employed; one-half grain of Eddy's dry lampblack, and four drops of boiled linseed oil, were mixed with—

	White lead.	Barytes.	Color produced.
1st........	100 grains	0 grains	light drab.
2d.........	95 "	5 "	slightly darker drab.
3d.........	90 "	10 "	" " "
4th........	66⅔ "	33⅓ "	" " "
5th........	50 "	50 "	" " "
6th........	33⅓ "	66⅔ "	" " "
7th........	0 "	100 "	black.

The specimens were submitted to six different persons successively, and all agreed in pronouncing them as above recorded. Five per cent may therefore be considered the limit of the accuracy of this test.

OXIDE OF ZINC.

As oxide of zinc is often mixed with the white lead, experiments were made to determine the effect of this pigment upon the tints. The best American zinc white was employed. One-half grain of lampblack, and four drops of boiled linseed oil were mixed with—

	White lead.	Oxide of zinc.	Barytes.	Gave color.
1st....	33·33	33·33	33·33	light bluish drab.
2d.....	50	25	25	darker bluish drab.
3d.....	50	12·50	37·50	still darker bluish drab.
4th....	50	6·25	43·75	" " " "

The tint of the mixtures containing oxide of zinc was quite different from that obtained without the addition of this substance; while with white lead alone, or white lead and barytes, the color was a pure drab; the presence of six and a quarter per cent of oxide of zinc was sufficient to communicate a very decided bluish tint. I think as little as two per cent of oxide of zinc would make itself apparent in this way. This difference in tint makes it a little difficult to decide between two samples of adulterated white lead when one does, and the other does not contain oxide of zinc, as between tints so different in character, it is not easy to decide which is the darkest. In doubtful cases, however, this difficulty may be overcome by adding to both samples the same weighed quantity of oxide of zinc, say ten grains to each.

The colors communicated by the lampblack will then be of the same bluish tint, differing merely in intensity.

The only practical objection to this method of testing will arise from the difficulty of weighing half a grain of lampblack with sufficient exactness.

In my experiments, a chemical balance, which shows the thousandth part of a grain, was employed. The practical painter, however, will have no difficulty in applying this test with sufficient accuracy, if he will weigh out in ordinary scales, say 100 ounces (6¼ lbs.) of each sample to be compared, adding to each half an ounce of dry lampblack and an equal quantity to each sample of boiled linseed oil. After mixing the lead, black, and oil together, *very thoroughly*, spread each sample on glass, wood, or other smooth surface, as nearly alike as possible, when the difference in depth of color, produced by the black, will determine the comparative value or body of each sample.

The sample *most discolored* will have the *least body*, and that *least discolored* the *most body*.

Another very simple test for determining the comparative value of *any white paint* ground in oil, was suggested by the same person—the correctness of which I have fully demonstrated—namely, weigh out, say 100 grains of each paint to be compared, add three drops of linseed oil to each, and spread them with a steel spatula on sheets of glass, 6 by 12 inches, as nearly as possible in the same manner. Place the samples thus prepared between yourself and the light, and you will have no difficulty in deciding which is most opaque. The sample which has obsured the light the most, or appears the darkest when held between yourself and the light, must have the greatest body or covering capacity.

CONCLUSION.

After having made a great number of experiments with these tests, I am satisfied that when they are applied with ordinary intelligence, they will not fail to determine the comparative value of the different grades of white pigments. I would advise every person who makes use of these tests to begin by preparing a series of standard plates for comparison, selecting samples of paint obtained from the most reliable makers.

The East River Bridge.

The Government Commission, appointed to examine into the feasibility of the East River Bridge, has accomplished its task, and has approved all the calculations of Mr. Roebling, the engineer, regarding it. Authority will doubtless be given to begin the work on the return of the Commissioners from a visit to the suspension bridges at Cincinnati, Pittsburgh, and Buffalo, when they will present their report.

The first operations, says the *Evening Post*, will be upon the Brooklyn side, near the Fulton Ferry, where excavations will be made, ninety-seven feet, down to the rock upon which the foundations of the abutment towers will be laid. Digging on the New York side will immediately follow, near Pier 29, East River. Rock is there found at one hundred and seven feet, and is of the gneiss description generally found on Manhattan island.

The new bridge will be a striking and graceful feature of the surrounding scenery. Its proportions will be colossal. The entire length will be 5,862 feet, or about a mile and one-ninth, these figures may vary slightly when the termini become finally settled. The New York terminus will either be on Chatham street, opposite the Register's office, or in Chatham Square. The terminus in Brooklyn will be near the junction of Main and Fulton streets. The structure will thus overtop many houses which are situated upon the slope toward the river on each side. It will be suspended in three openings, two of which will be on land, and one, of 1,600 feet, over the water. The floor will be both fire and water-proof, and will serve as a roof to the houses and stores beneath. Its width will be 80 feet within the railings, equal to Broadway, and will be divided into five spaces, marked by six lines of iron trusses, independently of a sidewalk of six feet on each side.

As the new bridge will weigh 3,483 tuns, being far more than twice as heavy and wide as any other structure of the kind in existence, the jar upon it will be scarcely perceptible, and the most violent winds will be powerless against it. Its weight, in the daytime, will be perpetually augmented by more or less cars, carts, animals, and human beings. The maximum weight of these, if covering the entire surface, would be 1,270 tuns, but an average of about 400 tuns may be calculated on. Two passengers train of cars, upon steel rails, will run backward, and forward over the bridge alternately. They will be attached to an endless wire rope, propelled by a stationary engine on the Brooklyn side. Their speed may be at twenty or thirty miles an hour without injury to the structure. The hight of the bridge, above high tide, will be one hundred and thirty feet, and vessels, the upper masts of which exceed that measurement, will be required to lower them on passing, which can be easily done. Prominent features of the work will be the towers on each side of the river. Their length at the base will be one hundred and thirty-four feet, and extreme width fifty-six feet. Their hight to the roof will be two hundred and sixty-eight feet, at which point the length will be reduced to one hundred and twenty feet, and the width to forty feet.

The charter of the company does not provide for the opening of new streets in the neighborhood of the bridge, nor for other improvements. It is suggested by the architect that one or more blocks between William and Rose, or between Rose and Vandewater streets, should be turned into market halls. A market, he also thinks, might be built in James street, next to the anchorage in Brooklyn.

The estimated cost of the bridge is to be $6,675,357, without the purchase of real estate on either side. It will, perhaps, be nearer $7,000,000. Of this, $5,000,000 have been raised—$3,000,000 by the Brooklyn Common Council, $1,500,000 by that of New York, and $500,000 by private subscription. When the work will have become far advanced, through the expenditure of the $5,000,000 it will be easy to issue bonds for the remaining sum needed.

The Union Ferry Company are now transporting forty million persons annually across the East River. The travel by horse-railroad cars in this city is over one hundred millions a year. It is thought that the certain communication, in all weathers, from Brooklyn, afforded by the bridge, will cause a vast influx of residents to Long Island, in preference to New Jersey, and that in 1880 the amount of passengers to and from Brooklyn will approach one hundred millions a year. The traffic upon the bridge will in no wise injure the shore travel of the ferry boats. It will simply prevent an increase of their number, and an additional obstruction to the shipping of the river.

The Earliest American Engraver.

Mr. Nathaniel Hurd was undoubtedly the first American engraver. Mr. Hurd was born in Boston, Mass., on the 13th of February, 1730. In Buckingham's *New England Magazine* appeared a series of articles on "Early American Artists and Mechanics," the first number of which (Vol. 3, July, 1832) was devoted to an account of Mr. Hurd, accompanied with a portrait. This writer says: "Among our seal cutters and die engravers and engravers on copper was Nathaniel Hurd. His grandfather came from England and settled in Charlestown. He died in that town in 1749, aged 70. His son Jacob married the only daughter of John Mason, of Kingston, in the Island of Jamaica, and died in the year 1758. He was the father of Nathaniel Hurd, who is the prominent subject of this memoir."

Hurd was a real genius. To a superior mode of execution he added a Hogarthian talent of character and humor. Among other things of his, he engraved a descriptive representation of a certain swindler and forger of bills, named Hudson, a forgner, standing in the pillory. In the crowd of spectators he introduced the likenesses of some well-known characters, which excited much good-natured mirth.

The following is an entertaining account of this print:

"In the year 1672 there appeared in Boston a curious character, who called himself Doctor Hudson. He gave out that he was a Dutchman, that he was possessed of a large fortune, and that he was traveling for his amusement. He was dressed very gayly, tried to push himself into genteel company, and, though rather expensive in his appearance, he showed but little money and displayed no resources. He was well watched. After some time, a fellow was detected in putting off a note purporting to be from the Treasurer of the Province, which proved a counterfeit. His name was Howe; he confessed he was a partner in villiany with Doctor Hudson, and that they had been privately engaged in making up a number of the province notes, which were in high credit in this and the neighboring provinces, and sold readily at an advanced price. The doctor was also taken into custody. They were tried and convicted; Hudson was ordered to the pillory, and Howe to the whipping post. The execution of their sentence was accompanied by the collection of an immense crowd, and immoderate exultation.

"Hurd immediately put out a caricature print of the exhibition, which excited much attention. Hudson was represented in the pillory, and at a short distance was Howe, stripping, near the whipping post. The devil is represented flying towards the doctor, exclaiming, 'This is the man for me.' In front of the print is the representation of a medallion, on which is a profile of Hudson, dressed in a bag-wig, with a sword under his arm (as he generally appeared before his detection) partly drawn from the scabbard, with the words 'Dutch Tuck,' on the exposed part of the blade. Round the edge is 'The true profile of the notorious Doctor Seth Hudson, 1762.'

"In an obituary notice of Mr. Amos Doolittle, of New Haven, Conn., published in *Silliman's Journal of Science and Arts* (Vol. XXII., page 183), April, 1832, it is claimed that he was 'the first person who engraved on copper in this country.' This notice states that his first attempt was a print of the Battle of Lexington, after a drawing by Earl, in 1775, which was only two years prior to the death of Mr. Hurd, as will be seen by the above date, eleven years subsequent to the likeness of Dr. Sewall. Paul Revere also engraved on copper some time before the earliest date claimed for Mr. Doolittle. There is a copy of a print engraved by Paul Revere in the Redwood Library, Newport, R. I., representing the massacre of citizens in Boston, on the 5th of March, 1770, which was issued the same year.

"In the art of line engraving Mr. Hurd was his own instructor, and had he lived to a more advanced age would doubtless have distinguished himself yet more in an art, in the exercise of which it is evident he took great delight, and for which it is equally manifest he possessed both taste and talent. He died 17th December, 1777, and was buried in the old 'Granary Burial Ground' in Boston."

Hydrogen as an Illuminating Gas.

In every process, chemical or mechanical, says the *Mechanics' Magazine*, a certain amount of loss or waste of either material or power must take place. The results obtained by a chemical process never coincide exactly with the theoretical formula, nor, mechanically, can the work done, ever equal the power applied. An ignorance, or, what is worse, a culpable neglect of these fundamental principles, has led scientific fanatics to spend their time, money, and ultimately their lives, in a fruitless search after the impossible. The loss accruing to ordinary gas, from the very commencement of its manufacture, to the moment that it flows from the burners, as a source of illumination, is occasioned by both chemical and mechanical unavoidable imperfections. The latter is caused by leakage, owing chiefly to defective joints, unsound pipes, and the carelessness of those who are concerned in its manufacture and distribution. The former is due to chemical action solely, and could scarcely be prevented, which is not the case with the other sources of loss. About fourteen per cent may be taken as the average loss incurred in the manufacture and burning of ordinary gas, or that which represents the actual discrepancy between the theoretical and practical results. The composition of ordinary gas consists mainly of carbureted hydrogen gases, and as hydrogen itself possesses no power whatever of illumination or brilliancy, it is not, at first sight quite obvious what advantage results from its presence. Any one who has dabbled in elementary chemistry is aware that hydrogen gas, when tolerably pure, burns with a pale blue flame, emitting little or no light, but endowed with a very high temperature. At the same time, by causing its high temperature to act upon other bodies, such as platinum and lime, it develops a flame of great beauty and brilliancy. To a similar cause is due the illuminating properties of ordinary gas. The action of the high temperature of the burning hydrogen upon infinitesimal particles of carbon renders them incandescent, and imparts to the gas its powers of illumination. Hydrogen, therefore, destitute of brilliancy when pure, becomes possessed of that property when in mechanical combination with carbon; in other words, when it is carbureted. If it were possible to bestow upon hydrogen illuminating properties without carbureting it, as in the ordinary manufacture, the whole process would be rendered much simpler and more economical. It has been asserted that it would be found a great advantage to employ a much larger proportion of hydrogen in the ordinary gas than what at present prevails; in fact, to constitute it rather a hydrogen gas than that of which it is now composed. A very large proportion of hydrogen is lost in the manufacturing process, which might easily be preserved and utilized, resulting in the production of a gas of a superior quality. The same may be stated with respect to other volatile and illuminating ingredients, including the paraffine and benzine, which for the most part are left in the bye products. Were hydrogen more carefully sought for and preserved in the manufacture of gas, the volume would be considerably increased, in addition to a greater purity being imparted to the product. It is notorious that the ordinary gas, in many of the smaller towns, is so impure, and possessed of so small an illuminating power, that many persons refuse to have it laid on their premises. A gas composed mainly of hydrogen would be free from most of the noxious and disagreeable properties unquestionably possessed by the present great source of public illumination, but until it can be demonstrated that a better gas can be supplied at the same rate, we shall, as usual in such matters, stick to the old plan of manufacture.

Animalization of Vegetable Fabrics.

In the older theories of dyeing, it was held tha the animal tissues of wool and silk absorbed and retained colors more readily than the vegetable tissues of cotton and linen, by virtue of some peculiar animal substance they contained. As a consequence of this theory, attempts were made to communicate some animal principles to vegetable fabrics, with a view to improving their powers of receiving colors. The use of cow dung in dyeing madder goods; the use of sheep's dung and bullocks' blood, and urine in turkey-red dyeing, were explained, upon the supposition that they animalized the fabric in some way or other. The present view of animalization is, that it is not possible to animalize a fabric in any other way than by actually depositing upon it the animal matter in question, and that any increased facility for taking colors thus communicated, is effected by the animal matter itself held on the fabric, and not by any new property of the fabric itself. Thus, if a piece of calico is steeped in a solution of albumen, dried, and then steamed or plunged into boiling water, the albumen is fastened upon the cloth, and such cloth is then capable of receiving colors from picric acid, sulphate of indigo, magenta, archil, and other coloring matters, which previously had no affinity for the cloth. But it is impossible to look upon the albumen in any other light than as a kind of mordant acting as an intermediary between the color and the calico, differing, however, from ordinary mordants in some essential particulars. Beside albumen, the animal matters called casine and lactarine, possess similar properties, and have been tried on a large scale, but without any marked success, as mordants or bases for some of the colors, which are not attracted by the ordinary metallic mordants. The increased affinity for colors given to calico by oil, could not correctly, under any view, be called animalization, since the oils are all vegetable oils; but in fact there appears to be a considerable analogy between this case of mordanting and that by coagulable animal matters.—*Dictionary of Dyeing and Calico Printing.*

A Colony of Insane People.

Prof. Griesinger, in his work on "Mental Pathology and Therapeutics" says: "A colony of the insane has been formed in the remarkable Belgian village of Gheel, in which, for several hundred years past, lunatics have lived together with the inhabitants, and even resided in their families. In former times people frequently resorted thither to supplicate the aid of Dymphne, the patron saint of the insane, although people are seldom in the habit now of consulting her oracle. Out of a population of about 9,000, it has from 900 to 1,000 inhabitants who are insane. The lunatics enjoy an amount of pleasure and freedom which never could be permitted them in an asylum. All who are capable of it share in the mechanical or agricultural employments of the sane. The treatment in the main, is very mild, and restraint is never made use of without previously consulting a physician. Suicide is rare and the general physical health so good that in 1838 two of the patients reached upwards of 100 years of age. Owing to the peculiar situation of Gheel, escape by the patients is difficult. With all its advantages, it has undoubted drawbacks But the experiment at Gheel has proved that the greater number of the insane do not require the confinement of an asylum; that many of them can safely be trusted with more liberty than those institutions allow; and that association in family life is very beneficial to many insane patients.

Planters, Manufacturers, and Mechanics' Association of the State of Mississippi.

