# Scientific American

AN ILLUSTRATED

JOURNAL OF ART, SCIENCE & MECHANICS

Vol. XXIX.

NEW-YORK

PUBLISHED BY MUNN & CO.

# SCIENTIFIC AMERICAN

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

Vol. XXIX.—No. 1. [NEW SERIES.] NEW YORK, JULY 5, 1873. $3 per Annum, IN ADVANCE.


## THE PREPARATION OF PEAT FOR FUEL.

There is no more important economical question under discussion, at the present day, than that which broadly includes the production and manufacture of fuel for industrial and domestic purposes from new sources, and especially the substitution, for coal and wood, of peat and similar products, which are capable of being obtained and prepared at a much less comparative cost. The subject of the utilization of peat as fuel, though of great interest in this country, is in England, probably on account of the temporary famine and stress of prices in coal, and also by reason of the apprehension which exists regarding the ultimate exhaustion of the mines of the kingdom, strongly attracting the attention of scientific men, leading them toward investigations and experiments, the results of which may be considered as embodied in such improved machines as that to which our engravings refer, and to which we shall presently allude.

It is well known that both in the northwestern section of the United States, and to as great, if not to a greater, extent in certain parts of Canada, very large deposits of peat exist. It may be safe to predict that, in view of the scarcity of other fuel in such districts and the rapid progress which is being made to the improvement of means for utilizing the bog product, ere long the latter will be exclusively employed both for domestic and manufacturing uses.

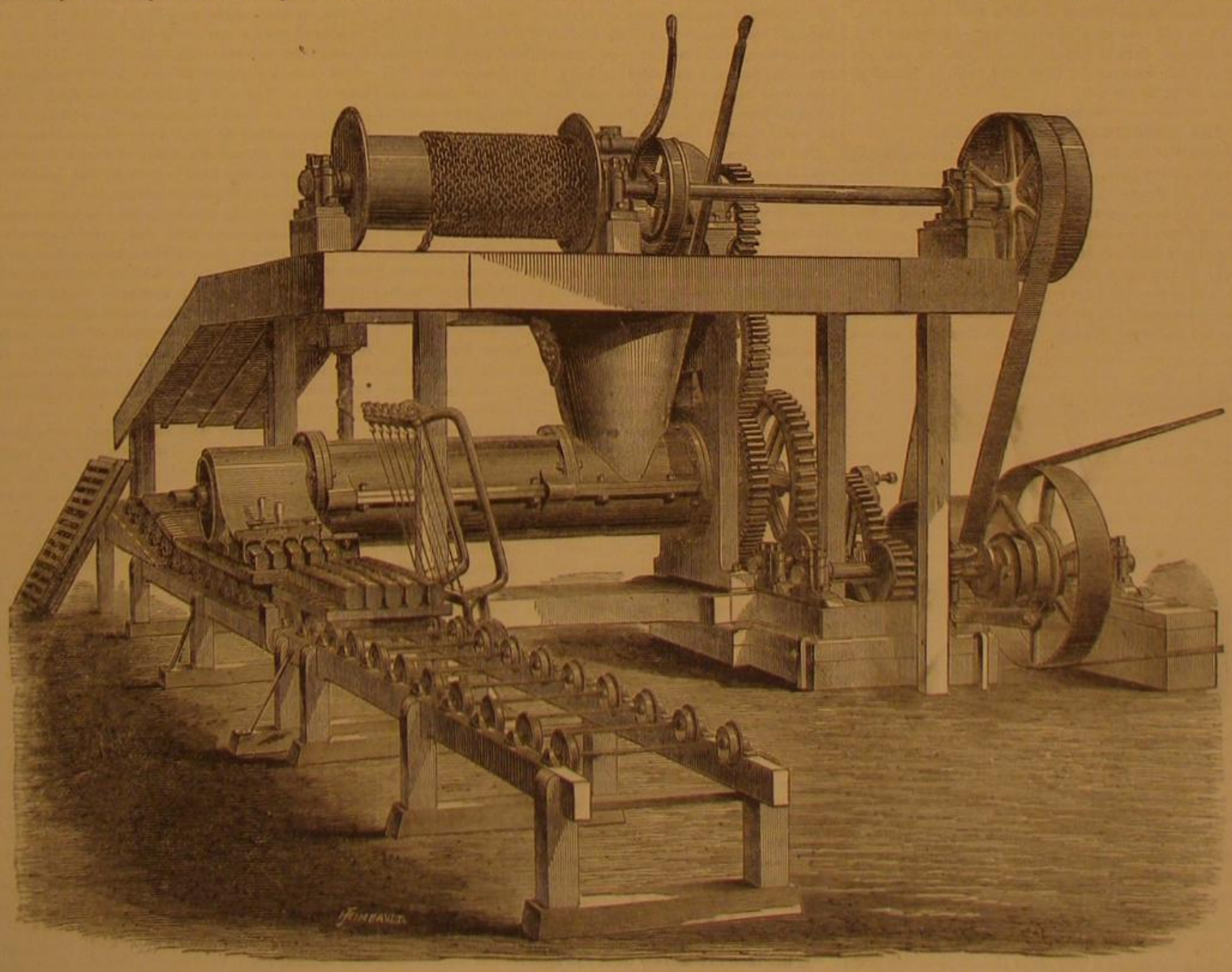
Of the associations which, in the Dominion, are at present organized for the prosecution of this industry, we have recently received the prospectus of one, the Huntingdon Peat Company, the field of the operations of which is located in the county of Huntingdon, forty-seven miles from Montreal. The peat bed there situated is said to be of superior quality, and comprises about 800 acres, averaging from 10 to 18 feet in depth of pure vegetable matter, and capable of yielding 3,000 tuns of dry peat per acre. The process employed, known as R. A. Griffin's patent, consists in raising the peat by a system of endless chains and buckets, throwing it into "cutters," in which the water is strained from it. The peat is then passed into a mill; and within fifteen or twenty days from the time it leaves the bogs, it is fit for the market. The cost of the necessary machinery calculated to produce 100 tuns per day, at a cost of $1.25 per tun, is estimated, in the prospectus above referred to, at $35,000.

Whether or not peat can be profitably employed in the manufacture of iron, is a question which many of the iron trade journals have lately made the subject of protracted controversy. The matter seems to rest upon the economical and more especially the rapid preparation of the fuel for use; for when it is first taken from the bog, it is so saturated with moisture that its combustion is perforce a very slow process. Naturally, the efforts of inventors have been especially directed toward surmounting this difficulty; and while the patentee of the Canadian process, before noted, has effected a stride in advance in reducing the three months, generally required for drying the material, to fifteen or twenty days, the manufacturers of the machine represented in our engravings, Messrs. Clayton, Son, & Howlett, of London, England, have made much greater progress by diminishing the time necessary to completely extract the hygroscopic and fixed water, and to compress the substance into convenient form for stowage and transportation, to scarcely as many hours.

Before entering the apparatus (for the engravings and description of which we draw upon the pages of the *Engineer* and *Engineering*), the peat is filled into squeezing trucks, in which, during its journey to the works, all free water is squeezed out of it by mechanical devices.

From the trucks the peat is tipped into the vertical hopper of the machine, in which are inclined blades fixed upon the vertical shaft. The blades which, with other internal arrangements are shown more clearly in the sectional view, break up the lumps of peat and press the mass downwards into the horizontal cylinder into which it is fed by a worm placed on the central shaft. The peat is thus brought within reach of the propelling arms which are fixed spirally around the central shaft in the horizontal cylinder, and which pass between sharp steel knives. The knives are made with dovetailed feet, and are received into corresponding grooves in a removable bar plate, which is secured in the side of the horizontal cylinder by bolts. By means of the scissor-like action of this internal machinery, the peat is cut up into small pieces and squeezed and kneaded together. The fibers of peat are, by this treatment, so divided that facility is given for setting free all moisture and fixed air that may be retained in the cells of the stalks, and the peat is deprived of elasticity, or resiliency, so that it is reduced to a suitable condition for molding. The spaces between the cutting knives are gradually reduced from the feeding to the delivery end of the cylinder, the propelling arms being correspondingly placed. The molding orifices are adjusted at the nose of the machine, and may be of any desired form. Five of these orifices have hitherto been used and have been found convenient in working.

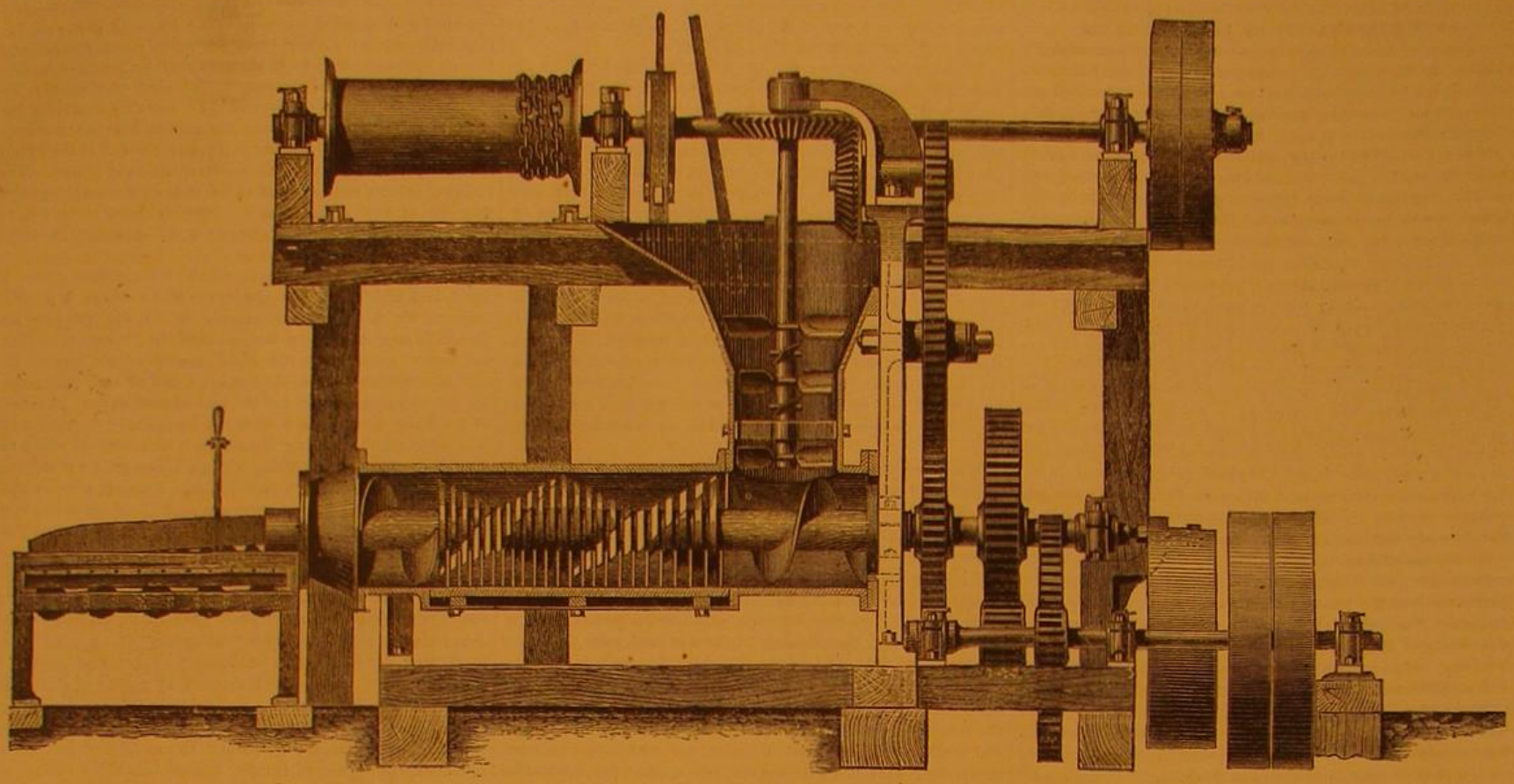
Beneath the chamber upon which the molding orifice is fixed, and which is seen to the left of the machine, is a roller table on which the trays for receiving the molded peat are placed in succession by a boy, so that they run in a continuous series underneath the molding orifices and receive the peat issuing from them. As the front end of each tray comes up, the workman severs the streams of molded peat by means of a sliding cutter, and pushes the loaded tray forward until it is opposite the cutting frame, in which several wires are stretched. These wires, being brought down on the peat, sever each bar into pieces five inches long, which is a convenient size for use. The loaded trays are sent along the roller table until they are opposite the tray racks. The trays are then lifted off on to the racks, where they remain for about three days, until the peat will bear handling, when they are placed upon the open shelving for final drying. The tray racks consist of uprights with arms fixed upon them between which iron rods are strained. The contingency of accident to the machinery, from stones or hard foreign substances passing in with the peat, is provided against by means of a friction clutch, seen to the right of the machine in front of the driving gear. This clutch can be screwed up to give any desired pressure, or resistance, and when any substance having an objectionable degree of solidity passes into the machine, the clutch slips, its resistance being overcome, and breakage is thus avoided. The cylinder has a movable cover so that the interior may be readily examined, foreign substances removed, knives replaced, or anything else necessary done.



CLAYTON & CO.'S PEAT COMPRESSING MACHINE.

The producing power of the machine has been fairly tested, and, so far, the yield has been found to be at the rate of from 75 to 95 tuns of crude peat per ten hours. The output of raw material appears to depend much upon the state of moisture of the peat bog, being greatest when the peat is wettest and least fiberous.

Various kinds of peat have been tried by this machine, and it is interesting to notice the difference between the peat dried without having been previously treated, by the machine, and that which has been operated upon. Peat of very fiberous nature when dry has an open spongy appearance, suggestive of cocoa nut fiber. The same peat treated by this machinery becomes compact and hard, and assumes a specific gravity of

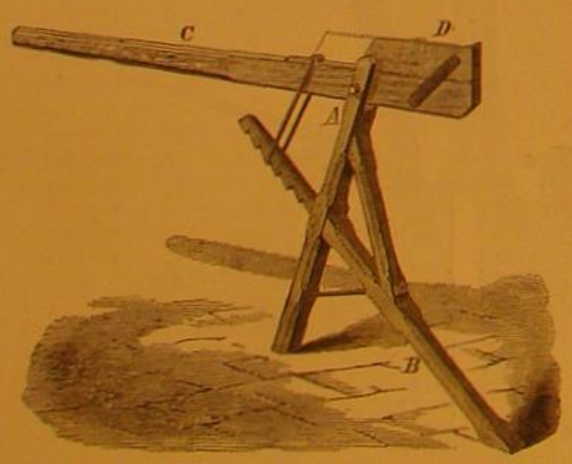


PEAT COMPRESSING MACHINE—SECTIONAL VIEW.

from 1·05 to 1·10, while black decomposed bog condenses to about 1·20. A set of machinery to work 100 tuns of crude peat employs, in all, ten men and five boys, including diggers, engine drivers, men in drying sheds, etc., so that the cost, allowing a fair amount for wear and tear, is placed at from 87 cents to $1.25 per tun.

### THE HERCULEAN LIFTING JACK.

The invention illustrated in the accompanying engraving is an improved lifting jack, invented and patented by John Riddlesberger, of Franklin county, Pa., and which, it is claimed, may be advantageously applied to many uses. The framework consists of a standard, A, combined with an auxiliary standard and brace, B, in a strong and substantial manner. A lever, C, rests in a slot formed in the upper end of the post, A, and is secured by a bolt passing through it. By means of an attachment, D, on its short arm, the lever can be adjusted to different hights. The falling link shown




serves to secure the apparatus while the weight is suspended.

In operation, the short arm of the lever is placed under the axle of a wagon or other weight to be raised. The opposite or long arm is then borne down, when the falling link becomes engaged in notches formed in the under side of the post, B, as represented.

For further particulars regarding sale of territory, agencies, rights, etc., address Dr. I. N. Snively, Waynesboro', Franklin county, Pa.

### The Modes of Steel Making.

*A priori*, the making of steel by removing carbon from cast iron is the most rational way, says the *Engineering and Mining Journal*, because it is the most direct; but a trial shows us at once that directness is not the only premise which must be regarded. There are two other things which go to the making of steel. One is purity of product and the other is equality of "temper." A pure product is only to be had by using a pure pig; and, as this article is not always obtainable, that process is, generally speaking, more rational which introduces some purifying operation—like the conversion of cast iron to wrought. As to the equality of temper, that depends upon the amount of carbon left in the steel (neglecting other elements). Here again repeated trials have shown that it is very difficult to hit the exact amount of carbon in every operation when oxidizing agents are used, and a large proportion of past failures have been due to this difficulty. So that, after all, the direct conversion of cast iron into steel is not the most rational mode, because it leaves two important requirements unregarded. On the other hand, wrought iron, being a purified product of a tolerably definite composition, satisfies these requirements, and may, therefore, rationally be used for steel making. In practice we find both these kinds of iron used together. In such cases, the wrought iron must be considered as the leading raw material, while the cast iron is a carbonizer.

