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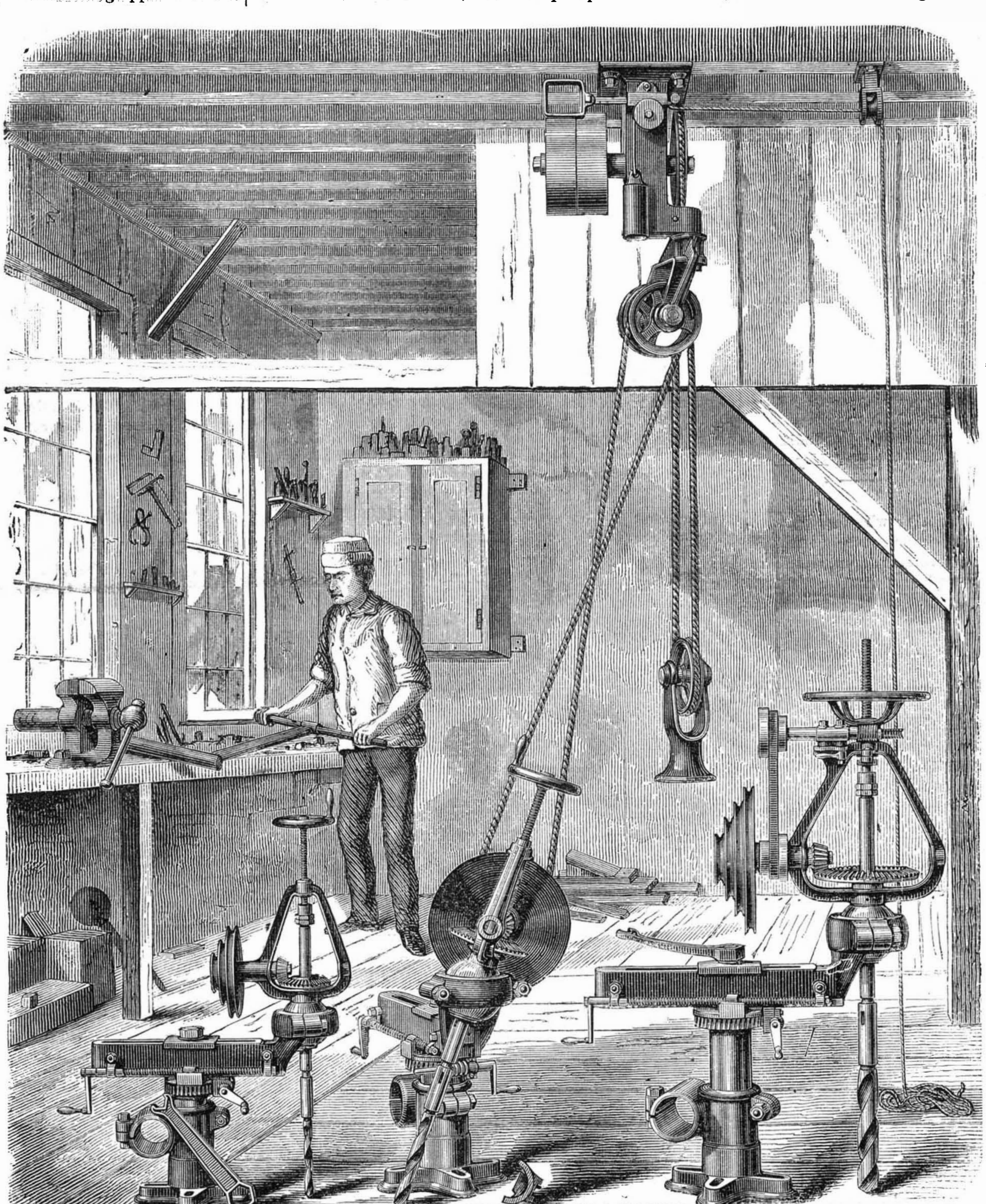
Portable Drilling Machines.

In all machine construction, much time and labor are wasted in drilling holes by hand, for the want of a practical machine driven by power, which would do the work. Our illustration represents three sizes of portable drilling machines, manufactured by Thorne and De Haven, of Philadelphia, which fulfil the conditions required of a tool for this purpose. They can be bolted to the work to be drilled, as easily as a ratchet brace can be rigged up for hand drilling, and can be driven by power in any position, at any distance, and in any direction from the driving apparatus.

Tarred rope is used for transmitting the power, and is found to be preferable in every respect to a round leather belt.

The operation is as follows: The power is transmitted, to the fast and loose pulleys on the countershaft, by means of a flat belt from the line shaft, in the usual way. On the other end of the countershaft is a grooved pulley, which gives motion to the rope which drives the drilling machine. The pulling side of this rope passes under an idler pulley held in a frame which rotates on a hollow stud, through which the rope passes. The rotation of this frame permits the rope to be led in any direction to the drill. A weighted idler is hung on the slack side of the belt, maintaining the tension and permitting the distance of the drilling machine to be varied at will. A weight of only 25 pounds hung there will prevent the rope from slipping on the pulleys when drilling a two and a half inch hole, in the solid, with an ordinary feed. When the rise and fall of this weighted idler does not give sufficient distance, additional lengths of rope can be inserted by means of the couplings used.

All the features of the machine are shown in the engraving. The hight of the post can be altered to suit different lengths of drills and chucks used in the spindle. The radial arm is traveled by a screw and rotated, on the post, by a worm and tangent wheel, giving great accuracy of adjustment and permitting this adjustment without the necessity of removing the rope from the cone pulley. The frame carrying the spindle, gears, and cone pulley can be rotated so as to bring this pulley in line for the rope, in whatever position the machine may be. By removing a collar from the bottom of this frame, as shown in the central figure, the spindle can be set to an angle, with the base of the machine, in any direction. By holding the post in the clamp bearing on the side of the base, the machine will drill parallel to the base.



PORTABLE DRILLING MACHINE.

Both the driving apparatus and the drilling machine have been patented in this country and abroad. Any further information can be had by addressing Thorne & De Haven, 23d and Cherry streets, Philadelphia, Pa., or J. Austin & Co, general agents, 168 Fulton street, New York.

Bone Dust as a Fertilizer.

The question is often asked whether boiled bones are worth less, and how much less valuable they are, than those containing the grease. Grease is of no value as a fertilizer, and its removal cannot diminish the cash value of the bones. The grease may even lessen their value, in so far as bones containing it are less rapidly decomposed.

There is a great difference in bone dust; the finer it is, the easier it becomes active. According to experiment, steamed and very finely ground bone dust is almost entirely decomposed in a few months, while coarse, raw bone dust has decomposed but slightly in years, so that it is in this respect very like wool and leather. On this account a very fine bone dust has a considerably higher cash value than the coarse.

When to use bone dust depends not only on the plants but also on the soil. Bone dust contains phosphates and nitrogen, both of which are necessary for the growth of all plants; so wherever these are wanting in soil, bone dust can be used to advantage. It is not judicious to employ bone dust or other insoluble organic substances in soils which already contain vegetable remains, as, for instance, in boggy and marshy ground, for we may safely assume that in such soils organic matter decomposes only very slowly, or not at all. In practice, bone dust is used on grain and on dry, not marshy, meadows, and especially on potatoes, since by manuring in the hill a smaller quantity of fertilizer accomplishes a more considerable result.

The method of applying bone dust is either to mix it with other manure, or sow it broadcast on the field and plow it (for grain), or manure in the hill (for potatoes, corn and beets); or it is mixed with sulphuric acid, and the superphosphate thus prepared is used in one of the above mentioned ways.

In making the superphosphate, the bone dust is piled up in a heap, and 30 to 40 pounds of sulphuric acid added to each hundred weight. A hole is made in the top of the pile, and the acid mixed with its weight of water poured in from time to time, and the whole as thoroughly mixed as possible. The heap is then covered with earth and left until it is to be used, or at least for a few days, then mixed with earth and applied.—*Journal of Applied Chemistry.*

Indium, the Last New Metal.

Indium was first recognized in 1863, by Drs. Reich and Richter, in the zinc blende of Freiberg in Saxony, and by reason of the very characteristic spectrum afforded, which consisted of two bright blue or indigo bands, the brightest of them somewhat more refrangible than the blue line of strontium, and the other of them somewhat less refrangible than the indigo line of potassium. Since its first discovery, indium has been recognized in one or two varieties of wolfram, and as a not unfrequent constituent of zinc ores, and of the metal obtained therefrom, but always in a very minute proportion. Indeed, indium would appear to be an exceedingly rare element, far more rare than its immediate predecessors in period of discovery. Its chief source is metallic zinc—that of Freiberg, smelted from the ore in which indium was first discovered, containing very nearly one half part of indium per 1,000 parts of zinc. A considerable quantity of indium extracted from this zinc was shown in the Paris Exhibition of 1867; and an ingot from the Freiberg Museum, weighing 200 grammes, or over 7 ounces, has within the last few days been kindly forwarded by Dr. Richter himself, for inspection on the present occasion. To Dr. Schuchardt, of Goerlitz, also, the members of the Institution are indebted for his loan of nearly sixty grammes of metallic indium, and of fine specimens of other rare chemical products, prepared with his well known skill, in a state of great purity and beauty.

When zinc containing indium is dissolved, not quite completely, in dilute sulphuric or muriatic acid, the whole of the indium originally present in the zinc is left in the black spongy or flocculent residue of undissolved metal, with which every one who has prepared hydrogen gas by means of zinc and acid is so well acquainted. Besides some zinc, this black residue is found to contain lead, cadmium, iron, and arsenic, less frequently copper and thallium, and in some cases, as that of the Freiberg zinc, a small proportion of indium. From the solution of this residue in nitric acid, the indium is separated by ordinary analytical processes, based chiefly on the precipitability of its sulphide by sulphuretted hydrogen from solutions acidulated only with acetic acid, and on the precipitability of its hydrate both by ammonia and carbonate of barium. From its soluble salts, metallic indium is readily thrown down in the spongy state by means of zinc. The washed sponge of metal is then pressed together between filtering paper, by aid of a screw press, and finally melted under a flux of cyanide of potassium.

Thus obtained, indium is a metal of an almost silver white color, apt to become faintly bismuth tinted. It tarnishes slowly on exposure to air, and thereby acquires very much the appearance of ordinary lead. Like lead, it is compact and seemingly devoid of crystalline structure. Moreover, like lead and thallium, it is exceedingly soft, and readily capable of furnishing wire, by the process of "squirting" or forcing. The specific gravity of indium, or 7·4, is very close to that of tin, or 7·2, and much above that of aluminium, 2·6, and below that of lead, 11·4, and that of thallium, 11·9. In the lowness of its melting point, namely, 176° C., indium occupies an extreme position among the metals permanent in air, the next most fusible of these metals, namely, tin and cadmium, melting at 228°; bismuth at 264°; thallium at 294°; and lead at 235°. Though so readily fusible, indium is not an especially volatile metal. It is appreciably less volatile than the zinc in which it occurs, and far less volatile than cadmium. Heated as far as practicable in a glass tube, it is incapable of being raised to a temperature sufficiently high to allow of its being vaporized, even in a current of hydrogen.

Indium resists oxidation up to a temperature somewhat beyond its melting point, but at much higher temperature it oxidizes freely; and at a red heat, it takes fire in the air, burning with a characteristic blue flame and abundant brownish smoke. It is readily attacked by nitric acid, and by strong sulphuric and muriatic acids. In diluted sulphuric and muriatic acids, however, it dissolves but slowly, with evolution of hydrogen. Oxide of indium is a pale yellow powder, becoming darker when heated, and dissolving in acids with evolution of heat. The hydrated oxide is thrown down from indium solutions by ammonia, as a white, gelatinous, alumina-like precipitate, drying up into a horny mass. The sulphide is thrown down by sulphuretted hydrogen as an orange yellow precipitate, insoluble in acetic but soluble in mineral acids. The hydrate and sulphide of indium, in their relations to fixed alkali solutions more particularly, seem to manifest a feebly marked acidulous character. Chloride of indium, obtained by combustion of the metal in chlorine gas, occurs as a white micaceous sublimate, and is volatile at a red heat, without previous fusion. The chloride itself undergoes decomposition when heated in free air, and the solution of the chloride does so upon brisk evaporation, with formation in both cases of an oxichloride.

But the chief point of chemical interest with regard to any newly discovered element, and consequently with regard to indium, is the establishment of its atomic weight; which, in the case of a metallic element, is based primarily upon the determination of the ratio in which it combines with oxygen and chlorine. In Cl_3, the atomic weight of indium is 113·5.—*Lecture by Professor Odling, in Mechanics' Magazine.*

The Eye.

There is no optical instrument maker who does not succeed in constructing an apparatus much more perfect in many points than the eye—that marvellous organ, which we are inclined to regard as the masterpiece of vital and organic architecture, on account of the great service it renders to man.

This sense of sight, which is so far reaching that it gives us the power to penetrate infinite space and apprehend the universe, at the same time makes us familiar with the minutest objects: this sense, which is the freest and most uncircumscribed in its actions—for our sense of touch is limited by the length of our arms, hearing to a few thousand feet, the senses of smell and taste having still greater limitations—this sense, I say, acts through an agent apparently so imperfectly adapted to its purpose, that recent investigations stand amazed at the idea how by it we receive any intelligible impressions. That we do is an evidence of the independence of the mind, and its power to make useful these necessary and imperfect means contact with the outer world, and proves the necessity of educating this sense to quick and precise perceptions in order to correct its faults and perfect the work which Nature has designedly left imperfect.

The eye has the defect of what in physics is called the "aberration of sphericity:" that is, the rays that pass through the center of a lens have a common focus, but rays which pass a certain distance from the center do not converge at the same point, but pass beyond. The nearer they come to the circumference, the greater the focal distance, if the lens is rigorously spherical. In good optical instruments, this defect is scarcely perceptible, the rays being centralized by flattening the lens. Again, the eye is not spherical, but has an elliptical curve. This was for some time thought to be an advantage, but the contrary is the truth. And this curve is not even well "centered," that is, placed symmetrically to the visual axis like a lens, but is changed and twisted in every direction. From this results what has been called the "astigmatism" of the eye, which consists in not being able to see at the same distance a vertical line with the same distinctness as one that is horizontal. This recently discovered phenomenon has attracted the attention of all oculists, as it sometimes constitutes a real disease of the eye. Again, the retina of the eye has spots where it is entirely blind to impressions of light. But is this eye, which is unsymmetrical, badly centered, blind in spots, at least perfectly translucid? Not at all. The cornea and crystaline lens of the eye are are not absolutely limpid, as appears when examined through an intense blue or violet light, which renders it fluorescent. This phenomenon is due to the traces of a substance analogous to quinine, a body which possesses in the highest degree the property of fluorescence, that is, of emitting a light of its own, under the excitement of blue or violet lights. The crystaline lens, itself, is not of a homogeneous composition, but has a crystaline structure of six branches. This is the cause of the stars appearing to us with rays. All attempts to explain this phenomenon were vain, until it was found to be in the visual organ itself. It is for this reason that the crescent of the moon, when it is very thin, seems to be double or triple to some persons.

These facts are enough to show to any one how prone the untrained eye must be to error and self deception, and that seeing is not a physical but a mental act. In infancy, the eye is aided by the hands or touch to acquire experience of the nature and consistency of things; later in life, the eye asserts its superiority by instructing the hands to perform ingenious and cunning work. The two senses seem thus to continue mutually to assist and act upon each other. Touch lends to sight material aid and support. The eye refines and gives intelligence to the material sense of touch, so that, when sight is wanting, touch takes its place and performs its duties.

The eye in its direct and steady look embraces but a small compass of actual sight; in fact, we clearly see but a small point, which comes just in the focus of the eye; and it is owing to a quick vibratory movement of the eye that we are able to see large extents apparently at the same time.—*Professor John H. Niemeyer.*

PATENT INFRINGEMENT CASES.

United States Circuit Court—Southern District of New York.

Rubber Tip Pencil Company *vs.* S. D. Hovey *et al.*

This was a suit in equity brought for an alleged infringement of the patent granted to J. B. Blair, July 23, 1867, for rubber heads for pencils. The nature of the patent and the facts are fully set forth in the opinion of the court.

Benedict, Judge:

This action is founded upon a patent for rubber heads for lead pencils, issued to J. B. Blair, dated July 23, 1867, and numbered 66,938. The novelty of the invention and the validity of the patent are put in issue.

The proper construction of the patent is the question first presented. The description, as given in the specification and claim, is as follows: The specification states the invention to be a new and useful cap or rubber head to be applied to lead pencils for the purpose of rubbing out pencil marks. It then describes it as follows: "The nature of the invention is to be found in a new and useful improved rubber or erasive head for lead pencils, and consists in making the same head of any convenient external form, and forming a socket longitudinally in the same to receive one end of a lead pencil or a tenon extending from it. * * * * The said head may have a flat top surface, or its top may be of a semicircular or conical shape, or any other that may be desirable. Within one end of the same head, I form a cylindrical or other proper shaped cavity. This socket I usually make about two thirds through the head and axially thereof; but, if desirable, the socket or bore may extend entirely through the said head. The diameter of the socket should be a very little smaller than that of the pencil to be inserted in it. The elastic erasive head so made is to fit upon a lead pencil at or near one end thereof, and to be made so as to surround the part on which it is to be placed, and to be held thereon by the inherent elasticity of the material of which the head is to be composed."

"The head is to be composed of india rubber, or india rubber and some other material which will increase the erasive properties, such as powdered emery for instance."

The article is further described by drawings, which, the specification states, "exhibit the elastic head so made as to cover the end as well as to extend around the cylindrical sides of the pencil; but it is evident that the contour of the said head may be varied to suit the fancy or taste of an artist or other person, and I do not limit my invention to the precise forms shown in the drawings, as it may have such or any other convenient for the purpose, so long as it is made so as to encompass the pencil and present any erasive surface about the sides of the same." The specification further states that the elastic or rubber pencil head, made as above set forth, may be applied not only to lead pencils, but to ink erasers and other articles of like character.

The claim is for "an elastic erasive pencil head made substantially in manner as described." In considering the effect of this language, it is to be noticed that the invention is not stated to be a combination, but a single article of manufacture—namely, an elastic erasive pencil head. The peculiarity in this article, by reason of which the inventor supposes himself entitled to secure it as his own, is not stated to consist in its elasticity; that is a quality of the material to be used, which is india rubber. Nor does it consist in erasive capacity; that, also, is solely due to the material out of which the article is manufactured.

An effort has been made to show that the erasive capacity of the Blair head is increased by means of certain swells or projections on the sides of the head, which are portrayed in the drawings and supposed to be indicated in the specification as a feature of the invention claimed; but I find no language which can fairly be said to convey the idea that such swells or projections form a part of this invention. On the contrary, the description states that the heads may be of any convenient external form, and expressly declares that the invention is not limited to the precise forms shown in the drawings, but may have any convenient form "so long as it is made to encompass the pencil and present an erasive surface about the sides of the same." The phrase last quoted from the specification discloses what is the real and only feature of the article in question upon which the right to it is based; and the characteristic is one of form, but not of what is called in the specification external form.

The characteristic form which the inventor claims to have invented is, broadly, any form which will enable the rubber to encompass a pencil, ink eraser, or other article of like character. The additional words "and present an erasive surface about the sides of the same" add nothing to the description, as it is impossible to have a piece of rubber encompass a pencil, ink eraser, or other article of similar character without presenting an erasive surface about the sides of the same. From this form which the inventor gives to a piece of rubber—otherwise to be of any convenient form—and from this form alone, does the article derive its value, as distinguished from rubber in any other form. By means of this form, any person is enabled easily to attach the rubber to a pencil, ink eraser, or other article of similar character, and the only useful result attained by the invention in question is that the head can be so easily attached to any pencil.

Now, what is it that accomplishes the useful result attained by the Blair pencil head? Simply the hole made in the rubber. There must be a piece of rubber with a cavity in it to constitute such a pencil head as Blair's specification describes, and there need be nothing more. The cavity may be round, square, or any other shape. It may go through or partly through the piece of rubber, and it may be of all sizes. The article sought to be secured by this patent, briefly and yet, as I think, fully described, consists, therefore, of a piece of india rubber with a hole in it. I am unable to fix any other limitation to the invention by any fair use of the language employed in the specification and claim.

Such an article cannot be the subject of a patent. The elastic and erasive properties of india rubber were known to all, and gave to that substance the names by which it is generally designated; and how to make a piece of rubber encompass and adhere to another article was known to every person who had ever seen a rubber shoe. No person knowing of the elastic quality of rubber could be wanting in the knowledge that a piece of rubber could be made to encompass and adhere to a pencil, ink eraser, or other article of similar character, by making a hole in it; nor could any one be deficient in the skill requisite to make such a hole.

I am of the opinion, therefore, that the patent in question cannot be upheld for want of invention.

This conviction, which I am unable to escape, renders it unnecessary for me to express any opinion upon the question of abandonment so largely discussed at the hearing, nor to determine whether the patent in question is for the same invention described by Joshua Gray in his application for a patent, and by others who have been relied on by the defence as showing prior invention.

A decree must be entered, dismissing the bill with costs.

United States Circuit Court—Northern District of New York.—

Jacob E. Buerk *vs.* Dennis Valentine.