The above association is a branch of the National Manufactures' association. We are indebted to Mr. Chas. H. Hale of Wesson, Miss., for a copy of the proceedings of this society from Oct. 10, 1868, to Jan. 20, 1869. It contains several able addresses, and other interesting matter, and shows that the people of Mississippi are getting into harness and pulling together intelligently for the advancement of the industrial interests of that State.

A State Fair will be held at Jackson on the fourth Tuesday in October, and as we presume many Northern manufacturers will be interested, we call attention to it. We are not precisely informed who may be addressed in regard to it, but presume letters addressed to the treasurer of the above association (Joshua Green, Esq.), at Jackson, will be proper.

VENTILATION.—The Massachusetts Medical Society offer a prize of fifty dollars for the best dissertation, worthy of a prize, which shall describe, in plain language, briefly, "A effective and ready method of ventilating sick-rooms—one that can be put in operation at once, at the moment needed with least difficulty and expense, in houses of ordinary construction." The committee of award consists of five well-known physicians; namely, Morill Wyman, George H. Lyman, Henry G. Clark, Edward H. Clarke, and William Read.

Correspondence.

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

Cheap Gas.

MESSRS. EDITORS:—I send you for publication a few words in reply to an article which appeared in your valuable paper, the SCIENTIFIC AMERICAN, for April 10th, Vol. XX., No. 15.

The article signed "X. Y. Z.," upon the subject, "Cheap Gas," I think is intended to discourage those who hope to secure for New York cheap gas and that of a better quality than has yet been delivered to the consumer. "X. Y. Z." says: "It has often been said, but never proved, that a mode of cheapening gas would be to diminish its cost by saving the amount of freight on the coal used in its manufacture, and that this could be done by making it at the mouth of the mines, and transmitting it, ready prepared, from thence to the center of consumption, which would be a saving of at least $3,000,000 annually."

"But," says "X. Y. Z.," "something stands in the way, which is, that it will take a pressure of 491·74 pounds per square inch to pass through a pipe fifty inches in diameter 195,750 cubic feet of gas per hour." In making this estimate "X. Y. Z." uses a formula based upon a certain result produced in some known case, and he therefore infers that a certain other result ought to follow under other given conditions.

The pipe will be straight and free from any influence tending to check the flow of gas, except from friction, which is proportional, first to the area of rubbing surface, and second to the specific gravity of the gas. The friction of gas upon the pipe is independent of the pressure to which the gas is subjected. That is, the friction of gas along a pipe under a pressure of one hundred pounds per square inch is no greater than if it were only one pound, while it varies with the velocity, the ratio of which "X. Y. Z." does not appear to understand. That gas under a given pressure, moving at a given velocity at the sides of the pipe, will move much faster in the center of the pipe, and with no friction except that of the particles among themselves, must be obvious to the most careless observer; this ratio increases in proportion to the sectional area of the pipe. That fifteen inches water pressure is all that is required to pass in two pipes, of fifty inches diameter each, all the gas necessary to supply New York city and its immediate surroundings, I am prepared to demonstrate to any party of gentlemen who will undertake the enterprise. Instead of a loss of fifty per cent in leakage, there will not be five per cent. I see no reason why there should be any, inasmuch as each and every joint can be driven from both sides, if driven joints were used. A pipe properly laid and lined with suitable material would be perfectly tight and smooth.

When the writer was in New York two years ago the estimate then made for this enterprise, with coal lands sufficient for one hundred years' supply, retort houses, laying of pipes, gas holders, exhausters, and all complete for use, was $32,500,000, which is ample.

When this pipe is laid gas can be sold in New York for $1·50 per 1,000 feet, until which New York must pay present prices for poor gas.

I have made the study of this particular enterprise a specialty for years past, and now am prepared to say that not one obstacle exists to prevent the successful accomplishment of the enterprise, and should "X. Y. Z.," or any other person, wish to meet me before a party of gentlemen ready to undertake a work of this kind, I am ready to convince the most skeptical that it is not a wild scheme but perfectly feasible and practicable, and one that must soon be put in operation.

Wenona, Mich. P. W. K.

Piles Driven by Gunpowder.

MESSRS. EDITORS:—I take the liberty of correcting a little paragraph that appeared in your issue of May 1st, relative to Thomas Shaw's method of driving piles by explosive charges. Instead of the ram being elevated by one charge and driven down by another, but one cartridge is used, as follows: The frame used is an ordinary arrangement, except at the top, where it is provided with a ratchet and pawl to hold the ram up until ready for use. When piles are to be driven, a cast-iron cap is put on the head of the pile, having a small cavity in the upper surface. The cartridge is put in this, and the ram allowed to fall on it by liberating the pawl from the ratchet teeth. A short nipple on the end of the ram strikes the cartridge and explodes it—the result being to force the pile violently down into the earth, and blow the ram back to its highest elevation; the objects attained being to raise the weight by the same force that does the work. By repeated experiments the results obtained by the use of the explosive charge over the ordinary dead fall of the ram alone are as *eight to one*. One man can manage the machine with great ease, supplying the cartridges and letting the ram fall. So quickly does the ram ascend that it is impossible to follow its motion with the eye, and the noise of the "explosion," so-called, is scarcely perceptible, or at any rate not distinguishable from any ordinary mechanical operation. We hope soon to present you with an illustration of it.

EGBERT P. WATSON.

Shipment of Unginned Cotton.

MESSRS. EDITORS.—In No. 4, Vol. XX., new series of your valuable paper, I see the idea suggested by S. D. Morgan, of Nashville, Tenn., of shipping cotton unginned, and believing with him that there would be great advantages, as well to the producer as to the manufacturer, in doing so, I hereby give you a few facts.

In my own State 1,700 pounds of seed cotton will make a bale of 500 pounds of ginned cotton, including the toll to the ginner, which is one-tenth or one-twelfth—1,700 pounds of seed cotton may be compressed in about two bales of the usual sizes of ginned cotton. The producer will save 170 pounds of seed cotton, now worth about 4 cents per pound, $6·80; less baling and ties for one bale, $2·50; balance in favor of producer, $4·30.

The benefit for the manufacturer will be, first, the greater facility in removing all trash with proper machinery before ginning; second, the better ginning of the cotton and the saving of one set of machinery and a great deal of labor; third, all the cotton seed and the oil contained therein.

I am satisfied that this plan would result to the advantages of both the manufacturer and producer. There is a large amount of cotton seed now shipped to Liverpool on account of the oil contained in the seed. The oil cake is fed to cattle. Why not ship the fiber with the seed at once? The cotton fiber during the time of transportation will improve in strength, when adhering to the seed; and there cannot be any doubt, that wherever steamboat or railroad facilities exist, it would be better to ship cotton as fast as gathered in the field with the seed, instead of storing in open pens, where the seed as well as the fiber, is injured by exposure to the weather, now frequently the case with us. H. MILLER.

Belleville, Texas.

Toothache.

MESSRS. EDITORS.—If any of your readers suffer from toothache, or neuralgic affections, arising from teeth in any stage of decay, they may experience relief instantaneous and permanent (at least so far as indicated by the experience of the writer hitherto), by saturating a small bit of clean cotton wool, with a strong solution of ammonia, and applying it immediately to the affected tooth. The pleasing contrast instantaneously produced in some cases causes a fit of laughter, although a moment previous extreme suffering and anguish prevailed.

I have used the remedy for over one year, and have obtained sufficient proof of valuable result to warrant publication. ENTERPRISE.

Cincinnati, Ohio.

Zinc for Roofing.

MESSRS. EDITORS:—I understand that some of the Eastern railroads are making use of zinc as a roofing material for their cars, and that in some portions of the oil regions it is also used for tanks.

Will you allow me to inquire of those of your readers who have had some experience in using it, as above stated, in what way it has been used and with what success?

La Salle, Ill. W. F. KEELER.

Question about Milling.

MESSRS. EDITORS:—I would like some practical miller, who has made experiments and can give a true explanation, to answer the following.

Will a 30-inch burr millstone grind ten bushels of wheat or corn in one hour with less power than a 48-inch stone? If there is any difference in the amount of power expended which stone has the preference N. H. ELLIS.

Croton, N. Y.

Blowing a Wineglass.

I spent hours in the workroom of Murano, at Venice, fascinated, despite the blinding heat, by the fairy forms and rainbow hues evolved before my eyes; by the intense, grave, silent enthusiasm of the workmen, which extends itself even to the small children admitted to watch the proceedings; by the impossibility of quitting the scene of labor until the piece in hand could be secured from failure by completion. On my first visit the head workman was requested by Salviati to make me any article I might fancy; I chose a wine-glass with a deep bowl, initial stem, and broad ruby-tinted foot. The man dipped his hollow iron rod into a pot of molten white glass, caught up a lump, rolled it on an iron slab, popped it into the furnace, blew through his rod, tossed it aloft, and a hollow ball appeared. His assistant handed him a rod of metal, in which a green serpent seemed coiled in a white cage; this he caught, and, quick as lightning, formed two initials, touching the bowl with the tip of the M, to which it adhered. Than his assistant offered more white glass, which was joined to the bottom of the M, spun round, opened with nippers, and so the foot was formed. Again into the furnace, and then the shears opened and hollowed the deep and slender bowl. Then the assistant handed a scrap of ruby molten glass, of which the master caught a hair as it were, wound it around the rim of the bowl and of the foot. Once more into an upper oven, where it must remain until the morrow to cool, and then I drew a long breath of relief; for—knowing that if the metal be too hot or too cold, if too much or too little be taken on the rod, the weight and color will be faulty; that too quick or too slow an action on the part of the assistant, in presenting or withdrawing his rod, may spoil the whole—one cannot watch such processes without intense excitement. This excitement the workmen share in their own silent fashion; and when any rare experiment is going on, all gather around the master in breathless anxiety, while no sound comes from the parted lips save in the form of a hint or caution.

Bureau of Printing and Engraving.

Under the new administration of Geo. B. McArtree this important bureau at Washington has already grown into real value and importance, as now the greater portion of the government money will be printed there.

The new arrangements entirely preclude fraud. The checks and balances are plain and comprehensive, and cannot be misunderstood. The superintendents and assistants make out daily duplicate reports of all work in their respective divisions. One goes to the chief of the bureau and the other to the chief of division in the secretary's office. The copper-plate printing division of this bureau is being refitted and the various divisions reorganized.

As it is proposed to issue a new description of paper money, the paper for the purpose is now being manufactured. A paper maker and clerk representing the Government has charge of the mill, and the contractors can work only under their supervision.

Part of the legal tender notes will be printed out of this city and the remainder here. It is now intended to print all of the fractional currency notes here.

The same plan has been adopted in regard to whiskey and other stamps made for the use of the Bureau of Internal Revenue. In the Secretary's bureau a counting room for the blank paper is in operation, while a similar one will be in use in the printing bureau, and the same, with the money after it is made, except that the counter check room is in the Treasure's bureau.

The hydrostatic presses, about ninety in number, will be abolished, and in their stead roller presses will be used with greater economy; no steam is required and the greater safety of the building from explosions is thus obtained.

The employés, men and women, of the bureau, in the various divisions, have been furloughed until the 15th of May. During this interval all the machinery will be put in perfect repair and everything prepared for a fresh start.

It is proposed to call in the fractional currency. No more of any of the series will be printed. The style of the legal tenders or greenbacks will be entirely different from those now in circulation, and as they supply the place of the old the latter will be withdrawn. A set of books will also be kept, in which all the transactions of the bureau will be recorded, and no difficulty will be experienced in the way of making the proper investigations at any time. The old machinery not required will be disposed of, and all useless dies and plates destroyed.

Editorial Summary.

BRITISH IRON-CLADS.—Laird, the notorious ship-builder at Birkenhead, opposite Liverpool, has just launched a turret iron-clad steamer of 4,272 tuns, twin screws, strong ram, and two large turrets, armed with rifled 600-pounders. This model ship has been built by the Lairds on Captain Cole's plans, in the most thorough and costly manner, to test the principle, and is intended to be the finest and most formidable war vessel in the world. Why the British Government is spending such large sums on its navy just now is not very apparent. It may be the Suez Canal; it may be to give Mr Laird the opportunity to atone for his fault in sending out the *Alabama*. Certainly, all things considered, employing him to build a large part of the British Navy is an act of singular magnanimity on the part of the government.

IMPROVEMENTS IN STEAM VALVES.—A new self-adjusting plug cock or valve is at present being introduced, the *Mining Journal* says, which, it is claimed, is superior to those at present in use, both for economy and efficiency. By the employment of an outer shell, forming a heated chamber round the working shell of the valve, expansion and contraction are equalized; while by the use of two inlets and two outlets, the travel of the plug is reduced to one-half, thereby diminishing the friction and the wear and tear. The plug is kept in its position by a spiral spring packing in the center of the cover inclosing the loose spindle. It is claimed that in first cost these valves are cheaper than any others in use, will last double the time, and will not get out of order.

SOURCE OF PATENT OFFICE REVENUE.—The sum of one hundred and fourteen thousand, seven hundred and fifty-six dollars was paid into the patent fund from the New York office of Munn & Co., for the year ending April 13, 1869. This sum does not include several thousand dollars paid in through our branch office at Washington. The professional business of the Scientific American Patent Agency is the most extensive in the world, and keeps pace with the progress of invention. The above figures scarcely need to be commented upon. They point unmistakably to the fact that inventors know where their interests are most faithfully served.

FIFTY MILES AN HOUR.—The great Runcorn Viaduct, carried on ninety-eight arches, completes at last the fast railway line between London and Liverpool, and the whole distance, 200 miles, can now be run in four hours. A saving of time is effected by not stopping for water, which is scooped up from between the rails, when running at full speed, an operation so easy that it might be universally adopted. It is only to have a long trough, let down a scoop, and the water will rush up a tube and fill the tank.

DE-BRANNING WHEAT.—In answer to the inquiry of H. G., of Maine, in our issue of 10th April, S. Bents, of Maryland, writes that the above process is in successful operation in Liverpool, Eng., and that arrangements are making with parties for its general introduction in this country. He also sends us a specimen of the de-branned wheat, which is a nice article. He does not, however, give any details relating to the process

A. T. STEWART'S property on Broadway alone is worth about five millions. W. B. Astor's real estate on Broadway is worth about three millions. The Lorillard estate has eight millions invested in that thoroughfare.

Improved Tuck Creaser for Sewing Machines.

The device shown in the accompanying engravings is intended to be applied to the well-known Wheeler & Wilson sewing machine, but may be adapted to other machines. It is a device for forming the tucks necessary in making the plaits on men's shirt bosoms, and for similar work belonging to the intricacies of feminine habiliments. We profess but little practical acquaintance with tucks, gores, biases, gathers, plaitings, etc, and, therefore, leave these mysteries to those more competent—the feminine portion of the community. But it appears to be certain, that the little device represented in the accompanying engravings is valuable, judging from a merely mechanical point of view, and our lady readers will appreciate the improvement, it being an invention of one of their own sex.

Fig. 1 is a perspective view of the arrangement, and Fig. 2 a vertical section of the drum, holding the pivot of the creaser arm, and a coiled spring with its attachments.

The creaser proper is a needle-like bar, A, with a V-shaped crease in its lower end that fits on a ridge, B. The cloth passes over this ridge, being guided by the gage, C, and held up to the edge of the plate, D, by the serrated guide or pressure pad, E, held to the cloth by an adjustable spring, F, and guiding the goods by the inclination of its serrations. The creaser, A, is operated by the needle bar of the machine, which reciprocates the lever to which the creaser bar is attached, by connecting with it at the point, G, covered with elastic rubber.