The old idea that the direct conversion of pig metal into steel is the only rational process has cost inventors untold agonies of mental activity, and capitalists have suffered quite as much in pocket on account of it. The proof that the idea was wrong is to be found in the constant abandonment of the process in steel making of every kind. Crucible steel, furnace steel, and Bessemer steel making processes are now, in most cases, founded upon the principle of using wrought iron as a basis and either carbon or pig metal as a carbonizer.

### Effect of Sulphur Water on Iron Pipes.

Dr. E. Priwozuik, in *Dingler's Journal*, says: It appears that, when the iron mains conveying the mineral water from a source near Hainburg, Austria, were taken up after having been for more than a dozen years underground, the iron thereof had been strongly acted upon, as exhibited, by the difference in structure, upon the fracture. On being analysed, the author found the interior layer to consist, in 100 parts, of: Hydrated oxide of iron [$(Fe^2)^2O^3(OH^6]$, 81·08; free sulphur, 12·29; sulphuret of iron, 4·48; hygroscopic water, 0·57; nickel, cobalt, magnesia, silica, traces of carbon, and chlorides of ammonium and sodium, 1·58. The second layer was found to contain only 79·2 per cent of iron, but no sulphuret or excess of carbon was discovered; while the third outmost layer was almost pure cast iron.

### A Leaf from the Early History of the Mowing Machine.

Jeremiah Bailey, of Chester county, Pa., was one of the early American inventors, whose contributions to the mechanical arts have so greatly assisted the progress of the country. In 1822 he obtained a patent for a self-sharpening mowing machine, which was considered of so much importance that it was engraved and printed in London, in the *Mechanic's Magazine* for November 1, 1823, almost fifty years ago. We here give a copy of the engraving and quote the remarks of our venerable cotemporary:

"The mowing machine, of which the annexed cut is a representation, was invented by Jeremiah Bailey, of Chester county, United States, who has obtained a patent for the same. [Patented February 13, 1822.]

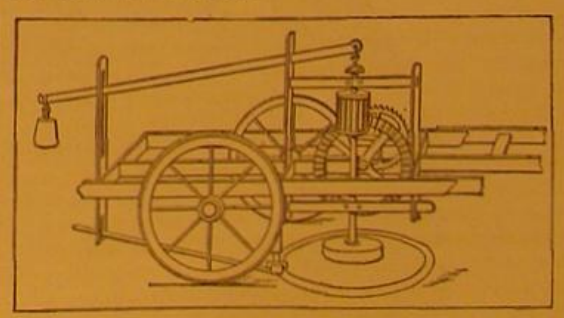
"It has been extensively used and approved of during the last season, in the neighborhood of the patentee, and promises to be of great public utility. It is understood that it will mow ten acres per day. The following description will explain its operation, and show the skill and ingenuity of the inventor.

"This machine is supported by two wheels on different axles. The left wheel is fixed to its axle so that they revolve together. The right revolves on its axle like a common cart wheel, and is placed about a foot further back than the other. The left works within the frame, and has a circle of cogs screwed on the outside of the fellows, but of a less diameter, to keep them from the ground. These cogs work into a vertical cog wheel in front, that turns an iron shaft extending horizontally towards the center of the machine; upon the inner end of this shaft is fixed a vertical face wheel, whose cogs turn a trundle head or a vertical shaft. To the bottom of this shaft, near the ground, is fixed a circular horizontal frame work, on the circumference of which is screwed the scythes in six parts, laid horizontally, with the edges turned outward, so as to form a complete circle. To keep the scythes at a proper distance from the ground, the bottom of the shaft is supported on a piece of wood of the machine, secured by a tye from the tail, somewhat resembling a sled runner, in which it works in the manner of a gudgeon—with the inequalities of the ground, the scythe frame, shaft and trundle head rise and fall.

"The edge of the scythe in its revolution passes under a whetstone fixed on an axis, and revolving with the scythe. To create friction, this axis is more or less inclined to the line of direction of the revolution according to the friction required. This stone, by means of a sliding rod, by which it is attached to the machine, rises and falls with the scythes.

"To prevent too great a pressure of the trundle shaft and scythe frames on the ground, a lever, like a steelyard, is fixed to the top of the shaft, extending to the tail of the machine, where it is weighed according to the nature of the ground and grass.

"The horse is put into shafts, and *walks* in front of the left side of the machine, and always on the mowed ground after the first swarth is cut.



"By the increase of velocity, the scythes revolve with great swiftness. The grass, as it is cut, is first thrown by the progressive motion against a rise in the scythe frame toward the center, and by the same motion is afterwards thrown off in a regular row, following the center of the machine."

### New Plan of Removing Sand Bars.

A method of removing sand bars from rivers, invented and patented by Alfred Garnham, of St. Louis, Mo., consists in anchoring a cable under water, and providing the cable with angular arms, so arranged that the force of the stream will actuate the arms, make them revolve and beat up the sand, which is swept away, as fast as loosened, by the current,

## LIFE IN THE BEEHIVE.

The following is from a recent lecture by Professor Agassiz, at Cambridge, Mass., reported in the New York *Tribune:*

At the close of my last lecture I made some general statements concerning parthenogenesis, a peculiar mode of reproduction by virgin females, first investigated in some families of insects, among which the progeny thus brought forth consists of males and of males only. In the family of phyllopods, among crustacea, this process obtains also; but the progeny in this case consists, on the contrary, of females only. The deportment of these animals at the time of reproduction is so singular, they exhibit faculties so peculiar, that they have been the objects of careful observation. Their seemingly intelligent action, known as instinct, has been compared with the intellectual powers of the higher animals and even with the mental faculties of man himself. A knowledge of the facts is therefore important to a just discrimination between those two faculties, which are considered by some as entirely distinct, while others regard them as modifications of one and the same power. It is often said that the possession of reason places man above the brute creation, to which instinct peculiarly belongs; and yet the facts do not justify such a distinction, as we shall find if we study carefully the lives of some of these creatures.

### THE BEEHIVE COMMUNE.

The beehive consists, when in full activity, of one queen, several hundred drones, and many thousand working bees. These constitute a community by which a combined system of labor is carried on, transcending in many respects the most complicated actions of man himself. Their structure shows no organ similar to those by which the mental functions are manifested in the higher animals and in man.

### INSECTS HAVE NO BRAINS.

They have no brain proper, nor does their nervous system correspond in any way to that of the vertebrates. In all vertebrates the solid front mass of the nervous system which we call the brain is prolonged backward into a long cord, known as the spinal marrow, from which many nervous threads arise and branch, spreading through the whole organization. The brain and the spinal cord, in fact the whole central nervous system, are inclosed in a cavity, the skull and rachitic canal, separate from those in which the organs of digestion, respiration, circulation and reproduction are contained—the chest and abdominal cavity. For the articulates, on the contrary, to which all insects, crustacea, and worms belong, the nervous system is scattered along the length of the body in a succession of swellings connected together by threads. The first of these swellings is situated in the head, above the alimentary canal; the rest are at regular distances along the lower side of the body. Thus it appears that the battery from which all volition starts, by which all the acts of life are performed or regulated, through which all external impressions are communicated and acted upon, are very different in these two types of the animal kingdom. It is therefore hardly probable that the life work done by these organs should be the same.

### INSTINCTS OF BEES.

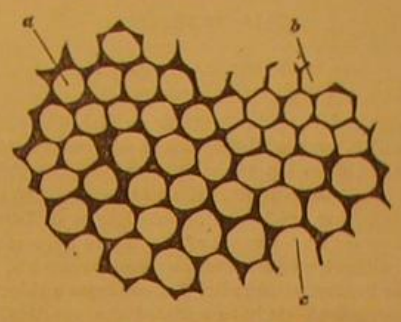
Let us look at some of the acts by which the quality we call instinct is manifested in a community of bees. When such a community becomes too populous for a given hive, the bees "swarm," as it is called; that is, a part of the overcrowded population separates from the rest and goes off to establish a new colony. In such case the emigrants are chosen or form their own band with direct reference, seemingly to the future welfare of the new colony, preserving the numerical proportions characteristic of all prosperous hives. The swarm consists of one queen, some thousands of working bees or undeveloped females, some hundreds of males or drones. This is the normal combination in the bee community, and hives so organized may survive and keep together for many years.

### DURATION OF BEE LIFE.

There are reports of beehives a century old. This is, however, probably an exaggeration; for beehives 20 years old are rare, and they do not often survive more than seven, eight, or ten years. When I speak of the life of a beehive, I do not mean to say that the individuals composing it live together for that length of time; indeed, a queen rarely lives beyond three or four years; one of seven years is seldom seen, while the males never survive the summer in which they are born, and the working bees die gradually and are replaced by new ones. But the hive as a community holds together for a much longer period, being constantly renewed by the process of reproduction, and comes at last, like a human settlement, to consist of a variety of individuals born at different times. When a swarm breaks off from an old community to form a new colony, the division is generally due to the appearance of a new queen.

### REMARKABLE FACTS CONCERNING THE QUEEN BEE.

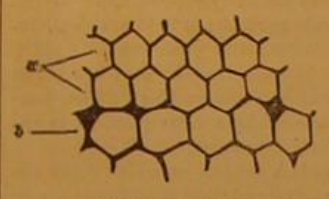
The queen bee, usually quite contented with her lot, watching over her progeny, active and patient in the care of her eggs, becomes furious if a rival arises in the hive. She pounces upon her, and they sometimes fight to the death. So well is this understood in the hive that the workers take care to prevent such conflicts by holding back the new queen, just ready to be hatched from her royal cell, till the bees have swarmed. At such a time the workers will stand by the cell, out of which a queen is to be born, ascertain how far her transformation is completed, and, should there be a disposition of the young queen shortly to creep out, they increase the deposit of wax upon the lid which shuts the cell, thus preventing the egress of the royal prisoner. If she tries to break through or attempts to gnaw her way out, the workers crowd around the opening or accumulate such an amount of wax upon it as to frustrate all her efforts. When the old queen has peacefully departed, the new one is set free. What makes this fact more extraordinary is that usually the workers have never seen the birth of a queen or perfect female before; their hive has known but one queen, and yet they anticipate and guard against all the dangers likely to arise from a second. Can it be that these creatures do the right thing at the right time consciously, by means of any faculty similar to our reason?




TRANSITION CELLS OF BEE.
a. b. Rows of intercalated cells. c. Drone cells.

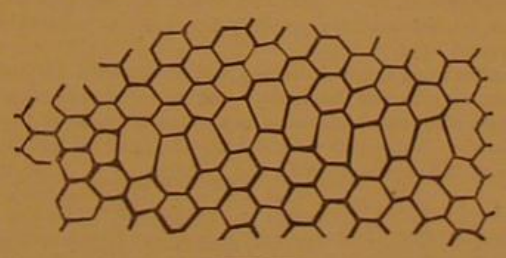
### CONSTRUCTING THE HONEYCOMB.

The swarm, having escaped, chooses a place for the new colony—a cavity in the rocks, perhaps, or a sheltered notch among branches of trees. The swarm having alighted near a favorable spot, a single working bee—one out of twenty thousand, perhaps—starts from the crowd and lays, not the first stone, but the first piece of wax which is to be the foundation of a new comb. Before swarming, they have provided themselves with an ample supply of wax and food, and are prepared to build their new home.



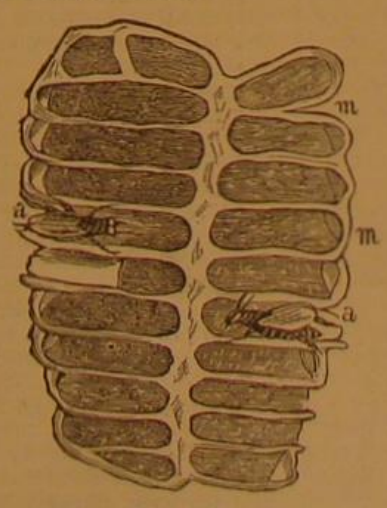

TRANSITION CELLS.
a. Working bees. b. Drones.

The construction of a honey comb, with a double row of cells on opposite sides, dovetailed into each other, and with larger cells for the drones and the special cells for queens, is so well known that I need not dwell upon what every encyclopædia will give. The first cells, being raised upon an uneven surface, are often irregular and may be uninhabitable on that account, but they then make the foundation for perfect cells, whose regularity and precision of form and relation have been the wonder of all ages. The irregularity of the first cells, adapted to the unevenness of the surface, seems only another evidence that these animals work deliberately, not like machines. Dr. Wyman has published a most interesting paper upon the irregularities of the cells in a honeycomb.



WORKER CELLS.
Showing variations in the form and size of the mouth. Copied from Professor Wyman's paper.

I dwell upon the fact that the first cells present every possible variety of shape modified to suit the situation, because it is not generally understood.

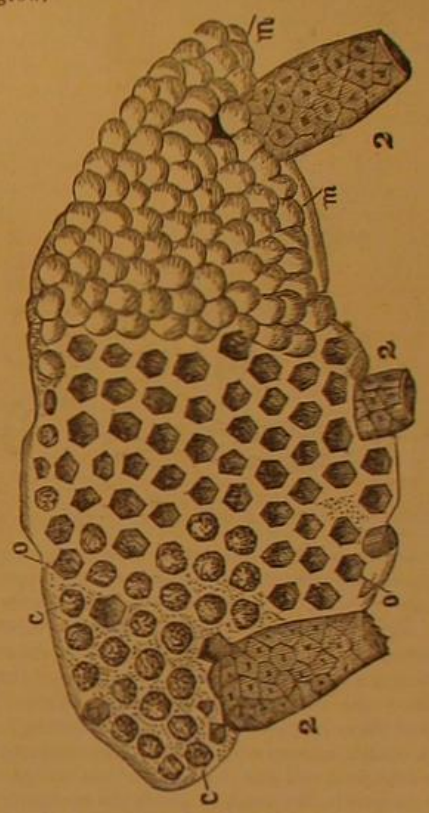



CELLS IN A BEEHIVE.
m. m. Honey cells with lid. a. a. Bees bringing honey in. The whole is seen against a pane of glass.

The first bee having made the first cell, a second bee comes and stands opposite her, head to head; then another at her side, so that the two stand side by side, and the rest follow in definite position, each building a cell around itself until gradually a good sized comb is built, it may be a foot in length and six or seven inches in depth, the width being uniformly that of a double row of cells. All this work is done by the imperfect females or so-called workers. Neither drones nor queen take any part in it. The working bees, on the contrary, are ever active, bringing in supplies for the community, swarming out daily to collect honey, filling the cells, as fast as they are completed, with food, and then closing them to prevent escape, thus securing large stores of honey. The drones meanwhile look lazily on. Sluggish and inactive, they seem to have different temperaments from the working bees.

### THE DISTINCTIVE CHARACTER OF THE CELLS.

The honeycomb being sufficiently advanced, the queen now begins to lay her eggs in the cells. Here comes in another marvelous evidence of that power we call instinct. We have seen that a certain numerical proportion is essential to the well-being of a hive. There must be but one queen and at the most two or three queens' eggs, and even then trouble is sure to arise when these are hatched; there must be several hundred drones, and there must be many thousand workers. In preparation for this, the workers have laid out the cells as systematically as if they had been guided by a superior intelligence; special cells adapted for the eggs out of which thousands of imperfect females or workers are to be produced; others somewhat larger, intended for the development of the less numerous drones, and a very few so-called royal cells, still larger than those of the drones, many times larger than those of the workers, and of a very peculiar form, out of which perfect females or queens are to grow.



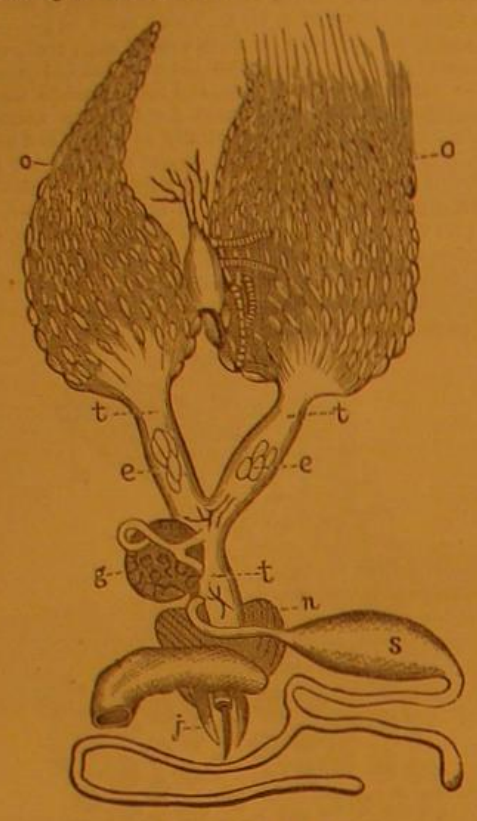

THE THREE KINDS OF CELLS.
m. m. Honey cells, closed. c. c. Cells with young bees, closed. o. Open cells. 2 2 2. Royal cells open.