This was a suit in equity on two patents for watchmen's time detectors. Judge Woodruff decides that both complainant's patents are valid, and that both were infringed by defendant, who imported time detectors and sold them in this country. The patented improvements (sometimes called by the trade watch clocks and watch control), are largely used in factories and public buildings, and enable the officers to have a check on the watchman. The watchman carries the detector with him in his circuit to the rooms to be visited, and inserts a marking key fastened in the room, so as to mark a paper dial secured inside the detector. This is done at every room and station visited, a peculiar key being fastened at each place for that purpose. An inspection of the paper dial, at any time afterwards, will reveal the time and order of the visits.

Decree awarding an injunction and account, as prayed in the bill.

Insect Wax of China.

In China, prior to the thirteenth century, beeswax was employed as a coating for candles; but about that period the white wax insect was discovered, since which time that article has been wholly superseded by the more costly but incomparably superior product of this insect. The animal feeds on an evergreen shrub or tree (*Ligustrum Unidum*) which is found throughout Central China, from the Pacific to Thibet.

Sometimes the husbandman finds a tree which the insects themselves have reached, but the usual practice is to stock them, which is effected in spring with the nests of the insect. These are about the size of a fowl's head, and are removed by cutting off a portion of the branch by which they are attached, leaving an inch each side of the nest. The sticks with the adhering nests are soaked in unhusked rice water for a quarter of an hour, when they may be separated. When the weather is damp or cool, they may be preserved for a week; but, if warm, they are to be tied to the branches of the tree to be stocked without delay, being first folded between leaves. By some, the nests are probed out of their seats in the bark of the tree without removing the branches. At this period they are particularly exposed to the attacks of birds, and require watching.

In a few days after being tied to the tree, the nests swell, and innumerable white insects the size of nits emerge and spread themselves on the branches of the tree, but soon with one accord descend towards the ground, where, if they find any grass, they take up their quarters. To prevent this, the ground beneath it is kept bare, care being taken also that their implacable enemies, the ants, have no access to the tree. Finding no congenial resting place below, they reascend and fix themselves to the lower surface of the leaves, where they remain several days, when they repair to the branches, perforating the bark to feed on the fluid within. From nits, they attain the size of lice; and having compared it to this, the most familiar to them of all insects, our Chinese authors deem further description superfluous. Early in June, they give to the trees the appearance of hoar frost, being changed into wax. Soon after this, they are scraped off, being previously sprinkled with water. If the gathering be deferred till August, they adhere too firmly to be easily removed. Those which are suffered to remain to stock trees the ensuing year secrete a purplish envelope about the last of August, which at first is no larger than a grain of rice; but, as incubation proceeds, it expands and becomes as large as a fowl's head, when the nests are transferred, in Spring, to other trees, one or more of each, according to their size and vigor, in the manner already described. In being scraped from the trees, the crude material is freed from its impurities, probably the skeletons of the insects, by spreading it on a strainer, covering a cylindrical vessel, which is placed in a cauldron of boiling water; the wax is retained in the former vessel, and, on congealing, is ready for market. The *pel-lah* or white wax, in its chemical properties, is analogous to purified beeswax and also spermaceti, but differing from both, being in my opinion an article perfectly *sui generis*. It is perfectly white, translucent, shining, not unctuous to the touch, inodorous, insipid, crumbles into a dry, inadhesive powder between the teeth, with a fibrous texture resembling felspar; melts at 100° Fahr.; insoluble in water; dissolves in essential oil, and is scarcely affected by boiling alcohol, the acids or alkalis.

The aid of analytical chemistry is needed for the proper elucidation of this most beautiful material. There can be no doubt it would prove altogether superior in the arts to purified beeswax. On extraordinary occasions, the Chinese employ it for candles and tapers. It has been supposed to be identical with the white wax of Madras; but as the Indian has been found useless in the manufacture of candles, it cannot be the same. It far excels. It far excels, also, the vegetable wax of the United States (*Myrica Conifera*).

Is this substance a secretion? There are Chinese who regard it as such—some representing it to be the saliva and others as the excrement of the insect. European writers take nearly the same view; but the best native authorities expressly say that this opinion is incorrect, and that the animal is changed into wax. I am inclined to think that the insect undergoes what may be styled auraceous degeneration, its whole body being permeated by the peculiar product, in the same manner as the *coccus cacti* is by carmine. It costs at Ningpo from 22 cents to 35 cents per pound. The annual product of this humble creature in China cannot be far from 400,000 pounds, worth more than $100,000.—*Dr. D. J. Macgowan.*

THE NEBULAR HYPOTHESIS.

Professor John Fiske, of Harvard University, recently delivered a very interesting lecture on the above subject at the Cooper Institute in this city, from which we derive the following:

The lecturer began by mentioning the planetary revolutions which have become so familiar to us that we commonly overlook them altogether through sheer inattentiveness, failing to realize their significance, though their harmonious relations, as Laplace has shown, prove that the various members of the solar system have had a common origin. The clue to that common origin may be sought in facts which are daily occurring before our very eyes. Every member of our planetary system is constantly parting with molecular motion in the shape of heat. Our earth is incessantly pouring out heat into surrounding space; and, although the loss is temporarily made good by solar radiation, it is not permanently made good, as is proved by the fact that during many millions of years the earth has been slowly cooling. The evidence is overwhelming which shows that the earth's surface was once hotter than the flame of an oxyhydrogen blow pipe. The moon also is cooler than formerly, as is shown by the fact that the stupendous forces which once upheaved its great volcanoes are now quiescent. The sun, too, is pouring away heat at such a rate that—according to Herschel—if a cylinder of ice 184,000 miles in length and 45 miles in diameter were darted into the sun every second, it would be melted as fast as it came.

PLANETARY GENESIS.

There is every reason for believing that sun, moon, and Earth, as well as the other members of our system, have been from time immemorial losing more heat than they have received in exchange. As in losing heat all bodies contract, it follows that the various members of the solar system must all be much smaller than they were at the outset. Though they have increased in mass by appropriating large quantities of meteoric dust, they must at the same time have greatly decreased in volume. Obviously, therefore, if we were to go back far enough, we should find the Earth filling the moon's orbit, so that the matter now composing the moon would then have formed a part of the equatorial region of the earth. At a period still more remote, the earth itself must have formed a tiny portion of the equatorial region of the sun, which then filled the Earth's orbit. At a still earlier date the solar system must have consisted simply of the sun, which, more than filling Neptune's orbit and consisting of widely diffused vapors, merited the name of nebula rather than of star. In the slow concentration of this solar nebula, the present peculiarities of the solar system may find their explanation. The incessant loss of heat radiated into the surrounding space caused a steady contraction of the solar mass; while, on the other hand, the increasing rapidity of its rotation impressed upon those parts of it nearest the surface a tendency to fly off into space, or at least to remain behind instead of accompanying the central portion of the body in its contraction. As in every rotating spheroid, this centrifugal force is greatest where the velocity is greatest—at the equator—a time came in the history of our vaporous sun when the bulging equatorial portion, no longer able to keep pace with the rest in its contraction, was left behind as a detached ring surrounding the central mass; which ring soon broke up into many fragments of unequal dimensions. At this stage, then, we have a host of satellites surrounding the solar equator, revolving in the direction of the solar rotation, following each other in the same orbit, and gradually becoming agglomerated, by gravitative force, into a spheroidal body, having a velocity compounded of the several velocities of the fragments, and a rotation made up of their several rotations. Meanwhile the central mass of the sun, cooling and contracting, left behind a second equatorial belt, which, breaking and consolidating after the same manner, became the planet Uranus. In like manner were formed all the planets and their satellites. Such is the grand theory of nebular genesis, in which, as Mill reminds us, "is no unknown substance, introduced on supposition, nor any unknown property or law ascribed to a known substance." It involves none but established mechanical and dynamical principles.

THE PHENOMENA OF PLANETARY HEAT.

Further evidence of the correctness of the theory is found in the present physical condition of the various planets. The theory assumed that all the planets, having successively originated from the same nebulous mass of vapor, must be composed in the main of the same chemical elements; and this inference has been uniformly corroborated by the results of spectroscopic observation wherever there has been a chance to employ it. The contracting process through which the Earth has passed to its present dimensions has been or will be, under proper conditions, repeated to a certain extent upon all the other planets. Upon any planet there must eventually occur a solidification of the outer surface, and extensive evaporation and precipitation of water, an upheaval of mountains, an excavation of river beds, and a deposit of alluvium resulting in sedimentary strata. But obviously the time at which these phenomena occur must depend upon the rate at which the planet parts with its heat, as well as upon the age of the planet, and upon the stock of heat with which it started. Against the facts that the outer planets are immensely older than the inner ones, and have received during recent ages much less solar radiance, must be offset the consideration that they must have started with a much greater amount of heat than the inner ones. Manifestly when the solar mass filled the entire Neptunian orbit, it must have contained the heat of which the subsequent loss has shrunk the sun to his present dimensions. The earliest planets must therefore have possessed relatively enormous quantities of molecular motion; and the ratios of their volumes to their masses must have been very much greater than in the case of the inferior planets since formed from a cooler and denser sun. Just as the hot water in the boiler may remain warm through a winter's night, while the hot water in the tea kettle cools off in an hour, so a great planet like Jupiter may remain in a liquid molten condition long after a small planet like the Earth, though formed ages later, has acquired a thick, solid crust and a cool temperature. Hence we may expect to find the largest planets still showing signs of a heat like that which formerly kept the Earth molten, and the smallest planets in some cases showing signs of a cold more intense than any which has been known on the Earth. This series of inferences, constituting simply an elaborate corollary from the nebular theory, is fully confirmed by observation in the cases of Saturn, Jupiter, Mars, and the moon—the only planets whose surfaces have been studied with any considerable success. According to the nebular theory, Jupiter and Saturn ought to be prodigiously hot; and so they appear to be when carefully examined. The absence of any atmosphere from the surface of the moon, with the absence of any signs of liquid oceans and running water, shows a discrepancy which, however, disappears when we inquire into its past history as revealed by the present condition of its surface. That surface is almost entirely made up of huge masses of igneous rock, through which, at short intervals, there yawn enormous volcanic craters whose fires seem to be totally extinguished. This implies that the moon is a dead planet—that the tremendous forces which produced this state of things are radiated off into space. In the later ages of a planet's history, when the heat is nearly all radiated away, and the expansive force of the nucleus is consequently reduced to a minimum, the ever thickening and hardening envelope will have shrunk in upon the nucleus in such a way as to leave vast abysses capable of ingulfing all the air and water which the planet possesses. Thus it is that in the chasms of the moon, all its oceans and atmosphere have disappeared. Mars, with his oceans, his atmosphere, his clouds and polar snows, is another strong supporter of our theory.

Facts which, on a superficial view, appear as obstacles to the nebular theory, turn out, on a closer examination, to be powerful arguments in its favor. The vexed question of "irresoluble nebulæ" has been settled forever in favor of the theory, by the discovery of the bright lines, which are sure evidence of a gaseous condition. Henceforward, we add the weighty argument that masses of matter still exist in space in the very condition in which our system must be supposed to have originally existed. The distribution of nebulæ is yet another significant argument. The parallelism between the positions of the planets and nebulæ indicates a common mode of evolution of the whole starry system, and points to a gigantic process of concentration going on throughout the galaxy, analogous to the local process of concentration which has gone on in our own little planetary group.

Singular Break Down of an Engine.

A few mornings ago, the residents of the vicinity of Front street, Brooklyn, N. Y., were suddenly alarmed by a report like that of a cannon. It seems that a steam engine, which is located on the first floor of the Brooklyn Brass and Copper Foundery, was working as usual just before the accident occurred. There was no unusual strain upon it, when suddenly, and without any previous noise or signs of anything amiss, the trace at the bottom of the walking beam snapped, and although the engineer was on the spot, the whole engine was wrecked before he could shut off the steam. About one hundred and fifty hands are employed in the works. The damage cannot be fully estimated until the whole machinery has been examined, but it will amount to several thousand dollars, and the repairs will require probably three weeks time. Fortunately no person was injured.

MARVELS OF THE MICROSCOPE.—A beautiful and easily produced exhibition of crystal formation may be seen under the microscope as follows: Upon a slip of glass, place a drop of liquid chloride of gold or nitrate of silver, with a particle of zinc in the gold and copper in the silver. A growth of exquisite gold or silver ferns will vegetate under the observer's delighted eye.

Edge Tools.

Shear steel began to be made in Sheffield in 1800. The inventions of Mushet and Lucas in 1800 and 1804 further extended the manufacture. Forks and scissors were made by rolling in 1805. From this time, immense cutlery works sprang up in England, France, and Germany, and the competition between the three countries has been highly beneficial, for while England stands undoubtedly foremost, yet both France and Germany possess their own peculiar excellences. Amongst the imports connected with cutlery, there is in Sheffield an annual consumption of more than seventy tons of ivory for the handles of knives and forks, and about 3,000 operatives are employed in forging and grinding the blades. An equal number of workpeople are engaged on pen and pocket knives, made annually to the value of $500,000. Very many are occupied in fabricating razors and scissors.

French cutlery is chiefly fabricated at St. Etienne and Thiers, where many hands are employed. Table cutlery is here produced at a rate almost incredibly cheap.

Germany, despite the superior natural advantages of England, exports knives and edged tools to a considerable amount. Solingen has received the appellation of the Sheffield of Germany, and has, since the middle ages, been celebrated for its cutlery, being especially famous for its swords, the blades of which sometimes sell for $500.

In Austria, scythes, sickles, and table knives are made annually by millions, at an exceedingly small cost of production. It is computed that 80,000 Bavarian grindstones are consumed annually in the preparation of these implements.

With the rapid development of the mechanical arts, the manufacture of tools has correspondingly grown. At one time England possessed a monopoly, and the English trade mark was a guarantee of quality throughout the world. The efforts of European States, however, have been rewarded with a share in the manufacture, while the demand for cheaper tools has extended British trade, and yet allowed a considerable portion to fall to foreign cutlers. Operatives in wood work, as carpenters, joiners, builders, turners, and cabinet makers, employ a great variety of cutlery tools; sculptors, modellers, and pattern makers require steel tools of many kinds, and all their branches of industry and art are much increased. The demand, therefore, for planes, augers, chisels, saws, and gravers is continually increasing. In some instances, the French and Germans claim to have outstripped the English. English planes, however, are as yet unequalled. Paris, on the other hand, since the period when Dubois and Dupuytren advanced practical surgery to the high scientific position it now holds, has prepared the finest surgical instruments, particularly for dentistry. The most perfect steel work has now been enlisted in the service of science, and delicate balances and other philosophical apparatus have contributed to the investigations made by our chemists and astronomers.

Luminous Electrical Tubes.

At a recent *séance* of the *Société d'Encouragement*, M. Alvergnat, maker of physical instruments, exhibited several apparatus of his invention worthy of notice. They consist of rarefied tubes which can be easily rendered luminous by electricity. The tension of the vapor in the tubes is measured by a hight of mercury varying from ·196 to ·314 of an inch. The vapor is the chloride or bromide of silicium, and by rubbing the outside of the tubes with any substance developing electricity, a bright light is produced within the tubes, formed of different colored filaments—rose colored for the chloride and yellowish green for the bromide. The tension of the vapor necessary to produce this phenomenon is greater than that for the Gessler tubes, and the electricity which illuminates these latter tubes does not pass through the new apparatus of M. Alvergnat. The ingenious arrangement which permits of the easy production of these phenomena is capable of application in the arts and sciences, and the *Comité des Arts Economiques* consider it well worthy of attention.

Antiquity of Birds.

Those most competent to give an opinion, supported by the disclosures of the rocks, which are records in the great volume of Nature more enduring than public libraries, are satisfied that the first birds on earth were waders, and not organized for flying. They were very large, too, and their legs long, fitting them for searching for food on the margins of muddy lakes and lacustrine shores. This is inferred from the foot marks of those monster bipeds found on the red sandstone in the Connecticut valley. The stride from one step to another shows they were tall, and known to geological science as *ornithichnites*. There may have been others on a smaller scale of construction. But they were extinct, probably, or disappearing with the advent of birds with wings. The ostrich, etc., are tolerable representatives of the non-flying birds of old red sandstone ages, both in their stilted legs, toes, resembling ornithichnite tracks, and their undeveloped pectoral stumps, which are merely the anatomical beginning of the wings exhibited in higher families, their successors.

When birds appeared that could soar in the air, an internal modification of structure came with expanded wings, and the weight and exterior form were essentially changed and diminished in size. The condor is probably a type of the most gigantic of flying birds whose appearance belongs to the tertiary formation of the globe.

AT a late meeting of the Polytechnic Association of the American Institute, Professor Vander Weyde exhibited artificial musk, made by treating blood in a peculiar manner. By adding little hairs, such as are found in genuine musk, the deception is so complete that it cannot be detected even by the microscope.

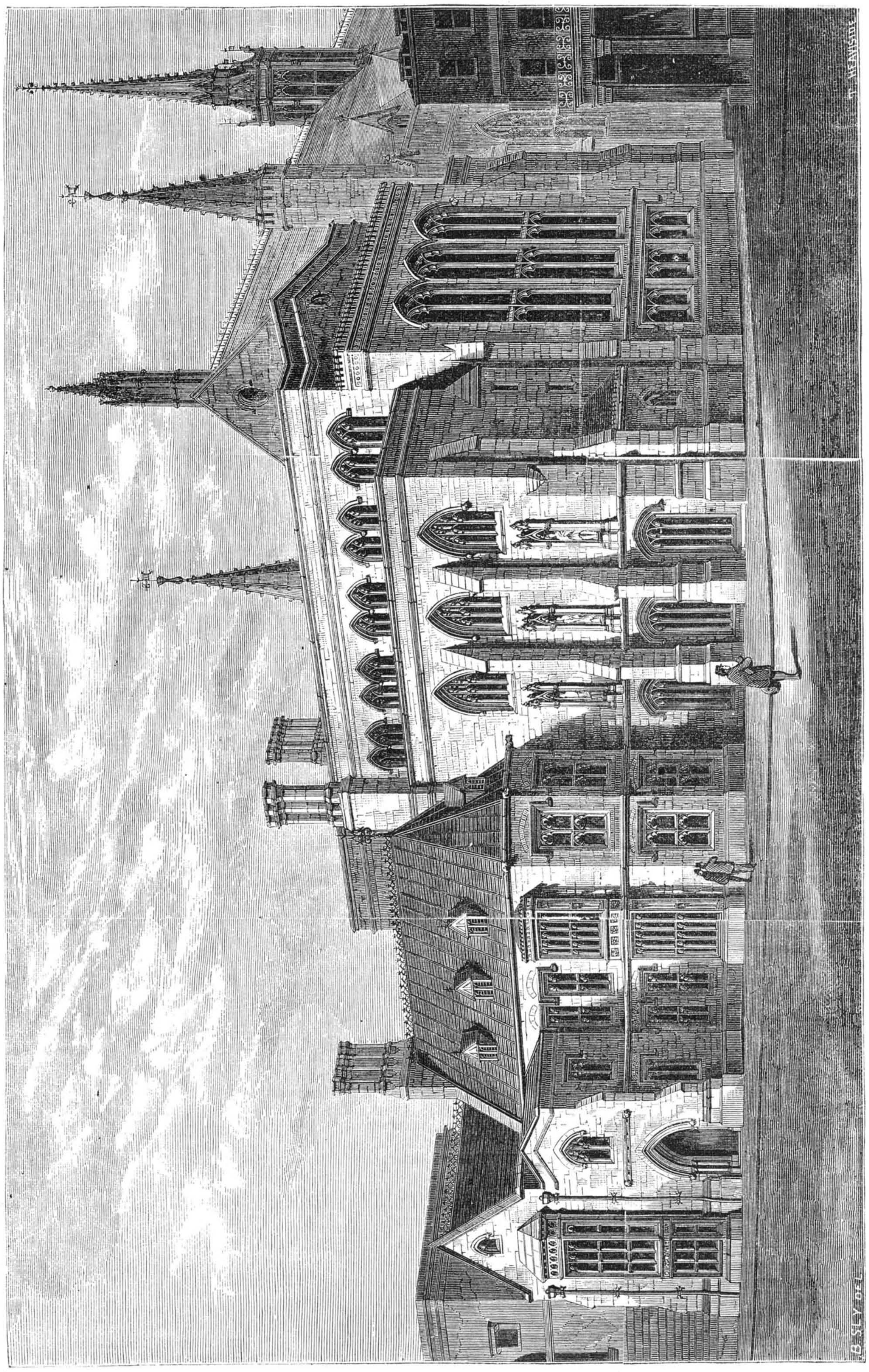
CITY OF LONDON LIBRARY AND MUSEUM.

Our engraving gives a view of a handsome edifice adjoining Guildhall, London, recently erected by the corporation of that city as a depository of their very valuable library and museum.

The style is gothic, to accord with the Guildhall, and the external facing, stone. The museum is on the lower floor, and is over 83 feet long by 64 feet wide. The library is above it, and is 98 feet long and about the same width as the museum. Adjoining the library are a public reading room, 50 feet in length, and a commodious committee room. A flight of stairs leads from the library to a vestibule opening into the Guildhall. Below are strong rooms and apartments for muniments and archives.

This commodious and appropriate building has reflected credit upon all engaged in its erection, and we would like to draw to it the attention of our own architects of public buildings.

The city architect, Mr. Horace Jones, prepared the design, and the contract to camplete the building, in accordance with it, was entered into for £21,-360.



CITY OF LONDON LIBRARY AND MUSEUM.

Improvements in Wheel Making.

One of the difficulties in making light carriage and buggy wheels has been to get a tight spoke and felly joint. One reason why this so often fails, and so many poor jobs are made, is, that if a round tenon fits very tight in a round hole, the driving on will often split the felly. This often occurs with the very best straight grained timber.