Fig. 1

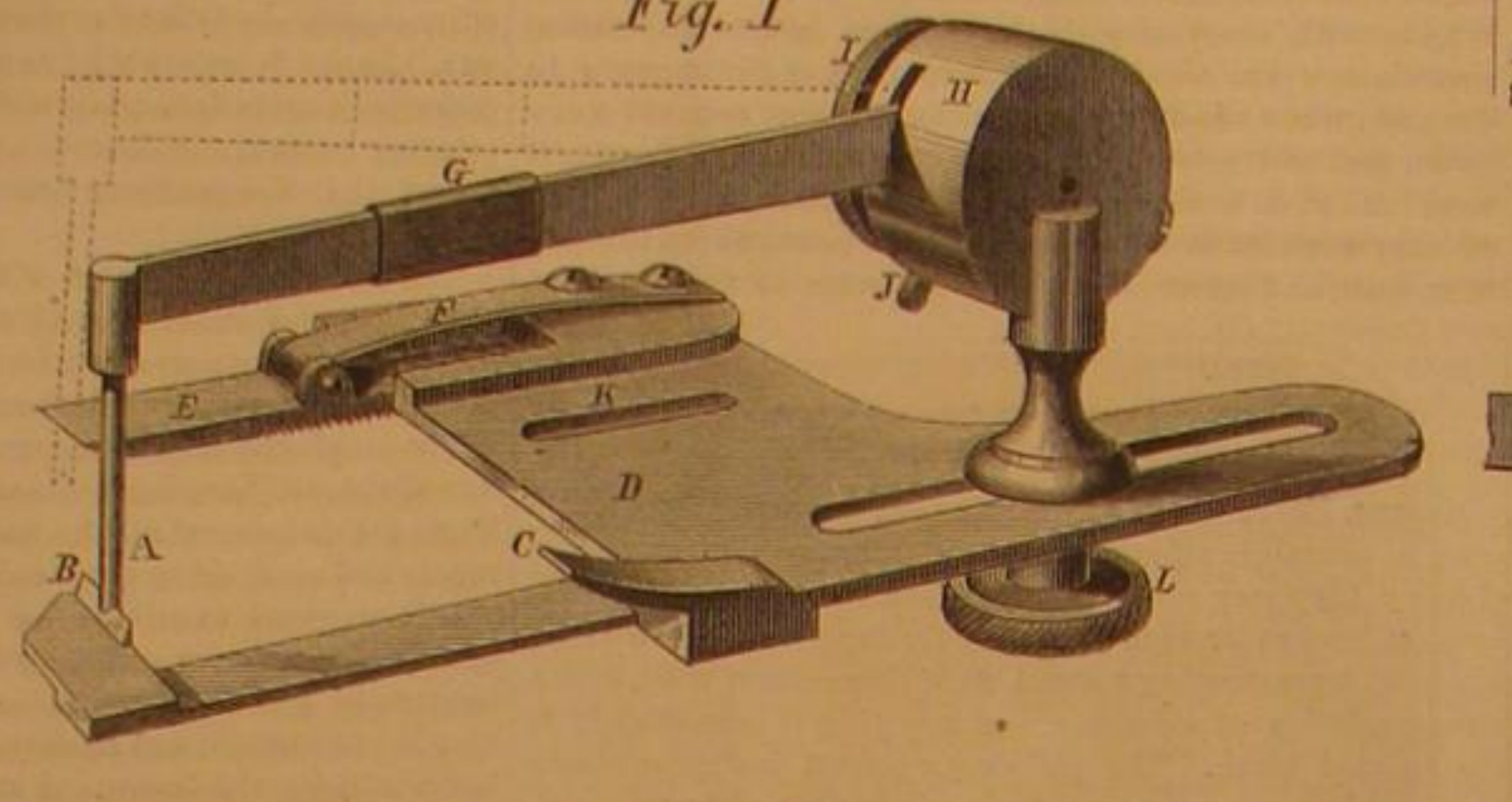


Fig. 2

IMPROVED TUCK-CREASING ATTACHMENT AND GUIDE.

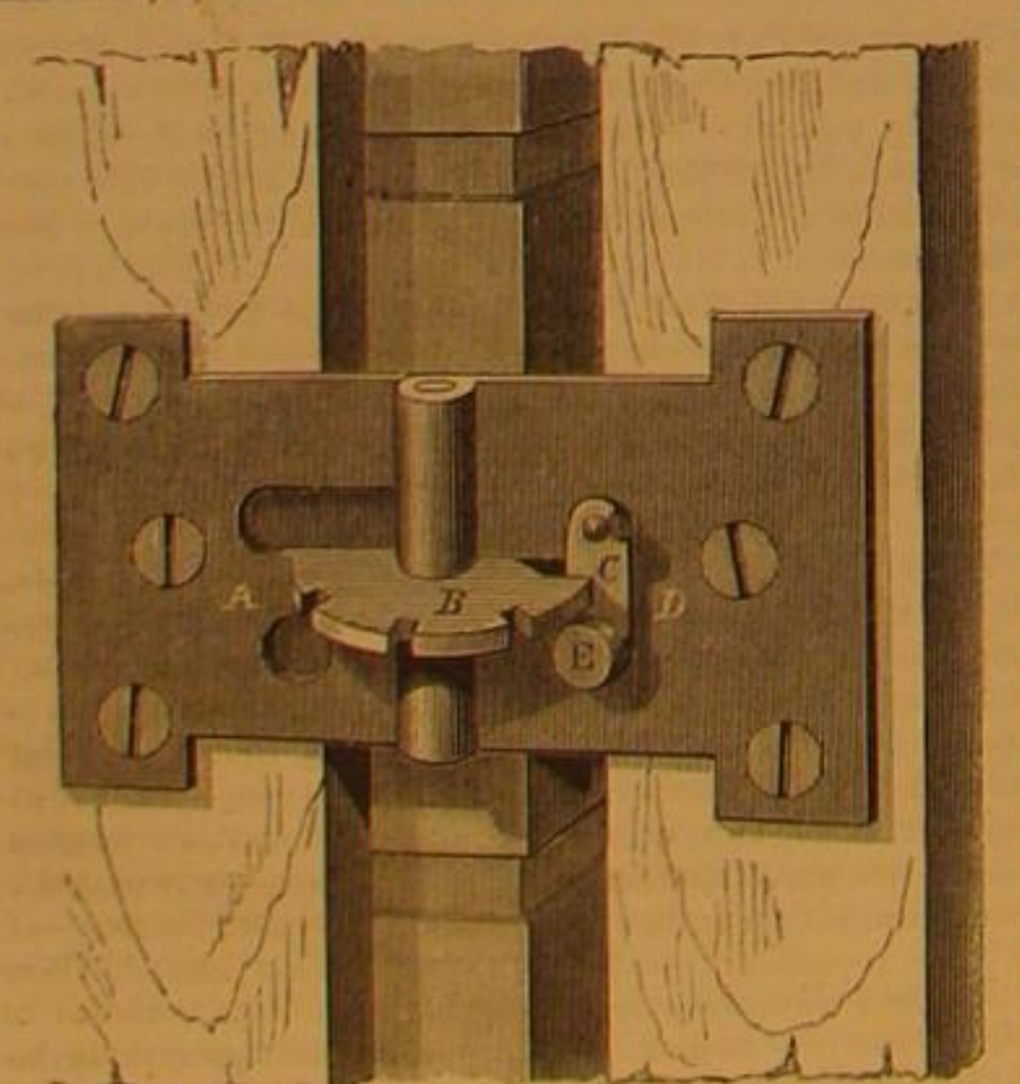
The power exerted by the creaser on the goods, between it and the edge, B, is adjusted to the thickness of the goods by means of a coiled spring, ratchet, and pawl, in the drum, H. This adjustment is effected by means of a knurled button, I, and the pawl, J, in combination with the ratchet that forms a portion of the lever, G. This arrangement is seen plainly in Fig. 2.

The device is attached to the bed plate of the sewing machine by a screw passing through the slot, K. The width of the tuck or plait is regulated by the thumb-nut, L. By this device, the labor of laying plaits and tucks is much lessened, as the work is guided without the aid of the operator, and as the pressure of the creaser may be regulated at will, there is no difficulty in starting the machine or in changing from one quality or thickness of goods to another.

Patented through the Scientific American Patent Agency, January 12, 1869, by Mrs. Anna P. Rogers, who may be addressed, in reference to the device, at Quincy, Ill., care Rogers & Malone.

IMPROVED HINGE AND DOOR STAY.

The object of this device is to produce a hinge for doors, window shutters and blinds, and chests, trunks, and boxes that will set door, blind, or lid, at any angle desired, and hold it in that position. It is an ordinary butt hinge, with single joint, having cast on one of the leaves, A, a semicircular flange, B, notched on its edge to receive the pivoted latch, C, that is pivoted to the other leaf, D. On this leaf is cast a snug, E, that receives and holds the end of the latch, C, when down. The opposite leaf, A, has recesses for receiving the snug, E, and latch, C, when the leaves are closed.



In operation, the door, or other valve, whether door, blind, shutter, or chest lid, is opened to the extent desired, and held in any position required by the catching of the latch, C, into one of the notches of the flange, B. It is evident that the door will be held firmly in this position.

When it is not required that any stop should be put to the movement of the door, the latch, C, is turned up, its free end resting on the flange, and the door may be swung as any other which is furnished with ordinary hinges. Of course there is a slot cast in the leaf, D, to permit the partial rotation of the semicircular flange, B. Adaptations of this device can be readily made for doors, swinging windows, blinds, inside or out, trunks, chests, boxes, etc.

From an examination of the model and the hinge (large size), we are inclined to consider the device a really valuable one, and hinges of this form specially adapted to all the purposes for which they are intended.

Patented Jan. 12, 1869, by M. Umstadter, who may be addressed at Norfolk, Va.

Perpetual Motion.

A correspondent, writing from Ohio, wishes us to use our influence to induce some learned society or wealthy devotee of science to offer a premium for the invention of a perpetual motion. This done, he thinks the invention will be forthcoming ere the end of the year. He speaks mysteriously of a perpetual motion that is almost, but not quite, ready to commence its endless labors. Now we have known something less than a thousand just such machines, but they never got quite ready. Under these circumstances, J. W. will please excuse us. We would rather not recommend any societies or devotees to offer any prizes. There is so much immortal genius lying around loose, that such a stimulant might be dangerous.

IMPROVEMENT IN THREE-WHEELED VELOCIPEDES.

The velocipede represented in the engravings is quite a curiosity; it seems to combine the safety of the three-wheeled

Fig. 1.

machine with the manageableness of the bicycle. Its peculiarities are in the construction of the rear axle, or axles, and the method of making connection between the feet of the driver and the driving wheel. The first permits short corners and small curves to be turned readily, and the latter the application of greater power for ascending inclines, or traveling over rough roads, than can be exerted on the ordinary machines. A brief description will suffice to show these points.

Fig. 2.

The rear axle, instead of being, as in the ordinary tricycle, a single shaft, is in two parts, the inner ends of each formed into toothed segments that engage with a small gear in a box to which the axles and the rear end of the reach are pivoted. The end of the reach is also a toothed segment engaging with the small gear. It will be seen that the inclination of the rider's body, when the vehicle describes a curve, will partly rotate the gear, and consequently elevate the inner end of one axle while it correspondingly depresses the other, thus inclining the wheels toward the center of the circle, of which the curve described is a portion. Ease and facility for turning short corners is thus assured, while the perfect balance of the rider is preserved.

This portion of the improvement is best seen in Fig. 2. In Fig. 1, the device for increasing the power of the vehicle in rising grades is shown. It is simply an adaptation of the plan of gearing used on engine lathes for increasing power and diminishing velocity. The upper or shifting gear stud, or axis, is secured in a slot in the upright support, and may be thrown into gear as required. When out of gear, the velocipede is driven, as others, by the direct application of the rider's feet. No detailed description is necessary to make this portion easily comprehended. It would seem also that this device might be advantageously applied to ordinary wagons with good effect. The method of adaptation will readily suggest itself to the intelligent mechanic from the foregoing description and accompanying illustrations.

Patent pending through the Scientific American Patent Agency. For additional details, address the inventor, N. C. Stiles, Middletown, Conn.

A Long-Tailed Comet.

James Fisk, Jr., of this city, was once a dashing peddler in New Hampshire, afterwards a dry goods merchant in Boston, and, if we mistake not, he was instrumental in galvanizing into life the "Goulding carding machine patent," which had been dead for a quarter of a century—an operation which, unassisted by anything else, would stamp Fisk as a genius of the highest order. His fame, however, does not by any means rest upon this performance, extraordinary though it be; he also plays the part of one of those brilliant long-tailed comets which go blazing away through space to the astonishment of everybody. He is in turn a peddler, a merchant, a Wall-street broker, a railway director, a financier, an operatic and theatrical manager—so shrewd and audacious withal, that everybody is wondering what Fisk is going to do next, and in order to gratify this laudable curiosity, Fisk adds to his other titles that of "Managing Director, Narragansett Steamship Company," and proposes to run two elegant steamboats from New York to Newport and Fall River. But to run them like other people would not be characteristic of Fisk. There must be a sensation on board. The comet's tail must blaze about the decks. The steam calliope will not do—that has played out. Fisk wants, therefore, to contract for two orchestras, ten pieces each, first-class musicians, and promises to give seven months' steady employment, living included. This steamboat company did not pay last year. Fisk makes everything pay.

Gold Beating.

The art of gold beating, says the *London Builder*, is a very ancient one. There seems great probability, that, like some other arts, it has been known and practiced and forgotten. Homer refers to it ; Pliny, more practical, states that gold can be beaten, one ounce making 550 leaves, each four fingers square—about four times the thickness of the gold now used This is most probably such gold as was used in the decoration of the Temple—"It was covered with plates of burnished gold." The Peruvians had thin plates nailed together. It is possible that if decorations of this character were used in these parts, their insecurity would so trouble some folks that they would have no rest till they were effectually "nailed." The Thebans have in their wall histories some gold characters done with leaf said to be as thin as the gold of the present day. Coming down with a jump from the long past to the present age, we find our country celebrated for its gold-leaf. Italy used to excel us, but Italy has been in a long sleep, and is only just awakened. It is one of the last things our overgrown offspring undertook to make for herself. Until very recently she imported all the gold-leaf she required from this country. The gold-beater's skin made here is still the admiration of the world (of gold beaters). This skin is gut skin, stretched and dried on frames, after which each surface is very carefully leveled, a labor intrusted to the delicate hands of young girls. A mold (as the number of square pieces of skin beaten at one time in the gold-beating process is called) is an expensive article, costing from £9 to £10, and when useless for gold beating is still of some value. Fifty or sixty years back a workman made 2,000 leaves of gold from 18 or 19 dwts. of gold ; now, by better skin and skill, he is enabled to produce the same number from 14 or 15 dwts., showing a considerable reduction in the cost of produce, and, as may be expected, a deterioration in the quality of the article. One grain of gold beaten between this skin can be extended to some 75 square inches of surface, the thickness of which will be 1-367650th part of an inch. These figures represent what may be done. What is done for the purposes of trade is somewhat less—namely, 56½ square inches per grain, 1-290000th of an inch in thickness. To give an idea of its thinness, it would take 120 to make the thickness of common printing paper, 367,650 sheets of which would make a column half as high as the Monument.

LOOKOUT MOUNTAIN, near Chattanooga, contains a cave that is said to have been explored for a distance of eight miles.

SOME California papers pronounce the White Pine mining district as being, with few exceptions, all "Wildcat."

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NEW YORK, SATURDAY, MAY 8, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

VIS INERTIA.

All are familiar with one of the many definitions given in the works on physics, of the term "Vis Inertia"—a want of power in a body to move itself when at rest or to come to rest when in motion. As however no human eye has ever seen a body or matter in a state of absolute rest, and as we know nothing of matter in that state, it is perhaps to be doubted whether we are justified in predicating anything of it in that condition. In fact it is quite possible that matter does not anywhere in the universe exist in a state of rest; and it seems quite consistent with the facts already established in physics, to consider motion as an essential condition of the existence of matter, that is so far as any knowledge of it is obtainable through the medium of our senses.

All the ideas we can get of matter are inseparably connected with motions of atoms, molecules, or masses. Let these motions at once and wholly cease in any aggregation of matter, and we have not the slightest ground to suppose that its existence would be determinable by us. We could walk through it without experiencing any resistance; it would no longer have color, form, weight, or any of those characteristics by which we are able to recognize material objects.

But while we know nothing of the state called rest, we see around us everything in motion and refusing absolutely to move less, without increase of motion in some other matter. Nay, the amount of motion lost in any body must be exactly compensated for by the motion of other matter. Nature will not permit a loss from the sum total of motion of even an infinitesimal amount. Her books always balance. We see then that of matter at rest we know nothing, and consequently, can predicate nothing. In moving matter we see the most positive tendency of motion to continue. Note this is not a negative proposition. Motion is as positive a property of matter as gravity.