The queen cells stand out from the rest of the comb, and have a large opening. Two or three such cells will usually be formed in one comb. In old colonies, it often happens that no provision is made for the advent of a new queen, and in that case no royal cells are built; but in a new community several such cells may often be seen upon one comb. Still more perplexing than the impulse, or instinct, or unconscious perception, by which the workers are guided in the preparation of these cells, is the intelligent selection shown by the queen in distributing her eggs among the various kinds of cells. She finds thousands and thousands of small cells, and in these she deposits fecundated eggs out of which nothing but workers grow. In the royal cells, or, as is the case in many hives, in one royal cell, she lays an egg, also fecundated, out of which is sure to grow a perfect female, or, in other words, a queen. The eggs of the perfect and imperfect females do not differ originally; the ultimate difference is brought about by a special mode of nursing and feeding the royal egg, the workers supplying the royal cell, in advance, with pollen from the stamens of flowers and honey; so that when the little grub comes out of the egg, it finds itself in the midst of the nourishment necessary for its development into a queen bee. How do these careful nurses know the amount and quality of food needed by the eggs they have in charge? To this question there is no answer. But there is no doubt of the fact, and they perform their work with surprising economy and accuracy. In the drone cells the queen lays only unfecundated eggs, and these always produce males and males alone. The faculty by which all these acts are performed without teaching, without preceding experience, without any antecedent knowledge of the conditions necessary to the life and growth of the eggs, that faculty we call instinct, in contradistinction to those mental processes involving argument, rational consideration, combination and adaptation, by which acts are performed under full consciousness of all contingent conditions.

### THE EGGS, WHAT THEY BRING FORTH AND HOW THEY ARE FECUNDATED.

It may be asked how it has been known that certain eggs were fertilized while others remained unfecundated. The facts have been gradually made out by very careful and connected observations. It is known that with bees, as with

most birds, the act of copulation takes place outside of the hive in the air during flight. It happens sometimes that a queen bee, from injury or from malformation, defective wings, for instance, is unable to fly and cannot leave the hive. Under these circumstances she is incapable of fecundation, and yet has been seen to lay eggs, and these eggs invariably produced males or drones. This fact gave the clew, and successive observations proved beyond a doubt that the workers were always born from fecundated, the drones from unfecundated eggs. It remained a mystery how, in the same ovary, a certain number of eggs could come under the fertilizing influence while the rest remained untouched.




OVARIES, ETC., OF BEE.

o, o. Ovaries. e, e, e. Eggs in oviducts. g. *Receptaculum seminis.* n. j. Sting. s. Poison bag.

Siebold ascertained by a skillful anatomical investigation that the special organ of the queen bee, in which spermatic particles are received, has a muscular apparatus which enables her to close or open it at will. This organ, known as *receptaculum seminis*, is placed just at a point of the oviduct or canal through which the eggs are passed when they are dropped from the ovary, half way between the ovary and the outlet of the oviduct. The queen stands on the edge of the cell in which either fecundated or unfecundated eggs are to be deposited. If the former, she has the power to open this receptacle, the organ in which the spermatic particles have already been received, and to allow one or two such particles to come into contact with the egg; if not, she can close the organ and allow the egg to pass out unfecundated. Siebold has shown that eggs cut out above the opening of the *receptaculum seminis* into the oviduct, at which these organs connect, are always unfecundated.

Siebold has investigated a similar set of facts in the history of another species of hymenoptera, a kind of wasp of the genus *tolistes*. In this case, the queens, which are fecundated in the autumn, begin to lay their eggs early in the spring; out of these eggs are born a variety of individuals, workers and males, as in the bee community. By a careful destruction of all the males, which was accomplished without injury to the comb, Siebold ascertained that parthenogenesis obtains in this family also. Plenty of eggs were laid after the males were destroyed, but the perfect insects they produced were always males and never a single female. It is now clearly proved, not only for wasps and bees, but also for a number of other insects belonging to the hymenoptera, that virgin females may produce male offspring without any participation of males.

### Scientific Prizes.

The report of the prizes offered by the *Société d'Encouragement pour l'Industrie Nationale* of Paris for 1873, is as follows:

Chemical arts.—Six prizes have been offered: 1. Prize of $400 for the industrial application of distilled water; no candidate. 2. Prizes of $200 for the industrial application of any cheap and abundant mineral product; no candidate. 3. Prize of $200 for a useful application of recently discovered metals; no candidate. 4. Prize of $600 for the artificial preparation of a black compact diamond; one candidate appeared, but, as the experiments of the committee showed that the specimens sent did not fulfil the conditions required, the prize was not awarded. 5. Prize of $200 for a process capable of effecting the prompt and durable disinfection and clarification of sewage; the engineers of the Municipal Service of Paris, commissioned to study the question of disinfection and the application of sewage water, have presented a complete and detailed account of the experiments made, and the remarkable results obtained; as these experiments have been conducted on a very small scale, and, as important sewage works are in progress, the Council of the Society has decided to suspend the award of the prize. 6. Prize of $200 for refining, in France, Bolivian nitrate of soda, and extracting the iodine which it contains.

Economic arts.—Prize of $600 for an apparatus giving an electric current, constant in direction and intensity whose electro-motive force and conductibility shall be comparable to those of a nitric acid battery of sixty to eighty ordinary sized elements, and showing superiority in economy or salubrity over the machines now in use; the prize was awarded to M. Gramme for his magneto-electric machine.

## Correspondence.

### Deep Sea Soundings.

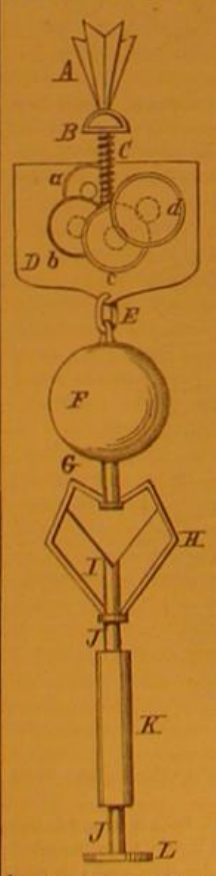
*To the Editor of the Scientific American:*

Dr. George Robinson, in an article published in your journal of April 19, suggested the idea of dispensing altogether with a line in deep sea soundings, and explained how an apparatus might be so contrived as to re-ascend to the surface after touching the bottom. Mr. Charles H. Lewis suggested afterward that the use of a pressure gage might obviate the difficulties presented by under currents, and by headway or leeway, if sounding is done from a ship. Several other correspondents have agitated the question, but as they are evidently unaware of the many experiments that have already been made to ascertain the depth of the ocean, a perusal of a short article, published in the *Nautical Magazine* forty-one years ago (in 1832), may prove interesting to them and to many of your readers.

Even if the idea of dispensing with a line in deep sea soundings were new, the obstacles described so clearly by Mr. Hawley N. Cargill, of Grand Rapids, Mich., present the real difficulties, namely, the under currents, the immense pressure of water, and the low temperature at a great depth. This correspondent takes a practical view of the matter, and I am as ready as he is to consider the suggestion, by Mr. Lewis, of a pressure gage as perfectly reliable and practical as far as a line could be made to reach; it is so practical, indeed, that it has been in use for many years, and I used it myself in the French navy at least twelve years ago. But to show the ideas of our grandfathers on this subject, here is a copy of the article, addressed by a correspondent to the *Nautical Magazine*, over forty years ago:

"The depth of the ocean is a subject on which many opposite opinions have been advanced; and with the hopes of determining so interesting a problem, a few years ago I constructed a machine, somewhat resembling that by Mr. Massey, but differing from his in not requiring the assistance of a line. The principal obstacles with which I considered that it would have to contend, were seaweed, tides, and under currents, which latter might sweep it away from the place where it was sent down. However, regardless of these, I set to work and completed the machine. My first experiments with it were made in shallow water, and, to ascertain its correctness, I attached it to a line that was marked. The results were most successful; and I was delighted to find it answer so well, for I invariably found the depth of water given by the machine precisely the same as that by the measured line.

"After being satisfied that my plan was likely to succeed, I submitted it to the Admiralty, and to my friend Captain Mudge, who communicated it to a scientific friend of his at Woolwich. This gentleman soon after inclosed me an etched plan of the apparatus, with his remarks on it, informing me, at the same time, that the celebrated Dr. Desaguliers had made an attempt, something similar to mine, with a glass globe; but that, after various essays, he could never recover the machine. This he attributed to drift, or to the bursting of the globe from excessive pressure; but as the trials had been made under many unfavorable circumstances, no positive inference could be drawn from them.




"The following is an explanation of the machine as annexed: A is the vane and flies; B, two connecting swivels; C, perpetual screw; D, plate for the wheelwork; *a b c d*, wheels of different diameters, similar to Massey's; E, suspension ring; F, float glass globe; G, catch with shoulders; H, clasps disengaged by the arm at I, connected with the rod, J J; K, lead to sink the whole; L, foot to the rod, in case of an oozy bottom.

"It will be readily seen that, when the weight is disengaged from the rest of the machine, by the opening of the clasps caused by the rod striking the bottom, it will remain there, and the globe will carry the other part to the surface."

Here ends the article; and as nothing has been heard of the experiments made afterwards by the inventor in deep water, it is probable that he met with no better success than Dr. Desaguliers. The method of adapting a pressure gage to a sounding apparatus must, according to the article in the *Nautical Magazine*, have been invented by Massey about fifty years ago.

LAURENS DE WARU.

Baltimore, Md.

### Psychic Force on the Slate.—No. 2.—An Exposition.

*To the Editor of the Scientific American:*

In my former article (on page 195, volume XXVIII) I gave a description of what appeared to be a wonderful phenomenon. After having witnessed the performances of the so-called spirits at several *séances*, I have at last hit upon the way the thing is done. I now give it to your readers that they may not be gulled as I have been. It may be made the source of a great deal of amusement.

Procure a slate and a number of short pencils, also a small table (one with four legs is the best). Cover the table with a cloth, and turn the lights down—this is done for concealment—but explain that spirits will only write in the dark for you, therefore the table must be carefully covered to exclude the light. Grasp the slate with the right hand, lay a pencil near your thumb, hold the slate under the table horizontally, place the left hand on top of the table. At first it is best to sit so that your knees will not be suspiciously close to the table. After holding the slate a few minutes, say that you don't know that the conditions are favorable. Presently throw the pencil off with the thumb or finger, or get it between the thumb and finger and shoot it up against the table, as a boy would a marble. Call attention to it, and say there appears to be something there. Replace the pencil and presently shoot it up again. Do this several times and it will excite a great deal of wonder, especially if you make as little movement as possible. Next place a pencil between your fingers under the slate, rap with it about a dozen times, ask: "Is there a spirit present? If so, rap three times for yes, twice for no." Answer: "Yes." "Can you write?" Answer: "Yes," if the spectators are not watching you too closely; otherwise rap "no," and continue to rap the answers. Now get closer to the table. To write on the slate, hold the pencil between your thumb and finger, and the slate between your third and little finger; rest the slate against your left knee, or between the knees if convenient, or against the side of the table. This will give you more freedom to write. After writing an answer on the slate, shoot up the pencil; turn the slate over, grasp it as at first, withdraw, and, wonderful to behold, the answer is written on the bottom of the slate. Not one in a thousand will suspect how it was done, if you are expert and make no perceptible movement. Always be willing for any one to test; and if they catch you, it will be your own fault, for it is very easy to fail and say the "conditions are unfavorable."

If any person desires to hold the slate with you, for a test, first contrive to draw or write something on the slate; and after turning, hold the pencil under the slate in position for rapping. Ask him to hold the side of the slate opposite you and pull against you. After numerous questions, to which you can rap answers, beg the spirit to write or draw something on the slate. Presently drop the pencil and have the other party take it out. He will think the writing was done while he held the slate. To ring a bell, show a "spirit hand," and perform many other wonders, suspend the slate by holding it between your left knee and the table, or any other way to free your hand. It excites more wonder to withdraw the slate with the pencil in its original position, after ringing the bell, etc. S. C. DODGE.

Chattanooga, Tenn.

REMARKS BY THE EDITOR.—This is a very clever way to imitate the spirit slate-writing, and for dark *séances* the trick would doubtless succeed very well. But the most accomplished spirit slate-writing mediums now discard the darkness, and do not touch the slate. A bit of a pencil is placed between a pair of slates which are laid on the table. No cloth. The gas lights, in full blaze, illuminate the scene, while the friction of the pencil on the slate may be distinctly heard; and on opening the slates, a written communication thereupon is found.

### Prevention of Incrustation in Steam Boilers.

*To the Editor of the Scientific American:*

We have a backwoods way of cleansing scale out of boilers, down in this section, which may be useful to some of your readers. Introduce a few green hickory poles in at the man hole, and let them boil with the water a day; then blow out about one third of the water. Repeat the process for a few days, and the inside will be as clean as a society shirt, and the hickory poles as brittle as rotten wood. A.

Eutaw, Ala.

A FLOATING CANNON BALL.—In the pavilion of the Ministry of Agriculture, at Vienna, a floating cannon ball may be seen. Although weighing 50 lbs. it lies like a down feather on a silvery mass, consisting of pure quicksilver from the celebrated mines of Idria; 150 cwt. of this metal is exhibited in a large iron cauldron, offering a sight seldom to be met with, and on it rests the solid iron ball. It was interesting to observe the emptying of the quicksilver into its receptacle. The metal is very cleverly stowed away in bags of white sheep leather, specially prepared for the purpose, each containing 50 lbs. of the mass, the bags being tightly bound round the top, and then put into small wooden barrels, carefully bunged up. Formerly, this liquid metal, which penetrates easily all porous substances, was transmitted in wrought iron bottles of very expensive make.

ELECTRICAL GAS LIGHTING.—A novel device for lighting gas by electricity, lately patented, is made as follows: A glass cup is immersed in liquid; and when the gas is turned on, it enters under the cup and lifts the same, thereby establishing connection with a battery which heats a platinum wire placed over the burner, and thus ignites the gas. Mueller and Meier of Hanover, Germany, are the inventors.

## ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations in the following notes, I am indebted to students. M. M.

### Positions of Planets for July, 1873.

#### Mercury.

Mercury rises on the 1st of July at 6h. 18m. A. M., and sets at 9 P. M. It is not at its greatest elongation from the sun until the middle of the month; but as it then has a lower altitude at meridian passage, it cannot be so well seen as earlier in the month.

On the 31st it rises at 6h. 46m. A. M., and sets at 7h. 48m. P. M.

#### Venus.

Venus was at its greatest brilliancy on the 10th of June, at which time it was easily seen at noonday, and a glass of low power showed it as a beautiful crescent.

In the first half of July, it will pass the meridian a little before nine in the morning, rising on the 1st at about 2 in the morning, and setting at near 4 P. M. On the 31st Venus rises at 1h. 37m. A. M., and sets at 4h. 13m. P. M.

#### Mars.

Mars rises on the 1st at 30 minutes after noon, and sets a little after 4 in the morning. On the 31st it rises at 1h. 10m. P. M., and sets at 11 P. M.

Mars is easily known by its ruddy light; it passes the meridian in July before sunset, and can be seen in the southwest after twilight. But little can be seen of its peculiarities with a small telescope, although a powerful one will show very decided markings on its disk.

#### Jupiter.

Jupiter is still conspicuous in the evening sky among the stars of *Leo*. On the 1st of July it rises at 8h. 39m., and sets at 10h. 12m. On the 31st of July it rises at 7h. 12m., and sets at 8h. 28m.

It is much less favorably situated for observation than in the winter, and very few of the phenomena of its satellites are visible in this locality for the whole month.

#### Saturn.

Saturn is more favorably situated for observation, but it is so far south that it does not reach, when on the meridian, an altitude of much more than 27°. It will be best seen at midnight on the 22d of July. It is among the stars of *Capricornus*, rising on the 1st of July at 8h. 48m. P. M., and setting at 6h. 14m. the next morning.