All wheelwrights know how very difficult it is to put on a light hickory felly tight and not split it. If, however, they are not split when put on, carriage makers know how often they give way afterward, and how many light carriages are disfigured by the bulging and swelling of the felly at the tenon of the spoke.

As a remedy for this difficulty, Mr. Jacob Woodburn, of Indianapolis, has applied to the Sarven wheel the following new principles, which are claimed to work very advantageously. Of the first he writes: "We make a tight joint, first, by making the tenon of the spoke oval; and, instead of doing this by filing and shaving, which is untrue and uncertain, we have a machine that turns the tenon perfectly smooth and true, and as oval as may be required. An intelligent mechanic at once sees the benefit of this. The hole is round, the tenon is oval; thus the wedging pressure of the tenon is upon the ends instead of upon the sides of the fiber of the wood, preventing, to a considerable extent, the swelling and splitting of the felly."

This idea, of making the tenons of spokes oval instead of round, appears to us to be a very practicable one, and it admits of wide application. Why would not every wheel be stronger with its spoke tenons ovaled? The points where the spokes connect, with the rim at one end and the hub at the other are the two weakest points in the wheel; but, in the Sarven wheel, this weakness is mostly transferred from the hub to the rim. This is why the oval tenon is particularly valuable in the Sarven wheel; but the same principle applies to all wheels. The second invention of Mr. Woodburn will be best understood by the following description by himself. He says:

"Our long experience in making wheels has shown us that, while the oval tenon is a very great improvement upon the common method, yet it only partially removes the difficulty. The best timber, under the extraordinary pressure and strain brought upon it by rough roads, crossing the rails of street railroads, etc., will sometimes split, and, this giving way, the spoke becomes loose. This is a great annoyance and expense to the owner of the carriage, and mortification and damage to the manufacturer of it. This difficulty has been met by our patent felly rivet, which makes it impossible for a felly to split. A tight fitting wood screw, with a sharp thread, is put through the felly, on each side of every spoke in the wheel, making over twelve feet of rivet in every set of wheels. This screw, after being tightly put in and firmly imbedded in the fiber of the wood, is cut off smooth on each side of the felly, so that when the wheel is painted it is not seen. This makes the joint more secure than the method of putting a bolt, with head and nut, to every spoke, and detracts nothing from the beauty of the wheel."—*The Hub.*

READING makes a full man, talking a ready man. The happy medium is reached when a man reads enough to give value to what he has to say.

Thread Cutting Tools.

Many carriage makers are in the habit of paying but little attention to their thread cutting tools; but the thread of a bolt or clip or nut will bear no more tampering with than the mainspring of a watch, and to attempt cutting threads upon bolts or clips with an imperfect screw plate, or to attempt cutting a nut with a worn out or useless tap, is nothing more than tampering with the thread. We would say to any correspondent on this subject, that he can himself repair his screw plates as well as any other person. To reproduce the thread in the dies, if they are heavy enough to allow of it, first reduce the temper by annealing. A good and easy method of doing this is to place sawdust in a metallic box, heat the dies to the required heat and deposit them in the sawdust, and let them remain until they are perfectly cool. After the dies are annealed, we reduce the dies in width just sufficient to allow of the removal of all the old threads; after which we place them in the plate and commence cutting the thread by means of the plug tap. To cut with a taper tap would not be so effective, and would have a tendency to strain the dies and their bearing on the slide of the plates.

The following are the standard threads of this country: $\frac{1}{8}$ in. diameter, 24 threads to the inch; $\frac{3}{16}$ in. diameter, 22 threads to the inch; $\frac{1}{4}$ in. diameter, 20 threads to the inch; $\frac{5}{16}$ in. diameter, 18 threads to the inch; $\frac{3}{8}$ in. diameter, 16 threads to the inch; $\frac{7}{16}$ in. diameter, 14 threads to the inch; $\frac{1}{2}$ in. diameter, 12 threads to the inch; $\frac{9}{16}$ in. diameter, 10 threads to the inch; and so on until we arrive at $\frac{3}{4}$ in., after which the V shaped thread is unsafe, and the square thread is substituted.

It is better to have the plug tap with which the dies are cut a trifle larger than the diameter of the bolt desired to be cut. The concave on the dies must not be made so that they will be perfectly round, and allow the edges of the dies to meet while the tap is inserted. Unless the object is to have the bolts all the same size, there must be some space allowed for cutting them smaller, by a trifle, than the standard.

The tempering of the dies is a simple process. First heat and cool off; brighten a little with sandpaper or brick dust, and reduce to the required temper by placing on a bar of heated iron, and cooling off when the proper temper is arrived at. To temper taps, the wood or oil process is, in all probability, the best.—*The Hub.*

THE WONDERS OF THE TELEGRAPH.—A correspondent at St. Louis, Mo., gives us the particulars of the sending of telegrams from that city to Hong Kong in China, and the return of answer, the time each way being only 4 hours, the message being sent and reply received both during the same day.

EBONIZING WOOD.—A simple method is to procure an ordinary slate and hold it over the gas, lamp, or candle, until it is well smoked at the bottom, scrape a sufficient quantity into French polish, and well mix; then polish your article in the ordinary way. If there are any lumps, gently rub them down with your finger, and apply another coat.

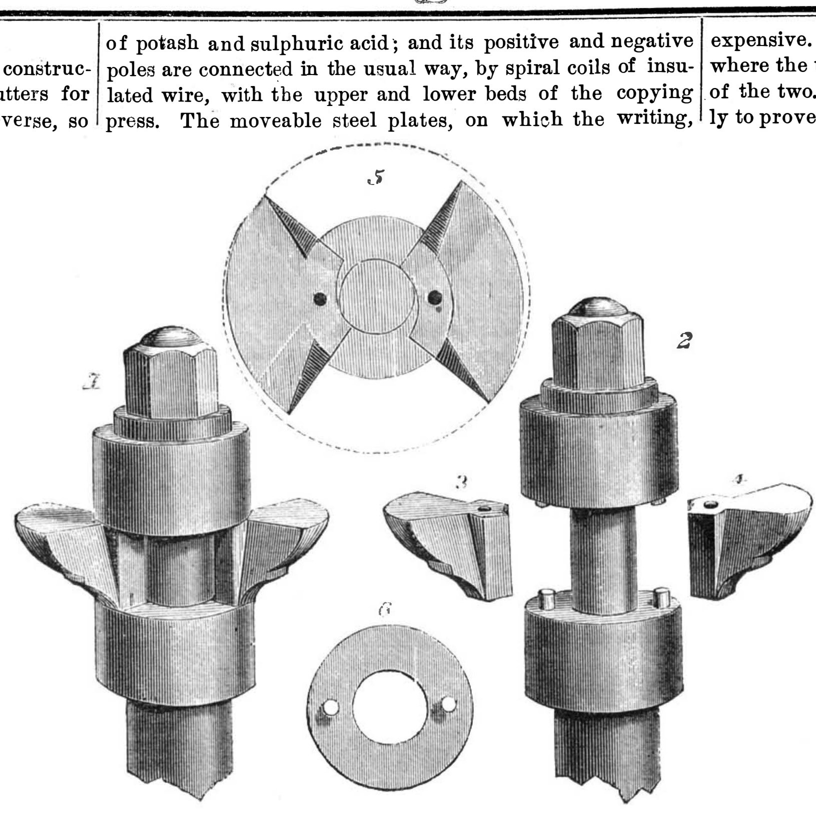
Molding Cutter Heads.

Our engraving illustrates an improvement in the construction of that class of "freizing bits," or rotary cutters for wood working machines, which are adapted to reverse, so as to present a cutting edge in either direction.

Fig. 1 is a perspective view of the improved cutter ready for work. Fig. 2 is a perspective view of the same, showing the collars ready to receive the bits. Figs. 3 and 4 represent bits removed from the collars. Fig. 5 is a cross section through the bits and spindle, the dotted lines showing the clearance. Fig 6 shows the face of a collar, with the pins on which the bits are pivoted. Without further explanation, it will be seen how, by the peculiar shape of the bits and their connection with the collars, they are made to turn on the pivots, according to the direction of rotation, and stop (in either direction) when they present a clear cutting edge in front and clearance in the rear. When desired to reverse the action, the nut seen in the figures is slightly loosened, the bits are placed in proper position, and the nut again tightened.

For manufacturers of moldings, furniture and picture frames, this invention seems well adapted, and the inventor claims it to be equally important to all kinds of wood working. Patented April 16, 1872.

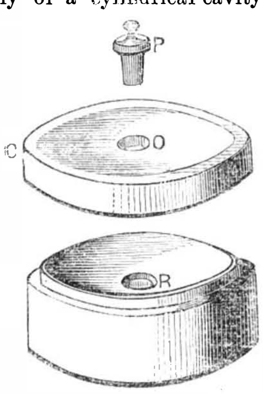
For further information, address Hope Machine Company, 181 West Second street, Cincinnati, Ohio. See advertisement in another column.



CUTTER HEAD MOLDING MACHINE.

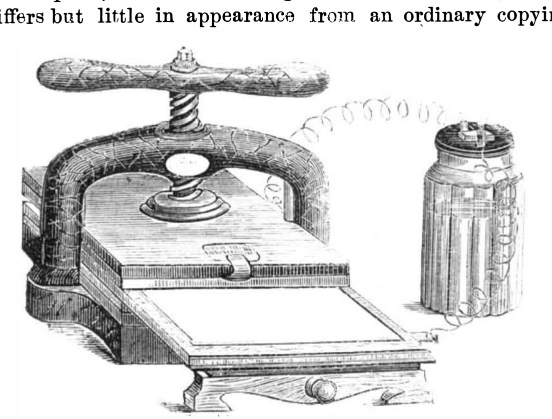
RESERVOIR PALETTE.

It is well known to draftsmen that it is evaporation, rather than use, that so rapidly diminishes the liquid, color, or ink; and moreover, the material particles or sediment are prejudicial to high class work. The reservoir palette is designed to remedy these defects, which it does perfectly by simple means. The reservoir is shown at R, in the body of the palette B, and consists simply of a cylindrical cavity filled by a plug, P, so that any water previously poured into it is expelled and rises on to the surface of the palette, where, in the usual way, it is prepared for use by rubbing with the stick of Indian ink or cake of color requisite. After the desired depth of ink, tint, or color is obtained, if left to settle for a short time, the sediment precipitates on the palette, and when the plug is withdrawn, the clear ink or colored fluid flows readily into the reservoir, where it presents a very small proportion of evaporating surface, combined with depth for dipping pens, etc. The cover, C, being put over the palette, the plug may be used to close the orifice, O; or a common marble is dropped on to it, which readily recedes on the insertion of the pen, and settles in its place again on the withdrawal of the pen.



ELECTRO CHEMICAL COPYING PRESS.

This press, the invention of Signor Zuccato, of Padua, Italy, differs but little in appearance from an ordinary copying



press, and that difference lies mainly in the construction of the upper and lower beds or surfaces of the press, of which the former consists of a plate of copper, and the latter of a plate of copper tinned, both on mahogany beds—the upper one being attached by lugs or clips to the solid iron press plate, and the lower being made to slide out as shown. These plates are placed in the ordinary way in the circuit of a battery, so that when brought into close proximity by the action of the screw, the circuit is completed and a current established over the whole of the surfaces.

But, by the aid of an insulating medium—a varnish—applied to a steel plate and removable by the action of a "style" in writing, printing, drawing, etching, etc., the electric current is confined to those portions only which are so denuded of the insulating protection; and here it is made to leave record of its passage by its continued action on the steel plate and sheets of copying paper specially prepared and damped with a solution of prussiate of potash. The electrolytic action causes the formation of the ferro prussiate known as the "Prussian blue," producing a perfect facsimile of the original manuscript or design wrought on the varnished surface of the plate.

The battery employed consists of a single cell, with zinc and carbon elements in an actuating solution of bichromate of potash and sulphuric acid; and its positive and negative poles are connected in the usual way, by spiral coils of insulated wire, with the upper and lower beds of the copying press. The moveable steel plates, on which the writing, drawing, or other design to be copied, is made, has to be thoroughly cleaned and well and evenly varnished; care also must be taken, by a firm, steady pressure on the style, effectually to remove the varnish, leaving the writing, printing, or other pattern, in bright steel on a raised ground of varnish, affording perfect insulation everywhere else on the surface.

By placing the copying sheets, efficiently damped with the prussiate solution, in any number from one to five or six, one over the other, superimposed on the prepared plate, a corresponding number of copies can be obtained, and so on, almost *ad infinitum*. Thus any required number of copies can be produced with perfect facility and ease—all being facsimiles of the original.—*Mechanics' Magazine.*

Asphalte Pavements and Roadways.

This subject is one of very great importance, especially in large towns and cities. The authorities of the city of London are disposed to afford, says the *Engineer*, an extensive trial to the asphalte pavements, at the same time admitting any other mode of paving which appears to offer any advantages. The Commissioners of Sewers have not even discarded wood, but are going to try the American system at a very important junction of streets, where failure would be exceedingly annoying. Trial is also being made of granite pavements jointed with asphalte. The task of providing proper carriage ways for the enormous traffic of London is no small matter. Within one square mile, or thereabouts, there are forty-eight miles of streets. "Of these," says Mr. Heywood, "about nine miles of carriage ways are subject to the largest, most concentrated, and most destructive traffic in the world." The wear from the traffic causes a large consumption of granite annually, and public convenience requires the use of a granite by no means the hardest and most economical. The expense of maintaining the granite carriage ways of the city is very considerable.

The luxury of asphalte paving is undeniable. It is quieter and cleaner than granite, though not quite so quiet as wood. Consequent on the laying of the Val de Travers asphalte, the roar of Cheapside has given place to the mere clatter of horses' hoofs, as if a regiment of cavalry had taken the place of the usual wheel traffic. The change is like the calm after a storm; but the process is at once reversed on quitting the region of asphalte and entering upon the granite roadways. In fact, the asphalte has the effect of a tramway, with the absence also of the grinding sensation which accrues from the flange of the wheel as it travels along the grooved rail. After being down for two or three months, the asphalte has more of a ringing sound than at first, a result which is attributed to the consolidation produced by the weight of the traffic. Being impervious to moisture, the asphalte paving promotes evaporation, and as there are no joints to retain dirt, it is comparatively easy to keep the paving in a state of cleanliness.

Horses falling on asphalte are found to be less injured than if falling on granite, but have more difficulty in getting up again. A little sand, or a horse cloth, removes this disadvantage.

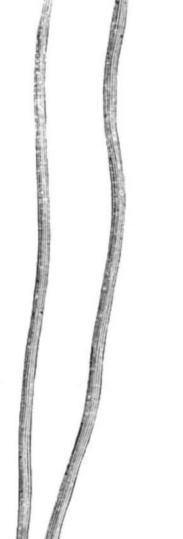
Proper care being taken, by a system of street orderlies, to keep the surface of the asphalte in a state of cleanliness, the use of the watering cart may be dispensed with. This of itself is a great comfort to the public. The sloppy state of the granite carriage ways in summer is a special nuisance, only tolerated because the alternative may be a blinding cloud of dust. With due care, asphalte need have neither dust nor mud.

The durability of the asphalte paving is a question of much importance, and at present can scarcely be answered, though there is reason to hope for a favorable result. This element in the problem materially affects the question of comparative cost as between asphalte and granite. The City Engineer concludes that the durability of asphalte will be less than granite, and in a report presented last year he calculated that, as a general rule, asphalte would be the more expensive. Compared with macadam, it is believed that where the traffic is heavy, asphalte would prove the cheaper of the two. The effect of temperature does not appear likely to prove injurious in London, unless it be in the case of asphaltes of an inferior character.

The steepest gradient for which asphalte has been used in the city appears to be 1 in 46. There is a pretty good prospect that the extensive trial now being given to various descriptions of paving will demonstrate the question whether we have practically any other choice than granite or macadam. The success of asphalte would be an enormous benefit to the metropolis in the cessation of the wearying roar which accompanies the passage of heavy traffic over paved roads, and in the comparative absence of dust and mud. Horseflesh is also to be considered. M. Leon Malo, a French engineer, has computed that, if all Paris were paved with the Val de Travers compressed asphalte, the saving in wear and tear to horses and carriages would be $1,700,000 per annum. How far the calculation is correct may be difficult to say; but of the economy of asphalte in its effects on horses and vehicles there can be no question. Its general use is a consummation much to be desired, and the present competition will doubtless tend to reduce the cost of this luxurious improvement in the art of road making. Our only fear is whether it will stand the hard work demanded of it; though it must be remembered that granite often has to be patched and mended, and what is called "relaying" is a formidable affair.

Remarkable Parasitic Fungus.

A correspondent, Mr. A. J. B., of Kansas, sends us a box of specimens and says: Please find herewith what to me is a wonder as well as curiosity, in the shape and character of what is, with us in Kansas, known and called a common grub worm. A bed of them was found and dug up recently while setting posts in this town. The grub when found was just as he now appears, having no life or animation whatever, while the sprout, *queue*, or whatever it is termed, grow ing from near the head of the grub, was in a growing condition, and full of vegetable life and greenness.



We give a drawing of the specimen sent by our correspondent. The grub is the larva of a brown beetle, which feeds upon the roots of grass, corn, wheat, etc. The long sprouts from the head are fungi (probably *Sphaeria* or *Isaria*) which grow at the expense of the nutritive fluids, and therefore of the life of the animal. They are generally found in the interior of the body (hence called *entophyta*) and near the posterior end. The dreaded disease of the silk worm (*Muscardini*) is caused by a fungus. Hosts of the seventeen year locusts are destroyed by a fungous disease. "It is probable," says Dr. Leidy, "that this disease is one of the means of maintaining the equilibrium in the aggregate of the life of the species under existing circumstances." These "vegetable grubs" are something of a mystery to the naturalist, and more light is wanted. Professor Orton noticed a like phenomenon on the western slope of the Andes, near Quito. The fact that all animals are liable to fungous diseases, that there is in fact a *flora* within man, ten different parasitic fungi having been found in him, the recent investigations of able naturalists on both sides of the Atlantic, and the lectures of Huxley and Tyndall, invest this subject with deep interest and importance.

Proposed Government Boiler Experiments.

Judge Bradley, of the United States Supreme Court, has made a valuable suggestion in his late letter to the Secretary of the Treasury on the subject of steam boiler explosions. He points out the absolute necessity of making a trial of steam boilers, of the size and kind generally used, to find the laws governing explosions and the means of preventing them, and cites the few experiments made at Sandy Hook as showing there is much to be learned by this method of investigation. He recommends Congress to appropriate $100,000 for the purpose, and to authorize the Government to have a system of experiments made under charge of a board of skillful engineers.

THE CURRANT WORM.—A small yellow fly, with brown wings, about the size of the common house fly, deposits its eggs about May 1st. The worms appear about the middle of May. Remedy: Hold a pan under the brush and jar the branches; the worms fall into the pan and are easily destroyed. Repeat the operation as often as necessary. The *larvæ* are supposed to burrow in the earth.

Correspondence.

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

Maple Sugar.

To the Editor of the Scientific American:

There is a short article headed "Maple Sugar," in your issue of April 27, in which the writer gives an account of the process of the manufacture of that sweet compound. He says that nearly all of our hard wood trees will yield more or less sugar; this I doubt. I do not deny but what all of our hard wood trees will yield sap, but I deny that nearly all of them will yield sugar. Take, for instance, the birch; one birch tree of common size will yield more sap than two or three maple sugar trees will, in the same length of time; but the sap concentrated by boiling yields a compound as unlike sugar, in looks, taste, and smell, as tar is unlike honey. Again he says: "After the sap is drawn, it is concentrated by boiling it until it commences to crystalize." Now this is not so. Having had considerable experience in sugar making, I will give to your many readers the usual process of the manufacture of that desirable article. After the sap is drawn, it is concentrated by boiling to the consistency of sirup, but never until it crystalizes. When the sirup becomes thick enough to "apron" (as the farmers call it), or when it will drop from a dipper (which they always have to stir the sap with and to dip off the scum which rises to the top) in thick sheets, it is immediately removed from the fire, and allowed to cool or not as the maker of the sugar may desire. After it is removed from the fire, it is dipped from the kettle or pan in which it is boiled into wooden pails or barrels. The next operation is to strain or filter the sirup through woolen cloth This done, it is set away, and the farmer can sugar it off at his convenience.

If the sap were allowed to boil until it commenced to crystalize, it would be impossible to filter the sirup; consequently it would be of no value, for the reason that it would be so full of dirt that it could not be used.

When the farmer comes to "sugar off" his sirup, as it is called, the kettle or pan is cleansed until it is perfectly clean. The sirup is then poured in and two or three eggs, according to the quantity, are well beaten and added to the sirup. This is to cleanse it from all impurities which rise to the top while boiling. Some use milk in the place of eggs; others, both. Farmers never boil the sap that runs after the trees commence to bud, for sugar made from such sap is unfit for use, because it is black and has a taste which is termed "buddy." I have known trees that have been tapped for fifty successive years, and then look as though they would last for as many more.

H. N. L.

The Cause of Earthquakes.