Now, if "vis inertia" means anything, it is negative in its signification. It means that a body *cannot*, of itself, change its state, whether that state be one of motion or rest. Now, we might go on to any length and predicate negative qualities of matter without giving or attaining a single idea in regard to it. To say that vinegar is not sweet, would give no idea of vinegar to any one who had no knowledge of it. It is only when we assert some positive quality that ideas are conveyed. If we say vinegar is sour, then we express a quality of vinegar, and a definite idea is conveyed by our language. When we say, as does Bartlett, in his "Philosophy of Mechanics," that *matter is inert* in relation to the state of motion and rest, we are either hiding a negative meaning in a positive form of expression, or stating a false proposition.

Many modern writers have seen this and have dodged the issue in their definition of inertia, in so far as they have confined it to the tendency which bodies have to maintain such motion as they possess.

Now we submit—and we believe the greater number of those who write and think upon this and cognate subjects will coincide with us in the opinion—that if it be desired to indicate the tendency of motion to continue, no more inappropriate term could have been selected to indicate this property than inertia.

The use of terms which in their primary signification mean one thing, to indicate something which is not only different but diametrically opposite, is not, to say the least, logical; and the different views of the real meaning of the term in question, have not only given rise to differences in opinion but also to grave error. The term is the offspring of obsolete notions of force, and the attempts to make it do duty in the vocabulary of modern science should be abandoned. Certainly it would not be difficult to agree upon a substitute that should aptly characterize the tendency of motion to continue, and shake ourselves clear of ideas pertaining to a purely hypothetical state of matter—rest.

CENTENARY OF THE STEAM ENGINE—JAMES WATT.

For the purpose of perpetuating the fame of revered patriots and renowned warriors, almost every nation has been accustomed to hold anniversary ceremonies. In more recent times such occasions have been laudably instituted to pay respect to great poets, such as Shakespeare, Schiller, and Burns—those mighty bards who have made the chords of the human heart vibrate with every emotion. But there is another class of great men whose achievements have been as beneficial to society as those of heroes, poets, and statesmen, and yet, so far as we recollect, no suitable anniversary ceremonies have ever been held to do honor to their memory. We refer to inventors of improvements in mechanism—those men who by their genius, skill, and perseverance have made the forces of nature,

the docile servants of man. We therefore embrace the present opportunity of paying a tribute of respect to the memory of one whom we regard as the representative man in his domain of invention. We mean James Watt, the great improver of the steam engine—that wonderful motor which has not inaptly been called "the iron apostle of civilization." This is not his natal day, but it is the centenary of the occasion when his first improvement was made manifest to the world by descriptive enrollment in the London Patent office.

A century ago, there was not a single steam engine in the strict sense of the term, in the wide world. The windmill, the water wheel, and the horse-gin were the common extraneous powers employed by man to assist him in executing severe toil. Excepting in the case of animal labor, these powers could only be used in few situations. Look now at the triumphal career of steam power. Since 1769, it has become the chief ruler over the manufacturing and commercial world, as it is applied everywhere, on land and water, for innumerable purposes. It operates mechanism in mines on the lofty Cordilleras, as well as in mines in the valley of the Mississippi. It moves vessels on the rivers of every continent—on the Nile, the Ganges, the Thames, and the Hudson, and, scorning the fickle winds, it has made the Atlantic ocean a great ferry between the old and new world. And in its latest and most princely adaptation—the locomotive—it moves long trains of elegant carriages over the Alps, and the Alleghanies; and on the railroads of the United States alone, no less than fifteen thousand of such engines are at present employed. From the cradle to the grave, it has become the faithful servant of man, operating the mechanism which prepares his daily bread, and the loom which weaves his swaddling bands, his wedding garment, and his funeral shroud. There is no individual now living who does not share in the benefits which James Watt has conferred upon society.

The town of Greenock, in Scotland, is the native place of James Watt; the 19th of January, 1736, was the day of his birth. From infancy his health was feeble, but he early gave evidence of possessing superior mental gifts. Not being able to attend the parish school, his father, who was an educated man, gave him instruction at the fireside, and the pupil was not an inattentive scholar. His very amusements were of a useful and recondite character. Drawing, geometry, and the construction of machines were his delight. Having been provided with a box of tools, he made various machines before he was twelve years of age, and among the number was one with which, at that early date, he astonished the household and the boys in the neighborhood by giving them shocks of electricity. As he advanced toward manhood, his thirst for solid information and his power of acquiring a knowledge of the severer sciences seem to have been wonderful. His love of practical mechanics, however, was dominant, and his predilection led him to London at the age of nineteen years, for the purpose of perfecting himself in the art of making philosophical instruments, there not being a single establishment, at that period, in all Scotland, where he could be instructed in the business.

It is stated that after a year's residence in the British metropolis, he returned to his native land with such a high reputation for mechanical skill that he was at once employed to repair and set up the astronomical instruments for the new "Macfarlane Observatory," connected with the college of Glasgow. Being a stranger and not a burghess of the city, the old trades guilds would not allow him to do business on his own account within the bounds of the corporation. But the faculty of the college—always distinguished for encouraging practical mechanics—got over the difficulty by providing the young mechanic with a shop within the gates of that famous institute.

Here he pursued his calling unmolested by the trades societies, and he fitted up the instruments in the observatory to the entire satisfaction of his patrons. The learned authorities had also the good sense to retain him afterward as their mechanic, to superintend, make, and repair all the machines and instruments required in exposition of the subjects taught in the classes. It was while engaged in repairing one of the working models belonging to the class of natural philpsophy, that he made the discovery, and invented the improvement, which has immortalized his name in connection with the steam engine.

A small working model of what was called "Newcomen's combined steam and atmospheric engine," was placed under his charge for repairs, as it did not work satisfactorily. It represented practically all that was then known of steam applied to operate mechanism, and consisted of a boiler 9 inches in diameter; a vertical cylinder 2 inches in diameter and 6 inches in length. The cylinder was open at the top, but fitted with a piston to which was attached a chain connected with a walking beam, secured on a pin to a post upon which it vibrated; the other end of the beam was connected with the plunger of a pump. Steam was admitted from the boiler under the piston, and when the latter was elevated to the end of the stroke, the steam was shut off and a jet of cold water from an elevated reservoir was injected into the cylinder, condensing the steam and forming a vacuum under the piston, which descended by the pressure of the atmosphere upon its outer surface. When the piston had made its descent, the condensed water was allowed to flow out of the cylinder, steam was again admitted and condensed, and the piston elevated and depressed, as before described, thus giving a vibratory motion to the beam and working the pump. It was single acting—not a pure steam engine—crude of construction, and only about a dozen of such were in use in Great Britain for pumping in some of the English mines. Its waste of fuel was so great, that some of the mines where it had been employed were about to be abandoned as unprofitable investments. The great waste of steam in heating the cylinder, which was the condenser, up to 212 deg. after each stroke of the piston, at once arrested Watt's attention and engaged his thoughts; and it is related that, while taking a walk on the banks of the river Clyde, on the morning of the 28th of April, 1765 (this date rests upon memory, no record having been made at the time by the inventor), the thought beamed into his reflective mind, like a ray from the celestial regions, that steam being an elastic fluid, if he placed a second cylinder on Newcomen's engine, connected with the steam cylinder by a pipe, and allowed the jet of cold water to play upon it, the steam from the working cylinder would flow into it, at the end of the stroke, and be condensed forming a vacuum under the piston. If this could be effected, he reasoned, the working cylinder would be maintained at a uniform temperature and a great saving of fuel secured. Within twenty-four hours after this thought flashed into his mind, he had made a rude model and tested the invention by an experiment with such satisfaction to himself that his mind was filled with rapture. From this we trace the invention of the separate condenser—that improvement in the steam engine, which at once saved two-thirds of the fuel formerly required and rendered the steam engine the King of motors.

We have been somewhat minute in describing this invention because it was the first grand improvement in steam engineering by which, in these latter days, commerce and the manufacturing arts have been revolutionized, man supplied with almost unlimited productive power, and the name of Watt become to practical mechanics what Newton's is to philosophy.

At the time of this invention, James Watt was twenty-nine years of age, and during nine of these years he had been mechanician to the college in Glasgow. During the regular hours of labor he attended faithfully to his trade—his regular business—but his spare hours were devoted to the highest and noblest ends—acquiring solid and useful information. And so superior were his abilities and powers of acquisition, it is related that he became a philosopher and scholar as well as a skillful mechanic. He was acquainted with chemistry, anatomy, architecture, civil engineering, and the science of music; and he acquired the Latin, French, Italian, and German languages for the purpose of finding out what knowledge in science and the arts was contained in these tongues. His parlor was the rendezvous for all the students remarkable for scientific predilections, and the celebrated Dr. Robison—afterward professor of natural philosophy—said of him: "Whenever any puzzle came in the way of any of us, we went to Mr. Watt. He needed only to be prompted: everything became to him the beginning of a new and serious study, and we knew he would not quit it until he had either discovered its insignificance, or had made something of it. No matter in what line—language, antiquity, natural history, nay poetry, criticism, and works of taste; as to anything in the line of engineering, whether civil or military, he was at home and a ready instructor. Hardly any projects, such as canals, deepening rivers, surveys, or the like were undertaken in the neighborhood without consulting him." Such is the testimony of a very distinguished man to the character, skill, and acquirements of our representative mechanic.

The mind of Watt seems to have perceived the importance of his invention almost before his first rude model was completed. His purse, however, was light, but his faith was strong. He therefore borrowed sufficient funds to make further experiments, and a good working model to show the advantages of his improvement. But beyond this he could not proceed, not even to secure a patent, without further assistance in the way of capital, and the difficulty was to find it. His native country was then poor to a proverb, except in religious freedom, education, and philosophy, and these could not build a steam engine. After many discouragements, a friend to the invention was found in an English gentleman—Dr. Roebuck—who agreed to furnish one thousand pounds (five thousand dollars in gold) to introduce the invention in consideration of owning two-thirds of the patent.

This instrument was obtained in January 1769, but not enrolled until the 29th of April following—just one century ago! It contained a very clear description of his condensing engine, also of a high pressure steam engine, and how it could be applied to various purposes. At this stage, however, its introduction was arrested by financial difficulties in Dr. Roebuck's business, and for the following five years, James Watt could not find a person in all Great Britain who had the capital, courage, and enterprise to become his partner, and furnish the funds to build engines. At last, through the friendship and zeal of Dr. Small—once the tutor of Thomas Jefferson—an engine with a cylinder 18 inches in diameter, was put up in Birmingham; and Mr. Matthew Boulton, a wealthy manufacturer, was so pleased with it, that he purchased the interest of Dr. Roebuck, and at once the manufacture of the engines was commenced with energy. A special act of Parliament extending the patent for twenty-five years was obtained. Watt took up his abode in Birmingham, to superintend the business. Soon the fame of the invention spread far and wide, orders for the new engines poured in rapidly, old mines that had been abandoned were reopened, many new mines were commenced, and a new era in practical mechanics was introduced. Generous and fair was the conduct of Boulton and Watt toward those who desired their engines for mines. They took the old engines of Newcomen as a standard, and simply required the payment, as a royalty, of one-third the value of the fuel saved by the new engines. James Watt was now afforded the leisure and means to devote all his attention to improve his engine. Very soon, he made it double acting—a complete steam engine—and added improvement to improvement so rapidly and successfully that under his care he rendered the low-pressure condensing engine nearly as perfect as it is at the present day. The struggle was long and arduous, but deserved success ultimately crowned the efforts of the great inventor. He had the satisfaction of applying it himself to almost every purpose, for which it is now employed, and we in the New World feel gratified that he planned and built in 1805 the engine of the *Clermont*, our first successful steamboat.

Other heads and hands developed the locomotive, but he seemed to have beheld it in mental vision moving down the avenue of time, for he described in his patent, how steam could be applied to drive carriages on roads. Language is incapable of conveying adequate ideas descriptive of the benefits which have been conferred upon man by the steam engine. Day and night, on land and sea, on steamship and locomotive; in factory, foundery, mill, and workshop, the grandeur of the invention is proclaimed throughout the whole civilized world.

In the United States steam power is employed equal to the labor of 130,000,000 of men, and in Great Britain, equal to 400,000,000. It gives speed to the iron steed surpassing that of the fleetest Arab, and it moves the press which daily prints the records of our morals and the transactions of our lives. Perhaps the city of Glasgow, where Watt invented his engine, affords the best illustration to be found anywhere respecting what steam power has done for some communities. In 1755, its population was only 22,000, to-day it is 500,000 Then no man could be found in it, possessing sufficient wealth and enterprise to invest one thousand pounds in Watt's engine, now it is the engineering metropolis of the world, furnishing nearly all the great iron steamships for the merchant navies of every nation in Europe.

In the old college where the invention had its birth the inventors first model is still reverently preserved in the museum, standing beside a noble bust of its inventor. But as a fitting climax to its history, illustrating the conquering and progressive power of steam, a new structure of grandeur and more imposing dimensions, to take its place, is about to be erected in another part of the city, and the venerable old building, the cradle of modern steam engineering, will soon be occupied as a great railway depot, a rendezvous of the highest type of the steam engine.

As James Watt advanced in years, wealth and honors flowed in upon him. He was elected a member of the Institute of France, and men of the highest attainments in science and art sought and cherished his friendship. He must have been a lovable man personally. All the records of him afford abundant evidence of his wonderful gifts, his gentle and unassuming manner, and his generous and truthful nature, and that he was admired and warmly beloved by everyone who knew him intimately. We have chiefly dwelt upon his life and character as connected with the invention of the steam engine, but that was not his only invention. The power indicator, the steam hammer, and several other machines in common use, were also the fruits of his genius; and in the science of chemistry, he was the discoverer of the composition of water. Take him for all in all, he stands out on the page of history, a unique and wonderful man. Old age stole gently upon him, and although his constitution was delicate, he attained the advanced age of fourscore and three years. In the early autumn he felt the approach of the messenger summoning him away to "The better land." In calmly contemplating the solemn event "he expressed his gratitude to the Giver of all Good, who had prospered the work of his hands and blessed him with length of days, riches, and honor;" and the great inventor calmly fell asleep, to wake no more on earth, on the 19th day of August 1819. All that remained of his earthly tabernacle was carried to the parish church of Handsworth, and there interred beside his departed associate Matthew Boulton. His funeral was attended by a large concourse of distinguished persons and his faithful workmen who exhibited sincere sorrow at his departure from among them forever.

The news of his death produced a profound sensation throughout the kingdom, and men of all ranks and degree held meetings and passed resolutions of respect to his memory. Monuments have been erected to him in various towns and cities, and a colossal statue by the celebrated Chantrey has been placed in Westminster Abbey bearing the following unequaled lapidary inscription, by the late Lord Brougham.

Not To Perpetuate A Name
Which Must Endure While The Peaceful Arts Flourish,
But To Show
That Mankind Have Learnt To Honor Those
Who Best Deserve Their Gratitude,
The King,
His Ministers, And Many Of The Nobles
And Commons Of The Realm,
Raised This Monument To
JAMES WATT,
Who, Directing The Force Of An Original Genius
Early Exercised In Philosophic Research,
To The Improvement Of The Steam Engine,
Enlarged The Resources Of His Country,
Increased The Power Of Man,
And Rose To An Eminent Place
Among The Most Illustrious Followers Of Science,
And The Real Benefactors Of The World.
BORN AT GREENOCK, MDCCXXXVI.
DIED AT HEATHFIELD, IN STAFFORDSHIRE, MDCCCXIX.

HABITS OF MECHANICS.

That "habit is second nature" is not only true, but it is evident to the observant that this second or acquired nature is frequently stronger and more influential than the first or original nature. This is equally correct whether predicated of bad and injurious habits, or of good and beneficial ones. No one who has arrived at maturity but knows from his own experience the strength of habits—habits acquired, perhaps, imperceptibly and remaining unnoticed by himself until matured, and then but for an effort of memory their possessor would find it difficult to determine that they were mere accretions and not innate qualities. The importance of forming, or rather acquiring correct habits, is thus very forcibly made apparent. It forms the text for many a homily by teachers of morality; we prefer to use the fact in a different but perhaps not less important, although restricted, sense.