On the 31st Saturn sets at 4h. 13m. in the morning, and rises again at 6h. 43m. P. M.

#### Uranus.

Uranus is still among the stars of *Gemini*, and is very unfavorably situated for observation, rising in the morning and setting at 9 P. M. on the 1st of July, and at 7h. 7m. on the 31st.

#### Neptune.

Neptune rises between 12 and 1 A. M. on the 1st of July, and sets a little before 2 P. M. On the 30th it rises at 10h. 39m. P. M., and sets at 11h. 46m. A. M., on the 31st.

#### Meteors and Sun Spots.

Meteors were frequent on May 1, but have thus far (June 18) been rare in this month. It has also been a very remarkable period for the absence of sun spots. No spot could be found on the sun's surface (a glass of low power being used) from June 13th to June 17th. On June 18th a very small one was perceived.

### New Planets Discovered in 1872.

Since the beginning of last year, twelve small planets have been discovered, as follows:

*Peitho*, discovered at Bilk, by R. Luther, March 15.

A not yet named planet, discovered at Ann Arbor, Mich., by Watson, April 3.

*Lachesis*, discovered at Marseilles, by Borelly, April 10.

A not yet named planet, discovered at Ann Arbor, by Watson, May 12.

*Gerda*, *Brunhilda* and *Alcestis*, discovered at Clinton, N. Y., by C. H. F. Peters, the two first on July 31, and the last on August 23.

A not yet named planet, discovered at Paris, by Prosper Henry, September 11, and two others, at the same observatory, by Paul Henry, November 5.

A not yet named planet, at Ann Arbor, by Watson, November 25, and another at Clinton, N. Y., by C. H. F. Peters, on February 5, 1873.

### Railways of Massachusetts.

Massachusetts has today invested in railroads one hundred and forty million dollars, of which eighty-one million is stock and fifty-nine million bonds, and there is one mile of road to each four and three fourth square miles of territory. This is a greater development than in any other portion of United States, and equals the average of any country in Europe. The average cost per mile is $51,250, and, adding equipment, $58,125. The gross earnings last year were over $30,000,000, and the cost of operating 72·2 per cent. The average dividend on stock of paying roads was 8 per cent.

### A Cheap Fire Alarm.

J. N J. says: Take an old gun or pistol; put a heavy charge of powder in it, and put it in the most dangerous place in a house or barn (near the rafters in the latter;) and if the building should take fire, it would immediately give the alarm, and thus might save many lives and much valuable property.

A STEAM wagon is to run from Nashville to Pulaski Tenn., commencing regular trips in October next.




### NOTES FROM THE VIENNA EXPOSITION.

The bird's eye view herewith presented of the vast building erected in Vienna will convey as good an idea of the magnitude and splendor of the World's Fair of 1873 as is possible in so small a space. The site chosen is the Imperial Park or Prater, along one side of which extends the new channel of the Danube, while on the other runs the Danube canal, which separates the Park from the city.

The central rotunda, with its conical roof, occupies the most prominent position in the view presented. It springs from the ground, a circular façade of piers of no less than 426½ feet in diameter, with Roman-Doric columns at either side, and connecting arches filled with glass. Within this is a gallery 50 feet wide, covered with its own roof, while above rises the great arcaded circuit. The large lantern seen above the roof is 105 feet in diameter, and is surmounted by a second lantern and cupola fully 300 feet above the ground. The rotunda stands in the middle of the grand quadrangle, which is 755 feet square. The vast central gallery or spine is 2,985 feet long, width 82 feet, and its hight from floor to wall plate 52½ feet. The cross galleries are 250 feet in clear length by 49 feet in width.

The machinery annexe is a substantial brick building, shown in our illustration to the rear of and parallel to the central gallery. It is intended to be permanent, and after the Exposition will be used for mercantile purposes. The extreme length is 2,614 feet, and the width nearly 155 feet in the clear. The side walls consist of brick piers, running up to the roof, with segment arching between, at a level to suit the side buildings. Ample means of lighting and ventilation are provided. Boiler houses are constructed at various points along the length of the building, and steam and water introduced from end to end.

The building faces the southwest. The thirty-two transverse galleries are for the reception of the lighter articles of industry, and the assignment of divisions to the different nations corresponds to their geographical situation, the extreme right or eastern division being given to India, and that to the extreme left or west to America. The gallery to the extreme left and front is occupied by the United States, and the gallery directly back of that by South America.

The Exhibition closes October 31, 1873.

#### THE EXHIBITION WATER WORKS.

The arrangement, as carried out, is the design of Professor Grimburg, and has for its object the supply of the fountains, hydrants, and fire engine reservoirs, the feeding of the boilers and the kitchens of the different restaurants, and also the sluicing of the water closets and other sanitary conveniences. The plan is as follows: For the supply of the high pressure water necessary for the fountains, hydrants, and water closets, a water tower, 138 Austrian feet high, was erected, this consisting of a reservoir of riveted boiler work, 24 feet in diameter by 20 feet in depth, supported on nine cast iron tubular columns, each 105 feet in hight, which stand on an octagonal pedestal of brickwork, 15 feet high. The columns are bound together and stiffened by means of wrought iron rings and diagonals; two of them serve as outlet pipes, while the third one, in center of the group, feeds the reservoir, which contains 8,000 cubic feet of water. This water tower furnishes about 18,000 cubic feet of water per hour, and supplies the fountains, nine in number, as well as 180 hydrants. It draws its supply from a well 18 feet wide and 22 feet deep, by means of a double cylindered horizontal steam engine of 100 horse power nominal.

Two of the larger fountains are fed by a separate apparatus, which serves also as a reserve to the water tower just described. The arrangement is rather peculiar, for there is no reservoir, the pumps forcing the water directly into the pipes which lead to the fountains. The plan is, says *Engineering*, an American one, and everything about it is original; the two engines, which are each of 50 horse power, work the pumps by direct action, without the intervention of cranks; as there are no crank axles, there can also be no eccentrics, and so the valves are worked by tappets. The well from which the water is drawn is in this case 12 feet wide by 20 feet deep, and has to furnish 6,000 cubic feet per hour.

The boilers and condensers of the machinery hall are supplied by another set of pumps, which are quite different from the two sets already mentioned. The system in this case is a sort of Norton's tube well on a large scale. Continuous iron piping is driven into the ground till water is reached, and then the pumps are attached to the heads of the pipes; thus no well is needed, and the water is sucked up through the pipes and delivered into a reservoir, which in this case is situated 18 feet above the level of the floor of the machinery hall. It will convey an idea of the requirements of a large exhibition in the matter of water when it is stated that the united length of the pipes connected with the waterworks in the Prater is about 12 miles.

#### BOILER ENGINEERING.

In respect to stationary boilers, the *Engineer* pronounces the display as disappointing and unsatisfactory. As regards size, the number of boilers of any importance is small. Nothing especially new is exhibited in this line, and little concerning the construction of the boilers shown can be learned, because they are so put up as to render it difficult and impossible to get at their dimensions with accuracy. Nothing is on exhibition to illustrate boiler construction, and this omission our cotemporary thinks is unfortunate.

#### THE AMERICAN FLAG.

The Austrians, in getting up a United States flag to adorn one of the transepts of the exposition building, left out all the stars, added two extra stripes, and set the flag as a signal of distress, that is, "Union down." So says a correspondent of the Boston *Advertiser*.

### Clarke's Combination Lock.

We were recently shown, by Mr. W. F. Beasley, the agent of the Clarke Lock Company of Louisville, Ky., a very ingenious and novel form of combination lock, as manufactured by the above corporation. It obviates the necessity of a key, acts as a secure fastening upon any object to which locks are applied, and also serves, upon doors, drawers, etc., as a convenient knob.

The device principally consists of a number of tumblers arranged in longitudinal slides on the periphery of an inner solid metal cylinder. Enclosing the latter there is another cylinder, within the inner end of which are radially disposed a number of small steel projections which take against the inner extremities of all but a certain number of the sliding tumblers, and thus prevent the acting of the fastening mechanism. The outer ends of the tumblers extend through an exterior small circular plate upon which are letters or other marks. By suitable means the tumblers can all be drawn forward at once; then by pushing in certain ones (previously known by the letters or otherwise distinguished) by means of suitably arranged notches in their extremities, permitting the projections to pass, the lock can be turned and the bolt drawn or withdrawn. It is impossible to open the lock without pushing in the right tumblers. The combination, or relative position of the latter, can be altered by interchanging their positions in the slides of the cylinder, a process easily accomplished.

The invention cannot be picked, as there are no orifices giving access to its interior, nor can the projecting lock be rotated by a wrench. The combination can be readily actuated in the dark, it being merely necessary to feel for the proper tumblers which, projecting, are easily distinguished. The mechanism is simple and not readily thrown out of order; and the device, as a whole, appears of considerable merit, both in design and construction.

### A New Telegraph Instrument.

Mr. G. M. Phelps, of the Western Union Telegraph Company has recently completed a printing instrument, for the use of the Gold and Stock Telegraph Company, which is really remarkable for its ingenuity and compactness. This instrument works on one line wire, without local batteries, has two type wheels, one for letters and the other for numerals, with a device for shifting the impression instantaneously from one to the other, and is capable of working continually at the rate of forty words per minute. The whole affair is, perhaps, eight inches in diameter, and of about the same hight. Mr. Phelps may well take an honest pride in this creation of his mechanical genius, as it is, probably, the most elegant printing instrument ever yet produced. It is probable that this machine will, in time, be exclusively used by the Gold and Stock Telegraph Company for their work, as its speed of transmission is nearly or quite five times as great as the one now in use by them.

### A Useful and Interesting Picture.

Messrs. Kimmel and Voigh, of Nos. 254 and 256 Canal street, in this city, publish a neatly executed lithograph which will doubtless prove an acceptable ornament on the walls of the houses of those to whom it is dedicated, the mechanics and tradesmen of the United States. The subject is a group of workmen engaged at their different occupations in the foreground, while the distance presents a view of a harbor with vessels, etc., and also of factories, railroads, bridges and other structures indicative of industrial pursuits. The picture bears the appropriate title "By industry we thrive—Progress our motto." It is of quite large size, and in execution is a fair specimen of recent advancement in the lithographic art.

### Hampton Normal and Agricultural Institute.

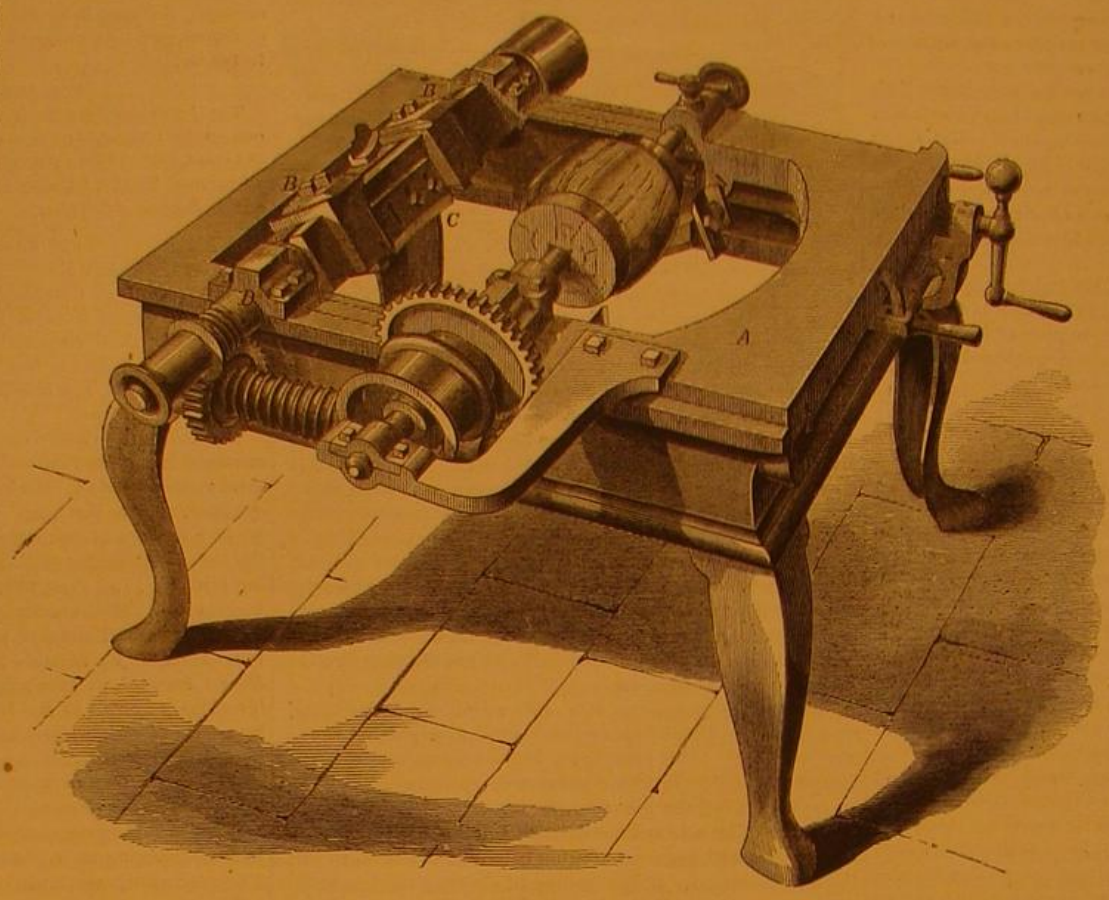
There has recently been established at Hampton, Va., an institution for technical education, where employment is furnished to colored students who are unable to bear the whole of their expenses; and thus they are enabled to help themselves. There are now 200 scholars of both sexes, whose ages range from 14 to 25 years. They are employed on the farm of the institute, and in the printing office, sewing room and laundry which are attached to the establishment. But these do not afford sufficient occupation, and it is proposed to add some light manufacturing business. Mr. S. C. Armstrong, the principal, will be glad to receive suggestions on this subject from any of our readers.

## IMPROVED HUB LATHE.

The accompanying illustration represents an improved hub lathe for turning the hubs of vehicle wheels, which is at the present time employed at the American Hub and Spoke Factory at Schoharie, N. Y.

The logs of elm, white oak, and birch are first cut with circular saws into pieces of proper length, which, after being bored by suitable machinery, are, while still untrimmed, with the bark on, placed in the lathe. The block is fixed to a mandril arranged on the sliding carriage, A, on which, by means of the power transmitted by the two spirally threaded shafts and cog wheels, gearing with the cutting shaft as shown, it is drawn up to the cutting knives, B and C. The latter somewhat resemble plane irons, but are shorter and stronger, and their edges are shaped to correspond with the edge of a vertical section of the hub. They are four in number, for each machine, and are fastened by bolts to the sides of the strong shaft, D, which is some four inches square. This shaft, by the pulley represented, is caused to revolve very rapidly, the knives, B, cutting the straight portion of the convex surface at the ends of the hub, and the blades, C, forming the curved and grooved central portion. The diameter of the hub is regulated by putting a pin in a hole in the frame on which the carriage moves. The lathes are of different sizes, each being adjustable to work of varying dimensions. The smallest hubs made are six inches long by three in diameter, and the largest eighteen by twenty inches. At the factories above mentioned machines are in operation, turning daily from forty to fifty sets of the larger sized hubs, and from sixty to eighty sets of buggy hubs. The smaller sizes are finished, we are informed, in less than one minute, and the larger sizes in from one to two minutes. It is claimed that the work is performed better than it can be accomplished by hand, for the reason that the hubs are turned perfectly smooth and of exact uniformity in size and style.

For further particulars regarding sale of machines, rights, etc., address the owner of the patent, Mr. Treat Durand, Schoharie, N. Y.




RICKART'S PATENT HUB LATHE.