To the Editor of the Scientific American:

I do not know whether the theory I wish to advance about earthquakes is new or old. The phenomena are felt all over the world; and I ask, are they not caused by the shrinking of the earth's crust? Our mountain chains and river valleys are diagonal to the greatest diameter of this planet; and the volcanoes allow vent for the gases, the upheaved crust forming the mountains. The shells and other sea fossils which lie in the formation of these mountains indicate the salt plains; the deep soil through which the rivers plow furrows shows that the richness of the earth is washed into the sea, to be upheaved again when the land has become too poor to support life. When new streets are opened in Kansas City, Mo., the excavation is sometimes thirty or forty feet deep through alluvial deposits, uncovering water worn ledges of rock which are now 100 feet above the river. The tree growth of the Eastern portion of this continent denotes that the land does not show great antiquity.

I hope to learn, through your columns, what *savans* think of the causes of earthquakes.

J. W.

Elgin, Ill.

Making Shingles.

To the Editor of the Scientific American:

Some years ago I owned a manufactory for cutting and sawing pine shingles, and I tried the following experiment: I had an old thick 40 inch saw, from which I broke off the teeth, and then, by running it slowly in a mandrel and holding against it pieces of broken grindstone, ground down the edge upon one face till it was sharp all round like a circular knife. I then put it on my sawing machine, and by putting on a larger pulley and reducing the driver, made it revolve at about 60 revolutions per minute. Then by using well steamed blocks, I succeeded in cutting with it, before the edge turned too much, some scores of perfectly sound and smooth shingles. It required but little power to force the block on to it, and though it crowded or rubbed pretty hard, I do not think it would have heated injuriously if run constantly at that motion. The experiment convinced me that, above all others, this is the way to make shingles, or cut other thin and small sized boards. The difficulty lies in getting a proper and well tempered solid knife, of the kind, made; and after corresponding with several tool and saw makers on the subject, without getting any one to attempt the job, I gave it up. I believe now, however, that a knife made in sections, or plates of tempered steel riveted on to either a cast or wrought solid circular center of the right thickness, would answer the purpose. This might be an inch or more in thickness at the center, so as to give great rigidity. A knife of this kind need never be taken from its bearing to be sharpened, but could always be kept with the keenest edge by having a stone so fixed as to bear against it as it revolved. Owing to its drawing cut, it would pass through knots or other tough places in the timber much more easily than a straight knife, and its edge might be made much thinner and yet stand. My experience in cutting pine shingles shows this to be a great advantage, for, out of good well steamed timber, with a sharp thin knife, shingles perfectly sound can be made, while with a thick or dull knife they will always be checked. An edge that will stand knots safely when chopping through a bolt will not cut a sound shingle.

The advantages of using such a machine as this are so manifest that, when once it were settled that it would work, its adoption would be universal. It would be constantly ready for use, and there would be no stopping for filing or sharpening. It would not take one fourth the power of a saw. It would save at least one fourth of the timber, and would make perfectly smooth shingles. If inclined to heat in use, a stream of water might be run on it to keep it cool.

The best way to set it would be on the top of a perpendicular shaft, with a reciprocating frame holding the bolts sliding back and forth over the top face, cutting two bolts at once from opposite sides.

The cost of steaming timber is merely nominal in a steam mill, using waste steam, which is the best, and it is a positive advantage to the timber to steam it.

CHARLES BOYNTON.

Memphis, Tenn.

Power Required for Canal Towage.

To the Editor of the Scientific American:

The SCIENTIFIC AMERICAN of May 4 contains a paragraph under the title "Cable Towing on the Erie Canal," which might lead your readers to think that you sanctioned all the statements therein made, and in this way serve the interests of the Cable Towing Company, to the prejudice of many other inventors who are now engaged in working out different methods of accomplishing the same result. The portion of the paragraph alluded to, which I think requires your correction, is the statement of the comparative cost of towing loaded boats by horses, and the system by cable. By the former, it is stated, the aggregate cost of towing a boat the entire length of the canal, 350 miles, is $122.50. By the steam cable system, "it is confidently believed" that one tug will haul six boats at a speed of three miles per hour, with an expenditure of two tuns of coal for twenty-four hours, six days being allowed for making a trip. The cost of coal for towing the six boats will be $6 per tun, or $72. I am very anxious to know the facts. My own experience is that it takes three horse power to tow a boat with 200 tuns freight at a speed of one mile and a half per hour, no matter what the motive power may be; and that, to tow the same boat at three miles an hour, will require about twenty-four horse power. This great difference in the power required—with but a small increase of speed—arises from a law which cannot be shirked by any mechanical contrivance. It will, therefore, take 144 horse power to tow the six boats at three miles per hour, and say 26 to propel the tug; in all, 170 horse power. Eight pounds of coal for each horse power per hour is as little as can be allowed; that is 1,360 pounds, equal to 16½ tuns per day, or 97¼ tuns, which, at $6 per tun, equals $585, the cost of coal for the trip.

If the foregoing statement is about correct, it is safe to say that boats cannot be towed economically at a speed of three miles per hour. The best speed for towing by steam will be found to be two miles an hour, and this can be attained economically by any of several systems that have been invented.

A. B.

Rochester, N. Y.

[While the resistance to vessels in canals is much greater, especially in narrow canals, than in open water, still we think that our correspondent is in error in his estimates for the propulsion of a train of six boats. Some useful data upon the economies of steam power, as applied to propulsion, will be found on page 321 of our present volume, where it appears that 2½ lbs. of coal per horse power per hour are consumed on the steamer *Adriatic*, her maximum speed being 16½ knots per hour, and her burthen 4,200 tuns.—EDS.]

NORTH CAROLINA FISHERIES.—Herring and shad are so abundant in North Carolina that the former are selling for $1.50 per thousand, and the finest shad at from 10 to 25 cents each. The seines used are of immense size, and are worked by steam power. A seine worked at the mouth of the Chowan is said to be a mile and a half in length, and in it 300,000 herrings have been taken in one day. They also take from one to two thousand shad at a catch. Steamers are at the wharves, constantly loading with these fine fish, packed in ice, for the New York and other northern markets.

HOW TO WASH PRINTING ROLLERS.—Avoid all grit, sand, and dirt, simply use strong ley to loosen the ink; and quickly, with a soft sponge, wash off with water (in winter blood warm) the ley, squeezing the sponge dry, face up the roller, so that no moisture remain thereon. Let it then stand exposed to the air one hour, machine rollers two hours, before distributing ink on its surface. The time for exposure must be guided by the state of the weather, as shorter time will do in dry or windy weather. Be careful to ink the roller as soon as possible after exposure to keep it tacky.

CEMENT FOR FIXING GLASS LETTERS.—A thick solution of marine glue in wood naphtha will answer perfectly if color is no object. But the glass must be chemically clean, and this is not always easy. The least trace of soap or grease will spoil the adhesion of any cement. Try soda or ammonia, followed by whiting and water, clean cloths, and plenty of rubbing, and let the cement dry on the letters till the surface just begins to be "tacky" before you apply them.

The Uses of Old Rags.

Woolen rags, as they come in from the peddlers, comprise every variety of fabric that it is possible to produce from wool, from a coarse and harsh carpet to the finest and softest product of the loom. These are piled up in huge heaps upon the warehouse floor, and women and girls, whose wages average from four to five dollars a week, attack them on all sides and "sort" them into no less than ten grades, each of which has a special use and an established value. The greater part of these are manufactured into "shoddy," and, as this is a word concerning which a general misapprehension exists, it may be well to devote a paragraph to its consideration.

Shoddy is, perhaps, the best abused material in use. So far from being a mere sham and a poor substitute for wool, it is, in reality, a valuable material, and enters, in certain proportions, into the composition of nearly all cloth. It is not, as is generally supposed, woolen rags ground to a powder and worked into the cloth to give it weight, but wool fiber, combed out of wool fabrics by a peculiar process, and, mixed with new wool when the latter is carded, is spun with it, and finally becomes a component part of the cloth.

Thus, by mixing a due proportion of fine grade of shoddy or wool fiber with new wool of a coarse grade, a substantial yet soft and handsome fabric can be produced and sold at a moderate price; while the same thing, with fine high cost wool in the place of the much reviled shoddy, would cost far more and possess but little more value so far as wear and appearance are concerned.

Cotton and linen rags are sorted with equal care. They are the principal source of papermaking material, and are in constant demand. Used alone, they make the highest grade of paper, while, in combination with varying proportions of paper stock, they produce the various grades of paper to be found in the market. Paper material may be used over and over again, provided always that a given amount of new rag stock is used, but it deteriorates in value with each process, owing to the breaking and consequent shortening of the fiber; and, beginning, say in the form of writing paper of fine quality, it passes successively through the various grades, and eventually is found in the shape of a coarse article, possessing little strength and small value.

Saving Money.

The possession of a few dollars often makes all the difference between happiness and misery, and no man, especially with a family dependent upon him, can be truly independent unless he has a few dollars reserved for the time of need. While extreme carefulness as to the expenditure of money will make a rich man poor, a wise economy will almost as certainly make a poor man rich, or at least make him, to a considerable extent, independent of the caprices of employers and of the common vicissitudes of life. Nothing is more important to the poor man than the habit of saving something; but his little hoard will soon begin to grow at a rate which will surprise and gratify him. Every working man ought to have an account in some savings' bank, and should add to it every week during which he has full employment, even if the addition is but a dollar at a time. If he does this, he will soon find the dollars growing into tens, and these tens into hundreds, and in a little time will be in possession of a sum which is constantly yielding an addition to his income, which secures him a reserve fund whenever one is needed, and which will enable him to do many things, which, without a little money, he would be powerless to do.—*Pittsburgh Post.*

Anvils.

The best anvil in the market is, perhaps, the Peter Wright anvil, made in England, and patented. The peculiarities of this anvil are that the horn, bick, face, and arse are one solid piece of metal, and the surface is put on in one piece, while with the ordinary anvil the horn and bick are a separate piece, the body a separate piece, and the arse and four arms or legs are also separate pieces, making, in all, seven pieces before the steel is applied, which is put on in three pieces.

Persons that have never witnessed the manufacture of anvils would naturally suppose, says *The Hub*, that the same were made upon anvils. Such, however, is not the case. The anvil upon which anvils are forged consists of a large cast iron frame of about three inches in thickness, one foot in depth, and about four feet square, resting upon the earth, or having four feet of space either way, which is filled with the heaviest kinds of iron turnings, or the smaller grades of scrap iron, the former being preferable. When the anvil is removed from the fire, it is placed upon this bed of adjustable scrap iron, and after a few blows soon sets itself into the proper position to receive the remaining blows from the strong arms of the half-dozen men who stand about the frame. The small square holes in the ends of the anvil, at what is termed the waist, are called by anvil makers "port holes" or "porter holes," into which the iron porters are inserted when taking to and from the fire and changing the position while forging. The face is finished on the grindstone.

ENDEAVOR to take your work quietly. Anxiety and overaction are always the cause of sickness and restlessness. We must use our judgment to control our excitement, or our bodily strength will break down. We must remember that our battle is to be won by a strength not our own. It is a battle that does not depend upon the swift nor the strong.

ACCORDING to a recent report of the New York and New Haven Railroad Company, not a single loss of life or limb to any passenger, on any train on that road, has occurred during the past sixteen years. Two and a half millions of passengers are annually carried. Length of road, 76 miles. This is one of the safest and best managed roads in the country.

"Sorry He Did Not Learn a Trade."

A young man, well dressed and of prepossessing appearance, called at our office recently and inquired in great earnestness if we had employment of any kind to give him for but a few days, if no longer, as he was a stranger in the city out of money, and unable to pay for a few days' board and lodging. He further stated that he was a book-keeper, but after a diligent search, he had found no one who wanted any help in that line, nor could he obtain employment at anything that he felt competent to perform in a satisfactory manner. The positions of clerk and book-keeper, he remarked, were all filled, and applicants for them far in excess of the demand. "I am sorry," said he, "that I did not learn a trade."

The appeals of the young man excited our sympathy, but, requiring no farther assistance in the office, we were compelled to reply to his eager questioning that we could not employ him.

The door closed after him, and he again went out to continue what, in all probability, proved to be a fruitless search for employment. But his words lingered behind and, as we sat musing on them, recalled to mind the oft repeated expressions of the mechanic, in which he reproves himself for want of foresight in selecting an occupation. Here I am doomed, he says, to toil in a shop, at work which is hard, affording but poor pay. Like a dog, I must come at the call of a whistle, or like a servant, obey the summons of a bell; had I studied book-keeping or entered a store as a clerk, I might have been leading a much easier and more pleasurable life.

In the cases cited, we find each one dissatisfied with his selection, and wishing to exchange places. And the difficulty at once presents itself, as to how we shall decide for them and the classes they represent, so that the seeming mistakes in selection may be remedied. We acknowledge we are unequal to the task.

Food, clothing, tools, machinery, houses, ships, and an almost endless variety of other things are continually in demand, which require the labor of farmers and mechanics; while that class which makes exchanges (merchants) is of necessity comparatively few in number, and, therefore, needs but a small force of assistants. The necessities of the millions of earth require by far the largest number of persons to be employed in agriculture and manufactures. Whenever then, through pride or any other motive, parents disregard the law and encourage their sons in seeking after situations, as clerks, book-keepers, etc., rather than to engage in those pursuits for which there is always a natural demand, there must be a corresponding amount of suffering as a penalty. Hence we find the so called respectable occupations are glutted, while the mechanical branches are suffering through the lack of skilled laborers. An advertisement for a clerk will quickly bring to the office door a small army of applicants of all sizes and ages, while the want column may plead several days for a good mechanic, and fail to meet with a response.

"Sorry he did not learn a trade." Let apprentices and journeymen, who may be bewailing their lot, at once resolve to thus repine no longer, but by hard study and close application master their trades, and having done so, demand a fair compensation. Then by adding to skill, honesty, punctuality and economy in expenditures, there need be no fear that they shall be compelled at any time to beg for sufficient employment to pay for a day's board and lodging.—*Coach Maker's Journal.*

The Diamond in its Matrix.

Professor Gustav Rose, of Berlin, in a communication to the Chemical Society of the Prussian capital on the recent discovery of diamonds *in situ*, said that the diamonds were found not loose and detached in alluvium, but actually enclosed in another mineral, and though of but microscopic size, had not on that account been the less surely identified. They were found by Professor von Jereemjew, of St. Petersburgh, in a mineral first described by Professor Rose during his journey through the Urals, and named by him xanthophyllite. This rock occurs in yellow tabular crystals, cleaving along the principal face, or radially segregated in rounded masses, and was found to be a silicate of alumina, lime, and magnesia, with some water. The spherular segregations often enclose a nucleus of the talcose schist. It is in these crystals of xanthophyllite that the crystals of diamonds are met with, lying in parallel positions in respect to each other and in a definite position as regards the crystals of their matrix, in a similar way to the minute crystals of iron mica in felspar or oligoclase; the diamond crystals, however, are smaller than these, and are not visible to the naked eye. On placing a thin plate of xanthophyllite under the microscope, the diamonds are recognized by their peculiar form, hexakistetrahedra, with somewhat rounded faces, and are seen to have their tetrahedral faces, which are also frequently visible, parallel to the cleavage face of the xanthophyllite. The diamonds are not in equal abundance in all parts of the xanthophyllite. In the yellow transparent crystals they are sparsely found, or not at all; the greenish, less transparent varieties contain them more plentifully, and are often filled to excess with them. In its bearing on the questions of the formation and origin of the diamond, the occurrence in the Urals is very interesting. There, as in Brazil, it occurs with crystaline schists, in the so called metamorphic rocks, which are supposed to be Neptunian rocks that have been deposited from water, and have subsequently undergone certain changes, amongst others that of taking crystaline characters, whereby all the organized constituents have been removed. Why carbon has separated in the itacolumite of Brazil as diamond, and at Strehlen, in Silesia, as graphite, is a phenomenon demanding explanation. Professor Rose asks whether we may trace the cause to the far greater diffusion of itacolumite in Brazil than in Silesia, where it only occurs as beds in gneiss?

Japanese Metal Work.

The Japanese are very skillful in all that relates to the artistic treatment of the metals, and produce works in this branch of art as commendable as they are varied. They are expert in casting, carving, damascening, engraving, inlaying, weaving, and tempering; and in many of these departments produce specimens comparable to anything done in Europe. Perhaps the most characteristic of all their metallurgic works is that called by them *syakfdo*. In this, numerous metals and alloys are associated, the designs being produced in colors through the agency of the various colored metals—white being represented by silver, yellow by gold, black by platina, all shades of dull red by copper and its alloys, brown by bronze, and blue by steel. Gold, silver, and polished steel, of course, represent themselves in designs as well as abstract colors. A red garment, embroidered with gold and clasped with silver, would be executed in red colored copper, inlaid with gold, and furnished with a silver brooch; the sword in the hand of a warrior would be in polished steel, and if bloody, would have red copper inlaid on it. These instances will suffice to illustrate the general mode of producing colored designs by the exclusive use of metals. The Japanese have brought bronze casting to great perfection, as is proved by the superb incense burner which was presented to H.R H. the Duke of Edinburgh by the Mikado, now on exhibition in the South Kensington Museum. They also produce a highly finished and polished bronze work, on which the relief ornamentation is produced by cutting the surrounding metal away. The relieved objects are then engraved, and richly damascened with gold and silver. Bell founding is carried on to a considerable extent, and art is never neglected in the designs. *Repoussé* work is well known to the Japanese metallurgists, but is not so largely adopted by them as it is by western artists. Flat silver wire, woven into diaper patterns, is a favorite material for covering uniform surfaces, and is frequently applied by the Japanese artists in an effective manner. In drawing the attention of the meeting to a group of storks, executed in gold, silver, bronze, and other metals, Mr. Audsley, in a paper recently read by him in England before the Architectural Association, said the audience would agree with him that the Japanese have been more successful than our silversmiths in appreciating the nature of their materials, and realizing the correct modes of working them. This group—where every feather is a thin plate of metal, carefully engraved; where the legs, tails, necks and heads of the birds are in their natural colors; where the rock they stand upon is modelled with accuracy, and its stunted vegetation truthfully rendered—would bear comparison with the best efforts of our silversmiths as displayed in presentation plate, of which the best that can be said is that it contains many pounds of "solid silver;" and the comparison would lead to the award being given in favor of the Japanese work.

Old Rubber.

A fortune awaits the happy inventor who shall teach manufacturers to restore old rubber to the condition in which it was before vulcanization, for, with that secret, there would be practically *no consumption* of this invaluable article. The thing has been done, and successfully, and we have ourselves, says the *Commercial Bulletin*, seen pieces of vulcanized rubber possessing great strength and elasticity which were made entirely from old car springs; but it has never been accomplished on a large scale, and awaits the enterprise and ingenuity of some new Goodyear to develope it.

Meantime, old rubber has its uses. By a system of steaming and passing between rollers, it is reduced to a semi-plastic state, and in this condition is used in combination with a coarse fabric for heel stiffening, a purpose for which it is admirably adapted, its waterproof qualities being of especial value. There is, in a neighboring city, a factory devoted entirely to this branch of manufacture, where several hundred tuns of old rubber of all kinds are consumed annually.

Old rubber is also largely used to mix with new raw material in the manufacture of all kinds of rubber goods. It serves to give bulk and weight, and if it does not increase, it certainly does not lessen, the strength of the fabric. It may also be mentioned that powdered soapstone, white lead, *terra alba*, and other heavy substances enter largely into the composition of almost all rubber goods, the use of which becomes apparent when it is remembered that they are generally sold by weight.

Cure of Hydrophobia.

Dr. Alford, at Flint, Mich. has cured a case of hydrophobia. The disease did not make its appearance until eight months after the patient was bitten. The treatment was this: Sulphate of morphia, one grain, was injected subcutaneously every four hours, and half a dram of powdered castor given internally, in sirup, at the same time. Chloroform was also inhaled in small quantities. In about half an hour, sleep occurred, and continued over an hour. Convulsions then recurred, and continued, with intervals of variation, for about twelve hours, when they entirely ceased. Vomiting and great prostration followed, but the patient ultimately recovered. The excessive prostration was counteracted by wrapping the patient in a woolen blanket moistened with a warm solution of muriate of ammonia, twenty grains to the ounce.

Dr. Alford states that he had another successful case of cure of hydrophobia eight years ago.

A New Sensitive Singing Flame.

Philip Barry has recently described a very sensitive flame produced by placing a piece of ordinary wire gauze on the ring of a retort stand, about four inches above a Sugg's steatite pin hole burner, and lighting the gas above the gauze. "The flame is a slender cone about four inches high, the upper portion giving a bright yellow light, the base being a non-luminous blue flame. At the least noise this flame roars, sinking down to the surface of the gauze, becoming at the same time almost invisible. It is very active in its responses, and being rather a noisy flame, its sympathy is apparent to the ear as well as to the eye."

A simple addition to this apparatus has given me a flame, which, by slight regulation, may be made either; (1) a sensitive flame merely, that is, a flame which is depressed and rendered non-luminous by external noises, but which does not sing; (2) a continuously singing flame, not disturbed by outward noises; (3) a sensitive flame, which only sounds while disturbed; or (4) a flame that sings continuously except when agitated by external sounds. The last two results, so far as known to me, are novel.

To produce them, it is only necessary to cover Barry's flame with a moderately large tube, resting it loosely on the gauze. A luminous flame six to eight inches long is thus obtained, which is very sensitive, especially to high and sharp sounds. If now the gauze and tube be raised, the flame gradually shortens and appears less luminous, until at last it becomes violently agitated, and sings with a loud uniform tone, which may be maintained for any length of time. Under these conditions, external sounds have no effect upon it. The sensitive musical flame is produced by lowering the gauze until the singing just ceases. It is in this position that the flame is most remarkable. At the slightest sharp sound, it instantly sings, continuing to do so as long as the disturbing cause exists, but stopping at once with it. So quick are the responses that, by rapping the time of a tune, or whistling or playing it, provided the tones are high enough, the flame faithfully sounds at every note. By slightly raising or lowering the jet, the flame can be made less or more sensitive, so that a hiss in any part of the room, the rattling of keys, even in the pocket, turning on the water at the hydrant, folding up a piece of paper, or even moving the hand over the table, will excite the sound. On pronouncing the word "sensitive," it sings twice; and in general, it will interrupt the speaker at almost every "s" or other hissing sound.