Let us apply it briefly to the mechanic, not as a man, an individual, a member of the community only, but mainly as a workman. It is evident that if slovenly and careless habits are once acquired it must require an effort to get rid of them; and this effort is much greater than that necessary to acquire others. Every observing mind must acknowledge this proposition, evidences of the truth of which may be found in his own experience as well as in his own observation. It is harder to overcome the pressure of habits already acquired and formed than to form others. From this it follows that the contraction of bad or improper habits is to be avoided. One of the duties of masters or employers to their apprentices and workmen should be the inculcation of correct habits in the shop, not by arbitrary rules, alone, or verbal direction, but by example. Here many fail. A master, employer, or foreman, in escorting a visitor through his establishment or department, frequently disarranges the work or the tools of the workman, and expects him to rectify these errors. So in examining a job in progress, he will delay the work and disgust the workman by his inattention to the details of "Heaven's first law," according to Pope. In such a case no rules or directions can overcome the influence of such carelessness.

Order should be the general rule of workshops and workmen; not merely order in the subdivision of the work and the arrangement of the men in gangs, but extended to the minutiæ of care of tools. Each workman should know the proper place of every tool he handles, when not in actual use, and should promptly return it to its place when done with. This presupposes a place for every tool; the providing of which should be the business of the "boss" or proprietor, or whoever has immediate control. It should be a habit of the mechanic to put a tool, he has used, in order for the next user, not to leave its repair for him who next needs it, whose time may be too valuable to waste in preparing the tool for his work. Of course, this rule is subject to modifications according to the nature of the work performed in the establishment, the number of workmen, etc.; but the rule should be imperative that the tool, when wanted, should be in working order. Some may think such a requirement entails useless labor, but from our own experience we are certain that time is really saved by a rigid enforcement of the rule.

"Sloppy" workmen, and disordered shops are an abomination; too many of them exist; none are necessary. Work men who leave a tool where they last used it, or throw it carelessly under a bench are unfit for their business. However skillful and experienced, their skill and experience will not outweigh the annoyance and cost in time by their careless habits.

A habit of promptness is hardly less necessary to make a successful workman than a habit of order. The tardiness of one man, delaying his appearance in his place at the proper moment, may hinder a dozen others and disarrange the order of a whole department. We have known of a case where a neglect of the practice of punctuality involved a cost to the proprietors of more than two hundred dollars, and secured the dismissal of the offender.

Not less is it necessary to cultivate a habit of using each tool for its special and intended purpose, and no other. The use of a screw wrench as a hammer is to be reprehended. By the way, nothing is more common than the use of *any* implement that happens to be in the hand at the time, as a hammer. The file, chisel, wrench, even the screwdriver, we have seen employed for striking a blow for which the hammer alone was fitted. And even the hammer is made to take the place of the wrench. Who has not seen the hasty and impatient workman attempt to tighten a nut by hammering at its corners instead of procuring a wrench? The result would be, generally, a battered nut, and possibly a sprung if not a cracked bolt.

These foolish, unnecessary, and injurious habits need not be formed, but being formed they should be abandoned as soon as possible, and sensible, reasonable, useful habits substituted. There is neither reason nor palliation for such carelessness. Our mechanics generally are men of education; they think for themselves, and are capable of estimating the force of the suggestions herewith presented.

EMPLOYERS AND EMPLOYED.

Much of the success which attends the management of any business, where help in a subordinate capacity is required, depends upon tact, by which subordinates are made to perform their duties willingly. Many establishments are filled with time-servers, who do their work grudgingly and shirk the moment the eye of their superintendent is off them. Other establishments exhibit, on the contrary, the more beautiful spectacle of cheerful workers, with faces good humoredly beaming, and whose blows fall harder and more constantly from very lightheartedness. They feel on good terms with their employers, their superintendents, and their fellow workmen, and thus feeling they must be more efficient than a corps of sulky sour-tempered men whose heart is not in their work, and whose superiors are regarded as their natural enemies.

These facts being admitted it is evident, that the superintendent, who, without coming short in other respects, keeps his men in good humor, is better than one who can only keep up a show of subordination by a harshness of manner which begets a reciprocal feeling in the heart of his inferiors. Such subordination is subordination under protest, a subordination which leads to secret combinations and mutterings, and is only one step from revolt.

It has been justly remarked that the most perfect subordination is that in which the rights of subordinates are recognized; in which every man has his rights, and knows that any violation of them can be promptly and surely redressed.

A good deal might be said on the rights of subordinates, but we shall only touch upon the subject at this time. In the first place every subordinate ought to have the right to defend himself from charges made against him by fellow workmen. How often is it the case that from petty malice a workman is made the subject of invidious charges, which injure his reputation for skill or his character for honesty. A workman in this trying position should feel that he has an impartial judge in his superior who will protect him from unjust accusation.

A subordinate has the natural right to expect kindness so long as his conduct merits it. Our sensibilities have often been shocked by the language we have heard employed by superintendents of large establishments towards inferiors. Swearing at workmen is a far too common vice. Were we to employ a man as a superintendent of a workshop, we should tell him at the outset that swearing at workmen could not be allowed. Any employé feels a sense of degradation from such treatment which injures his self respect and tends to make him vicious and unreliable.

The right of an employé to be treated justly and the right to be treated kindly can never be violated without loss to both employer and employed. The former loses in the amount and quality of the service performed, the latter loses a cheerful happy temper and the ennobling desire to perform his work in the best manner possible, both as a matter of principle and out of good will to his employer. Good will is worth money. It is an excellent thing to invest in. Its profits cannot be estimated as so much per cent of capital, for its first cost is nothing.

Having pointed out two rights, to which all employés are entitled, we shall point out one which many suppose belongs to them, but to which, on the contrary, they have not the slightest claim. This is the fancied right to expect or demand explanations from their superiors, why they are required to perform their work in the manner directed. Any principal of an establishment, when condemning the work of an employé, or directing him how to perform it, will voluntarily explain the matter, if he deems such explanation necessary, as instruction to guide in future work or conduct. It is his interest to do this because he gets better service by doing it. If he withholds it, however, that is his business, and his subordinate would be justly subjected to reprimand should he ask in regard to what concerns him not. If he needs instruction that is another matter; but men in active business have too much on their hands to argue with help upon the propriety of any course they may have decided upon. An arguing foreman is every bit as unfit for his place as the swearing, browbeating one. He should be a man of decision, and as decision in action is the result only of knowledge, skill, and courage, these qualities will entitle him to respect, if his other qualifications are such as to insure the good will of those under his charge.

The choice of a good foreman is one of the most important essentials to success in many kinds of business, and the difference between a good and a bad one is hard to estimate in dollars and cents. He that can be firm with kindness, and just without harshness, has the elements of good leadership. These qualities, joined with knowledge and skill, make a combination of qualities somewhat rare, but when found, sure to be prized and rewarded.

THE RELATIVE MERITS OF NEW IRON AND OF SCRAP IRON AS MATERIALS FOR THE SHAFTS OF OCEAN STEAMERS.

In number 22, Vol. XX., of the Scientific American, we discussed the method, hitherto in vogue, of forging shafts for sea-going steamers, from mixed scrap iron. We most decidedly disapproved the method, maintaining that a perfectly homogeneous shaft of such materials, even if its achievement were possible, must necessarily be a highly improbable result, of a plan opposed, not only to scientific principles, but to common sense.

Since writing the article alluded to, we have seen no reason to alter the opinions we then entertained and expressed with reference to this subject; and we now have the pleasure to state that those opinions are not only winning adherents, but that their truth is actually being tested, practically, by the Pacific Mail Steamship Company. This company have recently had a shaft forged for them at the Franklin Forge, corner of Twenty-fifth street and Third avenue, New York, of the Collins Iron Company's Lake Superior charcoal pig iron. This shaft is intended for the steamer *Japan*, San Francisco and China, and is, in the rough, 39 feet 7 inches long, weighing 80,000 lbs. The body of the shaft will be, when finished, 26 inches in diameter, and the diameter of collars 31½ inches. The forging of this shaft required a working force of 38 men, and consumed 15 days of ten hours each.

The iron from which this shaft was forged, was puddled by Tugnot, Thompson & Co., of the above works, expressly for the purpose, and twice hammered before the shaft was forged. None of the iron used has had less than three heats after the billets were prepared.

We were present on two occasions during the forging, and our opinion as to the great superiority of shafts made of such iron over those of scrap-iron, has been greatly strengthened by our observations. Mr. Tugnot, of the above works, under whose supervision the whole work has been performed, is one of the most experienced iron masters and forgers in this country, and the work throughout is of the most perfect character.

The steam hammer used weighs nine tuns, and under its ponderous strokes, the heated billets seemed as plastic and cohesive as wax.

Such a shaft must, necessarily, cost more than one made of scrap-iron, but its greater strength and consequent security, will more than compensate for its increased cost. The iron from which it is made is of a very superior quality, a larger quantity of charcoal being used in its manufacture than is ordinarily employed. It is made of half hematite and half specular ore, a mixture of which gives an iron of remarkable tensile strength. A chain link of this iron, made of 1½-inch bar, was once tested by D. B. Martin, formerly Engineer-in-Chief to the Secretary of the United States Navy, and broke only at the enormous tension of 169,120 lbs. We have also seen a specimen of this iron which had only been subjected to two heats, and which was tested by Paulding and Kendall, of the West Point foundery, which, after breaking at a tension of 63,376 lbs. per square inch, was found, upon examination, to be defective. These facts speak sufficiently for the excellence of this iron, and we are glad that the importance of using shafts made of the very best material is beginning to be appreciated by capitalists. A steamer with a broken shaft is almost as helpless as a ham-strung horse; it may, if it has good luck, finally crawl into port, after a delay which has cost more than two shafts would, or it may encounter bad weather and go to the bottom. Where so much is depending, considerations of first cost should weigh little in the scale against security, and it does weigh little to the engineer who knows his business. Unfortunately, however, these facts are too often overlooked by the men who invest their money, and who, not acquainted with the nature and quality of different kinds of iron, are too apt to consider them pretty much on a par. Nothing could be more unwise than such a conclusion, and the difference between a shaft made of inferior iron and one of the best quality, is so great in its contingent results that, within reasonable limits, cost should not be considered.

We hope the precedent established by the Pacific Mail Steamship Company, will prove the beginning of a wiser practice than has hitherto prevailed in reference to this subject.

THE RECENT AURORAL DISPLAY.

On the evening of the 15th of April remarkable auroral display took place, which, according to the newspaper reports, extended over nearly the whole of the Eastern, Western, and Middle States, and was also visible in some parts of the Southern States. At this point the display was a fine one, but was probably exceeded in many other localities. Accounts from portions of Ohio indicate that the maximum brilliancy was observed in that section. A correspondent writes us from Piqua, Miami Co., in that State, that at 10 o'clock, the beauty of the display was at its hight, and that its splendor was never equaled in the memory of the oldest inhabitant.

On the night of the occurrence we chanced to be in a suburban district away from gaslights and buildings, and in other respects favorably situated to observe the phenomenon. Our attention was first called to it about forty-five minutes past seven o'clock, at which time, although the new moon was shining brightly, the heavens were gorgeously lighted up. Mars was almost exactly in the zenith. Around this planet there seemed a small unilluminated space, inclosed by a ring of pale light. From this ring extended radial bars of light in all directions like spokes of a huge wheel, to the horizon. As these bars of light neared the horizon, they increased in width and brilliancy in some parts of the heavens, giving the most beautiful prismatic colors, of which violet was the most conspicuous. The moon looked like the nucleus of a huge comet, with a tail extending westward, and reaching quite below the horizon. The entire sky was covered with a maze of tremulous light, beautiful beyond description, but it soon diminished in splendor, and although visible much later, did not again appear as bright as in the earlier part of the evening.

The aurora borealis is not confined to the Northern hemisphere, or to any zone. It has been seen within 14° of the equator, although its most frequent and brilliant displays occur nearer the poles. It is without doubt electrical in its character, and bears an important relation to terrestrial magnetism. This is more particularly evidenced by its effects upon telegraphic wires and instruments. During the last display, as on frequent previous occasions, telegraphic wires were disconnected from the batteries and messages transmitted without their help. Some have assigned to this phenomenon a cosmical cause, like that of meteoric showers; but the analogies all seem to point to electricity as the prime agent in auroral displays, although the fact has never been positively demonstrated.

There also exist, no doubt, peculiar atmospheric conditions necessary to the occurrence of an aurora, but the precise nature of these conditions is not yet understood. They occur at all seasons; one of the most brilliant we ever saw occurred in midsummer. There has never been discovered any relation between the relative positions of the earth and moon, and the occurrence of auroras, although some have thought it probable such relations exist.

Professor Olmstead thought he had discovered secular periods in the occurrence of auroral displays, but we consider this as hardly warranted by the facts. He fixed the commencement of such a period as being August 27, 1827; the length of the period being twenty years with intervals of from sixty to sixty-five years.

The observations of auroras have not been so frequent in the Southern Hemisphere as in the Northern, and it is quite probable that the whiteness of the light and absence of color, described by navigators as being characteristic of Southern auroras, may rest upon insufficient evidence.

The subject is one fruitful of speculation, and calculated to excite the most intense interest in the minds of investigators. The application of the spectroscope to such investigations seems obviously promising.

Tree Mining.

From the new work by Prof. Cook on the Geology of New Jersey, recently noticed in the Scientific American, we condense the following account of Tree Mining in New Jersey. In most of the marsh, known as the "Jersey Flats," near the upland, which is shallow, fallen timber is found buried; and the stumps of trees are still standing with their roots in the solid ground where they grew. The timber found in this condition is of oak, gum, magnolia, cedar, pine, and other species, such as are now the natural growth of the country. Where they are of pine, cedar, or other durable wood, their broken and weather-worn trunks are seen projecting above the marsh which has overrun the place of their growth. On the land-side of the beaches, along the sea-shore, large numbers of leafless and dead red cedars may be seen standing in the marsh, the indestructibility of the wood keeping the trees erect, although the marsh has, in some instances, gathered around them to the depth of several feet.

The remains of trees are not equally abundant in all localities, owing partly, perhaps, to differences of exposure, but more to the difference in durability of the various species of wood. In many places where oak, gum, and other deciduous trees were known to stand formerly, there are no traces of them now; they have entirely rotted away. On the contrary, the pine and the red and white cedar are almost indestructible. Pine stumps are found several feet under the marsh, where they have been for an unknown period, and which retain the characteristic smell and appearance of the wood almost as perfectly as the fresh-cut specimens. At several places in southern New Jersey, an enormous amount of white cedar timber is found buried in the salt marshes, sound and fit for use, and a considerable business is carried on in mining this timber and splitting it into shingles for market. In some places it is found so near the surface that fragments of the roots and branches are seen projecting above the marsh, while in other cases the whole is covered with smooth meadow-sods, and there is no indication of what is beneath till it is sounded by thrusting a rod down into the mud.

The tree of which these swamps are composed, is the white cedar, the *Cupressus huyoides* of the botanists. It is an evergreen, which thrives best in wet ground, and in favorable situations forms dense swamps. It is most commonly found on the head-waters of streams.

Timber which is buried in the swamp undergoes scarcely any change; trees which are found several feet under the surface, and which must have lain there for hundreds of years, are as sound as ever they were; and it would seem as if most of the timber which had ever grown in these swamps was still preserved in them. Trunks of trees are found buried at all depths beneath the surface, quite down to the gravel; and so thick, that in many places a number of trials will have to be made before a sounding-rod can be thrust down without striking against them. Tree after tree, from two hundred to one thousand years old, may be found lying crossed one under the other in every imaginable direction. Some of them are partly decayed, as if they had died and remained standing for a long time, and then been broken down. Others have been blown down, and their upturned roots are still to be seen. Some which have been blown down, have continued to grow for a long time afterwards, as is known by the heart being very much above the center, and by the wood on the under side being hard and boxy. These trunks are found lying in every direction, as if they had fallen at different times, as trees would in a forest now.

The cedar logs which are buried in the swamps are mined, or raised, and split into shingles; and this singular branch of industry furnishes profitable occupation to a considerable number of men.

In conducting this latter business, a great deal of skill and experience is requisite. As many of the trees were partly decayed and worthless when they fell, it becomes important to judge of the value of the timber before much labor is wasted upon it. With an iron rod the shingler sounds the swamp until he finds what he judges to be a good log; he tries its length and size with this rod; with a sharp cutting spade he digs through the roots and down to it; he next manages to get a chip from it, by the smell of which he can tell whether it was a windfall or a breakdown; that is, whether it was blown down or broken off. The former are the best, as they were probably sound when they fell. If he judges it worth taking, he cuts out the matted roots and earth from over it, and saws it off at the ends. This latter operation is easily performed, as the mud is very soft, and without any grit. By means of levers he then loosens it, when it at once rises and floats in the water, which is always very near the level of the swamp. The log is then cut into shingle lengths, and split into shingles. The logs are sometimes, though rarely, worked for thirty feet.