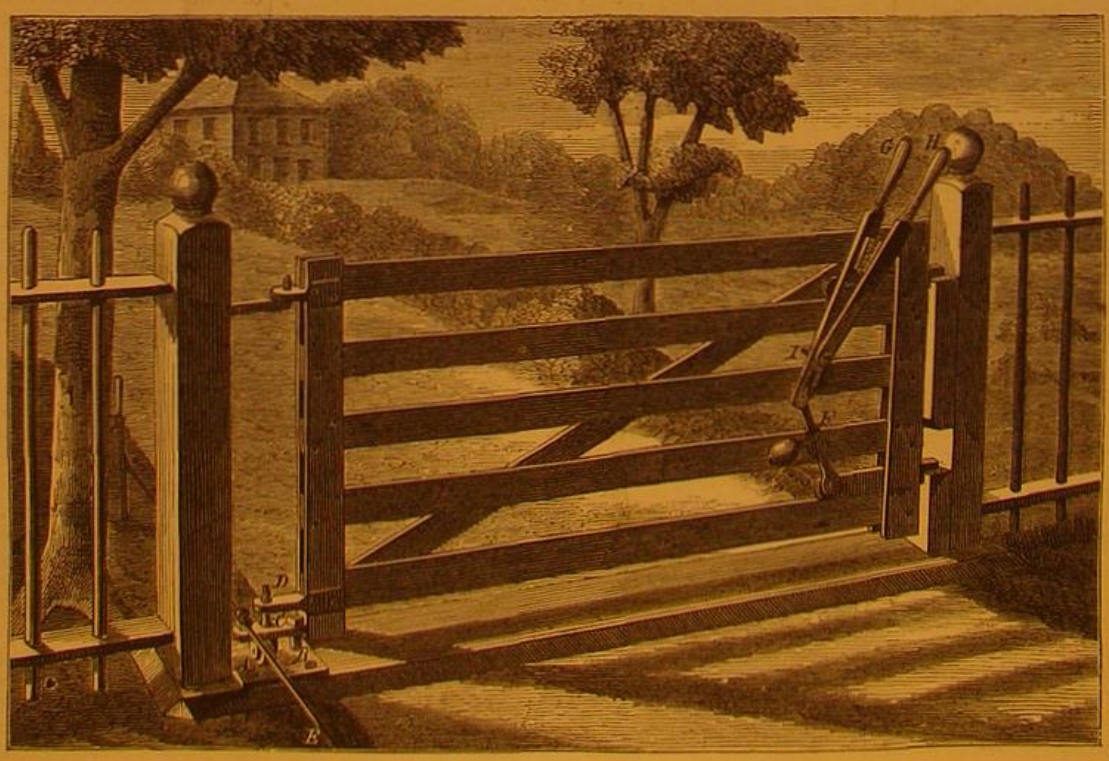
## IMPROVED FARM GATE.

The invention represented in the accompanying engraving is an improved form of farm gate, with which is combined suitable mechanism for opening and closing, which is actuated by the operator some distance off, thus enabling a person to operate the gate without alighting from his carriage. The construction of the device is also such that it is not liable to be pushed open by cattle rubbing against it.

On the hinge post, and a little above the ground, is attached an inwardly projecting metal plate, A, to which, near its free end, is fastened a short stud, B. The latter serves as a pivot for the short arm, C, through the middle part of which passes a pin carrying a small wheel at its lower end. This wheel rests upon the plate, A, and is beveled so that it may readily cut through ice or snow that may pack upon said plate. The upper end of the pin enters the strap, D, attached to the gate. On the inner extremity of the short arm, C, is formed a projection to receive the eyes of rods, E, which extend from the gate in opposite directions, as shown, and communicate with hand levers suitably arranged. The latter are located at the side of the roadway at such a distance from the gate that the operator will be out of the way of the same when it swings open or shuts.

By this construction, when the inner end of the arm, C, is moved in either direction by the rods and levers just mentioned, the forward end of the gate, is raised, when the latter becomes unlatched and swings open in a contrary direction; or similarly, by actuating the lever in the opposite way, the gate may be caused to shut. The use of the forward end enables the gate to swing over snow, ice, or any other temporary obstruction. The two latches shown work in slots in the upper and lower parts of the forward crossbar and engage in the catches on the front post. The inner end of the lower latch is pivoted to a short lever, F, also pivoted to the gate, and connected similarly with a lever, G, which projects above the gate, and is readily operated. To the lever, F, is attached a weighted arm, which serves to throw the latches forward into position. H is another hand lever hinged to the lever, G, as shown, and having at its lower end a pin, F, which passes through an orifice in the latter. By this means the lever, G, cannot be worked to withdraw the latch without pressing the handle of the lever, H, inward, and so pulling out the pin, I. This device serves to prevent cattle from opening the gate by rubbing against it. The gate may be constructed of wire, iron, or any other suitable material.

Patented through the Scientific American Patent Agency, June 10, 1873. For further information, address the inventor, Mr. Cyrus E. Gillespie, Edwardsville, Madison Co., Ill.




GILLESPIE'S FARM GATE.

### Alcohol in Bread.

In the ordinary process of bread fermentation, a portion of the sugar contained in the flour is decomposed and converted into alcohol. It has been heretofore supposed that by the heat of baking the whole of this alcohol was expelled, but recent experiments, made by Thomas Bolas, in London, indicate that a perceptible amount of alcohol still remains in yeast-raised bread after baking. The result of six experiments showed that one third of one per cent in weight of alcohol was obtainable from fresh baked bread; but the quantity of alcohol was much less in stale bread. From forty loaves of fresh bread, two pounds each, alcohol equal to one bottle of port wine may be extracted. From what is known as "aerated bread," or bread raised by mixture of carbonic acid gas with the dough, without fermentation, no alcohol can be extracted.

### Fabricating Sulphate of Ammonia from Nitrogenous Waste.

A great quantity of nitrogenous substances, such as the waste or clippings of wool, skins, leather, horn, feathers, sponge, etc., are thrown away in various industries; these materials contain from six to fifteen per cent of nitrogen, and often enter into the fabrication of so-called organic manures. Their putrefaction in the soil is, however, a very slow process, hence it is of importance to obtain their nitrogen in the more assimilable state of ammonia. To effect this, M. L'hote proposes the following process:

When the substances are treated with a tenth part of solution of caustic soda, cold or slightly warmed, in order to avoid an ammoniacal production, they are not only dissolved but completely disaggregated. The viscous liquid so prepared is then mixed with slaked lime to form a pasty mass, which is introduced into a cast iron retort which communicates with receptacles containing chambers of sulphuric acid. Distillation is effected (at as low a temperature as possible, in order to avoid the dissociation of the ammonia) until all disengagement of gas ceases when the retort is brought to a red heat. When the operation is concluded, a white pulverulent residue is found, composed exclusively of carbonate of soda and quicklime, which treated with water, regenerates the caustic soda, which may be again employed. The sulphate of ammonia obtained is colored but may be purified by crystallization. If care be taken to operate on a homogeneous mixture of nitrogenous and alkaline wastes, all the organic nitrogen may be recovered in the state of ammoniacal nitrogen as the product of distillation.

### Dissolving Action of Glycerin on the Oleates and on Sulphate of Lime.

M. Asselin has made a series of researches with the view of determining the solubility in glycerin (1) of soaps, made with metallic bases, of magnesia, and of lime; (2) of soaps (*sous-savons*) made with an excess of base; (3) of the sulphate of lime of calcareous waters.

Operating with pure glycerin of a density 1·114 he obtains the following results: 100 parts glycerin dissolve 0·71 soap, iron base; 0·94 soap, magnesia base; 1·18 soap, lime base.

A series of experiments upon the metallic and earthy soaps of the second class above mentioned, which impregnate the fibers of wool during carding, gave variable figures, due to the badly defined composition of the materials treated. A quick emulsion was obtained in water charged with glycerin, in a degree directly proportional to the recent formation of the soap. Sulphate of lime and, notably, the compound $(CaOSO_3)^2$ H O dissolved in the proportion of 0·957 in 100 parts of glycerin. Moreover, and contrary to the case with pure water, the ratio of solubility augmented with the elevation of temperature.

Considering these facts and the hygrometric properties of glycerin, the part which it should fill in woolen industries is clear. Its moderate employment will permit of the fabrication of tissues in plain tints and light colors which have been generally regarded as impossible to obtain, and the soft feeling which it communicates to the wool will give a real superiority to the cloth made therefrom, and will, by increasing the flexibility of the fiber, render it more durable.

DR. JOSEPH G. RICHARDSON, of Philadelphia, has discovered that the corpuscles of the saliva are migrating white blood-globules. So, the more you spit, the more you rob your system of blood. Smokers and tobacco chewers, take notice.

# Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

**TERMS.**

One copy, one year..... $3 00
One copy, six months..... 1 50
CLUB RATES { Ten copies, one year, each $2 50..... 25 00
{ Over ten copies, same rate, each..... 2 50

VOL. XXIX., No. 1 . . [NEW SERIES.] *Twenty-eighth Year.*

NEW YORK, SATURDAY, JULY 5, 1873.


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## AN IMPOSITION UPON THE PUBLIC.

That meritorious inventions should receive protection by patents is generally conceded. Such has been the practice during nearly the whole of our national existence, and rightly so. The great benefits resulting to the country urge a continuance of a liberal policy towards inventors. On the other hand, we must not be unmindful of the fact that the numerous industries of the nation have a claim for protection against the creation of oppressive and improper monopolies. By this we mean that the grant of patents for old devices which have, for many years, been made, sold, and used by the public upon the faith that a patent neither existed nor could be granted, is both oppressive and wrong. There is neither law nor warrant for depriving the public of vested right, created by lapse of time and *laches* and abandonment on the part of the alleged originator, nor for the placing of the device exclusively in the hands of such alleged originator and his assignees.

But this is virtually what has taken place by the grant of a patent, bearing date April 29, 1873, to Joseph P. Woodbury, of Boston, Mass., for an alleged improvement in planing machines, consisting, in brief, of the use of yielding pressure bars in planing machines. It will be interesting to our readers to learn something of the facts of this extraordinary case, since, as it appears by the records in the Patent Office, this application for the patent was made as early as June 3, 1848, nearly twenty-five years prior to date of issue of the patent. The device was not only in public but common and almost universal use, on planing, tonguing and grooving, molding, and veneer cutting machines, between the time the Patent Office refused to grant the patent and its present date of issue, and this with the knowledge and acquiescence (presumptively) of the said Woodbury himself. In fact, it was a device mainly originated to get around the Woodward patents, so many years in litigation, and held by the courts to be an equivalent of it.

As against the equities of the public in this matter, it is contended that Mr. Woodbury made repeated efforts to obtain a patent after so filing application in the year 1848, and that his case was withdrawn in October, 1852, and the government fee of $20 was then returned to his attorney without the applicant's knowledge. But, granting all this, it still appears that, from October, 1852, until December, 1872, nothing further was done by the inventor towards obtaining a patent. Section 11 of the act of 1839 provided him with an appeal to the District Court of the United States for the District of Columbia; and he did not choose to avail himself of the remedy, in order to test his right as against that of the public. Was there ever a clearer case of intentional abandonment?

The statute under which this case was resurrected is the 35th section of the act of 1870. It, in general terms, permitted the renewal of rejected or withdrawn cases for a period of six months after the date of the passage of said act. But few interested were probably aware of this questionable piece of legislation until after the period and privileges had alike passed away, except the initiated few, who got the bill passed to admit of just such cases as the one under discussion. Congress, in reviving expired patents, invariably provides for the unrestricted use of machines made after expiration of the grant sought to be revived, and in use at the time of seeking the aid of that body for renewal of the patent, by excepting them as being lawfully made and used. By this Woodbury grant, however, existing machines are claimed to be tributary from date of the patent.

We venture to state that Congress had no such intention in the passage of the general statute under color of which this gigantic monopoly has been granted. Such a grant ought not to be sustained against any machines, whether built before or after date of its issue, because of the uninterrupted making and using having been so long vested in the public with the full knowledge and acquiescence of the alleged inventor.

Congress may, under certain circumstances, with propriety appropriate from the public funds a sum of money to an inventor, if it appears that he is raised by his invention to the dignity of a public benefactor; but it scarcely would, while guarding the worthy and diligent inventor, take from the community that which has unquestionably vested in it by reason of lapse of time and other causes. Such was not the intention of that clause of the constitution giving Congress power to enact laws to promote the progress of the useful arts; and such is against the spirit and fair interpretation of the laws already enacted in pursuance thereof.

The patent is but *prima facie* evidence of an existing right, and the whole matter will no doubt be thoroughly ventilated in the courts should any attempt be made to enforce it by legal proceedings.

## SCREW THREADS---ENGLISH AND AMERICAN PROPORTIONS.

A correspondent recently asked for the standard proportions of the Whitworth screw thread. They are given below, as communicated by Mr. Whitworth, to the Institution of Civil Engineers, in 1841. We have also added the standard American proportions, which were published some years ago, and may be acceptable to some of our readers. They were communicated to the Franklin Institute, by a committee appointed for that purpose, in 1864:

PROPORTIONS OF THE WHITWORTH THREAD.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Diameter in inches, | 3/16 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | 5/8 | 3/4 | 7/8 | 1 |
| Threads per inch, | 24 | 20 | 18 | 16 | 14 | 12 | 11 | 10 | 9 | 8 |
| Diameter in inches, | 1 1/8 | 1 1/4 | 1 3/8 | 1 1/2 | 1 5/8 | 1 3/4 | 1 7/8 | 2 | 2 1/4 | 2 1/2 |
| Threads per inch, | 7 | 7 | 6 | 6 | 5 | 5 | 4 1/2 | 4 1/2 | 4 | 4 |
| Diameter in inches, | 2 3/4 | 3 | 3 1/4 | 3 1/2 | 3 3/4 | 4 | 4 1/4 | 4 1/2 | 4 3/4 | 5 |
| Threads per inch, | 3 1/2 | 3 1/2 | 3 1/2 | 3 1/2 | 3 | 3 | 2 3/4 | 2 3/4 | 2 3/4 | 2 3/4 |
| Diameter in inches, | 5 1/4 | 5 1/2 | 5 3/4 | 6 | | | | | | |
| Threads per inch, | 2 3/4 | 2 3/4 | 2 1/2 | 2 1/2 | | | | | | |

Angle of threads = 55°. Depth of threads = pitch of screws. One sixth of the depth is rounded off at top and bottom. Number of threads to the inch in square threads = 1/10 number of those in angular threads.

STANDARD AMERICAN PROPORTIONS.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Diameter in inches, | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | 9/16 | 5/8 | 3/4 | 7/8 | 1 |
| Threads per inch, | 20 | 18 | 16 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
| Diameter in inches, | 1 1/8 | 1 1/4 | 1 3/8 | 1 1/2 | 1 5/8 | 1 3/4 | 1 7/8 | 2 | 2 1/4 | 2 1/2 |
| Threads per inch, | 7 | 7 | 6 | 6 | 5 1/2 | 5 | 5 | 4 1/2 | 4 1/2 | 4 |
| Diameter in inches, | 2 3/4 | 3 | 3 1/4 | 3 1/2 | 3 3/4 | 4 | 4 1/4 | 4 1/2 | 4 3/4 | 5 |
| Threads per inch, | 4 | 3 1/2 | 3 1/2 | 3 1/2 | 3 | 3 | 2 3/4 | 2 3/4 | 2 3/4 | 2 1/2 |
| Diameter in inches, | 5 1/4 | 5 1/2 | 5 3/4 | 6 | | | | | | |
| Threads per inch, | 2 1/2 | 2 3/4 | 2 3/4 | 2 1/2 | | | | | | |

Angle of threads = 60°. Flat surface at top and bottom = 1/8 of the pitch. For rough bolts, the distance between parallel sides of bolt head and nut = 1 1/2 diameters of bolt + 1/8 of an inch. Thickness of head = 2/3 distance between parallel sides. Thickness of nut = diameter of bolt.

In finished bolts, thickness of head = thickness of nut. Distance between parallel sides of a bolt head and nut, and thickness of nut, are 1/16 of an inch less for finished work than for rough.

## FIRE LADDERS.

Considerable attention has of late been directed to the subject of mechanical or folding ladders, and it is proposed to supply the fire department of this city with them. Of course the very best invention in this line is what is wanted; but if we may judge from the existing productions, there is still opportunity for ingenious people to work out new ideas. We are inclined to think that a steam machine of this kind, or a carbonic acid gas machine, might be devised and made to operate advantageously. At present the sliding ladders are all of them worked by hand power, by ropes and winches; and the aim has been, by diminishing weight, to render them easily operated; but this involves lack of stability. To be of real service, they must be made firm enough to resist danger of capsizing from ordinary causes, such, for example, as a blow of wind. In London they have been found defective in this respect.

During a recent trial in this city, another defect in stability was brought out. The ladders tried were those of the Uda pattern. It operated quite successfully in the facility with which it could be run up to a hight, bearing a man with hose pipe, mounted on the summit. But when the water was let suddenly on, the ladder began to straighten perpendicularly and was on the point of toppling over backward, when chief engineer Bates, of Boston, rushed forward and with a pocket knife opened the hose pipe, thus instantly reducing the water pressure and saving the fireman's life. It is evident that stability, under the force exerted by sudden application of a head of water to the hose pipe, is another quality that the coming fire ladder must possess.

The subject is an important one, and whoever can devise a first rate implement will render an important service to his fellow men.