The several parts of the apparatus need not be particularly refined. By the kindness of President Morton, I have used several sensitive jets of the ordinary kind made of brass; they all give excellent results. Glass tubes, however, drawn out until the internal diameter is between one sixteenth and one thirty-second of an inch, will do almost equally well. For producing merely the singing flame, even the inner jet of a good Bunsen burner will answer. The kind of gauze too is not important; I have generally used a piece which had been rounded for heating flasks; it contained about 28 meshes to the inch.

The experiments can be made under the ordinary pressure of street gas, three fourths of an inch of water being sufficient.—*W. E. Geyer, in the American Journal of Science.*

The Origin of Petroleum.

The recent development of the reproductive power, of petroleum wells that had been for some years abandoned because they were believed to be exhausted (says the *Petroleum Monthly*), is not alone a matter of value, to the owners of the territory that was until lately presumed to be incapable of further production, but it affords a more trustworthy basis than any the world has hitherto been able to obtain for forming an approximately correct opinion concerning the chemical process whereby petroleum is generated. Until within a few days, a popular opinion prevailed that petroleum, in spite of its name, was the product of coal; and so nearly was this idea general among a majority of people, that many foreign receivers of petroleum are still accustomed to order it as "coal oil." The belief, however, that the terrene oil of Pennsylvania and Canada is exclusively a product of bituminous coal may now safely be pronounced to be an error. There is certainly no evidence that coal is not one of the substances from which petroleum is distilled; but, at the same time, it is a somewhat strange fact, allowing a proper degree of credit to the belief that coal does enter into the composition of petroleum, that no coal beds susceptible of being worked are known to exist within fifty miles of the oil-producing territory. Again, it is a manifest and recognized fact that carbon does predominate as an integral essence of petroleum; and the other fact that the oil territory of Pennsylvania is surrounded by beds of bituminous coal, renders it eminently reasonable to believe that coal enters largely—if not, indeed, more largely than any other substance—into the process of distillation whereby petroleum is produced. Petroleum is certainly a mineral oil. But whatever may be the number and chemical variety of the minerals from which it is formed, the distillation of it is more intimately associated with limestone than with any other mineral. Sandstone is also found in boring oil wells, but it is from the pores of limestone that, in the chemical process of extracting oil from the minerals found in connection with its production, the greatest quantity of petroleum is taken. It is singular that, in boring for oil, no coal has ever been found, even in the smallest quantities, while sand, sandstone, and limestone abound. The inference, therefore, cannot be escaped that petroleum is the product of the distillation of at least two, and probably of more than three distinct mineral properties.

Improved Fire Shield.

It is the object of this invention to provide convenient and efficient means for preventing the spread of fires in cities and villages. It consists of a portable adjustable shield or screen, composed of fireproof plates or sheets, mounted on wheels, as indicated in our engraving, so that the machine can be transported from place to place without difficulty and with expedition.

A light frame or platform, A, is supported on the axles, B, of the wheels, C, but raised above and projecting over the wheels. Two pairs of stanchions, D, attached at the bottom to the platform, A, and connected at their top ends, have a pulley hanging from the center of each pair. There is an upright rod, G, at each corner, or one for each stanchion, rigidly connected to the platform and extending up about half way, more or less, to the top of each stanchion. The upper ends of these rods are curved and forked, and each contains a pulley, H. There is a brace for each of the rods, G, on which horizontal pulley shafts, J, are supported. A horizontal pulley shaft, K, at each corner of the platform, is supported by stands, L. Another horizontal pulley shaft, M, at each corner of the platform, is also used.

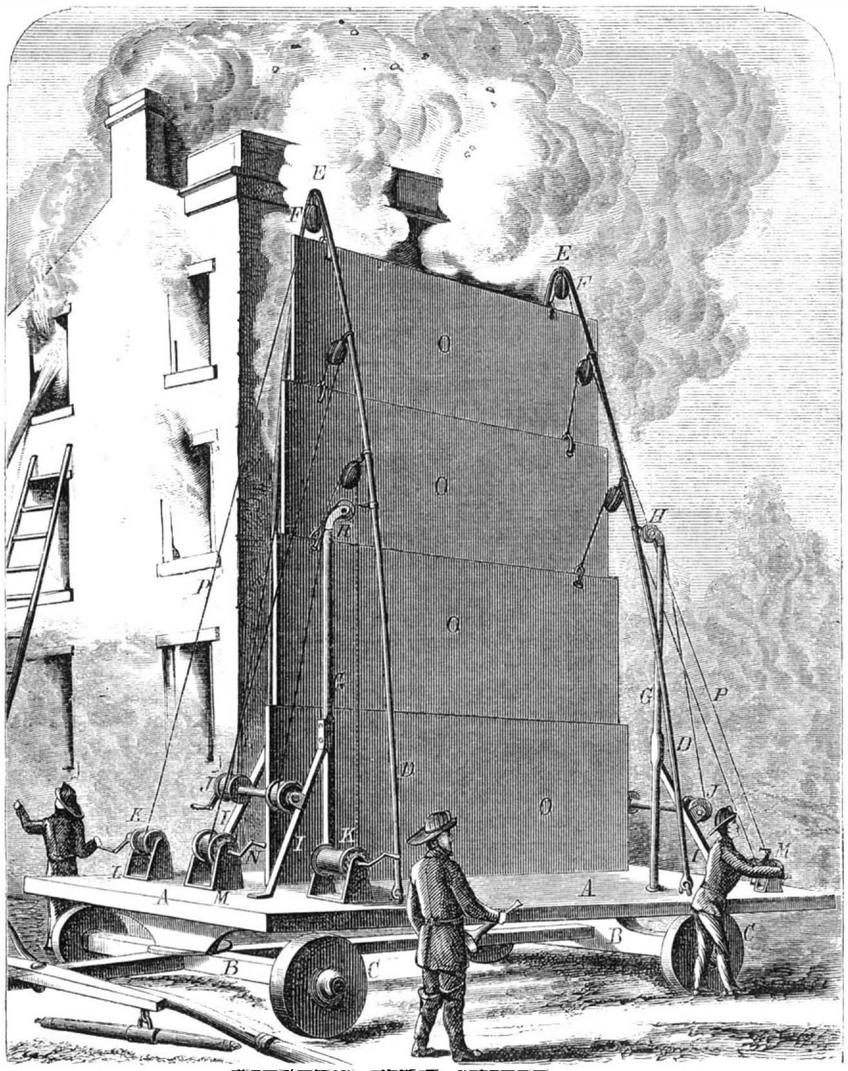
All these shafts are provided with cranks, by means of which they are revolved, and are also furnished with wheels and pawls, by which movement may be prevented.

Sheets or plates, O, of metal or other incombustible material, are suspended from the stanchions, and from the rods, C, by means of chains or wire ropes, P, and are raised or lowered by means of the crank pulley shafts.

The plates may be of any size or thickness, and are so arranged that they work independently of each other; and they may be adjusted in a mass, or so as to present two or three thicknesses to the heat of a burning building.

It is claimed that, by interposing this shield between buildings, one of which is on fire, that the fire may be limited in extent and much property saved.

Patented through the Scientific American Patent Agency, Nov. 28, 1871, by Henry Rieger, whom address, Kansas City, Mo., for further information.



RIEGER'S FIRE SHIELD.

Improved Mattress Stuffing Machine.

Our engraving illustrates a mattress stuffing machine, by which, it is claimed, the stuffing of mattresses can be effected with astonishing rapidity. The whole arrangement is simple, easily managed, and, we judge from examination of a model of the machine, constitutes a valuable and important addition to appliances of the upholsterer's art. It is adapted to all sizes and kinds of mattresses, and its use will, we think, effect a large saving in this branch of business.

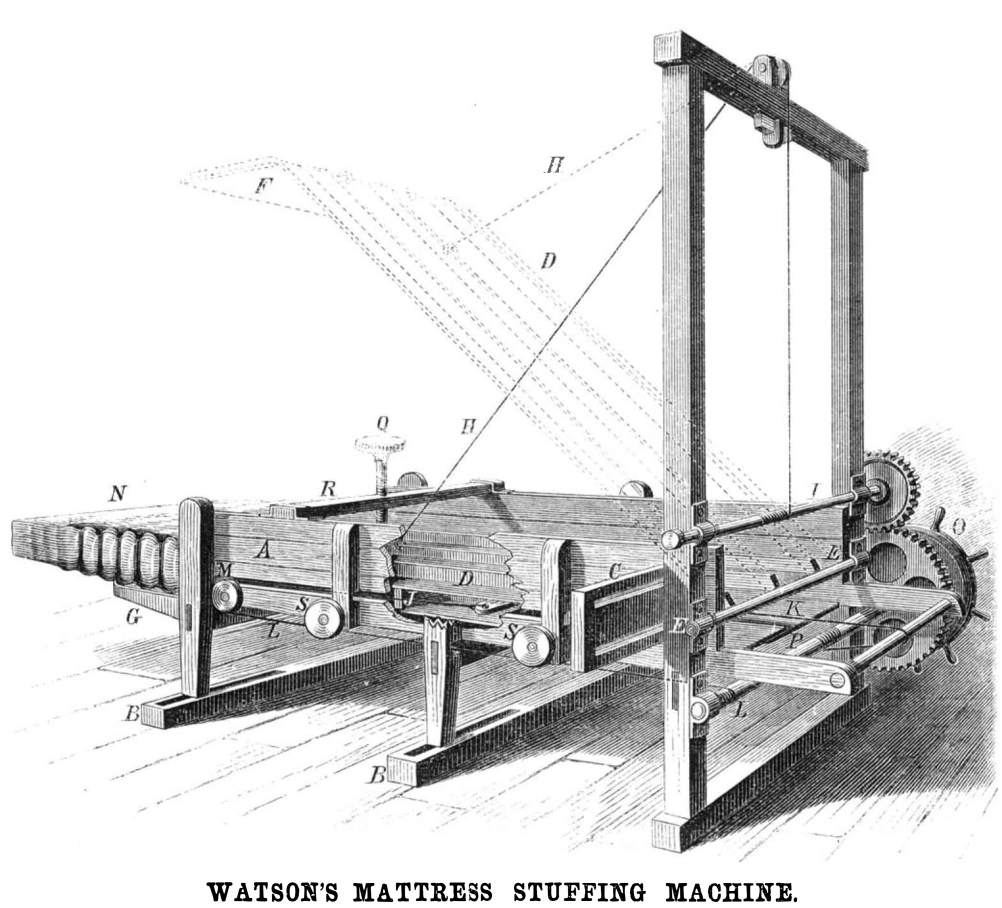
A box, as wide and as long as the largest sized mattress, has one side, A, laterally adjustable for any required width of mattress, the legs of that side sliding in slots formed in the sills, B. One end of the side, A, has attached a slotted board, C, which slides on bolts (not shown), and by which, and the screws, S, the side, A, may be adjusted and held in position when adjusted for width. A cover, D, ribbed longitudinally and pivoted at E, is raised, while placing the filling in the box, into the position shown by the dotted outline. That part of the cover shown in dotted outline, and lettered F, is pivoted to the other portion, and, when the cover is lowered, turns down to form a closed end of the box while the stuffing is being placed; but when the pressure is applied, it extends straight with the rest of the cover, so that, in connection with extensions of the sides and bottom of the box, it forms a chute, through which the filling is forced into the case or tick. The latter is placed for filling over this chute, being gathered into folds thereon, and is held from yielding and escaping too readily by laterally bent springs, G, which press against the tick and hold it against the bottom of the chute.

The cover, D, is raised by the rope, H, which runs over a pulley and is wound up by the shaft, I, at the same time that the compressing follower, J, is withdrawn by the action of the cord, K, the cords, L, running over the pulleys, M, actuating the follower, J, in the direction to force the filling into the tick, N, whenever the hand wheel, O, is turned to wind up the cord, L, on the shaft, P.

The shaft, I, has long bearings, which allow it to be thrust endwise to run its pinion out of gear and permit the cover to be lowered independently of the action of the hand wheel. When thus lowered, the cover is forced down to compress the filling by the action of a screw, Q, which runs in a thread formed in the removable bar, R, this bar being taken out while the cover is raised or lowered. When the follower is actuated against the stuffing, the latter enters the tick, which, as fast as it is filled, slips off the chute very much as a filled case slips off the nozzle of a sausage stuffer.

With the use of this machine and that of a trifling machine by the same inventor, and on which a patent is now pending, a mattress can be filled and stitched in a remarkably short space of time. The machine has already elicited high praise from practical men, and has won prizes in all fairs where it has been exhibited. There is no doubt that it is a first class machine for the purpose intended; and we would recommend parties interested in this class of manufactures to make personal investigation into its merits.

The simplicity of its arrangements, and the ease with which it is managed, together with the time saved by its use, cannot fail to be considered points in its favor. It was patented through the Scientific American Patent Agency, April 2, 1872, by Thomas A. Watson. For State, county, or other territorial rights, address Watson & Phillips, Brenham, Washington, Co., Texas.



WATSON'S MATTRESS STUFFING MACHINE.

WATER ordinarily freezes at 32° Fah. But if it be confined in a strong vessel, so that its tendency to expansion is restrained, the freezing point may be lowered to 23° Fah.

Effects of Electricity on Milk.

The *Milk Journal* states that, in an address before the North Western Dairymen's Association, Mr. X. A. Willard repeats the following interesting facts:

Mr. Andrew Cross, the celebrated English experimenter, considered that the roots and leaves of plants were in opposite states of electricity; some of his experiments in this direction are very interesting. He cut two branches from a rose tree. They were as nearly alike as possible, with the same number of buds, and both equally blown. An arrangement was made by which a negative current of electricity was passed through one, a positive current through the other. In a few hours the negative rose drooped and died, but the positive continued its freshness for nearly a fortnight; the rose itself became full blown and the buds expanded, and survived an unusual length of time. Again, he was able to keep milk sweet for three weeks in the hottest weather of summer, by the application of a current of positive electricity.

On one occasion, he kept fishes under the electric action for three months, and at the end of that time they were sent to a friend, whose domestic knew nothing of the experiment. Before the cook dressed them, her master asked her whether she thought they were fresh, as he had some doubts. She replied, that she was sure they were fresh, indeed, she said, she would swear they were alive yesterday. When served at table, they appeared like ordinary fish, but when the family attempted to eat them, they were found to be perfectly tasteless; the electrical action had taken away all the essential oil, leaving the fish unfit for food. However, the process is exceedingly useful for keeping fish, meats, etc., fresh and good for ten days or a fortnight. Now this is consistent with our observation and the facts known to every one in the habit of handling milk. When the condition of the atmosphere is in a negative electrical state, or shows a deficiency of positive electricity, a state of weather which we designate as sultry, close, muggy, and the like, there is always difficulty in keeping milk sound. Even in good, healthy milk, the fungus germs common to all milk increase and multiply with great rapidity, producing the common lactic acid fermentation or souring of the fluid; but in case fungi from decomposing animal or vegetable matter comes in contact with the milk, rapid decomposition takes place, and we have rotten milk, putrid odors, and floating curds. The exposing of such curds to the atmosphere, as well as the aeration of milk to improve its condition, are both philosophical, because these minute organisms of fungi are affected by the oxygen of the air, which checks their development and multiplication.

The influence of electrical action is a question entirely new to the dairy public, but it is one concerning which I think some useful suggestions present themselves for our consideration. When the electrical equilibrium is disturbed, or when the state of the atmosphere indicates a preponderance of negative electricity, we are all made aware of the fact by its depressing influences. At such times, it is important that we take more than ordinary care in the handling of milk; that it be kept out of harmful odors; that attention be given to its aeration, and such treatment be given it as shall be inimical to the growth and development of fungi. And again, the fact that milk may be kept sweet a long time in hot weather by electrical action will offer a very important suggestion to inventors in the preservation of milk, and perhaps in the improvement of cheese at the factories. I believe that we are only on the threshold of the cheese making art, and that as we become better acquainted with the laws of Nature and their application, great progress is yet to be made in every branch of dairy husbandry.

THE best authorities estimate the entire world's wool product for 1871 at 1,620,000,000 lbs. Of this enormous quantity, Europe produced about 827,000,000 lbs; Asia, 470,000,000 lbs.; Australia, 175,000,000 lbs.; the United States, 122,600,000 lbs., and South Africa, 34,000,000. Great Britain presents the largest market for wool in the world, her own annual production being estimated at 260,000,000 lbs., while her consumption is something over 250,000,000 lbs. The United States used of the raw material, in excess of the home production, about 68,000,000 lbs., imported at a cost of $9,780,000. The value of the manufactured articles imported into the United States, in 1871, was about $44,000,000.

THE production of quicksilver in California amounts, on an average, to about 2,250 flasks per month.

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Contents:

(Illustrated articles are marked with an asterisk.)

HOW TO CONDUCT NEW SCIENTIFIC INVESTIGATIONS.

Any one, inclined to use his leisure hours to enter a new field of scientific investigation, for the purpose of the promotion of science or for personal benefit, either reputation or profit, must first proceed to find out all that is known, respecting the subject chosen, before he commences his attempts to find something new. This is indeed the only way in which he may expect to be rewarded for his trouble; for what is the use of consuming our time and money to find in the end that we have only arrived at results which others before us have left behind long ago? That this statement is not exaggerated will be acknowledged by many who have either themselves made that mistake, or been the witnesses of the same mistake made by others.

The preparatory investigation suggested here will lead the explorer through many most fascinating paths of knowledge; and in order to conduct it rightly, we will give a few hints to all concerned.

The first information which we may obtain may be in a cyclopædia, found in almost every public library or in the possession of any well-to-do private citizen who loves books and ought to be willing to occasionally give others the benefit of his treasures when properly approached. If the cyclopædia is written in the right way, the article looked for will first give the general reader sufficiently full instructions in all he cares to know concerning the subject, and secondly, it will suggest to the student how and where to get further information. A good cyclopædia is similar to a finger post in the footpaths of science; it must point out the way, as it cannot be the whole way itself. It places the mere visitor on a hill, from which he may overlook the prospect, and gives the laborious traveler the guides necessary for his explorations. Those finger posts of the cyclopædia point to two kinds of roads, to special treatises on the different branches of science, mathematics, mechanics, physics, chemistry, etc., and to the transactions and memoirs of scientific associations. Of these two, we consider the latter as the most important, notwithstanding there is a general tendency to overlook them. It is argued that the truths they contain have been absorbed in the special treatises of science, while there are errors in them that have been rejected, and that therefore they are confusing and even dangerous to the student. There is some foundation for this opinion, and we agree that a totally ignorant person may thus be led astray; but any one having only a moderate knowledge of the present condition of science, as far as can be learned from the latest ordinary text books, is not subject to this danger, and only such are fit to enter at all in new scientific investigation. And these surely will find such documents, especially the old memoirs, instructive and even delightful reading. They have the great merit of being conscientiously written, with an admirable truthfulness and simplicity, and in this respect contrast very forcibly with many modern writings. They are earnest and condensed, true models of style, true models for practical investigators, and they describe the most admirable modes of research.

There is another reason why these scientific records should be consulted. The most valuable *data* were not often represented in such a way that the attention of subsequent compilers was sufficiently directed to them. Such a one takes no more than what strikes him, or what he wants, and the result is that second hand compilers, who abridge and sometimes even alter the abstract, misrepresent the results of the original investigators. In this way, the most valuable incidental matter lays buried and neglected among the volumes of the memoirs, taking years to be unearthed; and even it is often not found there at all, but has been rediscovered by great labor and republished; and afterwards, some explorer of the old memoirs finds the original discovery and, by publishing the truth, robs the later discoverer of one of the gems in his crown.

We know that nobody will undertake the kind of labor we are speaking of except when he loves the subject so much as to be truly inspired with such an interest that, even when he doubts if pecuniary profit will accrue to him in consequence, he will not abandon his investigation. Scientific knowledge has its claims on us to be cultivated for its own sake, as well as literature, poetry, or music; we must not solely pursue it for the sake of money making, but first for its beauty and beneficial influence on our minds, and consider the profit, often the consequence of scientific investigation, as a secondary matter, but an important one at the same time, in which science has a decided advantage over literary and poetical pursuits, which can do nobody any material good, and never exerted the least influence of the improvement of the conditions of mankind.

All the great agents which have reformed the modern relation of man are due, not to literary and poetical, but to practical scientific pursuits. Is it a wonder, then, that the tendency of the most advanced minds is to modify our institutions of learning and to make them more scientific and less literary? Not only are physics and mechanics more pleasant studies than Latin, and chemistry more interesting than Greek grammar, but we assert that a man may make more money by applying a mere superficial knowledge of these sciences than by a much more profound knowledge of the dead languages. That these latter have not been more extensively superseded by more practically useful studies is a matter of surprise.

ENGINEERING IN BRUSSELS.

The recent completion of the public improvement works at Brussels affords a good illustration of the successful issue to which great engineering undertakings in large cities can be carried. These works have given to the city a beautiful boulevard extending (with its branch) over a mile and a half, and conveying, in its tunneled substructure, the contents of a river which had become a nuisance.