It is very interesting to see one of these logs raised. It comes up with as much buoyancy as a freshly fallen cedar; not being water-logged at all. The bark on the under side looks fresh, as if it had lain but a few days; and what is remarkable, the under side of the log is always the lightest; the workmen observe that when the logs floats in the water it always turns over, the side which was down coming uppermost. The buoyancy of the timber remaining, it is probable the lower logs rise in the mud when the roots over them are cut loose, and the logs which laid upon them are removed.

These logs are found not only in the swamp, but also out in the salt-marsh, beyond the living timber. Such marsh has, however, a cedar swamp bottom, which has been overrun by the tide. The heaviest part of the business in making the shingles is done in the neighborhood of Dennisville.

By sounding with an iron rod, these logs can be felt under the surface at all depths, from one to ten feet, and some have said for even more than that. At Dennisville a well was dug in the marsh eleven feet in depth. The mud near the surface was the common blue mud of the marshes; at a small depth the peaty cedar swamp-earth was reached, and in it cedar timbers, logs, and stumps, were found for several feet, and near the bottom the sweet gum (*Liquidambar styracifolia*) and the spoon-wood or magnolia (*Magnolia glauca*) were found. The well reached hard bottom. The white cedar grows on peat, and its roots run near the surface, so that it might be supposed the mud had settled with them, were it not for the fact that, when cedar grows where the mud is shallow, so that its roots reach hard bottom, its wood is unfit for timber, the grain or fibers being so interlocked that it will not split freely. Such is found to be the case in the buried timber; the bottom layer, as it is called, is worthless. From this the inference is conclusive that the hard ground was above tide-level when these trees grew. Large stumps are frequently found standing directly on other large logs, and with their roots growing all around them, and then other logs still under these, so that one soon becomes perplexed in trying to count back to the time when the lower ones were growing. Dr. Beesley, of Dennisville, some years since communicated to the newspapers an article on the age of the cedar swamps, which was copied by Mr. Lyell in his Travels in the United States Second Visit, Vol. I., p. 34; in which Dr. B. says that he "counted 1,080 rings of annual growth between the center and outside of a large stump six feet in diameter, and under it lay a prostrate tree, which had fallen and been buried before the tree to which the stump belonged first sprouted. This lower trunk was five hundred years old, so that upward of fifteen centuries were thus determined, beyond the shadow of a doubt, as the age of one small portion of a bog, the depth of which is, as yet, unknown."

To our Correspondents.—We repeat what we have often published in our columns, that no notice will be taken of letters not signed by the writers. The correspondence of this office amounts to several hundred letters daily, and we have a right to know the names of parties who write to us for information, and also what claim they have upon our attention. All letters (except anonymous) are carefully read, and when the subject of the inquiry is one that we deem useful and important, we endeavor to answer it; but it sometimes happens that the information sought for is beyond our immediate reach, or is considered too frivolous to merit time and attention. In all such cases, we are necessarily obliged to decline answers, but, as a general rule, letters addressed to this office are either noticed in the Scientific American, or answers are sent by mail. Our correspondents seldom complain of inattention to their inquiries; but we urge upon them to be clear and concise in stating their points.

NEW PUBLICATIONS.

KEMLO'S WATCH REPAIRERS' HAND-BOOK: Being a Complete Guide to the Young Beginner in taking apart, putting together, and thoroughly cleaning the English Lever and other Foreign Watches, and all American Watches. By F. Kemlo, Practical Watchmaker. With Illustrations. Boston: A. Williams & Co., 100 Washington street.

This work contains information of practical importance to every one engaged in repairing watches. It is express, clear, concise, and comprehensive. While of special interest to the craft, it is also a valuable work for owners of watches. We need not instruct our readers that the man who understands a machine is the only one who can take proper care of it. The book before us is eminently adapted to give even the amateur a good understanding of the mechanism of the watch.

THE VELOCIPEDE: Its History, Varieties, and Practice. With Illustrations. New York: Hurd & Houghton.

A pleasantly-written, convenient, and entertaining little pamphlet, which will be sought for by enthusiasts in this sport.

Business and Personal.

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

The original oil paintings, by Jerome Thompson, "Home, Sweet Home," "The Old Oaken Bucket," "Paddle Your Own Canoe," and "The Captive Child," will be sold without limit, at auction, on Friday, April 30, at 8 o'clock, at Fifth Avenue Art Galleries, cor. Fifth Ave. and 14th st., by John H. Draper & Co., Auctioneers, Hanover Square.

Henry Baughman, care Wm. C. Jessup & Co., Augusta, Ga., wishes to obtain a sand belt for smoothing spokes.

Map Engravers—Address Box 29, Greensboro', Ala.

A Machinist and Draftsman desires a situation as Draftsman. Address Paul Whitney, Frankfort House, cor. Frankfort and William sts., New York city.

Wanted—Parties to manufacture a new patent braider foot for sewing machines. Address D. Coon, Postoffice Draw 52, Ogdensburg, N.Y.

Rossing Machine.—Manufacturers of machines for rossing bark off saw logs, send circulars to J. R. Hoffman & Bros., Fort Wayne, Ind.

Blue Rapids—The best mill power in Northern Kansas, with 287 acres of land, for sale, near a railroad. Address R. S. Craft, Holton, Kansas.

"Grindstones—How to Hang and Use them Properly." Send for descriptive pamphlet. J. E. Mitchell, 310 York Ave., Philadelphia.

For sale at a bargain—a complete barrel factory, nearly new. Address Hartmann, Laist & Co., Cincinnati, Ohio.

Rubber Tire for velocipedes and light carriages upon a new principle, obviating all objections. H. G. Tyer, India-rubber Manufacturer, Andover, Mass., and 86 Pearl st., Boston.

Foreman Wanted—A young man that has had some experience as Foreman in a machine shop, competent to superintend the construction of large machinery, apply to Murray, Moore & Co., Portsmouth, Ohio.

Reckart's Patent Hub Lathe—A matchless sweep. For descriptive circular, giving full particulars, address J. M. Scribner, Ag't, Middleburgh, N. Y.

Wanted—Steady employ for portable saw mill, 3 to 5 years' contract, by the thousand. Address Box 8, Albion, Erie Co., Pa.

Sieve-hoop makers address Reimer & Holdsworth, 57 Fulton street, New York city.

Wanted—A situation by a first-class Electro Gold and Silver Plater. Address H., Box 178, Waterbury, Conn.

Riehle Bros., the Modern Scale Makers, successors to Banks, Dinmore & Co., 9 and Melon sts., Philadelphia. Circulars describing their recent Patents, & containing testamentary letters, sent free on application.

"Engineer."—You will save much oil and have none of the difficulty you speak of, if you put on one of "Broughton's" Lubricators, for which address H. Moore, 41 Center st.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

J. D. Borin, Scottsboro, Ala., wants a first-rate Brick Machine.

Pickering's Velocipede, 144 Greene st., New York.

A. B. Fisher, practical millwright, 9 Ross st., Brooklyn, E.D., N.Y.

$1 per year.—Inventors and Manufacturer's Gazette. The cheapest, best, and most popular journal of the kind published. Send stamp for specimen copy. Saltiel & Co., Publishers, P. O. box 448, or 37 Park Row, New York.

Machine for bending fellies—Patent for sale—the whole, or State Rights. Address DeLyon & Werner, Canton, Miss.

Diamond carbon, formed into wedge or other shapes for pointing and edging tools or cutters for drilling and working stone, etc. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

The new method for lighting street lamps! For illustrated circular, with letter from President Manhattan Gas Light Co., and Sup't of Lamps N. Y. City. Address J. W. Bartlett, Patentee, 569 Broadway, N. Y.

The Tanite Emery Wheel.—For circulars of this superior wheel, address "Tanite Co.," Stroudsburgh, Pa.

The manufacture and introduction of sheet and cast metal small wares is made a specialty by J. H. White, Newark, N. J.

The Magic Comb will color gray hair a permanent black or brown. Sent by mail for $1·25. Address Wm. Patton, Treasurer Magic Comb Co., Springfield, Mass.

For coppered iron castings address J. H. White, Newark, N. J.

W. J. T.—We think the patent asbestos roofing manufactured by H. W. Johns, of this city, is the best substitute for tin or slate. It is cheap and easily applied.

Tempered steel spiral springs. John Chatillon, 91 and 93 Cliff st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of Parker's Power Presses.

Mill-stone dressing diamond machine, simple, effective, durable. Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

Winans' boiler powder, N. Y., removes and prevents incrustations without injury or foaming; 12 years in use. Beware of imitations.

The paper that meets the eye of all the leading manufacturers throughout the United States—The Boston Bulletin. $4 00 a year.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

KNITTING MACHINE.—John Pepper, of Gilford, N. H., has petitioned for the extension of the above patent. Day of hearing, June 28, 1869.

MACHINE FOR MORTISING WINDOW BLINDS.—Joseph A. Peabody, of Philadelphia, Pa., has petitioned for the extension of the above patent. Day of hearing, June 28, 1869.

BRIDLE REIN.—Kingston Goddard, of Richmond county, N. Y., has applied for an extension of the above patent. Day of hearing, July 5, 1869.

REFRIGERATOR.—William Moultrie, of New York city, has applied for an extension of the above patent. Day of hearing July 5, 1869.

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.*

C. B., of Ohio.—The dampness of the wall of which you write us, will be hard to remedy entirely under the circumstances. A brick wall in contact with damp shaded soil will always be damp. You can help matters, however, by digging down below the brick on the outside and painting over the wall with pitch, such as is used on ships' bottoms. On the inside put up studs, and lath and plaster a wall, leaving a space between it and the brick. The studs may be of inch boards, as the only object is to get a wall not in contact with the damp brick.

E. H. R., of Ill.—You are not the first who has considered the *vis formatrix*, of a crystal the same, except in degree, as that of plants and animals. Prof's Owen and Huxley entertain nearly the same view, but when you ask what is the cause of this power, you go farther than those vigorous intellects deem it possible for philosophical inquiry to receive an answer. That is a subject for faith, not for physical research.

W. A., of Ind.—The velocity of a 36-inch burr stone to do best work ought to be about 150 per minute. To grind ten bushels of corn per hour will require, according to Nicholson's "Operative Mechanic," about three horse power.

M. E. O. C., of Wis.—The pressure in a boiler per square inch when it blows off, is found by multiplying the weight into the long arm of the safety valve lever, and dividing the product by the product of the short arm into the area of the valve in square inches, or a proportion may be used. In the special case you mention, where the long arm is 30 inches the short arm 3 inches, the area of the valve 5 square inches and the weight 125 lbs., the proportion would be 3 : 30 : : 125 : 1250, the entire pressure sustained by the valve, which divided by 5 inches, the area of the valve, gives the pressure per square inch in the boiler.

F. U., of Ill.—"Will coal soot cause water to harden in a cistern?" Ans. In general it will not. If however, the soot precipitated on the roof comes from a zinc smelting furnace it might contain oxides which would effect the water. The probable cause is the use of cement containing soluble compounds of lime. All new plastered cisterns render water more or less hard for a time.

G. J. B., of Vt.—Water engines are a very old device; you will find them described in Ewbank's Hydraulics, and in various other works.—Spencer's Water meter is a small double cylinder engine operated by water instead of steam, with slide valves and eccentrics. The objection to these machines arise from the inelasticity of water, and the liability of parts working under water to wear, etc.

H. K., of Mich.—Try the alum and plaster for stopping holes in burr stones without the glue, the latter does harm rather than good. If the holes are large use some fragments of burr stone as part of the filling.

E. W. L. C., of Ohio.—Shellac dissolved in alcohol is a good cement o make paper labels adhere to tin. The varnish should be tolerably thick.

T. H. G., of N. Y. inquires, "Can any of your numerous readers inform me, why it is, that, although many patents have been obtained for aerial machines, we hear nothing of their practical results?" The reason is simply that all aerial machines up to this time have been practically worthless.

"Jersey Farmer" can obtain such information about sawmills as he wants, by putting an advertisement in the SCIENTIFIC AMERICAN.

C. S. H., of Pa.—You ask "What constitutes a day's work for a draftsman?" There is no rule in reference to it that we know of, but draftsmen in our office work about eight hours—That is as long as they ought to bend over the board.

F. W. Woodward, of Winnsboro, S. C., states that there is an excellent quarry of oil and white stone near him and wishes to correspond with manufacturers.

S. F. H., of Mass., wishes to know "If the earth in proportion to its size is not as smooth and finely polished as a cambric needle?" We answer that in our judgment it is, but if our correspondent has any doubt about it we advise him to submit the question to an experimental test, and inform us of the result. It is a subject that deserves to be investigated.

N. H. S., of N. Y.—Calcium was obtained by Matthiessen by the electrolytic decomposition of a mixture consisting of two equivalents of chloride of calcium and one equivalent of chloride of strontium. The mass may be fused in a Hessian crucible, in the center of which is placed a porous tube filled with the same mixture, and into this an iron wire passed through the stem of a tobacco pipe is inserted. This wire is connected with the platinode of a battery, the zincode of which consists of a plate of iron bent into a cylindrical form, and immersed in the melted mass exterior to the porous tube. The calcium is reduced and preserved from oxidation by so regulating the heat that a film of solidified salt shall form upon the surface of the mixture in the porous cell. Lies Bodart obtained it more easily by fusing iodide of calcium with an equivalent quantity of sodium. See Miller's Inorganic Chemistry, page 407.

S. U. B., of Mich.—There is no difficulty in superheating steam in pipes to 300° Fah., but it is doubtful if the temperature of a room for kiln drying can be kept, by that means, to that temperature. Much of the heat is lost by radiation. Direct heat from a properly constructed furnace is better than steam heat for kiln drying purposes.

N. F. P., of N. J.—We do not hold ourselves responsible for the statements of advertisers in our columns, under whatever head they may choose to address our readers. The "Business and Personal," is an advertising column; we do not feel at liberty to express an opinion as to the value of the devices therein mentioned, or on the character of the advertisers. Our opinion of the Whitlock Exposition is freely expressed on page 280, current volume, in an editorial article.

C. W. I., of Iowa, asks if there is any practical rule for the position of a water wheel in a "draft tube;" whether there is any point in such "tube" at which a wheel will give a greater percentage of power than at any other. We hardly know what this correspondent means. He may suppose that more force may be gained by conducting the power (head of water) through a tube, to the wheel, at a distance from the source, than in receiving it direct from the source, or fall; but it is evident that the closer the wheel to the force—the less friction and consequent waste—the more power will be delivered.

J. E. C., of Mass.—Malleable cast iron is simply ordinary cast iron subjected to a red heat for hours, or days, according to the size of the articles, they being packed in iron scales or pulverized specular iron ore, the object being to combine the oxygen of the oxide with the carbon of the iron. A visit to any malleable iron concern will show the *modus operandi* better than we can describe it in a column.

Recent American and Foreign Patents.

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

IMPROVEMENT IN MATCHES.—Our readers will recollect an article recently published in the SCIENTIFIC AMERICAN, headed, "Wanted—A Pipe Light." The endless match, patented by Wm. H. Rogers, seems calculated to meet this want as well as to take a prominent place among competitors for domestic use. This match is self-igniting, and combustible throughout its whole length; when lighted it can be extinguished and re-lighted as well as before, and so on until it is entirely consumed. The match, when in use, is taken from the case and slipped into a metallic tube, so arranged that the match can be thrust out as wanted; when used, it is put out by a small extinguisher, which is slipped over the end of the tube. It is a very convenient and safe arrangement. The flame is very persistent, and is not easily blown out. For smokers and travelers the new match is specially adapted. The composition for these matches was patented through the Scientific American Patent Agency October 27, 1868, and the tube, or safe, October 13, 1868. The agents for New York city are J. H. Tennant & Co., 221 Pearl street.

HOOP ADJUSTER FOR FORE-AND-AFT SAILS.—F. B. Dunton, Center Lincolnville, Me.—The object of this invention is to provide the means for causing the mast hoops of fore-and-aft sails to work more perfectly than was hitherto the case.