## PROGRESS OF WOMAN'S RIGHTS.

Miss Anna Nichols, of Massachusetts, has recently been appointed an assistant examiner in the Patent Office. The lady has for some time very creditably fulfilled the duties of clerk; and on the occasion of some vacancies in the examinerships, she was one of several ladies who competed for places. All of the candidates were subjected to a general scientific examination as to their capabilities for the position, and four ladies passed the ordeal with much credit. The Commissioner, however, concluded to appoint only one of them for the present, as a sort of experiment.

There are few duties connected with the operation of the Patent Office but may be efficiently performed by intelligent women. It is all indoor work, mostly of a fixed, clerical nature, for which petticoats are admirably adapted; and if the Commissioner would make a more general use of them, he would set free a large number of pantaloons to be usefully employed in developing the more direct outdoor industries of the country, for which men are, by nature, so especially prepared.

At Canandaigua, in this State, Miss Susan B. Anthony, who insisted that she had as good a right to vote as any other man, and who did vote at the last election, has been tried and, we regret to say, found guilty, and fined for violating the law. Judge Hunt decided that, although women were entitled to the general rights of citizens, there were certain special privileges which the law of New York, as it stands, did not give them, one of which was the privilege of voting. The law must, in the opinion of Judge Hunt, be changed before our feminine fellow citizens can enjoy themselves at the ballot box.

In the meantime, the Commissioner of Patents having wisely decided in favor of the eligibility of women as patent examiners, we shall hope to see his decision sustained and ratified by the appointment of Miss Anthony as his successor when he shall retire—and that day, we understand, is not far distant. The lady in question is a female steamboat, so far as untiring energy and useful capacity are concerned. She is, undoubtedly, competent to manage a dozen or two of sleepy institutions like the Patent Office. We nominate, for Commissioner of Patents, Miss Susan B. Anthony, of New York, and Miss Anna Nichols for Assistant Commissioner.

## A PATENT CONGRESS.

It will be remembered that, when the prospectus for the present exposition at Vienna was announced, the Austrian government appealed to the United States, requesting that a full display of the new and ingenious productions of this country might be supplied.

We took occasion to point out the hindrances to a compliance with the Austrian request, and showed that, owing to the illiberal nature of the Austrian patent laws, American inventors could not obtain proper protection for their new improvements in that empire; and that unless better security could be immediately assured to our citizens, they would be likely to take but little share or interest in the exposition.

The result has fully justified our interpretation of the feelings of American inventors and manufacturers. The exhibit from this country, though good in quality, is scanty as compared with what it undoubtedly would have been, had the Austrian government been a little more compliant in respect to inventive protection. Instead of granting protection to Americans, all that the Austrians could be induced to do was to agree to favoring the assembling of an International Congress for the purpose of talking over the subject of patent laws in general, and the propriety of promoting the enacting of uniform patent laws in all European states.

This Congress is to meet in Vienna during the present summer, and the President has recently appointed, as a special delegate from this country, the Hon. J. M. Thacher, now Assistant Commissioner of Patents. This appointment is an excellent one. Mr. Thacher is a gentleman of ability, and his extended official experience will enable him to present the clearest explanations of the working of our patent system, and the needs of our inventors in respect to patents in foreign countries.

The Department of State, in officially notifying us of the appointment of Mr. Thacher, requests our views upon the points accompanying the following letter:

DEPARTMENT OF STATE,
WASHINGTON, June 17, 1873.

*Messrs. Munn & Co., New York city.*

SIRS:—An International Patent Congress is about to be held in Vienna, at which it is proposed that the United States be represented. In order that the interests of American inventors and manufacturers may be properly represented thereat, information is desired on the subjects of inquiry subjoined hereto.

Will you have the goodness to answer the several inquiries, or such of them as you may think proper to reply to, and return your answer to Hon. J. M. Thacher, Acting Commissioner of Patents, Patent Office, Washington?

As it is understood that the Congress will convene early in August next, it is very desirable that your answer may be received by Mr. Thacher before the first of July. I have the honor to be, Very respectfully yours,

HAMILTON FISH.

SUBJECTS OF INQUIRY.

1. Is the protection of inventions by patents just and expedient, and, if so, on what grounds?
2. To whom and for what should patents be granted?
3. Should the grant depend on preliminary official examination?
4. What limitations are proper, if any, as to manufacture of the patented article, or payment of additional fees?
5. Should a distinction be made between home and foreign applicants, and, if so, what?
6. What has been the influence of patents on manufacturing interests in this country? Examples.
7. If a manufacturer, how is your special branch affected by patents?

Statistical, as well as general information is desired, and also suggestions in relation to any other matter connected therewith.

REMARKS BY THE EDITOR.—Each of these questions would form the subject of an elaborate essay, which at present we cannot undertake. We shall leave their extended discussion to our various readers. The Secretary of State is desirous of drawing out as general an expression of views as possible.

We suggest to those who take part in the discussion that they send us copies of their remarks, with the understanding that such portion thereof as the editor approves may be published in the SCIENTIFIC AMERICAN.

We will now give as briefly as possible some of our views, suggested by the enquiries above offered:

1. A patent is a private monopoly, which is a species of tyranny, an infringement of equal rights, and therefore untenable on the ground of justice. The invention by an individual of a new device by which his fellow men are benefitted does not entitle him, by any process of natural right or natural justice, to be a monopolist over his fellows, in respect to such article. On the contrary, every man in every community is bound by the strongest natural obligations freely to contribute his best powers of mind and body to promote the common welfare. Patents are therefore granted upon the ground of expediency, not of justice.

2. For the purpose of encouraging or quickening the growth of the useful arts, and spreading among the people a practical knowledge thereof, so that all who desire may find employment and profit from the new forms of industry, articles or processes thus brought out, it has been found expedient to grant patents for a limited period. Patents should therefore be issued for every new and useful article, process, device or manufacture, and, obviously, should be granted only to the original and first discoverer.

3. The grant of a patent is simply the issue by the government of a stamped receipt or piece of paper certifying that the holder has deposited a proper description of his invention, which, if new and useful, entitles him to a special monopoly thereof during the term of the patent.

To give occular importance to these documents, the ancient governmental custom was to write them on skins, attach great seals and ribbons thereto, and otherwise make an official fuss over the same. In England the skin and the big seal are still employed. The inventor, on filing his specification, receives the skin of a sheep, on which is printed a long rigmarole about "Victoria by the grace of God, Queen," etc. The document is signed by His Highness This, and My Lord That, and stamped with an immense seal of wax, one pound in weight, put up, for security, in a round tin box.

In this country we have, within a few years, abandoned the use of skins, high sounding words and other paraphernalia in connection with the issue of patents, but we contrive to make fuss over them in other ways.

The Commissioner of Patents must go through the formalities of an official examination as to the novelty of the invention, which consumes a deal of time and subjects the applicant to great inconvenience, delay and expense. This examination is of no real use, because, after all, it is the Court that decides whether the invention is new and useful.

The process of official preliminary examination at the Patent Office is attended with a variety of troubles, expenses and difficulties.

(a.) It involves the employment on the part of the government of a large number of officials, for whose support, and the materials they consume, the inventors, who are mostly poor persons, are heavily taxed.

(b.) It involves the employment of examiners to revise and correct the mistakes of assistant examiners; and of appeal boards, to revise and correct the mistakes of the examiners.

(c.) It involves the time and energies of the Commissioner of Patents, in the hearing of appeals from the appeal board, to revise and correct the decisions of such board.

(d.) It involves the time and labors of the District Court in hearing appeals from the decisions of the Commissioner of Patents, for the purpose of revising and correcting the decisions of the Commissioner.

(e.) It involves the employment, and support by the inventors, of an army of lawyers and agents, for the purpose of explaining law points to the Patent Office officials, pointing out to them the mistakes they have made in their examinations and decisions, obtaining the correction of such mistakes, putting in amendments to suit the whims of examiners, preparing, arguing and attending to appeals, etc.

(f.) In many cases, the applicant for a patent, unable by writing to explain away the objections brought by the Patent Office examiner, is obliged to travel in person from some distant part of the country to Washington, and then employ the help of a solicitor to assist the official in seeing and rectifying the official mistake.

(g.) Inventors are thus obliged to employ and support two distinct corps of helpers, in order to obtain a certificate for a patent, which, when obtained, is of uncertain value, because the Patent Office may subsequently grant another patent for the same thing to another party, or the Court, on trial of the patent, may decide that the invention lacks novelty, and that the Patent Office made a mistake in its official preliminary examination.

If any body doubts the worthlessness of Patent Office official examinations, let them read such decisions as that of Judge Blatchford in the refrigerator patent case, reported in the SCIENTIFIC AMERICAN of June 28, 1873. In that case, the Patent Office not only examined, but re-examined, and re-examined its re-examination, and decided each time that the device was new, putting the parties concerned to the greatest trouble and expense through a series of years, only to have it pointed out by the court, in the clearest manner, that the official Patent Office examinations were nothing but blunders.

For every case of this sort actually brought into court there are hundreds that are never made public because the worthlessness of the Patent Office examination is detected by the lawyer before the suit has progressed, and proceedings are not begun or, if commenced, are at once stopped.

(h.) In other cases, where the inventor is entitled to a patent, he is rejected by reason of the stupidity and incapacity of the official examiner; and on account of poverty, unable to pay the expenses of further prosecution, the applicant is compelled to abandon his attempt to procure a patent.

In view of the foregoing considerations, we think that the grant of the patent should not depend on the preliminary official examination.

The Patent Office should be simply an office for the registration and issue of patents. The official examination should be simply clerical, the only requirements being that the specifications and drawings are executed in accordance with prescribed rules. This done, and the fees paid, a certificate of patent should be promptly issued to every applicant.

Let those who are foolish enough to pay fees for a patent on an old invention do so. The number will be small, and they will harm none but themselves.

The abolition of the official examination would simplify the business of issuing patents, greatly reduce the cost of obtaining them to those for whom alone they are intended, and would necessarily result in giving renewed development to useful improvements of every kind.

The official examination was formerly essential in the grant of a patent, for then only one copy of the patent existed, and all additional copies had to be made by the hands of scribes, just as the Bible was formerly copied and circulated. But the matter is now entirely changed and presents itself in a different aspect. The publication of the drawings and specifications of all patents, in the cheap, popular, and admirable style in which they are now issued by our government, renders the work of official preliminary examination at the Patent Office superfluous. The inventor may now readily supply himself, or get access to every patent ever issued, and so become his own examiner. His eye is always quicker to detect resemblances or differences than any official examiner can be, and he understands better than the official what ought or ought not to be claimed.

4. The idea generally prevails in Europe, and also to some extent in this country, that by the grant of a patent the government gives away to the inventor a valuable privilege, for which the receiver should pay high fees in money, or place himself under obligations to do certain other things, well nigh impossible. This, we think, is a false idea and should be discarded.

If there is any obligation conferred by either side, it is on the part of the inventor, who, for the paltry reward of a temporary patent, places the government in possession of his new invention, from which, in due time, by the spread of the improvement and the creation of new industries among the people, the government is strengthened, its taxable resources increased, and the wealth of the nation augmented.

The object of granting patents is to encourage men to study, experiment and find out new arts.

The *introduction* or manufacture of a newly discovered thing is a different kind of labor from that of invention.

The one is the exercise of mind upon matter.

The other is simply the manipulation of matter into known forms.

Hence the patent should not be issued with any limitations as to manufacture, nor should new fees be demanded.

It should be clearly understood that the patent, when issued, is the exclusive property of the inventor, throughout its entire term, issued to him in reward for his discovery. It should be subject to no official interference, liable to no taxes. This is the only straightforward, equitable and satisfactory method. The attempt to make manufacturers out of inventors as they do in Canada, Austria, and other countries, by nullifying the patent if the inventor fails to manufacture under his patent within a specified time, is an utter failure. The only result is to defraud the original inventor out of the money he paid to procure the patent, besides robbing him of all his rights under the patent.

5. No distinction should be made between home and foreign applicants for patents. What we need, as a people, for the promotion of industry and the supply of constant employment for our teeming population, is the greatest possible variety of new and useful arts and industries. Let us have these arts and industries, no matter where their authors live, gladly granting the cheap price of a patent certificate for their procurement.

6. The influence of patents on manufacturing interests in this country has been beneficial in the highest degree.

In addition to the ordinary productions made by the common appliances, the fabrication of patented articles by means of these appliances has vastly contributed to the wealth and prosperity of our manufacturing interests. Think of the enormous number of men, with engines, wheels, lathes, hammers, and ordinary tools of every kind, now constantly employed in the fabrication of patented articles. Add to this the extraordinary number of patented tools that have been given to our manufacturing interests by means of patents, whereby human labor has been rendered more powerful, more effective, and more economical, and the sum total of benefit thus derived will be marvelous.

7. We only manufacture the SCIENTIFIC AMERICAN, which has now been published twenty-eight years. It has been so favorably affected by patents, and by the increased desire for scientific information which the studying out of improvements produces, that its regular issue has risen from one hundred and fifty copies per week to almost fifty thousand copies per week.

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OLD PROBABILITIES, the modern clerk of the weather, is about to establish a station on Pike's Peak. We shall be likely to know what is going on in the upper regions, for the Peak is 11,497 feet above the level of the sea.

## SCIENTIFIC AND PRACTICAL INFORMATION.

### NEW CHLORIDES OF PROPYLENE.

M. Reboul states that, in addition to the ordinary chloride of propylene, $CH^3—CH—Cl—CH^2Cl$, and methyl-chloracetol, $CH^3—CCl^2—CH^3$, already known, there are two others, namely: Normal chloride of propylene, $CH^2—Cl—CH^2—CH^2Cl$, and chloro-propylol, $CH^3—CH^2—CH\,Cl^2$.

### PERILS OF SURGEONS WHILE OPERATING.

The *Bordeaux Medical* states that Dr. Marc Girard, an eminent surgeon of that city, has lately died from a prick of a pin. He was operating upon the shoulder of a patient for a wound in which mortification had set in, and in placing the last sutures he accidentally scratched his finger. The effects appeared trivial, and the hurt soon apparently healed, but shortly after again inflamed, the poison extending through the body, and a lingering death was the result. M. Declat states positively that there is no necessity for any ill effects as above being caused by inoculation of the blood of either a diseased patient or the cadaver, when so simple and sure an agent as carbolic acid will promptly and almost infallibly arrest them.

### STEEL LOCOMOTIVE BOILER.

*Engineering* of recent date contains the following items regarding a new steel locomotive boiler, made at the Crewe works of the London and Northwestern Railway, from the designs of Mr. F. W. Webb. It is of the ordinary type and the barrel is made telescopic, the mean inside diameter being 3 feet 11 inches and the plates $\frac{13}{32}$ inch thick. The most noticeable peculiarity is the system of fire box construction, which consists of forming the front, back, and sides of one plate. A portion is cut out of the front and the plate is flanged back to receive the tube plate. The ends of the plate are made in a jump joint under the tube plate and secured by a welt on the outside. The plate forming the top of the fire box is flanged down on three sides, and is riveted to the side and back of the box and to the tube plate. In order to insure a good joint around the tube plate, a copper calking strip is introduced between the flanges, so that the joint can at any time be repaired from the inside of the fire box. A $\frac{5}{16}$ inch plate is used for the body of the box, and a strong plate, $\frac{7}{8}$ inch thick, for the tubes. The dome is formed of one piece flanged at the bottom. The cover is made from a flat steel plate $\frac{1}{2}$ inch thick, and is stamped under a steam hammer into the required shape, the stamping being done by two blows of the hammer. There are 178 tubes of steel, $1\frac{3}{4}$ inches outside diameter. The tensile strength of the plates employed does not exceed 32 tuns to the square inch, and they will stretch 25 per cent before breaking. The boiler was subject to a test, by hydraulic pressure, of 200 lbs. per square inch before leaving the works.

### CLEANING GUNS WITH PETROLEUM.

Greasing a weapon with fats and oils does not entirely protect it from rust; the so-called drying oils get gummy and resinous, while the non-drying oils become rancid; and by exposure to the action of the atmosphere, acids are formed, and these attack the iron. These are some of the reasons why petroleum is to be preferred for this purpose. Petroleum, is as great an enemy to water as are the fatty oils; and hence, when a gun barrel is covered with a thin film of petroleum it keeps the water away from the metal which forms the barrel; the water which rests upon this film of petroleum evaporates, but the oil does not, and hence no rust can be formed. It is very essential, however, that the petroleum or kerosene employed be perfectly pure, for impure oil, such as is often met with in commerce, attacks the metal. Care must also be taken not to allow it to come in contact with the polished stock, as it is able to dissolve the varnish.