The Senne, which passes through the city, had there a very tortuous channel with very slight descent. Choked with the drift brought in from the outside country, and receiving all the refuse from the populous districts bordering it, it degenerated at last into an open sewer, which, swelled by the rains, occasionally inundated the adjacent parts of the town. The disastrous consequences to health and property induced much anxiety and deliberation, which resulted finally in the building of the present works. The leading features of the design consist in the construction of a large tunnel, and the diversion of the river waters into it on a straight course. Earth was filled in upon the tunnel even with the adjoining ground surface, and a new street formed upon the top of the tunnel. The latter is composed of a system of arches structurally connected, presenting, in cross section, four channels; the two middle arches, of twenty feet span and fourteen feet seven inches hight, draining the river, and two side arches, thirteen feet one inch high, and, respectively, ten feet five inches and eight feet two and a half inches wide, collecting the city sewage. These channels can be made to communicate for the purpose of flushing; and ingenious provision has been made to accomplish this by utilizing the water from the city water works. The boulevard or street above the tunnel is ninety-two feet in width, wider than our Fifth Avenue, and runs nearly across the city. Besides sanitary considerations, the improvement has great importance. It opens a new and commodious thoroughfare between two distant railroads, and affords sites for public and other much needed buildings.

Great as is this achievement, it is far exceeded by the Thames Embankment in London, and the Metropolitan and other underground railroads in that city. In these, greater difficulties have been overcome. How successfully, is proved by a glance at the noble quay along the river, and at the constantly changing crowds in the handsome stations built many feet below the busy streets. We cannot but look upon them all as monuments of engineering skill exerted in the interests of the people; and it seems strange that in our own city we are so backward in admitting the practicability of minor efforts in the same direction.

THE COLORADO POTATO BEETLE.

In the last annual report of the State Entomologist of Missouri, Mr. Charles N. Riley, we are given some interesting additional facts regarding the Colorado potato beetle, its ravages, parasites, and enemies, and the means taken to counteract its work.

The insect showed numerously in the spring and summer of 1871, and there was a consequent falling off, of the potato crop in several States, of from 20 to 35 per cent, while new territory was being steadily invaded. Parts of the borders of New York and Pennsylvania and the interior of Canada were reached, and its continued march eastward is confidently predicted. The southern columns of the invader extend far more slowly than the northern, which is, no doubt, because the insect cannot thrive when the thermometer ranges near 100° F. It never entirely quits any district where it has once obtained a foothold, but in two or three years generally proves less injurious, because its natural enemies have multiplied sufficiently to keep it in check. These natural enemies are on the increase, and twenty-one cannibal or parasitic insects are now known to attack it, in one State or another, while toads, crows, ducks, and chickens are learning to devour it also. It is believed the skunk likewise preys upon it. The Colorado potato beetle has in the past been found to flourish only on plants of the nightshade genus proper (*Solanum*), other members of the same family being but little to its liking, and it therefore is an interesting fact that last summer it was found feeding upon the cabbage, which is, botanically, so very distinct. Whether it will continne so to do seems a matter of considerable doubt.

Various have been the expedients tried to rid the potato of this pest, both chemical and mechanical. Of the former, Paris green has been found to be the most efficacious; but a good deal of objection has been made to the too general use of this poison on the ground of its dangerous nature, and it has been stated that the bugs could be subdued by determined handpicking. It has been thought that potatoes grown on land where Paris green has been used are often watery, rank, and of bad flavor, and that peas planted in soil mixed with the green rotted immediately, and that some, flourishing finely in unadulterated soil, died when transplanted into the mixed soil. Each cultivator must judge for himself how far these statements are to be relied on. It is certainly advisable to avoid as much as possible the use of the poison. Properly mixed, it has been used without the slightest injury to leaves or tubers, and what is wanted in the matter is a series of accurate and reliable experiments.

The green may be shaken over the vines in various ways, and some make use of an old sack attached to the end of a stick; it is most safely applied, however, by aid of a perforated tin box attached to the end of a stick three or four feet long. The least possible dusting suffices, and by taking the handle in one hand and then tapping the box with a stick held in the other, the amount sifted can be regulated as the rows are rapidly walked along. The green is most effective when mixed with flour, though plaster has the merit of cheapness. If the green be pure, it may be mixed with 25 to 30 times its weight of flour, though 12 to 14 parts are usually recommended; and a deep, bright green color should be chosen, as the paler colors are weaker. It does not appear to seriously endanger the animals around, except where left exposed in quantity sufficient to be eaten by them; but nothing can excuse the careless use of the poison, which must be especially guarded against during the heat of the day; it should always be dusted in the cool of the morning, while the dew is on the plants. The antidote for Paris green poison is hydrated sesquioxide of iron. Where it cannot be purchased, it may be prepared thus:—Dissolve copperas in hot water, keep warm, and add nitric acid until the solution becomes yellow; then pour in ammonia water—common hartshorn—or a solution of carbonate of ammonia, until a brown precipitate falls. Keep this precipitate moist and in a tightly corked bottle, and administer a few spoonfuls when a case of poisoning by Paris green or arsenic occurs. It might be supposed that as arsenic is one of the principal ingredients of Paris green, it could be used as an economical substitute. It has been tried, however, with no satisfactory result. It does not kill the bug with anything like the certainty of Paris green, and causes injury to the leaf of the plant.

Various mechanical contrivances for knocking the bugs off the vines are in use. One is a simple box six inches high, with wheels to which brooms are attached so as to sweep the bugs into the box. Another consists of a trap held under the vine to catch the bugs which are detached by means of a light, flat, and broad broom. The trap is afterward emptied through a sliding door and the bugs destroyed. The great difficulty with all such devices is that they can only be used when the vines are a considerable size, while it is necessary to fight the enemy from the moment the tuber breaks the ground. This is what makes the Paris green so valuable.

THE RUBBER TIP PATENT CASE.

For several years past, the stationers have supplied to the public a new and highly useful little article known as rubber tips for lead pencils. These consist of small blocks of rubber, molded into various fanciful forms and provided at the center with an orifice into which an end of the lead pencil is thrust. Small and simple as the article is, a very large business is carried on in its manufacture and sale.

Several conflicting patents and claims for patents at one time existed concerning the rubber tip; but the various parties finally consolidated their interests under the name of the Rubber Tip Pencil Company. One of the principal patents, held by the Company, was that of Blair, 1867, and on this patent the Company lately brought suit in the United States Court against Hovey and others for infringement. We publish the decision of the court in another column. It will be seen that Judge Benedict takes a very narrow view of the invention. He regards it as simply a piece of rubber with a hole in it; and, looking at it from this point of view, he thinks there is not enough invention about it to support a patent, and so dismisses the case.

This decision we believe to be erroneous. True, there was no great amount of invention exhibited in the article. In such a small affair, not much is to be expected. But enough of invention was manifested to produce a new article that everybody wants—enough to create a new and important branch of industry, and therefore sufficient to support a patent.

SLEDGE HAMMERS made from cast steel are superior to those made from iron and faced with steel. They cost about twice as much as the latter, but will perform fully four times the amount of work without requiring to be dressed.

NATURE AND ART.

One of the most interesting general subjects, with which a philosophically inclined mind can occupy itself, is the comparison of a natural object with a product of human art. An artificial object may indeed excite our admiration and even delight; but after some study, we comprehend all that it is intended to, and all which it possibly can, teach us. As it has been executed by the genius, skill, and perseverance of a man, it can be understood by another man, provided his intellectual development is not so low and his preparatory education not so defective that he cannot elevate himself to the standard required to appreciate the genius of his more advanced fellow man. By studying the products of such genius, he finds that, after all, they partake of many (and if not of many, at least of some) of the human imperfections. The finest human production represents, after all, nothing more than the state of scientific knowledge or artistic ability possessed at the time of its production; it silently admits of improvements, and confesses that probably it will be improved by advancing science, or, even worse, entirely set aside by the more perfect productions produced by later generations, and elaborated on a different type.

In studying a natural production, that is, an object made by Nature, alone, without human interference, we find that all the above remarks are totally inapplicable. We find that we never will be able to learn all that it can teach. Its place in the universal economy is such that we are compelled to confess that it was assigned by the most Supreme Wisdom, and while science comes, in its giant steps of progress, nearer and nearer to that wisdom, new perfections are discovered in it. Every natural production appears more and more elaborate, and more and more in harmony with the whole universe; it will never be superseded or set aside, but is steadily fulfilling its functions in the great mysterious evolution and differentiation of the material universe. At every step of our investigation, it admonishes us of the eternal laws of its being. A thought of the great German philosopher and poet Goethe, which flowed from his pen when his mind was turned to the study of botany, is worthy of attention; it is

"Suchst du das Höchste, das Grösste?
Die Pflanze kann es dich lehren.
Was sie wissenlos ist.
Sei du es wollend,—das ist's."

We add the translation:

"Wouldst thou the highest, the greatest attain?
The plant may instruct thee.
What it unwittingly is,
Wittingly strive thou to be."

And this may be said of any natural object as well as of the plant, even of every part of a plant, of every part of the minutest animalcule; and if we recall the millions of organisms which the microscope is revealing in our time, in every grain of fossil earth, in every drop of stagnant water, even in the mud of the ocean bottom, at depths so great as to be formerly considered utterly inaccessible and devoid of life, we are dumbfounded at the infinity of the mysterious Power which presides over Nature's productions, and the comparative insignificance of man, notwithstanding all his pride.

CANADIAN PATENTS.

Our provincial neighbors have commenced their annual discussion of their Patent law. In the Canadian House of Commons, a few days ago, the Hon. Mr. Pope moved that the House go into committee on certain resolutions to amend the Patent law. He explained that in effect the measure was intended to assimilate the Canadian Patent law to that of England and the United States. The proposed amendment does away with the provision of the present law which requires a year's residence in Canada. The only other change proposed is that patented articles shall be manufactured in Canada. The House then went into committee, Colonel Gray in the chair, and adopted the resolutions and reported. The report was received. The resolutions were read a second time, and a bill founded on them was introduced.

We shall watch with interest the progress of the new bill, but have but little hope that the Canadians will so amend their Patent law as to permit their cousins in the States to secure protection for their inventions within the Provinces. The Canadians have so long practiced the habit of appropriating the inventions of our people that they will not readily give up the privilege; but at every Parliamentary session, a great deal of virtuous discussion takes place about Patent reform, which always ends without affording any protection to American inventors. We apprehend that the present discussion will terminate in the same manner.

EAST INDIAN IRON.

The *Indian Mail* is wondering why so little has been done to develop India's alleged wealth in iron, while the demand for that metal is so great as to divert British capital into foreign mines. It states that the steel now wrought in Cutch may vie in beauty of temper with the best productions of Sheffield and Glasgow, and that iron was lately turned out, from a rude furnace erected in the hills near Simla, superior to that obtained from Glasgow and Merthyr Tydvil at seventy shillings a ton. For sixty miles, along the base of the lower Himalayas, extends a rich iron bearing country, while the materials for smelting the ore lie close at hand in the shape of forests of hard timber. The iron bearing tract near Simla, covers two hundred square miles and yields a malleable ore very like that of Sweden. No doubt is entertained that plenty of iron may be found all over India, and that it may be brought into the market there cheaper than the English metal.

SCIENTIFIC AND PRACTICAL INFORMATION.

A NEW BLUE COLOR.

If metallic antimony be dissolved in *aqua regia*, after filtering through granulated glass, a solution of prussiate of potash being added as long as any precipitate is produced, a beautiful and permanent blue color is exhibited which can scarcely be distinguished from ultramarine. With chrome or zinc yellow, it gives a green, almost equal in color to Schweinfurth green and far less poisonous.

ACOUSTIC TELEGRAPH.

Professor Weinhold, of Chemnitz, Germany, has invented a phonic telegraph, employing neither electricity, magnetism, light, nor heat. The wire, which must be very carefully insulated, is attached at both ends to sounding boxes. Words uttered near one sounding box are repeated by the other very distinctly. This telegraph has been found to work well on the short line (2,200 feet long) where the experiment was made.

THE MARSH TEST FOR ARSENIC.

In the Berlin laboratory, it was customary to pass the arsenuretted hydrogen gas through several wash bottles containing dilute solutions of nitrate of lead, before passing it into nitrate of silver. It was often noticed that, although using chemically pure acid and zinc, the lead solution always became quite black, a fact indicating the presence of sulphuretted hydrogen. If concentrated sulphuric acid were used, the smell of sulphuretted hydrogen is also noticed. Professor Kolbe, who has been studying this subject, concludes that the sulphuretted hydrogen is due to a reduction of the sulphuric acid by nascent hydrogen, the amount of heat generated favoring the decomposition. This reaction could perhaps be represented thus:

$$H_2SO_4+8H=H_2S+4H_2O.$$

It seems probable that the sulphuretted hydrogen thus generated would precipitate a portion of the arsenic introduced and render the test less accurate. To avoid this, Professor Kolbe suggests the use of a very dilute acid.

ADULTERATION OF STEARIN WITH PARAFFIN.

To determine the amount of paraffin in stearic acid or in stearin candles, the following simple and practicable method may be employed: About five grammes of the substance is weighed out and treated with warm potash lye, not too concentrated. The stearic acid is, of course, converted into soap, while the paraffin remains suspended in the liquid in small drops which finally collect on the surface. By allowing it to cool, most of the paraffin could be taken from the top, but to avoid errors, caused by drops of paraffin which remain suspended in the liquid, a solution of common salt is added which throws down the soap from the solution. The solid soap and paraffin are brought on a filter and washed with cold water, or a very dilute alcoholic solution. After all the adhering salt solution is washed out, the soap itself dissolves and passes through the filter, leaving the paraffin alone on the filter. This is dried at a temperature below the melting point of the paraffin, say at about 35° to 40° C. The paraffin may still contain some water and excess of alkali, so that it is not yet ready to be weighed. It should be treated with ether on the filter, and the ethereal solution evaporated, in a weighed porcelain or glass capsule, at a low temperature on a water bath. This operation must be conducted with great care, for the solution is apt to foam and spatter. The weight of the evaporated residue gives the amount of paraffin present, while the difference is stearic acid.

THE FOREST FIRES.

The calamities of last autumn, which destroyed so much property in Michigan, Wisconsin, and other parts of the Northwest are now being supplemented in the States of New York and Pennsylvania. Fires are destroying the timber and brushwood on the mountains in Delaware county, N. Y, At Hancock, a steam sawmill and much other property, including over 1,000,000 feet of hemlock timber, have been destroyed. We are informed by a traveler on the Delaware, Lackawanna and Western road that a tremendous scene of devastation was visible from the train, the heat being such that the glass windows of the cars were uncomfortable to the touch.

SEXUALITY OF HEART DISEASE.

Dr. Richard Quain reports that enlargement of the heart, one of the most distressing and fatal diseases, is more than twice as frequent in males as in females, the precise proportion being 8 to 3. This remarkable liability to enlargement of men's hearts, as compared with those of women, is, he thinks, unquestionably due to the greater amount of work and anxiety which, under the present dispensation, falls upon man. Ladies may take this fact to heart, and reflect whether, in claiming the rights of women, they may not at the same time incur the risks of men, and with them a new and unexpected form of disability.

AN ANCIENT RECORD.

Mr. Henry Fox Talbot has recently read, before the Society of Biblical Archæology, a paper on a "Curious Myth respecting the birth of Sargina." Sargina the First was an ancient king in Babylonia, his capital being at Agani, in that country, at a date so far distant that the site of the city has never been discovered. The remarkable discovery of Mr. Talbot is that the account of his birth and infancy, recorded on a tablet in the British Museum, has many strange points of similarity to the history of Moses recorded in the Pentateuch. The following is a literal translation of the hieroglyphical inscription: "In a secret place, my mother brought me forth. She placed me in an ark of bulrushes; with bitumen she closed up the door. She threw me into the river, which did not enter into the ark. The river bore me up and brought me to the dwelling of a kind hearted fisherman. He saved my life and brought me up as his own son," etc. The original inscription was doubtless a long one, but only the commencement has been preserved.

ABSORPTION OF SOLID MATTER BY ANIMAL TISSUES.

Dr. Auspitz, of Vienna, gives the following result of a number of experiments on the behavior of some insoluble matter in contact with the living tissues. In mammals, granules of starch are absorbed by the subcutaneous tissue, and are able to reach the lungs and thence the general circulation; and, moreover, they pass through the lymphatic system to win their way into the veins. The epidermis presents an obstacle, to this absorption, which doubtless varies in pertinacity with its condition and the varying state of the pores in different states of health and cleanliness. "Absorption," says Dr. Auspitz, "is essentially promoted by the assistance of fatty matters which enter the system much more readily than starch, and in the same manner."

INDUSTRIAL ACTIVITY IN VERMONT.

The Messrs. Remington, whose works at Ilion, N. Y., we recently described, have taken a large interest in an extensive rolling mill at St. Albans, Vt. The capability of the new works may be judged from the following figures: Three steam engines, of an aggregate of 1,200 horse power, will run the machinery, and twenty-six steam boilers will be required to supply them. The iron mill will employ twenty puddling furnaces, ten reheating furnaces, and two 21 inch trains. The works are estimated to be able to turn out 90 tuns of rails per day, using 500 tuns of coal, and will employ 400 men, working day and night.

ELECTROPLATED JEWELRY.

The great demand for jewelry of the more ornamented patterns has induced manufacturers to produce the most elaborate specimens in inferior metal, coated with gold by electric process.

STEAM TILLAGE.

Mr. William Smith, of Woolston, England, has long been a successful practitioner of cultivation by steam. He states that by thus thoroughly working the land, he has grown on two fields fifteen crops in succession, wheat after beans, without a fallow; and the yield of wheat last year was fully forty bushels per acre. On two other fields of heavy soil he has grown wheat after wheat, and estimates the crop this year at quite forty bushels per acre. "The produce of these four fields under horse culture was," he says, "about twenty bushels per acre on an average of years." And notwithstanding the heavy and continued cropping under steam tillage, the land is so clean "that the total cost of working the seed bed for each crop, from the smashing up of the previous stubble to the pulverization of the surface in readiness for the drill, is $1.60 per acre.

IMPROVEMENT IN PUMPS.

An effective and novel application of steam power to the raising of water is evidenced in the action of a Reynold's atmospheric engine, at present engaged in pumping out the coffer dam surrounding the caisson which is being sunk, on the New York side, to support one of the towers of the East river bridge. The engine, which is of an improved form, has two vertical cylinders of 7¼ inches in diameter, and two cranks. Its stroke is 14 inches. The steam, at a pressure of about 50 pounds, is led from the boiler through a half inch pipe for a distance of 75 feet, and enters the engine through a valve half an inch in diameter. With this valve half open, the engine, working at a rate of 65 strokes per minute, and condensing all its steam, raises a six inch column of water 28 feet high without the interposition of any extra machinery whatever.

There is no question but that this is one of the best results yet obtained from any pumping engine, more especially as the raising of the water is rendered doubly difficult from the fact of its containing large quantities of mud and grit. Two steam pumps from a well known manufactory in Brooklyn are also engaged at the work, but it has been found that, although they use together nearly eight times as much steam, raise only a four inch stream, and are placed some ten feet below the Reynolds engine, the entire volume of water discharged by them is not more than half as great as that raised by the latter.

BUILDERS' HARDWARE.

The complaints of our correspondent F. G. W. at page 76 of the current volume, regarding the very inferior quality of builders' hardware, we find echoed in the correspondence of *The Ironmonger*. It seems they have in England equal cause with ourselves to demand better articles in that line. F. G. W. and others think that the fault lies with the manufacturer, who should supply the market with goods of better quality; but a Wolverhampton lock maker takes the ground that the purchaser is the party to be blamed. He deplores the question of price taking so large a place in the purchase of useful articles, and thinks that if the buyer would only look to quality, and be willing to pay enough, the run of common goods would become unsalable. He states that manufacturers would rather send out a good article than a poor one, but so long as the public prefer quantity to quality, builders and cabinet makers will buy the cheapest they can.

There appears to be some force in these remarks. Whether they would apply to the relations existing between our own manufacturers and buyers is a question worthy of consideration.

TIMELY HINTS FOR PATENT OFFICE EXAMINERS.

The Commissioner of Patents, in a recent decision on a case appealed to him, gives expression to the following timely and common sense views respecting the duties of Patent Office examiners:

"Where two parts of a device co-act to produce a useful result, they should not be separated for the purpose of rejection. A legitimate combination must be met as such or the claim admitted.

To dissect a claim and reject it piecemeal is not admissible. The invention claimed in this case is for the double purpose of preventing the losing of the key that holds the standard and beam of a plow together, and of strengthening the beam at its point of greatest weakness.

The device consists of a notched key to pass through the standard and a wedge shaped plate having a slot to receive the standard, the slot being considerably longer than the width of the standard. The slotted plate is then dropped over the upper end of the standard and so adjusted as to bring the thinnest end of the wedge under the keyhole, when the notched key or gib is inserted and the wedge plate driven under it firmly and then fastened to the beam by a screw.