ONE-WHEELED VELOCIPEDE.—Henry S. Cohn, New York city.—This invention relates to a new one-wheeled velocipede, which is arranged with spokes diverging laterally from the tire, so that sufficient space is formed within the wheel and between the spokes for arranging the drivers' support, or seat, on the axle, and for operating the vehicle by applying power to the said axle in a suitable manner.

GANG PLOWS.—Thomas J. Hall, Byran, Texas.—This invention relates to a gang plow, which is so arranged that the beams can be swung side-ways and up and down at will, and so that they can be permanently secured in any desired position.

MITER BOX.—Robert Burchell and Robert T. Burchell, Trenton, N. J.—The object of this invention is to provide an improved apparatus for guiding hand-saws in the operation of mitering strips of wood, as molding and the like.

BLOTTING PAD AND HAND REST.—Peter Gorsline, Elizabeth, N. J.—This invention relates to a new apparatus, which is to be attached to the hand of a writer, and which will form a convenient hand rest, and act as a blotter. The invention consists in the combination, with a place for holding them, of a strap and blotting pad.

CORE COMPOUND.—John I. Vinton, Altoona, Pa.—This invention relates to a new and useful improvement in material for making cores in iron and brass founding, and for all purposes for which cores are used in forming metal castings.

WINDOW CORNICE.—O. L. Gardner, New York city.—This invention relates to a new and useful improvement in cornices for supporting window curtains in dwellings and other buildings, the improvement having reference to a mirror frame, for which letters patent were granted to the present inventor, dated September 10, 1867.

VISES.—F. H. Furniss, Waterloo, N. Y.—This invention relates to improvements in vises, he object of which is to provide for more permanently holding those vises which are arranged to be adjusted to any angle relatively to the bench.

WASHING MACHINE.—W. B. Gardner, Almond, N. Y.—This invention relates to improvements in washing machines such as have a grooved roller, and a reciprocating curved and grooved board acting in conjunction therewith; and it consists in the application to the said grooved roller of a brake arranged to arrest the motion thereof when required to subject some part of the clothes to a greater amount of rubbing than other parts.

STEAM PUMP.—John McCloskey, New York city.—This invention relates to improvements in steam pumps, designed more especially for employment in buildings in connection with ranges, for elevating water where it is not attainable from reservoirs; but is also applicable for general use as a steam pump. It consists in the adaptation of one cylinder and two pistons for both the steam and water engine and in the valve mechanism.

PLOW.—G. M. Atherton, Friendsville, Ill.—This invention has for its objec to furnish an improved plow, designed especially for plowing stumpy and rooty ground, but which shall, at the same time, be so constructed as to be adjusted for ordinary plowing.

COMBINED BOLT AND LOCK.—Darwin V. Miller, Weedsport, N. Y.—This invention has for its object to furnish an improved bolt and lock, which may be used either with or without a key, and which shall be simple in construction, easily operated, and, at the same time, burglar proof.

ROTARY OILING PUMP.—Alexander Shafer, Wellsville, N. Y.—This invention has for its object to furnish an improved device for introducing oil into the steam chest or cylinder of a steam engine, which shall be so constructed that the oil may be introduced in any desired quantity and at any desired time.

CLOTHES FRAME.—William A. Daggett, South Vineland, N. J.—This invention has for its object to furnish a simple, convenient, strong, and durable clothes frame, which shall be so constructed and arranged that when extended it may furnish a large drying surface, and when closed it may be shut up into small compass.

HEATER.—J. S. Van Buren, Norwich, Conn.—This invention has for its object to furnish an improved heater, which shall be so constructed as to utilize a much larger proportion of the heat developed by the combustion of the fuel than is possible with the stoves and heaters constructed in the ordinary manner.

HEATER.—John H. Goodfellow, Troy, N. Y.—This invention has for its object to furnish an improved base-burning heater, simple in construction, and effective in operation, utilizing almost entirely the heat in the products of combustion before they escape into the chimneys.

ATTACHING HORSES TO CARRIAGES.—C. McElroy, New Baltimore, Mich.—This invention has for its object to furnish an improvement in the manner of attaching horses to carriages, by means of which the horse can be easily and quickly attached and instantly detached when required, which shall be safe and reliable, and, at the same time, will dispense with the use of the ordinary traces and whiffletrees.

TABLE ATTACHMENT FOR BEDSTEADS.—Mrs. E. D. W. Hatch, Chicago, Ill. The invention has for its object to furnish a simple and convenient table for attachment to bedsteads, lounges, etc., designed especially for invalid use, which shall be so constructed and arranged that it may be adjusted hight or positions as the convenience of those using it may require.

STOVE SHIELD.—Edward C. Stoddard and John R. Hoyt, Woodbury, Conn.—This invention relates to a new attachment to stove pipes, which has for its object to prevent the overheating by the pipes of wooden mantelpieces, or other combustible devices near which the pipe may be arranged. The invention consists in the use of sheet metal, or other plate or shield, suspended at the side from the stovepipe, so that an air space is formed between the pipe and shield.

NOZZLE FOR SHEET-METAL CANS.—Charles Pratt, New York city.—This invention has for its object to produce an improved seal for the nozzles of sheet-metal cans, such as are used for the transportation of a certain branch of burning oils, which, when removed from the nozzle, will leave evidence of its having been used.

Combined Cultivator and Planter.—Benjamin Anyan, Fitchville' Ohio.—This invention has for its object to furnish a simple, convenient, and effective machine, which shall be so constructed and arranged that it may be easily and quickly adjusted for use as a cultivator or planter, doing its work thoroughly and well in either capacity.

Potato Peeler.—Wm. Zeiger, Elmore, Ohio.—This invention relates to a new machine for peeling potatoes and other fruit; and it consists in the application of revolving graters, and of a stationary removable grater, to operate in the desired manner for paring apples, potatoes, etc.

Glass-blowing Apparatus.—Benj. F. Cloud, Philadelphia, Pa.—This invention relates to improvements in apparatus for glass blowing, whereby the blast may be supplied by power, and regulated in the application with facility.

Cream Saver.—P. F. Lewis, Columbus, Pa.—This invention consists of an attachment suspended from the underside of the cover, and arranged to take the cream from the handle and deliver it back within the churn.

Velocipede.—Joseph Irving, New York city.—This invention consists in producing a brake, arranged to act on the front wheel, to be operated from the guiding lever, and capable of turning with the wheel as the latter is changed in its course for steering, and also in producing a leg rest capable of turning with the said front wheel.

Machine for Pulling Beans.—S. R. Niles, Rawsonville, Mich.—This invention relates to improvements in bean-pulling machines, designed to provide a simple and effective machine, of cheap construction, with an improved arrangement of adjustable truck device, capable of being readily adjusted to permit the machine to be worked, or to hold it out of the working position and support it while moving to or from the field, or along the road.

Tenon.—Jackson Barnes, Burlington, Vt.—This invention relates to improvements in devices for securing parts of framing together, whether of wood or other substance, especially such articles as are required to be taken apart, as bedsteads; and it consists in a metallic tenon (preferably of circular form) secured to one part in a manner to allow it to rotate, and capable of hooking behind a pin passing through the mortice in the other part.

Wood-Boring Machine.—B. F. Mohr, Mifflinburg, Pa.—This invention relates to improvements in machinery for boring wood, and consists in an improved method of clamping the wood to be bored to the feeding carriage; also, an improved arrangement of the carriage and its feeding devices, whereby it is fed past the auger and up to it; and also, in an improved arrangement of the auger support for adjusting and detaching the auger.

Boiler for Cooking and Other Purposes.—Fenn Wilcox, Newark, N. J.—This invention relates to improvements in vessels used for boiling vegetables, clothes, etc., the object of which is to provide a means for preventing the water of condensation from escaping into the fire, and thereby extinguishing it; and it consists of a boiling apparatus, arranged to convey the steam into the stove or furnace.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING APRIL 20, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

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89,002.—Gold-leaf Condenser.—John F. Adams, Worcester, Mass.

89,003.—Railway-carriage Wheel.—John P. Allen, Manchester, Mass.

89,004.—Lawn Mower.—Jos. Arbeiter, East Hartford, Conn.

89,005.—Manufacture of Glass Ware.—J. S. Atterbury and T. B. Atterbury, Pittsburgh, Pa.

89,006.—Saw Sharpener.—Austin Bartlett, Chester, Mass.

89,007.—Lasting Boot and Shoe.—Isaac N. Beals, North Bridgewater, Mass.

89,008.—Corn Marker.—Jacob H. Beam, Woodside, Ill.

89,009.—Shoe Last.—H. R. Bean (assignor to himself and S. N. Aldrich), Marlborough, Mass.

89,010.—Ice Chest for Soda Apparatus and Refrigerators.—E. Bigelow, Springfield, Mass.

89,011.—Loom.—E. B. Bigelow, Boston, Mass.

89,012.—Stopping Mechanism for Power Looms.—E. B. Bigelow, Boston, Mass.

89,013.—Box Opener.—Robert Blake, Scranton, Pa.

89,014.—Railway-car Brake.—J. T. Blois, Jonesville, Mich.

89,015.—Steering Apparatus.—A. T. Boon, Galesburg, Ill. Antedated April 5, 1869.

89,016.—Sled Brake.—A. J. Braley, Berlin, Vt.

89,017.—Spinning Frame.—H. Beaumont Briggs, Clarksburg, assignor to James Hunter and James E. Hunter, Adams, Mass., for one-half of said invention.

89,018.—Fastening for Stays of Corsets.—J. W. Brooks, Boston, Mass.

89,019.—File Holder.—A. P. Brown, Worcester, Mass. Antedated April 10, 1869.

89,020.—Pump Valve.—J. H. Brown (assignor to himself and J. B. Harris), Pittsgrove, N. J.

89,021.—Device for Steering Sleds.—George Buchanan, Washington, Pa.

89,022.—Press for Baling Hay and Cotton.—E. Buel, Silver Creek, N. Y.

89,023.—Pump Valve.—H. C. Bulkley and Amos Shepard (assignors to the Union Manufacturing Company), New Britain, Conn.

89,024.—Gong Bell.—Legrand S. Carpenter, East Hampton, Conn.

89,025.—Ring for Spinning Frame.—William T. Carroll, Medway, Mass.

89,026.—Mechanical Movement.—H. J. Case, Auburn, N.Y.

89,027.—Railroad-car Stove.—Levi R. Comstock, Keokuk, Iowa.

89,028.—Fluting Machine.—C. F. Corbett, Boston, Mass.

89,029.—Horse Rake.—Edward Crandal, Northville, Mich.

89,030.—Catarrhal Syringe.—J. W. Culbertson, Richmond, Ind.

89,031.—Shelf, Coat Rack, and Clothes Frame.—John Danner, Canton, Ohio.

89,032.—Thill Coupling.—James Dempsey (assignor to himself and Nathan Levy), Geneva, N. Y.

89,033.—Sad-iron Heater.—Arnold Doll, Cleveland, Ohio.

89,034.—Safety Pocket.—Josiah Foster, Sandwich, Mass.

89,035.—Copying Press.—G. C. Gage, Waterford, N.Y. Antedated April 9, 1869.

89,036.—Voltaic Battery.—A. C. Garratt, Boston, Mass.

89,037.—Snap for Bracelets, etc.—G. S. Grant (assignor to A. O. Baker), Providence, R. I.

89,038.—Lubricating Sleeve for Loose Pulleys.—O. E. Greene, Lawrence, Mass.

89,039.—Medicine for Purifying the Blood.—Richard Guinn, Baltimore, Md.

89,040.—Sewing Machine.—W. S. Guinness (assignor to himself and A. G. Seaman), London, England.

89,041.—Mop Wringer.—William Hall, North Adams, Mass.

89,042.—Saw Sharpening Device.—Jamison H. Harrison, Boston, Mass.

89,043.—Shuttle Binder for Looms.—Myron E. Haskell, Lowell, Mass.

89,044.—Stove Tongs.—Nehemiah L. Hatch, Cape Elizabeth, Me.

89,045.—Table-leaf Support.—John Hilts, Detroit, Mich.

89,046.—Churn.—S. B. Holden, Woburn, assignor to himself and L. L. Holden, Boston, Mass.

89,047.—Velocipede.—J. A. House and W. B. Snyder, Bridgeport, Conn.

89,048.—Machine for Finishing Cloth.—Daniel Hussey, Nashua, N. H.

89,049.—Material for Journals and Bearings, and for Lubricating.—A. B. Jones, Wilmington, N. C.

89,050.—Turbine Water Wheel.—John Jordan, East Windsor, assignor to himself and C. N. Harlow, West Cummington, Mass. Antedated April 15, 1869.

89,051.—Still for Turpentine and other Substances.—Robert W. Lamb (assignor to himself and A. Paul Repiton, Jr.,) Wilmington, N. C.

89,052.—Ladies' Work Table.—William St. George Little, Boston, Mass.

89,053.—Mode of Rendering Brick, Stone, Clay, Plaster, etc., Water Repellent.—Robert O. Lowrey, Salem, N. Y. Antedated March 23, 1869.

89,054.—Mode of Rendering Fibrous Fabrics Water Repellent.—Robert O. Lowrey, Salem, N. Y. Antedated March 23, 1869.

89,055.—Manufacture of Water-proof and Water Repellent.—R. O. Lowrey, Salem, N. Y. Antedated March 23, 1869.

89,056.—Water-proof Compound.—R. O. Lowrey, Salem, N. Y. Antedated March 23, 1869.

89,057.—Harness Buckle.—A. C. Luther, Canton, Ohio.

89,058.—Folding Perambulator.—Charles Lyne, Padstow, England. Antedated April 6, 1869.

89,059.—Attaching Handles to Cutlery.—Samuel Mason and Edward Binns, Beaver Falls, Pa.

89,060.—Pump Piston.—S. G. Mason, Rochester, N. Y. Antedated April 15, 1869.

89,061.—Car Coupling.—Alpine McLean, Boston, Mass.

89,062.—Machine for Punching, Shearing, and Straightening Fish Bars.—William Morehouse, Buffalo, N. Y.

89,063.—Water Wheel.—Isaac Morse, Henniker, assignor to himself and C. H. Thorndike, Weare, N. H.

89,064.—Sewing Machine.—Wm. Muir, Montreal, Canada.

89,065.—Power Loom for Weaving Ingrain Carpets.—Andrew Murray (assignor to Lowell Manufacturing Company), Lowell, Mass.

89,066.—Jam Nut.—B. W. Nichols (assignor to himself and W. R. Raynolds, Jr.,) Canton, Ohio.

89,067.—Beehive.—Ole Osmundson, Mission, Ill.

89,068.—Eaves-trough Suspender.—T. F. Palm (assignor to himself and L. J. Bliven), Toledo, Ohio.

89,069.—Velocipede.—G. T. Parry, Philadelphia, Pa.

89,070.—Railway Rail.—Denison C. Pierce, Clayton, N. Y.

89,071.—Stop-valve for Steam and other Enginery.—Robert Pilling, Waterford, N. Y.

89,072.—Seeding Machine.—Archibald Putnam, Owego, N.Y.

89,073.—Submarine Pump Dredge.—David Quinn, Chicago, Illinois.

89,074.—Manufacture of White Lead.—Tryon Reakirt, Philadelphia, Pa.

89,075.—Chimney.—W. G. Reed, Chelsea, Mass.

89,076.—Composition for Making Chilled Castings.—J. Reichenbach (assignor to himself, John Heath, and W. R. Fitzsimons), Allegheny City, Pa.

89,077.—Bag Holder and Truck Combined.—H. A. Reid, Beaver Dam, Wis.

89,078.—Automatic Feed Crib for Stable Stalls, etc.—E. B. Rich, South Boston, Mass.

89,079.—Railroad Chair.—T. C. Robinson, Boston, Mass., assignor to himself and G. H. Sanborn.

89,080.—Rotary Pump.—Geo. W. Rogers, Philadelphia, Pa. Antedated April 3, 1869.

89,081.—Automatic Seed Separator.—Mark M. Rowell, Brandon, Wis.

89,082.—Harvester.—Alonzo Saltsman and C. H. Charlesworth, Avoca, and R. F. Osgood, Rochester, N. Y.; said Osgood assigns his right to said Saltsman and Charlesworth.

89,083.—Cotton Gin.—C. G. Sargent, Westford, Mass.