The gun is cleaned as follows: Each rifleman carries a tin flask of pure kerosene and a round brush, of stiff hogs' bristles, which fits the barrel of the gun. The brush is screwed to the ramrod. The gunner also carries some dry hemp or tow. When about to clean a gun, some tow is wrapped about the rod and enough petroleum poured upon it to thoroughly moisten it; it is then pushed in a rotary manner through the barrel and back a dozen times, and the hemp taken out and unrolled, and the upper and lower ends of the barrel rubbed with the clean part, after which it is thrown away. This removes the coarser portion of the dirt. The brush is then moistened thoroughly with petroleum and twisted into the barrel, running it back and forth at least a dozen times, thus loosening the dirt that is more firmly attached to it. The first operation is now repeated, except that the hemp or tow on the rod is left dry, and the rubbing with this must be continued in all directions as long as it comes out soiled. The use of wire brushes is objectionable for cleaning guns, as the numerous little steel points cut into the tube. Only soft tow, hemp, woolen rags, or the like, should be used, as the petroleum dissolves off the dirt sufficiently.

### PURIFICATION OF LUBRICATING OIL THAT HAS BEEN USED.

We find the following details of a practical method for regenerating lubricating oils given in an Austrian paper: A wooden tub holding 63 quarts has a faucet inserted close to the bottom and another about 4 inches farther up the side. In this apparatus is placed 7 quarts of boiling water, in which are then dissolved $4\frac{1}{2}$ ozs. chromate of potash, $3\frac{1}{2}$ ozs. carbonate of soda, $3\frac{1}{2}$ ozs. chloride of calcium, and 9 ozs. common salt. When all these are in solution, 45 quarts of the oil to be purified is let in and well stirred for 5 or 10 minutes; after which it is left to rest for a week in a warm place, at the expiration of which time the clear pure oil can be drawn off through the upper stop cock without disturbing the impurities and cleansing fluid at the bottom.

## NEW BOOKS AND PUBLICATIONS.

FLOW OF WATER IN RIVERS AND CANALS. By D. Farrand Henry, Chief Engineer of the Detroit Water Works. Detroit: W. Graham, 52 Bates Street.

This is an able treatise on a very difficult and interesting subject; and, written as it is by a competent authority, must be considered as an important contribution to our knowledge of hydrostatics. It was originally published in the *Journal of the Franklin Institute.*

THE AMERICAN NEWSPAPER DIRECTORY: containing accurate Lists of all the Newspapers and Periodicals published in the United States and Territories, and the Dominion of Canada and British Colonies of North America. New York: George P. Rowell & Co., 41 Park Row.

This valuable compilation is here issued in a new edition, and the information is carried down to the latest date, with the elaboration and accuracy for which the work is justly renowned.

THE COAL REGIONS OF AMERICA; their Topography, Geology, and Development. With Maps and Illustrations. By James Macfarlane, A.M. New York: D. Appleton & Co., 549 and 551 Broadway.

The coal supply of the world is now a most vital question, and the enormous deposits known to exist in our country have long drawn the attention of practical scientists to the best means of raising and making available for public use this indispensable commodity. Mr. Macfarlane's book is a collection of all the ascertained facts as to the geographical, topographical, geological, and other characteristics of the coal regions of the United States, and the commercial and economical relations of this immense wealth, classified for study and reference. We believe this work will be eminently useful to all interested in the question, and we recommend it as a trustworthy authority.

UNDERGROUND; OR LIFE BELOW THE SURFACE. By Thomas W. Knox, Author of "Camp Fire and Cotton Field," etc., etc. Hartford: J. B. Burr and Hyde. Chicago: J. B. Burr, Hyde, & Co.

Under this attractive title, the author has collated much curious information concerning mines, caverns, borings, shafts, tunnels, diving and divers, volcanoes, prisons and dungeons, cellars, sewers, underground railroads, rapid transit and many kindred topics. It forms a book of light and entertaining reading, containing many remarkable and little known facts.

BURNS' PHONIC SHORTHAND, for Schools, Business and Reporting. By Eliza Boardman Burns. Published and for sale by Burns & Co., Phonographic Publishers, 33 Park Row, New York. Price $1.

Mrs. Burns, in the neatly printed volume above named, aims to supply to the public a work which shall be in every respect a self instructor. To this end, she has brought her long experience as a teacher of the art of phonography to bear in its preparation, and, by an excellent arrangement of printed keys to every page, careful and lucid explanation of the fundamental rules and a judicious selection of examples, has produced a book which will doubtless prove of great service. We may add here that the recent introduction of the postal card renders phonography a science which may be called even into greater practical utility than at present. On the back of one of the ordinary cards, a letter of considerable extent may be inscribed in phonographic symbols, thus not only saving postage, but preventing the perusal of its contents by the general public. For business and other large correspondence, phonography is a most valuable auxiliary, and any means which, like the volume under notice, has for its object the popularization of the science will be generally welcomed.

A CATALOGUE OF EIGHTY-ONE DOUBLE STARS. By S. W. Burnham, Chicago, Ill.

Mr. Burnham here gives the result of investigations by which he has succeeded in discovering 81 double stars, which are not noted as double in any former publications. The list, valuable as indicating the progress of astronomy in America, was published in the March issue of the *Monthly Notices* of the Royal Astronomical Society of England. Eighty of these double stars were discovered with a six inch Alvan Clark refractor.

REPORT ON A TOPOGRAPHICAL SURVEY OF THE ADIRONDACK WILDERNESS OF NEW YORK. By Verplanck Colvin. Albany: The Argus Company.

This report describes the work done under authority of the Legislature of the State of New York; and it contains much new, valuable and interesting information. Among many discoveries, we especially notice the fact that Whiteface Mountain, hitherto considered to rise to only 2,500 feet above the sea level, and consequently to be inferior to the highest of the Catskill peaks, is really 1,900 feet above those elevations. Mount Marcy, the center of the Adirondack range and the highest mountain in the State, is here correctly located, for the first time.

## Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From May 31 to June 5, 1873, inclusive.

COLLAR AND CLASP.—A. Flatley, J. Marson, Brooklyn, N. Y.
CUTTING STONE.—G. Stacy, Nannet, N. Y.
ELECTRO-MAGNETIC ENGINE.—J. D. Wallace, New York city.
MAKING BOOT SOLES.—D. Mills, Brooklyn, N. Y.
MAKING WRITING INK.—J. W. Carter, Boston, Mass.
SAFETY VALVE BALANCE.—V. F. Lassoe, G. F. Meyer, Brooklyn, N. Y.
SEWING MACHINE TUCKER.—E. Bouillon, New Orleans, La.
SHEEP SHEARS.—A. S. McWilliams, Colusa, Cal.
STEAM ENGINE GOVERNOR.—J. M. Bottum, New York city.

## Recent American and Foreign Patents.

### Improved Cartridge Box.

Samuel McKeever, U. S. Army, Mobile, Ala.—This invention relates to the construction of that class of cartridge boxes which are made in two parts hinged together. The invention consists in making one part higher than the other so as to fold over at top and allow it to be latched; in a flexible connection and pivot rod across the middle to enable it to unfold easily and smoothly; and in putting the flap and button at the bottom of the box.

### Improved Sewing Machine.

Friedrich Koch and Robert Brass, Brooklyn, assignors to John Boyle, New York city.—This invention consists in the improvement of sewing machines for heavy fabrics. An elbow lever is pivoted to a slotted block confined in a recess of the head piece. The presser shank passes through this block, and a gib is placed between the shank of the presser and the short arm of the elbow piece that also projects into the block. When the awl is about to penetrate the material its cam strikes a roller, turns the elbow, and through the gib and block the presser is held firmly in position, so that it cannot rise under the action of the awl. A combination of motions causes the awl to ascend through the throat plate, pierce the fabric held there by pressure foot, feed the same to the descending needle, which follows the receding awl and enters the hole from above, carrying the burr toward the interior of the fabric, producing an even surface.

### Improved Cartridge Box.

Samuel McKeever, U. S. Army, Mobile, Ala.—This invention relates to the construction and arrangement of the parts which constitute a soldier's cartridge box. It consists in making the box in two parts that are pivoted together at the bottom so as to turn down and allow an important addition to the number of cartridges usually carried. It also consists in providing the movable part with a rigid cover and in making slots where this turns on the pivots of the other, so that it may be raised and lowered to bring the cover in place and admit of dispensing with the ordinary flap cover. It also consists in a novel mode of securing the pockets to the inside of box so that the cartridges can be placed in a convenient position for rapid removal by the soldier.

### Improved Sewing Machine.

Eugene W. Beebe, Evansville, Wis.—This invention consists in the improvement of sewing machine feed mechanism. The feed plate is secured to one end of a crooked bar hinged to the plate, by which the forward and back motion is imparted to the feed plate through a lever, one end of which works between a stationary lug on said plate and a movable one. A vertical bar is pivoted at its lower end to a stand under the bar, and has a roller in its upper end on which the bar rests. It is connected by a rod with the lever, so that, at the time that said lever works the plate, it will work the bar. The bar swings with the lever the full measure of its movement and raises the feed plate, while the plate only moves a short distance. The bar is curved downward so that it will raise the feed plate up to the cloth just before the lever comes to the lug, so that when the plate is moved forward, after the lever strikes this lug, the plate will move the cloth; then, during the back movement of the lever and before it comes up to the lug to move the feed plate back, it will pull the bar and roller back along the curve, so as to let the feed plate fall away from the cloth. The length of the stitch is regulated by moving the adjusting lug along the plate with an adjustable screw.

### Improved Wagon Brake Shoe.

Henry Seitz, Palmyra, Mo.—This invention has for its object to furnish an improved brake shoe, which shall be so constructed that it may be readily moved up as it is worn away by the friction of the wheel, and which may also be moved laterally to bring it into line with the rim of the wheel.

### Improved Chandelier.

Joseph Kintz, West Meriden, assignor to Joseph Kintz, of Meriden, and P. J. Clark, of West Meriden, Conn.—The essential object of this invention is so to make a chandelier that the center and suspending rod can be trimmed permanently without putting the arms in place, to facilitate the packing for shipment, and so that when received by the purchaser the arms can be readily put in without disturbing the ornaments to any material extent. The invention consists of a hollow center piece, to which the arms are attached, made of a ring and a bottom and top of a cup-shaped form, which are screwed against the ring by nuts on the rod, and have flanges overlapping the edges to hold it in place. The arms are hooked to the top of the ring and confined by the flanges of the top and bottom parts. The top part is swiveled to a female nut, which is a part of the ornamental piece above the center, by which it is readily raised up from the ring to admit the hooks of the arms for attaching them, and then screwed down again to secure them. The ring is connected to the suspending rod by bars projecting from the rod radially, to prevent turning.

### Improved Case for Law Blanks.

C. Irvine Walker, Charleston, S. C.—The object of this invention is to furnish to lawyers, clerks of courts, notaries public, and others a law blank case, which contains a number of leaves for the adjustment of different law blanks, to be available for ready use, and provided with an index for easy reference. The blanks or forms are thus preserved in good order, free from injury, and by their convenient arrangement a great deal of time is saved. The invention consists of a book composed of leaves of binders' boards, or wood, metal, or other suitable material. On each side, or on one side only, of the leaves, at the corners, are strips for confining the blanks and for holding them flat against the leaf. The strips are placed diagonally across the corners and so prevent any slipping of the blanks. They are stamped in such a manner that the parts which pass over the blanks are bent up suitably so as to form an elevation for slipping the blanks under them; and they hold the blanks firmly in their place, keep them flat, smooth and clean, and make them easy of access. The lettering (or numbering) of the pages, with an index sheet in front, makes it an easy matter to find any blank which may be wanted. It is a most convenient arrangement for lawyers, court officers, and others keeping blank forms, and is far preferable to shelves, as it is more compact, and can be laid on the desk or table immediately at hand.

### Improved Reversible Street Car.

William T. Jenks, Toledo, Ohio.—This invention has for its object to improve the construction of the improved street car, for which letters patent No. 135,277 were issued to the same inventor January 28, 1873, so as to make it more convenient in use and more effective in operation. The invention consists in the circle, constructed as described, the flanged segments, the rollers, and the guard, in combination with the car body, the truck frame, and the king bolt. By means of the king bolt the car body is pivoted to the truck frame, and the former is long, so as to allow the body to rise above the frame without drawing the bolt out of place. A guard brace is attached to the truck frame to hold the said bolt steady and in a vertical position while the body is being raised, turned, and lowered. A circle, the parts of which toward the sides of the car body are horizontal, is attached to the said car body. The parts of the circle toward the ends of the car body are also horizontal, and are at a lower level, so as, when the car body is parallel with the truck frame, to rest upon the central bar of said frame. Segments of circles are formed with side flanges upon their outer and inner edges, and are bolted through their outer flanges to the bars of the truck frame. In slots in the end parts of the segments are pivoted rollers, upon the faces of which the inclined parts of the circle rest. By this construction, as the car body is turned, the circle moves up upon the rollers, raising the car body above the wheels so that the said body can be conveniently turned; and as it comes into line in the reversed position, it again descends to its former level.

### Improved Cotton Worm Destroyer.

Jack. Helm, Hochheim, Texas, assignor to himself and Charles Tim, of same place.—This invention relates to a new machine for removing the destructive cotton worms from the cotton plants without injury to the plants and for destroying the worms. The invention consists in the arrangement of a movable frame, which is by animals drawn over the fields to straddle the rows of cotton, and which is provided with brushes for sweeping the worms from the plants, and with jointed bottom pieces or slides, which crush them on the ground.

### Improved Dental Drill.

Jonathan W. Baxter, Vevay, Ind.—This invention has for its object to furnish dentists with a rotary drill adapted to be operated by the hand through the medium of a worm, a toothed driving wheel, and pawl mechanism. The wheel is turned by a pawl crank and a push pawl, the latter extending down through the bottom of the case, and having a finger piece on the lower end to be acted on by the middle finger of the same hand by which the machine is held, which pushes it up and turns the wheel, and a spring pushes it down again.

### Improved Milk Boiler Alarm.

Samuel Mangold, New York city.—The object of this invention is to prevent boiling milk from becoming scorched by boiling over; and the invention consists in forming a milk boiler alarm which, when the milk is about to boil over, will cause a bell to ring, so that the cook may be informed and remove the milk from the fire. This invention is carried into effect by the use of a float, connecting with an elevated bell in such manner that, when the boiling milk rises to the top of the float and enters or weights it, the bell will be released and ring the alarm.

### Improved Harrow.

Thomas M. King, Murfreesborough, Tenn.—This invention consists of two harrows, the frame of each being formed of a straight bar and a semi-circular bar, and attached to a beam by bolts, so as to be adjustable at various angles to each other.

### Improved Mechanism for Operating Screw Propellers.

James Wixcoxen, Russellville, Ill.—This invention consists of twin screws and propellers, each mounted on a laterally vibrating frame, wherewith is a horizontal drive wheel on a vertical axis, coinciding with the axis whereon the frame swings, and gearing with the propeller shaft so that the propeller and the rudder can swing laterally to utilize both the propeller and the rudder for steering the boat, the said drive wheel being also geared with the crank shaft in the vessel for being operated. Twin screws and rudders are used, to have one counteract the other in respect to the tendency of the drive wheel to cause the propeller and rudder to swing around their axis in the application of the driving force. The two vibrating frames are connected together so as to act synchronously, and the chains of the steering wheel are connected to them to work them to steer the boat.

### Improved Nut and Coffee Roaster.

D'Alembert T. Gale, Fort Wayne, Ind.—This invention consists in the arrangement, in connection with a nut-roasting cylinder, of an escapement wheel, clutch, pawls, and pendulum, in connection with a spring-driving mechanism, whereby an intermittent rotary motion is given to the roasting cylinder: the mechanism being so constructed and arranged in relation to the roasting cylinder that, in winding up the springs which constitute the motor, the roasting cylinder is revolved the reverse way, thereby giving the contents thereof a thorough mixing, avoiding burning.

### Improved Combined Stop Cock and Check Valve.

Asa T. Waldron, Waterford, N. Y.—This invention consists of a combined stop cock and check valve, in which the water way of the hollow cock is divided by a partition with a hole through it, and a valve seat on the upper side, with a stem extending up into a hollow removable cap on the top of the cock, and having a coiled spring for closing it down on the seat, the partition being above the inlet port, so that the check valve prevents back flow. The construction is such that the check valve can be readily taken out at any time by removing the cap on the top of the cock to clean out sand and other matters collecting in the plug.

### Improved Shaft Coupling for Earth Augers.

Thomas Urie, Corning, Iowa.—This invention has for its object to furnish an improved shaft coupling for well borers and other machinery. The shaft is made square, and in sections or lengths. Upon the lower end of the lower section is attached a boring tool. In each end of each section or length of the shaft is formed a tapering square hole or socket to receive the coupling pin, which is made square in its cross section, and tapering from its center toward each end, to correspond with and fit snugly into the holes or sockets in the ends of the sections of the shafts, where it is secured in place by set screws. This construction leaves the surface of the shaft smooth throughout its entire length.