The application was rejected by a reference to Fowler's patent of March 26, 1867, which, it was thought, showed the wedge shaped slotted plate, and to various classes of machinery for the notched key. The key is not separately claimed, neither is the slotted plate, and if they co-act to produce a useful result they should not be separated for the purpose of rejection. A legitimate combination should be met as such or not at all. The practice of dissecting a machine and rejecting it by piecemeal is without the sanction of either reason or law. Under such practice, the Office might very soon close its doors, for the lever, the inclined plane, and the pulley are all very old and very well known, and might soon become sufficient references for every possible mechanical device; but in this case applicant's invention is not met even by the fragmentary mode in which it was examined. The wedge in Fowler's patent is a fork driven under a pin in the standard, for the purpose of regulating the pitch of the plow point and the draft of the plow. It has no other use, and is not designed or adapted to serve the end sought by the applicant. It has no influence whatever in retaining the key in its place more than the beam would have without the plate. It resembles the plate in this case in being wedge shaped, and in being fastened to the beam with a screw, but in no other respect. The key, when considered by itself, has no element of novelty, and the applicant sets up no claim to novelty in either the plate or key. His claim is for a novel combination of the two in such manner as to secure a single and desirable end. It is well known that the alternating strain and relaxation upon the beam of a plow while at work has a very troublesome tendency to loosen the pin that retains the standard and beam in their proper relative positions. If the pin drops from its place, the plow is in danger of being seriously damaged. To obviate this danger and trouble is the sole end of applicant's invention, and it was no part of the object of Fowler's invention; neither would nor could his invention accomplish such purpose.

The key and slotted plate in applicant's device clearly co-act in securing this end, and seem to be admirably adapted to the purpose. The notched key could not be successfully used except with a plate substantially in the form described, and the plate would be worthless for the desired purpose except with the notched key. When acting together, the end is attained. Hence the combination is legitimate, and is not answered by references that apply only to the parts when separated from each other.

The decision of the Board of Appeals is reversed."

DEATH OF AN INDIAN NOBLEMAN.

On the 11th of January last, died, at Poona, British India, Venaick Gungadhur Shastree, commonly called Aba Sahib. The deceased was a Marâtha nobleman who, unlike his class generally, chose a life of unobtrusive usefulness.

From his early youth he devoted his attention to science, and was in 1848 elected a member of the Royal Asiatic Society, which at that time did not number a dozen native members. He accomplished, unassisted, the correction of the ordinary Hindu calendar, which had remained for centuries in dispute, and is reputed to have been the first introducer of photography among the native communities of Western India.

Aba Sahib was for many years a subscriber to the SCIENTIFIC AMERICAN, and we are indebted to his son for a Bombay paper containing his obituary.

Aeronautics.

An ingenious instrument, for measuring the forces exerted by a horizontal current of air on planes in various positions, was lately exhibited before the Aeronautical Society of Great Britain. The plane is carried at one end of a horizontal arm passing through an eye at the upper end of a spindle, and can be fixed at any inclination by a clamp at the back. The direct pressure of the current is read off on a spring balance operated by the spindle, and the rising force due to the various inclines is shown on a vertical balance connected with the arm. The experiments show that, as the angle of inclination becomes more acute, the lifting force exceeds the horizontal (or power required to propel planes through the air) in an enormous ratio. At 20°, it is about three times more; while at 15°, the lift is four times greater than the thrust. More acute angles were not then tried, but it was deemed that further experiment would dissolve all mystery relative to the support of weights in flight.

Beecher on the Darwinian Theory.

Henry Ward Beecher, in the course of a recent sermon, thus expressed himself in regard to the Darwinian theory:

It is of little consequence to me where I came from; it is of a great deal of consequence to me to know where I am going. There are a great many men at the present day investigating the road which has brought man up to the present state, and I confess to a curiosity in the matter, and I do not say that these researches may not be of benefit. I regard the labors of Mr. Darwin with profound interest, believing that the world will in time accord him a great deal of credit. Although I am not prepared to accept all his speculations, I thank him for all his deductions of fact. I do not participate a particle with those who dread the idea of man's having sprung from some lower form of existence; all that I ask is that you show me how I got clear from monkeys, and then I am quite satisfied to have had one for an ancestor fifty centuries ago. (Laughter.) Only make the difference great enough and I am content. I had just as leave spring from a monkey as from some men I know around here. (Renewed laughter.) I look upon the Patagonians or the miserable crawling Esquimaux, and I don't see much to choose between them and any latent animalhood. I don't care so much about that thing, for I have never been there. I had no early associations a great while ago. I have not the least recollection of what happened a million years ago. All my life is looking forward. I want to know where I am going; I don't care where I came from.

Halls and School Rooms.

While sulphurous acid, chloride of lime and carbolate of lime cannot be used without inconvenience, on account of their unpleasant odor, in frequented rooms, chemical science has recently brought out a disinfectant apparently more effective than either, which can be safely and conveniently used anywhere, since it is free from odor, and when properly diluted does no harm to the color or texture of carpets or furniture. This is bromo-chloralum. Would it not be worth while, as a sanitary measure, occasionally to sprinkle the floors of our school rooms, churches and other assembly rooms with it? If this were done at the close of a session, the air, instead of being kept in its foul condition until the next gathering, would be cleansed of its impurities. If the sprinkling were repeated just before the pupils assemble, there would be a tendency to lessen the accumulation of unhealthiness in the atmosphere of the room. No thoughtful person can doubt that the question: How may we ecure the best sanitary condition of our school rooms and public halls? is worthy of more attention than it has generally received.—*Professor M. C. Stebbins.*

FIVE EIGHTH inch octagon steel is the best for making punches, cold chisels, or drills; one and a quarter inches square is the best size to use for making chisels. To make a good sized flatting hammer, you will require about six inches of one and a half inches square steel. This will also make you as heavy a hand hammer as any ordinary man ought to use. If you make but one hammer, let it be of the face and ball pattern.

THE first coal ever mined in the United States was dug near Richmond, Va. Bituminous coal was mined there as early as 1700, and in 1775 was extensively used in the vicinity. During the Revolution a Richmond foundery employed this coal in making shot and shell for the Continental forces.

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.

Notes & Queries.

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

1.—SUPERHEATING STEAM.—Can any of your readers inform me whether steam can be superheated to a red or higher heat, and how?—R. H. E.

2.—REMOVING NITRIC ACID STAINS.—Can some of your readers inform me if the yellow stains in cloth, caused by nitric acid, can be removed, and if so by what means?—S. H. F.

3.—DEPOSITING TIN BY ELECTRICITY.—Can thin sheet brass be galvanized on one side with tin? Can it be done without getting tin on both sides? Is there any preparation of tin that can be applied with a brush?—K. E. F.

4.—ACIDULATION OF ALE.—What is the cause, or what will prevent, ale in the process of brewing from running into the acetic acid state? In cleansing, should it be allowed to work until it is perfectly still, and then be bunged down?—W. H. C.

5.—ELECTRODEPOSITION OF IRON.—Can iron be deposited on brass or copper by the aid of a galvanic battery? Can any one give me a receipt to make a solution?—T. N. S.

6.—MEASURING THE FLOW OF STEAM.—How can I best ascertain the quantity of steam, in terms of horse power, passing through a given sized pipe, in a given time, the pressure in boiler averaging say 70 pounds per square inch? Do you know of a meter or other appliance which might be connected with the steam pipe which would indicate the amount of steam used in a given time?—J. W. G.

7.—WIRE ROPE FOR BALING PRESS.—I wish to know whether a wire rope would be suitable to use as a balance rope on a baling press, and what sized wire rope would be necessary where it has to hang on a foot roller and sustain 2,000 pounds attached to each end, each 2,000 pounds alternately passing up and down, and drawing the wire rope over the rollers? Would it weaken the rope to bend it over said roller?—A. J. B.

8.—PROPORTIONS OF ENGINE.—An engine, the cylinder of which is of eleven inches bore and three feet stroke, runs at forty revolutions per minute with fifty pounds pressure of steam, as shown by gage. Can I do the same work with an engine of seven inches bore and fourteen inches stroke, running at one hundred and fifty revolutions per minute, carrying eighty pounds of steam, or what part of the work per minute can I do?

9.—FANNING AND FLY BRUSHING MACHINE.—In our warm climate we need fanning and fly brushing machines, and the main trouble has always been the difficulty in securing some safe, light and steady power to run said machines. I think this difficulty can be overcome by constructing a wind mill which, night and day (whenever the wind is favorable) will force water up into an elevated tank. Said tank can be placed upon the roof of the house. This tank will supply water, by means of a pipe, to a turbine wheel placed over the well from which the water is first drawn, and will furnish, I think, ample and steady power for the purposes named, and will besides run the family sewing machine and supply the house throughout with all the water needed. Will some one get up the required machinery or else give us an idea of the sizes of the windmill, tank, turbine wheel, fans, etc?—S.

10.—CUTTING STEEL.—I wish to know the proper diameter and number of revolutions of a smooth-faced soft steel cutter, such as is used in cutting the screw point on augers.—A. V.

11.—WOODEN TANK FOR WATER.—Will some one inform me what is the most durable wood to use for a reservoir, to be placed on top of a house to hold water for domestic purposes? Of white poplar or pine, which would be preferable?—R. S. S. H.

Answers to Correspondents.

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

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

SPECIMENS.—We are indebted to Mr. J. L. Rhodeback, of Norway, O., for specimens of petrified honey combs, a rare and beautiful petrification upon which we shall remark hereafter. Also for specimens of agate spear heads of aboriginal construction.

POUNDING OF PISTON.—To S. R., of Pa.—This question has been fully discussed in the current volume of the SCIENTIFIC AMERICAN. See pages 138, 155, 170, 217.

PROPORTIONS OF SAFETY VALVE.—To C. H. C., of N. Y.—We have frequently answered your question. You will find full particulars on page 106 of Vol. XXV. of the SCIENTIFIC AMERICAN.

E. K., of N. Y.—The mineral you send is anthracite coal. Thin seams of this coal occur in many places throughout the State of New York, but there are no workable beds.

N. B. D., of Ill.—The mineral you send is iron pyrites or "fools' gold," of no great value. It is used in the manufacture of copperas and for the sulphur it contains.

C. R., of Va.—In the mineral you send there is a small percentage of iron, not enough to make it an ore of any value.

B. F. R., of Ala.—The mineral you send is not graphite, but a highly carbonaceous slate, which would make but a poor substitute for "black lead."

J. W. B., writing from Fayette, Miss., says: I send you herewith a large bug found on the bank of a creek in this vicinity. As no one here knows what it is, I take the liberty of sending it to you to find out the name of the "critter." Answer: We are much obliged for the specimen. It is one of the largest beetles occurring in the United States, the *Dynastes tityrus* of Linnæus. It is kindred to the sacred *Scarabæus* of the Egyptians.

J. H. D., of Ohio, sends a mineral specimen which he states was taken from a wooden water conductor ten rods long, which drains a well on a descending grade. The water is used for watering stock. The red sediment collects in large quantities in the pipe and also in the trough. The water has the property of turning all vegetable matter, falling into it, black in a very short time. Answer: The mineral you send is hydrous oxide of iron, mixed with earthy matter, and contains no poison. The tannin in the vegetable matter unites with the iron, forming a black precipitate, resembling ink.

EYE STONE.—E. P. B. says: A difference of opinion having arisen between myself and a friend in regard to the nature of an eye stone, whether it is animate or not, we beg of you to enlighten us on the subject. Answer: The best form of eye stone is said to come from Venezuela, where it is found on the seashore. It is flat on one side, oval on the other. When introduced under the eyelid, the motion of the eye causes it to move about, and any particles of foreign matter in the eye adhere to the stone. The eye stone is as inert as any other pebble.

NEUTRAL NITRATE BATH IN PHOTOGRAPHY.—In photography, the most difficult thing is to preserve the nitrate bath completely neutral, as, at every dip of a plate, free nitric acid is liberated. If we allow a small piece of carbonate of lime or common marble to remain in the bath, will it not neutralize the acid without incurring the risk of making the bath alkaline? Iceland spar is said to be the purest form of carbonate of lime; where can it be procured? Answer: Photographers do not want the bath completely neutral; a slight acidity is the best preventive against fogging. A neutral bath requires a shorter exposure. We prefer to add a little carbonate of soda when our bath becomes too acid; but it is better to filter, boil down, and make a new bath. The use of lime, as you propose, would be an injury to the bath.

SIPHON.—To J. M. J.—It is not possible to raise water from a well by means of a siphon, unless the siphon discharges at a point lower in level than the water of the well. To draw water from a depth by means of a siphon would be making the water run up hill, which is proverbially impossible. The size of the pipe does not affect the efficiency of the siphon.

GREASING COGS OF REAPERS, ETC.—I would say, in answer to query 14, May 4, that I consider it best to oil cogs when there is no sand or grit to get into them. The grease lessens the wear; but if the sand gets to it, it will stick to the cogs and make the wear more rapid.—H. C. B., of O.

EXPANSION OF MERCURY BY HEAT.—Query 10, page 249.—If a given volume of mercury at 32° be taken as 1, when heated to 212° it will equal 1·02; that is, raising its temperature 180° increases its bulk ·02 of itself. But the increase in the bulk is not uniform, for the ratio of expansion for liquids and solids increases with the temperature. Of the metals, zinc expands most. If the length of a bar of zinc be taken as 1 when the temperature is 32°, when heated to 212° it will equal 1·002942—an expansion of ·002942 of its length for 180°. Lead is next, and shows 0028426.—X. P. M., of O.

GREASING COGS.—Query 4, page 297.—Having had some experience in this with a reaper, I would advise C. A. A. to put his grease where it will do some good and no harm. For, if he puts it on the gearing of a reaper or mower, he will soon find that it catches and holds every grain of sand that drops on the wheels (and a good many will fall there in a day), and thus help to wear away the cogs faster than is necessary. I found this when I tried it, so I quit greasing and cleaned off the cogs, and the wheels were soon bright and smooth, and ran as light as ever and with much less wear.—X. P. M., of O.

BLACKBOARD.—Query 17, page 297.—I have known silicate slating (a liquid) to be used with much success.—G. L. F., of N. Y.

WILD BEES.—Query 5, page 297.—C. J. M. should go to where the bees abound, put a little honey on a log, and when a bee alights and is well loaded, take him by the middle of the back and attach a light piece of cotton to his legs. Then letting him go, he will take a straight line for home. Marking the direction with a compass, it can easily be traced by means of the cotton.—G. L. F., of N. Y.

WILD TEA.—In your paper of February 24, you advise a correspondent that Jersey tea (*ceanothus Americanus*) is commonly known as wild tea, and was used during the Revolution of 1776 as a substitute for tea. I write to inform you that another plant called Labrador tea (*ledum latifolium*) was also used in New England and Nova Scotia as a substitute for tea by our forefathers. See Bigelow's "Plants of Boston and its Vicinity," page 183.—W. B. S., of Mass.

PAINTING THE INSIDE OF AN IRON WATER TANK.—Query 5, page 313.—I would recommend the coating of the inside of an iron tank with beeswax hardened by adding about one fourth part of rosin. Clean the tank and coat it well with the wax preparation, as hot as possible without burning your brush. A long experience convinces me that the above is the best possible coating for an iron water tank.—H. W. M., of Mass.

WILD BEES.—Query 5, May 4.—Take the bottom of an old sugar hogshead and keep it saturated with water; or place on it waste honeycomb. "Stink bait," however, will draw them much further from home. I have known bees to go two miles to this last; some people say they will go three or four.—H. W. S.

MAGNETIZATION.—Query 9, page 297.—A circular piece of steel can be magnetized as well as any other form. In this case the poles must be on opposite sides of the circle, and at right angles to those points, there will be points that will manifest little or no magnetism. The steel must be tempered, else the force is lost as soon as the magnet is removed. The best way is to apply the steel to a powerful electromagnet; this might prove the only effective way for a piece as large as the one mentioned. But if this cannot be done, take two pieces of loadstone with their opposite poles towards each other. Place them upon the center of the piece of steel, and slowly draw them to the edge. Remove them, replace them at the center, and again draw them to the edge. Continue the process until the steel becomes magnetized. This method will not give as good results as the electromagnet.—L. R. F. G., of Mass.

BRITTLE SPIRAL SPRING.—Query 12, page 297.—The spiral spring of a pegging machine breaks after it has been run for some time because the continual jarring causes the particles to assume the crystaline form. Not only does iron crystalize in casting, but a continued jar will cause col l iron and steel to crystalize. I cannot say that the steel becomes harder by use, but it is more brittle. If W. A. S. will take a magnifying glass and look at his broken spring, he will plainly see the crystals. The remedy is to reheat and retemper the spring occasionally.—L. R. F. G., of Mass.

Recent American and Foreign Patents.

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

SOAP HOLDER.—Jacob A. Camp, of Sandusky, Ohio.—The invention consists in a perforated and handled soap cup by which all necessity for taking soap in the hands is removed, while a better lather, cleaner soap, and economy in use are all attained. All those who have used, and those who have omitted heretofore to use, soap will find it to their interest and convenience to have one of these soap holders.

CHURN AND BUTTER WORKER.—Wm. McKeever, of Staunton, Va.—The invention consists in a stop chamber, with stationary breaker thereunder, which is combined with a movable breaker, so that the milk or cream only moves backward and forward in a small arc. This compels the production of butter in three or four minutes. Its shaft is also provided with paddles which beat and work the butter, so that there is no need whatever to touch it with the hand. This invention doubtless possesses more real utility and novelty, and is a greater improvement in churns than has been made in the present century.

WHEAT SCOURING MACHINE.—George S. Newman, of Liberty Mills, Va.—The invention consists in a grain scourer which discharges the grain from the hopper around the shaft and upon a top cup, whence the centrifugal power forces the grain outward, over its concave sides, and rubs the pellicle with great friction. This detaches all or a large portion of the dirt. The grain is then conveyed down to the shaft and into one cup after another until the operation is completed.

MOLE TRAP.—Clark Polley, of McMinville, Tenn.—The invention consists mainly in applying a spiral spring to a mole trap, so as not only to impel the slide, but to hold together all the parts, and thus render them easily detachable. This greatly simplifies, cheapens, and makes more useful the whole trap.

OINTMENT.—Wm. C. Jones, of Henry County, Ala.—This ointment is a compound formed of beeswax, butter, honey, rosin, mutton suet, sugar, and verdigris, mixed in certain proportions and by certain successive manipulations. It is intended for cutaneous diseases, such as ulcer, tetter, scaldhead and sores of all kinds.

CULTIVATOR PLOW.—Cealy Billups, of Norfolk, Va.—The invention consists in providing a cultivator plow with wings, ratcheted on their shanks, and made fast, or adjusted by corresponding ratchets, on sides of shoe, and by having their front ends entered into the sockets of the shoe.

WASHING MACHINE.—John W. Hunt, of Liberty, Mo.—The box of the machine, the bottom of which is made inclined, contains a rack, the side bars of which are set in inclined grooves in the sides of the box toward its forward or deeper end. The rounds or rods of the rack are arranged at a little distance apart, so that the water forced forward by the plunger or beater and the water squeezed out of the clothes may pass through freely into a space between the rack and the forward end of the box. This space is covered by a platform or apron, which is slightly inclined to the rearward, and is attached to the sides and end of the box a little below their upper edges. The apron keeps the water from dashing out of the end of the tub. The plunger is inclined to correspond with the inclination of the rack, so that the clothes may be pressed squarely between the plunger and the rack. To the rear side of the plunger is rigidly attached the end of an arm, to the rear end of which is pivoted the lower end of a lever which is attached to the center of a cross bar, the ends of which are pivoted to the sides of the box. The lever is curved so that the power may be conveniently applied to it.

MACHINE FOR MAKING COP TUBES.—Robert Douglas, of Lowell, Mass., assignor to himself and James Douglass, of same place.—The liability of the paper tube formed in the usual way to collapse as it is passed from the mandrel, in consequence of a partial vacuum formed therein for want of air to resist the external atmospheric pressure, is remedied in this invention by providing a hollow mandrel, having an opening therein for the admission of air to the tube as it passes from the mandrel. From this mandrel the tube is received between a gripping pawl and a fixed griping jaw on a bar, carried by an endless belt, to be drawn from the mandrel, cut into suitable lengths for drying, and carried to the apparatus for conveying to the dryer. There are preferably three of these gripers on the belt; also as many cutting shears just in advance of each griper, between the jaws or blades of which the tubes are drawn by the gripers in advance of them, and these shears are automatically closed upon the tube and cut it off immediately after the gripers behind have taken hold of the said tube. At the same time that the tube is cut, the gripers in advance of the shears are opened and the piece of tube cut off falls upon a chute, by which it is conducted to endless carriers to be conducted into the heating chamber.

CIDER MILL.—William Aiken and William W. Drummond, of Louisville, Ky.—The bottom of the hopper is formed of two inclines, the lower one of which inclines more steeply, and between the inner edges of which is formed the space through which the apples pass down to the grinding cylinder, the journals of which revolve in bearings attached to the frame, and to which are attached teeth to break up the apples against the crusher plate. The crusher plate is pivoted at its upper edge to the sides of the hopper, in front of the opening between the inclined parts of the bottom of said hopper, so that it may be swung forward to crush the apples against the toothed cylinder to enable them to pass down between the said toothed cylinder and the toothed concave attached to the frame, where the crushing, grinding, or mashing process is completed. To the main shaft is attached an eccentric wheel which bears against a projection formed upon the rear side of the lower part of the crusher plate, so that at each revolution of the eccentric wheel the lower part of the said plate may be forced forward to crush the apples against the toothed cylinder.