89,084.—Music Rack.—Arthur Shaffer, Dubuque, Iowa.

89,085.—Gathering Attachment for Sewing Machine.—Carle Scharffe (assignor to W. Wilson), Cleveland, Ohio.

89,086.—Street Car.—Philander Shaw, Boston, Mass.

89,087.—Boiler Feeder.—Joseph Shirk and Isaac W. Martin, East Earl township, Pa.

89,088.—Cartridge.—Dexter Smith and J. W. Storrs (assignors to the Wesson Fire Arms Company), Springfield, Mass.

89,089.—Car Coupling.—J. F. Spaulding, Rutland, Vt.

89,090.—Gas Holder.—C. A. Stebbins, Springfield, Mass.

89,091.—Device for Measuring, Laying out, and Cutting Garments.—G. P. Sweezy, Riverhead, N. Y.

89,092.—Safety Switch.—C. A. S. Temple, Greenwood village, assignor to himself and S. E. Temple, Boston, Mass.

89,093.—Sewing Machine.—Alex. Tittman, Indianapolis, Ind., assignor to himself, W. H. Turner, and D. Henderson.

89,094.—Mode of Treating Paper and Other Fabrics, to Render them Waterproof.—C. Toppan, Wakefield, Mass.

89,095.—Water Repellent Material.—Charles Toppan, Wakefield, Mass.

89,096.—Horseshoe.—J. H. Tyler, Martin, N. C.

89,097.—Auger.—Calvin Wardwell, Painesville, Ohio.

89,098.—Churn.—G. W. Warren, Alma, N. Y.

89,099.—Potato Digger.—Hiram Webster and Cyrus Powers, East Pembroke, N. Y.

89,100.—Elastic Composition to Imitate Ivory and Similar Materials.—Wm. M. Welling, New York city. Antedated April 9, 1869.

89,101.—Door Holder.—J. S. White, Prescott, Wis. Antedated Feb. 1, 1869.

89,102.—Velocipede.—T. E. M. White, New Bedford, Mass.

89,103.—Steam Engine Valve Gearing.—Amos Whittemore, Cambridgeport, Mass.

89,104.—Mechanism for Operating Sewing Machines.—Amos Whittemore, Cambridgeport, Mass.

89,105.—Insole for Boots and Shoes.—Wm. Williams, Rochester, N. Y.

89,106.—Filtering Feed-Water Heater for Steam Generators.—B. F. Wilson, Geddes, N. Y.

89,107.—Carpet Stretcher.—Thomas Wilson and J. W. Appleyard, Chicago, Ill.

89,108.—Size Mark for Hats.—L. C. Woehning, New York, assignor to P. L. Ruthenburg, Brooklyn, N. Y.

89,109.—Pencil Sharpener.—S. S. Woodcock, Somerville, Mass.

89,110.—Buckle.—C. E. Woodman, Boston, Mass.

89,111.—Device for Moving Heavy Bodies.—J. A. Woodworth, Hickory Corners, Mich.

89,112.—Lathing Machine.—Wilson S. Wright, Ithaca, N.Y.

89,113.—Combined Cultivator and Planter.—Benj. Anyan, Fitchville, Ohio.

89,114.—Jacket, or Case for Teapots.—Alfred Arnold, Tenafly, N. J.

89,115.—Plow.—G. M. Atherton, Friendsville, Ill.

89,116.—Bedstead Fastening.—Jackson Barnes, Burlington, Vt.

89,117.—Hydrant.—Frederick Bauschtliker (assignor to himself and Fred. Gentner), Washington, D. C.

89,118.—Hook for Supporting Carriage Poles.—Samuel S. Bent, Portchester, N. Y.

89,119.—Spring Bedstead.—Jacob Bohmer, St. Louis, Mo.

89,120.—Shaft Support.—R. O. Brackett and D. W. Brackett, Vineland, N. J.

89,121.—Composition for Preventing the Incrustation of Steam Boilers.—Samuel Brock, New Orleans, La.

89,122.—Machine for Compounding and Applying Roofing Compositions to Felt, Paper, and other Fabrics.—B. S. Brown (assignor to himself and L. B. Joy), Buffalo, N. Y.

89,123.—Hydrant.—J. G. Bryan, Philadelphia, Pa.

89,124.—Miter Box.—Robert Burchell and R. T. Burchell, Trenton, N. J.

89,125.—Churn Dasher.—Jonathan Carl (assignor to himself and J. A. Carl), Grenada, Miss.

89,126.—Curtain Fixture.—A. M. Cheney, Charlotte, Mich. Antedated Oct. 29, 1868.

89,127.—Glass-Blowing Apparatus.—B. F. Cloud, Philadelphia, Pa.

89,128.—Velocipede.—H. S. Cohu, New York city.

89,129.—Beehive.—J. H. Crandell, Upper Marlborough, Md

89,130.—Vise.—D. C. Cumings, Fulton, N. Y.

89,131.—Clothes Frame.—W. A. Daggett, South Vineland N. J.

89,132.—Manufacture of Corded-Edge Paper Goods.—A. T. Denison, Poland, Me.

89,133.—Egg Carrier.—George Dorn and John Shibley, Albany, N. Y.

89,134.—Tubular Pump for Deep Wells.—C. H. Duncan, Pithole City, Pa.

89,135.—Mast Hoop.—F. B. Dunton, Center Lincolnville, Me.

89,136.—Band Drawer.—B. W. Field, Ferrisburg, Vt.

89,137.—Cultivator Tooth.—E. L. Freeman, Williamstown, N. Y.

89,138.—Vise.—F. H. Furniss, Waterloo, N. Y.

89,139.—Adjustable Cornice for Window Curtains.—O. L. Gardner, New York city.

89,140.—Washing Machine.—W. B. Gardner, Almond, N.Y

89,141.—Base-Burning Stove.—John H. Goodfellow, Troy, N. Y.

89,142.—Blotting Pad.—Peter Gorsline, Elizabeth, N. J.

89,143.—Water Cock.—Joseph Gregg, Manchester, N. H.

89,144.—Gang Plow.—T. J. Hall, Byran, Texas.

89,145.—Railway Car Coupling.—George Harris, Ipswich, Mass.

89,146.—Table Attachment for Bedsteads.—E. D. W Hatch, Chicago, Ill.

89,147.—Sash Holder.—E. W. Haven, Brandon, Vt.

89,148.—Burial Casket.—Cornelius S. Hurlbut, Springfield Mass.

89,149.—Velocipede.—Joseph Irving (assignor to A. T. Demerest and Company), New York city.

89,150.—Shutter Worker.—S. E. Jewett (assignor to himself, and Osgood G. Boynton), Haverhill, Mass.

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89,163.—Wood Boring Machine.—B. F. Mohr, Mifflinburg, Pa.

89,164.—Machine for Pulling Beans.—S. R. Niles, Rawsonville, Mich.

89,165.—Horseshoe.—R. H. Parks, Columbus, Ohio.

89,166.—Washing and Wringing Machine.—John Pinter, St. Louis, Mo.

89,167.—Nozzle for Cans.—Chas. Pratt, New York city.

89,168.—Whip.—A. C. Rand, Westfield, Mass.

89,169.—Horse Rake.—G. M. Richardson and C. C. Richardson, Dana, Mass.

89,170.—Twisting Tube for Spinning Machines.—Charles Roberts, Lake Village, N. H.

89,171.—Safety Hat and Coat Rack.—F. W. Roth, Washington D. C. Antedated April 17, 1869.

89,172.—Manufacture of Lumber.—E. B. Rowe (assignor to the South Branch Planing Mill Company), Chicago, Ill.

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89,174.—Egg Carrier.—Alex. Selkirk, Albany, N. Y.

89,175.—Lubricator.—Alex. Shafer (assignor to L. Sweet, and Company), Wellsville, N.Y.

89,176.—Manufacture of Feather Dusters.—C. F. Shourds, New York city.

89,177.—Shipping Apparatus for Metal Planers.—D. Slate (assignor to Pratt, Whitney & Company), Hartford, Conn.

89,178.—Saw Mill.—Charles Sommer, Chicago, Ill.

89,179.—Stove-Collar and Damper.—James Spear, Philadelphia, Pa.

89,180.—Base Burning Stove.—James Spear, Philadelphia, Pa.

89,181.—Stovepipe Attachment.—E. C. Stoddard, and John R. Hoyt, Woodbury, Conn.

89,182.—Curry Comb.—Miles Sweet, Troy, N. Y.

89,183.—Machine for Making Printers' Rules.—Stephen D. Tucker, New York city.

89,184.—Tool for Making Plugs for Gas and Water-Gocks.—Wm. Tweedle, Providence, R. I.

89,185.—Coal Stove.—J. S. Van Buren, Norwich, Conn.

89,186.—Cement Roofing.—Chas. G. Von Tagen, Philadelphia, Pa.

89,187.—Compound for Forming Cores for Molding Iron, etc.—J. I. Vinton, Altoona, Pa.

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89,191.—Bolt for Doors, etc.—W. F. Arnold and Ogden L. Steele, New Britain, Conn.

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89,198.—Composition for Coating Paper, for Manufacture of Neck-Ties, Cravats, and other Articles of Wearing Apparel.—M. W. Brown, New York city.

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89,200.—Cigar Machine.—G. B. Clarke, New York city.

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89,202.—Car Coupling.—E. S. Cram, New Hampton, N. H.

89,203.—Fire Place.—A. D. Dailey, Terre Haute, Ind.

89,204.—Concussion Fuse.—E. A. Dana, Brookline, Mass.

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89,213.—Stamp Canceling Device.—J. C. Gaston, Cincinnati, Ohio.

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89,216.—Dish Washing Machine.—Dan. Guptall, Elgin, Ill.

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89,248.—BASE-BURNING STOVE.—J. Q. C. Searle (assignor to Julia E. Searle), Topeka, Ka.
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89,250.—CRACKER MACHINE.—Theodore Sloat, Brooklyn, (E. D.) N. Y.
89,251.—WASHING MACHINE.—Abram C. Stannard, Milton, Wis.
89,252.—TABLE.—Nathan Stockwel, Windsor, N. Y.
89,253.—DENTAL PLATE.—Leander R. Streeter, Chelsea, assignor to himself and A. B. Ely (Trustees), Newton, Mass.
89,254.—PROCESS OF TREATING PYROXYLE, PYROXYLINE, AND THE LIKE SUBSTANCE FOR FORMING USEFUL AND ORNAMENTAL ARTICLES.—Leander R. Streeter, Chelsea, assignor to himself and A. B. Ely (Trustees), Newton, Mass.
89,255.—MACHINE FOR DISINTEGRATING WOOD FOR PAPER STOCK.—James Stutt, Fermanagh county, Ireland.
89,256.—NEEDLE-THREADER FOR SEWING MACHINES.—W. C. A. Thielepape, San Antonio, Texas.
89,257.—HORSE RAKE.—Moses N. Ward, Linneus, assignor to Frederick H. Coombs, Bangor, Me. Antedated October 20 1868.
89,258.—STEAM GENERATOR.—Elijah Weston, Buffalo, N. Y.
89,259.—ICE CREAM FREEZER.—David Wiggins, Greenport, N. Y.
89,260.—BASE-BURNING STOVE.—R. B. Willis, Rochester, N. Y.
89,261.—LOCOMOTIVE ENGINE FURNACE.—D. W. Wyman, New York city.
89,262.—SAD-IRON CLEANER.—A. R. Fuller, Burlington, Vt.
89,263.—MACHINE FOR CLEANING BRICKS.—James Lyon, Norfolk, Va.
89,264.—ROCK-CHANNELING MACHINE.—E. G. Lamson, Windsor, Vt.
89,265.—STONE-CHANNELING MACHINE.—E. G. Lamson, Windsor, Vt.
89,266.—EXTENSION TABLE.—John M. Blaisdell, Sanbornton, N. H.

REISSUES.

83,445.—STEAM GENERATOR.—Dated October 27, 1868; reissue 3,384.—Wm. Baxter, Newark, N. J.
77,161.—SPRING CHAIR.—Dated April 28, 1868; reissue 3,385.—A. Milton Blake, Canton, Ohio.
36,394.—MACHINE FOR SEWING BOOTS AND SHOES.—Dated September 9, 1862; reissue 1,585, dated December 16, 1862; reissue 3,386.—Francis W. Carruth, Boston, and Everett P. Richardson, Lawrence, Mass., assignees, by mesne assignments, of Henry Dunham, Jr.
50,462.—SEWED BOOT AND SHOE.—Dated October 17, 1865; reissue 3,387.—Francis W. Carruth, Boston, and Everett P. Richardson, Lawrence, Mass., assignees of Henry Dunham, Jr.
18,730.—CORN PLANTER.—Dated December 1, 1857; reissue 3,388.—Jarvis Case, La Fayette, Ind.
54,374.—HARVESTER.—Dated May 1, 1866; reissue 3,389.—C. R. Cook, Buffalo, N. Y., assignee of Hiram R. Lacey.
26,808.—MANUFACTURE OF SEWED BOOTS AND SHOES.—Dated January 10, 1860; reissue 3,390.—W. N. Ely, Stratford, Conn., assignee, by mesne assignments, of Francis D. Ballou.
15,354.—MOWING MACHINE.—Dated July 15, 1856; reissue 3,391.—Division A.—Eldridge M. Fowler, Bay City, Mich., assignee of John W. Thompson.
17,243.—BLIND FASTENING.—Dated May 5, 1857; reissue 3,392.—Randolph Hayden and James C. Ferree (assignees of Horace Vansands), Middletown, Conn.
17,205.—HARVESTER.—Dated May 5, 1857; reissue 548, dated May 4, 1858; reissue 3,393.—Division A.—James I. Hendryx, Cooperstown, N. Y., assignee, by mesne assignments, of Charles Crook.
17,205.—HARVESTER.—Dated May 5, 1857; reissue 548, dated May 4, 1858; reissue 3,394.—Division B.—James I. Hendryx, Cooperstown, N. Y., assignee, by mesne assignments, of Charles Crook.
84,669.—SUSPENDER.—Dated December 1, 1868; antedated June 1, 1868; reissue 3,395.—Samuel Warren Henlon, Selma, Ala.
53,682.—HARVESTER.—Dated April 10, 1866; reissue 3,396.—E. G. Passmore, Philadelphia, Pa.
86,316.—WOODEN PACKING FOR PISTON RODS AND OTHER ENGINEERY.—Dated January 26, 1869; reissue 3,397.—Charles N. Petersen, Chicago, Ill.
26,616.—HARVESTER.—Dated December 27, 1859; reissue 3,398.—Oscar F. Smith, Williamsport, Pa., assignee of Samuel N. Purse.
82,371.—PUMP.—Dated September 22, 1868; reissue 3,399.—Samuel Woodruff and H. B. Beach, Hartford, Conn.

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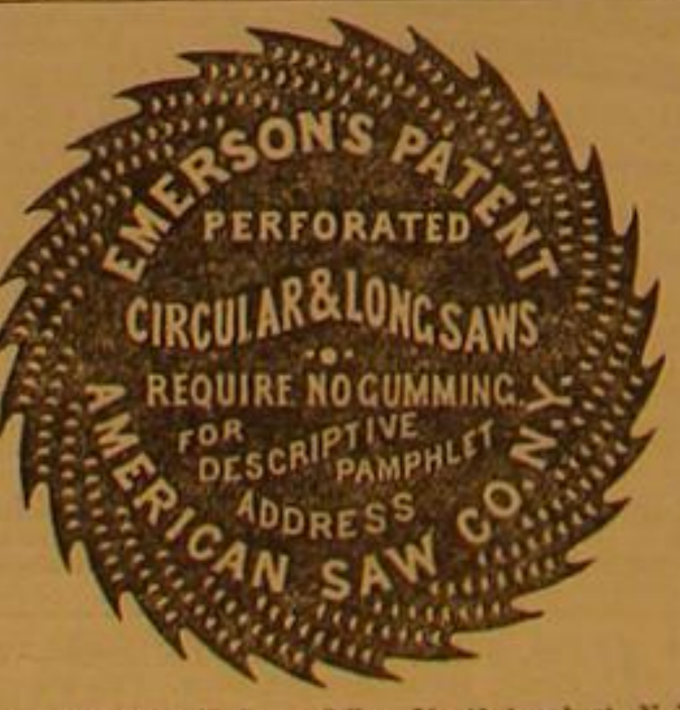

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