WAGON TIRE TIGHTENER.—John Kafader, of Jacksonville, Oregon.—This invention has for its object to furnish a device for tightening and securing tires upon the fellies of wheels, both when first applied and when they may have become loose from use. The adjacent ends of the fellies upon the opposite sides of the wheel are cut away, or made a little short, so as to leave narrow spaces between said ends. Within the space and resting against the ends of the fellies are placed two plates. The sides of the plates that rest against the ends of the fellies are made flat to bear squarely against said ends. The other or inner sides of the plates incline in both directions from the center. In holes in the plates, at their angles, are placed small rollers, said holes being so formed that the sides of the rollers may project sufficiently to receive the wear. Between the plates is placed a wedge shaped block, with its smaller end toward the hub of the wheel. Through the center of the wedge block is formed a screw hole to receive a screw which passes in from the inner side of the rim through the casing, against which a collar formed upon the said screw rests, so that by turning the screw forward the wedge block will be drawn between the plates, expanding the rim of the wheel, and thus tightening and securing the tire. The tubular casing is made of the same form and size as the fellies, and is let into the ends of said fellies, so that the outer surface of the case may be flush with the outer surface of the fellies. With this construction, should the tire become loose from use or other cause, a turn or two of the screws will expand the rim of the wheel and tighten the tire securely.

WAGON BRAKE.—Henry J. Hadden, Jr., of Catskill, N. Y.—This invention relates to that class of wagon brakes which are applied whenever the horses are held back. To the rear part of the under side of the wagon tongue is rigidly attached a downwardly projecting arm about twelve inches in length. To the lower end of the arm are pivoted the forward ends of two rods, which incline from each other and pass back beneath the forward axle with their rear ends attached to the brake bar. The brake bar is supported by and moves forward and back in keepers attached to the sway bar and hounds, and which is kept from longitudinal movement by guide pins attached to it, which strike against keepers. To the ends of the brake bar are pivoted or otherwise attached brake shoes, which bear against the rims of the forward wheels and thus check the advance of the wagon.

CATTLE POKE.—Orville Sweet and Clarence H. Sweet, of South Glen's Falls, N. Y.—This consists of a block of wood, which may vary in size and weight with the size and strength of the animal that is to wear it. To the forward side of the block, toward its ends, are attached two pins or prongs which project forward and incline slightly upward, and which are designed to keep the animal wearing the poke from using its horns. To the middle and upper part of the block is attached a longer pin, which projects upward and forward, and which is designed to prevent the animal wearing the poke from getting its head through or under the fence and throwing it down. Sharp pointed spikes or pins are attached to the middle part of the block, with their points projecting at the rear side of said blocks in such positions as to come in contact with the head of the animal wearing the poke, should the poke be jolted or should any pressure be applied to it. To the rear side of the block is attached a spring which rests against the animal's head, and which should have sufficient strength to hold the spikes away from the animal's head when grazing or walking, but which will yield and allow them to prick the animal should it attempt to run, jump, or push. The ends of a wire are passed through the block and coiled to form rings to receive the animal's horns; and they are then hooked to each other. The fastening thus constructed cannot injure the animal, and cannot shrink when it becomes wet, while at the same time it holds the poke securely in place.

TREE AND PLANT PROTECTOR.—William F. Eaton, of Cape Elizabeth, Me.—This consists of a standard or stake, the lower end of which is sharpened so that it may be readily thrust into the soil. The length and size of the standard is proportioned in size and length to the size of the plant to be supported. The upper end has two longitudinal slots formed in it, dividing it into three prongs. The ends of the side prongs are cut off, leaving the central prong the longest. There is a metallic strap, the middle part of which is bent into circular form. The arms of the strap are parallel with each other to pass through the slots of the standard, and their ends are bent outward at right angles to rest against the rear side of the standard. In using the support, the strap is passed around the plant, shrub, or tree. The parallel arms of the strap are then slipped down into the slots of the standard, the upwardly projecting central prong guiding them readily into place. The edges of the middle or ring part of the strap are turned or flared outward, so that they cannot chafe or rub the plant or tree.

BLINDER FOR HORSES.—Rudolph Lehmicke, of Stillwater, Minn.—This invention has for its object to furnish an improved horse blinder or blinker, which shall be so constructed that it may be readily and conveniently drawn forward and down over the horse's eyes when necessary to bring him under control; and consists of a plate sliding against coiled springs contained in the frame in which it runs, and pulled forward, when required, by blinder reins attached to eyes on its forward end.

PITMAN CONNECTION FOR HARVESTERS.—Willard Loucks, of Lowville, N. Y.—The lower part of the pitman is split and bifurcated, and carries at the ends inwardly projecting pins of conical form and with rounded points. A sleeve embraces the pitman, and is provided with a set screw, whereby it can be fastened at a suitable distance from the lower end. The cutter bar has an eye formed at its end, and a box, of cylindrical form fitted therein, said box having conical recesses at the ends for the reception of the aforesaid pins. The split ends of the pitman are spread apart in order to admit the pins into the box, and are then held contracted by means of the sleeve. If, by wear, the recesses in the box should become enlarged, it is only necessary to move the sleeve further down, and thereby further contract the pins. When the box is entirely worn, it is readily replaced by another.

COTTON PRESS.—Gus. Falkner, of Warrenton, N. C.—This invention consists of a combination of notches, bars, and operating levers, and holding pawls therefor, with the follower of a press working from the bottom upward, all so arranged that the pressing of the bale may be readily effected by hand power applied to said levers. It also consists of a novel arrangement of the top cover and apparatus for lowering the follower.

WASH BOILER.—Nicholas L. Rigby, of Chetopah, Kansas.—This invention has for its object to furnish an improved wash boiler in which the washing shall be done by water forced from the lower part of the boiler upon the upper parts of the clothes by water and steam pressure; and it consists in adding, to the ordinary one, another boiler with an inclined slotted bottom, fitting loosely within it. This slot is covered by a bridge which supports a rack on which the clothes are placed. The steam pressure forces the water between the boiler bottoms up through channels formed at the ends of the inner boiler, and discharges it on the clothes, after passing through which, it returns through the slot.

CORN GRATER.—George C. Rickards, Jr., of Philadelphia, Pa. assignor to himself and William Allen, of same place.—The object of this invention is to furnish convenient means for reducing green corn to pulp or nearly to a pulp, and it consists in the construction and arrangement of the following parts: The stock is made of wood, in two parts, which are two inches, more or less, in width, and one inch, more or less, in thickness. These pieces are connected together end to end, by two serrated plates, one of which is coarser than the other, so that the corn may be grated coarse or fine, as may be desired. These plates are of about the thickness of saw plate steel, cut out on the upper edge to form semicircles, with the semicircles serrated, the circles being three inches, more or less, in diameter.

HOOF SHEARS.—Micajah C. Malone, of Palmyra, Ill.—The two handles of the shears are connected by a pivot pin. The one handle carries the cutter of the shears, while the other has a hook, over the face of which the blade moves to cut. From the blade projects outwardly a pointed lug, for marking on the outside of the hoof the line to which the same is to be cut. The hook carries an outwardly projecting arm, for clearing the seam and frog of the hoof. There is also an inwardly projecting lug, on the hook. It serves to steady the blade in cutting, and to hold the hook against the portion of the hoof to be cut.

ANDIRONS.—John T. Dee and Isaac Murray, of Fredericktown, Miss.—The forward ends of the horizontal bars of these andirons are bent downward to form the forward feet. The rear ends of the horizontal bars are attached to the vertical bars, the lower ends of which serve as feet for the andirons. The upper ends of the vertical bars are connected by a horizontal bar, or rather formed in one piece with said bar. This construction enables the andirons to be made with only four feet instead of six, as they must be when made separate.

ICE MACHINE.—William R. Johnston, of Sedalia, Mo., and William Whitelaw, of Memphis, assignors to themselves and John Johnson, of Memphis, Tenn.—This machine (which would need the aid of drawings to describe in detail) is intended to effect the proper utilization of sulphide of carbon and kindred substances in ice making, by eliminating the vapor of the agent employed from the air by passing it through oil. Also, to regulate the evaporation of the bisulphide by a concentrated solution of chloride of sodium floating on it; and to eliminate the acqueous vapor in the current by passing it over chloride of calcium before it enters the freezing chamber.

LOCK NUT.—James A. Morrison, of Parker's Landing, Pa., assignor to himself and George H. Morrison, of same place.—The object of this invention is to provide simple and efficient means for preventing the nuts of screw bolts from working off when in use. It consists in the employment of a grooved bolt with a ribbed collar, which can be slid to any part of the bolt without being at liberty to turn; this collar has suitable springs attached, which fall into recesses in the nut to be locked, and hold it securely to the collar, so that it, also, cannot turn.

SOLDERING TOOL.—John A. Tillery, and Samuel A. Ewalt, Baltimore, Md.—The invention relates to that class of soldering tools which are usually rotated about the cap by twirling or carrying them around with the hand, and consists in combining therewith a simple mechanism for operating them more rapidly and conveniently. The invention, however, mainly and more particularly consists in an arc shaped soldering tool, adapted to all the various sized cans and caps used.

PATTERN FOR CUTTING GARMENTS.—Mrs. Sarah A. Millwee, Greenwood, S. C.—The invention consists in a pattern chart for front and back of human form, with scales of figures and perforations, arranged for fitting plain and full waists, loose sacques, and basques of all sizes. It would seem to be an invention greatly calculated to economize the cost, to ladies, of their various garments, since, with one of these charts, they may both cut and readily fit as well as make them.

DOOR CHECK.—Simon Peters and Cyrus D. Eisaman, of Penn Station, Pa.—This consists of an oblong plate made of metal, wood, or any other suitable material, with holes through it, of slotted or other form, and recesses or rabbets on its under side, around or partly around the holes; a spring, of molded india rubber, with a flange or flanges on its under side, which are designed to fill the recess or recesses in the plate, while the body of the spring is designed to fill the hole and project above the plate, and a stop for the door, of rubber, made to fill one of the holes in the plate, and to project above it, with a flange to fill the recess around the hole. The plate, with the spring and the stop inserted from the under side, is screwed down to the floor near the wall in such a situation that, when the door is opened and swung back, the door will pass over the spring and be kept from striking the wall by the stop. By this arrangement it will be seen that the door will be securely kept in the desired open position and that all noise will be avoided.

CANAL BOAT.—Hartley J. Hatch, of Chicago, Ill.—This invention relates to a new canal boat, which is made in two sections in such manner that its pointed bow can be detached and brought alongside of the pointed stern whenever a lock is to be entered, and which is provided with a hinged and swiveled paddle box. When the boat is to enter the lock, the bow section is detached and fastened alongside the pointed stern. The boat is thereby made shorter, and with broad ends, to fill the lock like ordinary canal boats. By this arrangement of detachable triangular section, the boat is enabled to proceed rapidly through the water without creating unnecessary disturbance of the same, and still to fit the locks like an ordinary boat, all without reducing its carrying capacity beyond the weight and space of the additional sides required by the detachment of the section. The paddle box or frame is hinged to an arm, which is swiveled to the pointed stern of the boat, and which carries a toothed disk gearing into a pinion on the steering shaft. By means of the shaft, the arm and the paddle box can be turned to either side. The shaft of the paddle wheel has its bearings in the frame, and is provided with cranks that are connected with the operating engine by suitable rods or devices, said engine being situated on a platform or projection of the frame, and connected by jointed pipes with the boiler, which is placed in the stern portion of the main boat.

FLY TRAP.—Perry A. Burgess, of Butler, Mo.—This invention relates to a new and useful improvement in devices for catching flies; and consists in a flanged disk of wood or other suitable material, with a central hole and an interior recess on the under side filled with some absorbent material, as soft leather, felt, or sponge. The disk is placed on a tumbler or similar vessel, the vessel being nearly filled with soap suds or other liquid. The absorbent is filled or smeared with molasses or other substance for attracting the flies. The flies enter through the central hole seek the bait, and drop into the liquid beneath.

CORN PLANTER.—Wm. H. Crosby, Parish, N. Y.—The invention consists in pivoting the two frames of a double planter, independently, to the axle and to a front beam, while they rest upon two castor wheels. They are then enabled to rise separately over obstacles and the planter to drop the seeds uniformly and at the proper intervals.

SAFETY VALVE.—Herbert S. Jewell and Ferdinand Steele, Brooklyn, N. Y.—This invention relates to improvements of the safety valve and alarm, for which letters patent were allowed to the same inventors on or about Jan. 6, 1872. It consists, first, in an adjustable plate, provided with a notched ring for graduating the steam inlet apertures; secondly, in a swinging weight applied to the sliding bolt of the valve; thirdly, in a weight sliding and adjustable on the stem of the valve by a set screw, and fourthly, in connecting a weighted lever, on which the valve rests, with a dial mechanism by an intermediate arbor.

GOLD FOR DENTAL PURPOSES.—Richard S. Williams, New York city.—The present invention relates to a new preparation of gold foil for dental purposes, by means of which the gold may be used for purposes for which it is not otherwise well adapted; and it consists in rolling the foil into cylinders, the length and diameter of which is governed by the size and number of sheets of the foil used, and then cutting the cylinders into pieces of proper size for use.

HARROW.—William J. Cordill, Blue Earth City, Minn.—The body or frame of the harrow is made in four parts, each of which is formed by rigidly connecting four, more or less, longitudinal bars by means of cross bars framed to them. The frames are arranged in pairs, the longitudinal bars of the frame of each pair being placed end to end and connected and hinged to each other by short bars, the ends of which are pivoted to the opposite sides of the adjacent ends of two or more of said longitudinal bars. Stop plates or bars are rigidly attached to the upper side of the inner ends of two or more of the longitudinal bars of one frame of each pair of frames, so as to overlap the upper side of the inner ends of the longitudinal bars of the other frame, so as to prevent the adjacent ends of the frames of each pair from sinking down below a certain fixed limit, while allowing their outer ends to drop down to conform to the surface of the ground.

REVERSIBLE FILTER.—John D. Parrot, Morristown, N. J., assignor to himself and Henry McCauley, of same place.—The object of this invention is to perfect a water filter for which letters patent, dated July 30, 1869, were granted the inventor, and to render it more useful than it has hitherto been; and for this purpose is attached to it a reversing apparatus, consisting of pipes and cocks, by means of which the flow of water may be reversed, and the filtering material and the chambers of the filter may be cleansed at any time.

COMBINED COOKING STOVE AND WATER HEATER.—Chester Comstock New Canaan, Conn.—The invention consists, first, in providing the inner sides of the fire box of a stove with auxiliary and adjustable sides, to lessen the fire room and the radiation of heat therefrom on the sides; second, in suspending over the oven, between cover and fire box, and out of range with the holes therein, a water vessel, which is connected with cold water vessel on top, and has certain hollow arms and pipes to give a greater heating surface; and, thirdly, in combining these two devices with a water chamber around the fire box.

FLEXIBLE SIDES FOR BELLOWS.—Alfred F. Jones, New York city.—This invention relates to a new construction of the flexible sides of bellows, air pumps, and similar apparatus which are to be contracted and expanded; and consists in the combination of a woven or porous fabric, for strength, with an outer rubber fabric which is impervious to air. The two fabrics are not intimately connected, except, perhaps, at the edges, and the impervious material will, therefore, not be strained, the other fabric taking all strain. Heretofore, such flexible sides were made of single fabrics, which, under strain, would open their pores and let air in, thereby defeating the object of the entire instrument. By the use of the double fabric absolute air tight sides can be obtained.

MACHINE FOR CUTTING CLOTH.—Andrew Heller, New York city.—This invention relates to a new machine for cutting the cloth used in the manufacture of clothing and other fabrics into certain definite shapes, and consists, principally, in the employment of a vertically reciprocating continuous cutting blade; in the combination therewith of marking troughs and apertures in the plate to which said blade is attached; and in the arrangement of a clamp for feeding the fabric to be cut to its place under the cutter.

PREPARING MOSS FOR ORNAMENTAL BASKETS.—Jonathan W. Shiveley, 697 Broadway, New York.—The inventor proposes to improve natural moss for various ornamental purposes, by coloring it with bronze or other metal or mineral dust, sprinkled on a coating of mucilage or other gummy matter previously applied, or by dipping in a bath of gummy matter and powder, and then drying it, and either stripping or dressing it to impart a glossy appearance or not. He sometimes steeps or boils the moss in hot water, and then dips it in linseed oil preparatory to coloring it, as above described, to keep it soft and pliable.

PADDLE WHEEL.—George H. Cushman, North Bridgewater, Mass.—This invention has special reference to side wheel steamers employed on canals. The principal object of the invention is to prevent the washing and wearing away of the banks of a canal by the action of the swell or waves created by the passing of the boat through the water. Another object is to so construct the floats of the wheel as to enable them to enter the water easily, and thereby produce little or no vibration of the boat. With the outer side of the wheel closed and with its inner side open, much of the water displaced and forced outward by the prow will be arrested and deflected and discharged toward the stern.

EXTENSION TABLE.—James Plenkharp, Columbus, Ohio.—This invention is a marked improvement in extension or dining tables, the same being formed mainly of two parts, connected by slides and furnished with legs in the usual way, and of a third part consisting of a circular plate or disk, designed to form the top of the table when not extended and the middle thereof when extended. The table is compact, strong, simple in construction, and attractive in appearance.

WATER WHEEL.—Samuel P. and Oliver H. Castle, Urbana, Ohio.—The invention consists, first, in constructing water wheels with a cylindrical hub to receive the radial buckets, and a conical frustrum to receive the aprons, so that while the outer edges of buckets and aprons are equally distant from the center of motion, the outlet is increased and the dead water discharged with greater facility. It consists, secondly, in constructing the chutes with a gradual inclination, at the top, toward the axis, whereby a greater uniformity in the percussion of different strata of water is obtained. And it consists, thirdly, in making a circular gate that turns on a pivot and admits of openings of different sizes in front of the chutes, while it takes up no space wanted for other purposes.

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[Compiled from the Commissioners of Patents' Journal.]

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DESIGNS PATENTED.

5,846.—COUPE.—W. H. Bradley, New Haven, Conn.
5,847 and 5,848.—CARPETS.—J. H. Bromley, Philadelphia, Pa.
5,849.—CARPET.—J. Fisher, Enfield, Conn.
5,850.—CARPET.—O. Heinigke, New York city.
5,851.—PENCIL CASE.—W. S. Hicks, New York city.
5,852 and 5,853.—CARPETS.—E. J. Ney, New York city.
5.854.—STATUARY.—J. Rogers, New York city.
5,855.—CARPET.—J. H. Smith, Enfield, Conn.
5,856.—MATCH BOX.—H. Sommer, Jr., Newark, N. J.
5,857.—PHOTOGRAPHS.—J. G. Stewart, Carlinville, Ill.
5,858.—COAT AND HAT HOOK.—A. B. Tanner, New Haven, Conn.
5,859.—COOKING STOVE.—N. S. Vedder, Troy, and S. Heister, Lansingburgh, N. Y.

TRADE MARKS REGISTERED.

811.—HAMES.—Baker, Carr & Co., Andover, N. H.
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815.—CIGAR.—E. Parodi, Key West, Fla.
816.—COUGH SIRUP.—J. S. Pemberton, Atlanta, Ga.
817.—MEDICINES.—Pettit & Barker, Fredonia, N. Y.
818.—COAL.—G. R. Tuttle, Cleveland, Ohio.
819.—PLOWS, ETC.—Wiard & Hugh, East Avon, N. Y.
820.—STUFFING LEATHER.—J. B. Young, Chicago, Ill.

APPLICATIONS FOR EXTENSIONS.

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

21,213.—MACHINE FOR FORGING NAILS.—S. S. Putnam. July 31, 1872.
21,275.—ICE STAND.—H. A. Roberts. August 7, 1872.
21,311.—SECURING PLANE IRON.—L. Bailey. August 14, 1872.

EXTENSIONS GRANTED.

20,243.—FINGER OR GUARD FOR HARVESTERS.—L. Miller.
20,192.—EXPANSIVE BIT.—W. A. Clark.
20,245.—SEWING MACHINE GUIDE.—L. W. Serrell.

EXTENSIONS REFUSED.

Extension of Robert Wilson, of Milton, Pa., for fly nets. Patented May 11, 1858; refused May 10, 1872.

Extension of G. W. Morse, of Greenville, S. C., for cartridge cases. Patented May 11, 1858; refused May 11, 1872.

Extension of Jeroboam B. Creighton, of Akron, Ohio, for railroad cars for day and night service. Patented May 18, 1858; refused May 9, 1872.

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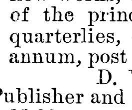

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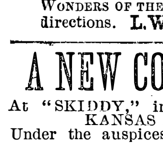

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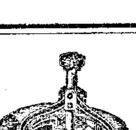

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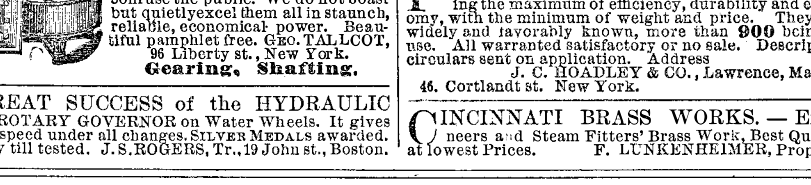

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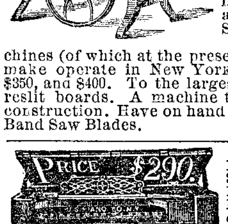

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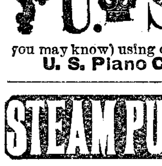

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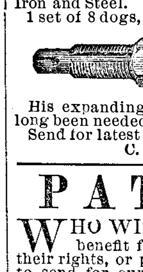

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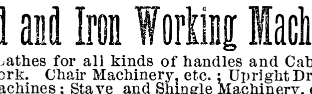

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