### Improved Filter for Water Cooler.

Charles Schneider, Newark, N. J.—The object of this invention is to provide an efficient filter for water coolers, by which not only the impurities contained in the ice may be excluded, but also impure and unhealthy pump or aqueduct water filtered in such a manner that the clear and limpid liquid is drawn off. The whole filter is constructed to be detachable for cleaning and refilling with charcoal or other absorbing material, as required. The invention consists of a cylindrical filter of wire gauze, having a detachable top and adjustable bottom. A conical spout, to be placed into the inside of the faucet of the cooler, closes the faucet and prevents thereby the escape of unfiltered water.

### Improved Railroad Switch Signal.

John Cullen, Oxford, Miss.—The object of this invention is to improve the signals of railroad switches so as to insure greater safety in running the trains; and it consists in connecting, with the signal levers, reflectors by which the head light of an approaching locomotive will be reflected and the position of the signal indicated to the engineer. To warn the engineer of danger ahead, a reflector may be placed on the rear car of a train ahead, which it is believed would be an improvement upon the signal lantern now in use.

### Improved Bed Bottom.

Nelson O. Wilcox, Omaha, Neb.—The object of this invention is to simplify, cheapen, and, at the same time, improve spring bed bottoms. Cleats at the end of the bedstead support spring slats. Cross pieces rest on the spring slats and support the middle slats. The spring slat is made in three pieces, with a supporting slat beneath. The pieces are connected by means of elastic bands made of rubber or equivalent material. The cross pieces are notched to the spring slats, and the middle slats are notched on to the cross piece. The spring slats are placed next the sides of the bedstead, and with this arrangement of the parts the middle slats are made to partake of the elasticity of the spring slats, and the whole to form a highly elastic and durable bed bottom, without the use of metallic springs or metallic fastenings.

### Improved Horse Power.

Washington P. Emerson, Pleasantville, Ky.—This invention consists of a series of vertical shafts arranged in a circle with pulleys at the lower end, all in the same horizontal plane, in which the driving belt works. The horse is hitched to a belt working on pulleys. The upper ends have transmitting pulleys in different trains, from which the belts work on a central vertical shaft, which is speeded up and transmits the motion by a belt from a large pulley.

### Improved Cultivator.

William T. Walker, Pottsboy Mills, Tex.—This invention consists in the arrangement of springs with the pivoted and stationary beams of a cultivator. The springs are secured to the fixed central beam and connected at their free ends with the pivoted and handled side beams by means of staples or other equivalent guides. By this construction, by operating the handles the side plows may be moved inward or outward as may be desired, and together or separately, as may be required.

### Improvement in Preparing and Packing Water Colors.

Edward L. Molineux, Brooklyn, N. Y.—In preparing these improved colors, sheets of cardboard or other substance, properly prepared in any of the well known ways to prevent them from absorbing the colors, are painted with one or several coats of color in a damp state, prepared with sufficient sizing. As the coats of color dry, other coats are added until a mass of color of the desired thickness has been formed. The sheets thus prepared are carefully dried, and cut into pieces of any desired size and form. The sheets, pieces, or tablets of color are then made into portfolios, albums, pocketbooks, or other convenient forms. In using these tablets the amount of color required is rubbed off with a brush moistened with water, thus dispensing with the use of slabs or tiles for grinding or rubbing the cake colors.

### Improved Hay and Cotton Press.

William H. McBurney, Sacramento City, Cal.—This invention consists in an improvement of the operative mechanism for hay and cotton presses. A pair of long levers are pivoted at one end to strong posts near their upper ends, the said posts rising up from the platform a suitable distance from the front of the case. At the other ends said levers project through slots in the front of the case, and are connected by short links with the under side of the follower. These levers have a bar pivoted to them, the said bars being pivoted to the free ends of other levers, which at their other ends are pivoted to the platform and also to the bars. These latter bars are pivoted to the axis of the upper wheel of a pair of eccentric segmental wheels, arranged between posts so that the said axis and a strong block above are caused to rise by the turning of the lower wheel to force up the follower. By the short movement of the upper wheel, due to the eccentricity of its face and that of the lower wheel whereon it rests, a long movement is imparted to the follower in consequence of the arrangement of the levers and the connections; and in the last part of the operation when the resistance has greatly increased, a considerable measure of the power is transmitted through toggle-jointed bars, by which the leverage is so increased that the greatest force is obtained at the time it is most needed.

### Improvement in Rolling Wire.

William Walton and John T. Fallows, Haughton Dale Mills, Denton, near Manchester, England.—This invention consists, first, in rolling two wires, round or otherwise, in the same groove, or in recesses formed in the circumferences of rollers, in order to produce at one operation two wires of the required section, angle, or other form. The invention consists, also, in making grooves or recesses of an angular or curved form in the circumference of one or both of the compressing rollers, the section of the grooves or recesses corresponding to the shape of the two angle irons required, so that, when the wires are compressed in passing between the rollers, each assumes the shape of half of the groove or recess. These rolled wires are particularly adapted for making wire cards, but they may be used for other purposes.

### Improved Row Lock.

George C. Wilen, Philadelphia, Pa.—This invention consists in a bracket or bail hinged to the rail, or, rather, to a plate through which the row lock passes, so that the row lock is supported by two bearings instead of one and is kept steady and in working order.

### Improved Refrigerator and Mode of Cooling.

Jacob F. Schneider, Brooklyn, N. Y., assignor to himself and Philip Lenhart, of same place.—The object of this invention is to furnish to the public an improved refrigerator which cools and preserves the articles placed therein without the use of ice. The invention is based on the principle of reduction of temperature by evaporation of liquids; and consists mainly in the application of very porous plates placed in vessels filled with the liquid to be evaporated, and arranged at the sides and tops of the refrigerator. The liquid will gradually rise in the plates, and, being exposed by the porosity of the plates to rapid evaporation, will reduce the temperature in the inside of the box. The porous plates are connected, by strips, to the sides of the refrigerator. The lower parts of the plates are placed in boxes of suitable metal. The liquid used is preferably water, with a small addition of salt and saltpeter for decreasing the temperature and purifying the air. The porous plates are obtained by the mixture of clay, sand, sawdust, charcoal, pulverized glass, and a slight addition of sulphur. On forming and burning this composition, very porous plates are obtained, in which the liquid rises rapidly, which is necessary for this purpose.

### Improved Revolving Rake Shoe.

Almerin J. Taylor, Rome, Pa.—This invention consists in securing the two sections of a rake shoe detachably, so as to bring the fulcrum directly under the rake head. The shoe is made in two parts, exactly alike, about eighteen inches in length, which are beveled off at one end for about six or seven inches. The parts are placed upon each other, long side to long side, with their beveled ends pointing in opposite directions, and are securely bolted together. In the adjacent edges are formed half round notches, which, when the said parts of the shoe are bolted together, form a round hole to receive and fit upon the rounded middle part of the rake head. The fulcrum is brought directly under the rake head. By this construction, as the rake is revolved to dump the hay, the other side of the shoe will come in contact with and will slide along the surface of the ground.

### Improved Driving Rein Support.

Wm. W. C. Willson, Summit Point, West Va.—This invention relates to means for preventing the usually annoying practice, which belongs to all draft quadrupeds, of switching the reins out of their proper position and clamping them under their caudal extremities.

### Improved Farm Gate.

Horace W. Mullennex, Alpine, N. Y.—This invention relates to gates which both turn and slide, and consists in the improved construction of the frame in which they slide. The gate when hung in the swiveled frames can be half opened, or more or less than half opened, by sliding it on the frames, and can then, or in any position on said frames, be turned and fastened at either end to the gate post.

### Improved Spinning Mule.

John J. Dewey, Queechee, Vt.—This invention consists of a combination, with the carriage of a spinning mule, of gearing, arranged for facilitating the running of the carriage in by hand (first throwing off the driving belt and turning the spindles slowly) when the bobbins are full and ready to be doffed, so that the yarn may be wound a few times around the bottoms of the bobbins to fasten it, and then run down below the bobbins on to the spindles, so as to be held, when the bobbins are doffed, ready to be run upon the new bobbins. By this means it is possible to wind, upon the spindles, the packing of fine threads for holding the bobbins thereto by friction.

### Improvement in Dyeing Madder Colors.

Frederick A. Gatty, Accrington, England.—These improvements apply to cotton fabrics and yarns printed, padded, or otherwise prepared with aluminous mordants for dyeing red colors with madder, garancine, extracts of madder, artificial alizarine, or other products of madder. In place of using cow dung, or any known dung substitute, for the operation commonly called dunging or cleansing, solutions of soap or solutions of fatty acids or resins are employed, combined with soda, potash, or ammonia, or their respective carbonates, or emulsions of oils, or the waste soap liquors of calico printers and Turkey red dyers. The object of using the ingredients named above in lieu of cow dung or dung substitutes is to combine a certain quantity of fatty resinous matter with the mordant in order to obtain brighter colors. By these means red colors similar to Turkey red are obtained without going through the tedious and expensive process of oiling.

### Improved Puddling Furnace.

John Heatley, Harrisburgh, Pa.—This invention consists in a stove, placed in the center of melting chamber, and provided with inlet and outlet openings thereinto and therefrom; in the cover of a melting chamber arranged to rotate thereover and thus to carry around therewith the stirrers; in a bed vertically movable on a shaft, and provided with arc slots at each end, in which the stirrers are moved so as to give a double adjustment; in a bottom in which the metal is stirred, connected with the water in pan by intermediate heat-conducting bars; in a bar made in two or more pieces clamped together on shaft and journals of stirrer blocks; in a revolving cover, having a series of pendent fan blades; and in vibratory regulators applied to the stirrers. These features, taken together, form a very great improvement in puddling furnaces, not only rendering them capable of producing a better article of metal but in greater quantity.

### Improved Iron Ore Separator.

Alexander Goodhart, Newville, Pa.—This invention consists in separating dirt from ore by drying them both together and then detaching the dirt by concussion. It also consists in a new mode of combining instrumentalities for drying the ore and dirt and for detaching the latter.

### Improved Soldering Apparatus.

Wm. D. Brooks, Baltimore, Md.—This invention relates to means whereby the intense heat of the blow pipes is prevented from coming into to close proximity with the can by an intermediate rotary soldering tool; also to peculiarities of construction in the soldering tool; also to a novel mode of constructing the bolt which couples together the sections that embrace the water, gas and air chambers; also to a novel mode of constructing a rotary tool intended to solder a cap to the body of a can without wasting the solder and smearing it on cap or head; and also, to a method of constructing and putting together the gas and air chambers so that they can be readily separated in order to substitute larger or smaller burners.

### Improved Fire Place.

Frederick Proudfoot, Toronto, Canada.—This invention consists chiefly of a fire place, which is provided with an open front and back and a single fuel or fire chamber to enable it to be inserted into partition walls of rooms for heating two adjacent compartments, and so arranged that it can be readily converted into a single or one front fire place. The invention further consists in the provision of a suspended fire or fuel basket located in the chamber of the fire place, and possessing a tubular shank which is adjustable on a stationary tubular post, said basket being also provided with counterbalance weights to cause the same to be elevated into the chimney when the fuel is removed. The invention also consists in the use or combination with such a fire place of a steam generating boiler or tank, and pipes to convey steam to the fire basket for aiding the combustion of the fuel, while the surplus steam is conveyed to the dome for radiation, and finally to the chimney.

### Smoke and Gas Consuming Furnace and Steam Generator.

Oliver W. Ketchum, Toronto, Canada.—This invention consists of a steam boiler with a vertical air-tight cylinder situated in the boiler and containing the fuel, which cylinder is flared towards the bottom and is closed at the top with an air-tight door opening inwards. The invention also consists in providing the boiler on the inside with concave projections running through its length in both sides above the pipes referred to and above the water line, so that the ebullitions of water above said pipes and caused by escape of gas are thrown back into the middle of boiler. It also consists in providing the dome of boiler with concave pieces of iron resting one upon the other, constructed with spaces between each and between the sides of dome to act as additional deflectors.

### Improved Twisting and Doubling Machine.

Albert H. Carroll, Baltimore, Md.—This invention relates to means by which the twister, flyer or spindle or twist plate of the twister and feed rolls of same twister or cord-making machine may be made to cease their operation automatically whenever a thread is broken or full number of ends ceases to be supplied to the rollers.

### Improved Steam Engine Governor Valve.

Elijah Ware, Norfolk, Mass.—The invention consists in the improvement of governor valves. Openings are made in the sides of the valves, which allow the steam to enter the chambers in the shells. There may be four of these openings and chambers, so as to balance the valve when it is made of large diameter. An arm is attached to the valve stem and connected to the governor, by means of which the valve is partially revolved. The valve is made slightly tapering in the shell, so that any wear may be taken up readily and the valve made steam tight. The valve will work equally well in either direction, and the steam may enter and be discharged from either of the openings. Plug screws are provided, by the removal of either of which the position of the valve can be seen so that it can be varied or set by sight. A small hole is made (one or more) in the top of the valve to equalize the pressure.

### Improved Mold for Forming Building Blocks.

Andrew Derrom, Paterson, N. J.—The invention consists in an improved construction of a concrete or brick mold. To form the blocks a mold or box, of the proper size and shape, is constructed, with the sides hinged together so as to allow the box to be thrown entirely open. When the box is in use, the sides are held in place by suitable fastenings. A false bottom is arranged by which to remove the block from the mold until it is hardened. After locking the sides of the box together, a layer of stone is placed in the box, and liquid cement is poured in until all the crevices between the stones are filled. Another layer of stone or brick is then inserted, more cement added and so on until the box is filled. The cement will set sufficiently in a few minutes to allow the box to be turned so as to bring the false bottom down, when the fastenings may be loosened and the sides turned down. The block may then be removed by means of and on the false bottom, and set away to dry, while the box is ready to be used again.

### Improved Machinery for Spinning and Doubling.

Thomas Henry Rushton and Robert Tongue, Bolton, England.—The object of the first part of this invention is to simplify the gearing of band and self-acting mules for producing the after stretching and for giving motion to the front roller during the twisting at the head; also to render self acting mules suitable for spinning fine numbers. Secondly, in an improved arrangement of mechanism for locking edge falleas and for unlocking the long lever forming parts of a self acting mule.

### Improvement in the Manufacture of Gas.

Frederick A. Sabbaton, Troy, N. Y.—This invention consists in the adaptation or application to a gas retort of a combined steam and air injector, whereby the tar from the hydraulic main or other gas depository is, in fine spray, forced under the retort and consumed. The injector is applied for the purpose of consuming the coal tar or other gas deposit produced in the manufacture of gas, thus saving a large amount of fuel used in heating the retort, and so arranged that the coal tar or other gas deposit from the hydraulic main or other place of deposit is carried direct to the injector, which is compactly arranged above the furnace door. By means of a current of steam, a spray of tar or other gas deposit, in combination with atmospheric air, is forced into the fire box or furnace, and there consumed.

### Improved Stucco Cornice.

Andrew Derrom, Paterson, N. J.—The object of this invention is to facilitate the construction of cornices or other ornaments of plaster, cement, or other composition at places distant from those at which such ornamentation is to be finally and permanently applied. At present it is an item of considerable expense and some inconvenience to form ceiling and panel ornaments of plaster or similar substance, chiefly because the ornaments must be formed on the spot on which they are to remain, thus exposing the artisan to every inconvenience of angles, high ceiling, etc. The invention consists in constructing such ornaments on and around a frame work of wood or metal, so that by such frame work the brittle or fragile substance of the ornaments will be strengthened. Thus made, the ornaments, whatever their length or size, can be safely transported from place to place, and firmly attached by screws, pins, or other means to the walls or ceilings and each other.

### Improved Door Check.

George E. Rittenhouse, Akron, O.—This invention is an improvement in the class of devices adapted to be applied to doors for holding them open at any desired angle; and it consists in a pivoted catch lever, a notched circular plate, and a rod, all arranged to adapt the lever to be locked in various positions, and thereby hold the rod engaged with the floor.


# Value of Patents,

## AND HOW TO OBTAIN THEM.

## Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Larger inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & CO. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & CO. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

### HOW TO OBTAIN *Patents*

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

### How Can I Best Secure My Invention?

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

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

### Preliminary Examination.

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

### Rejected Cases.

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### To Make an Application for a Patent.

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

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

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### Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & CO., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

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Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing MUNN & CO., 37 Park Row.

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

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Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a reasonable cost, the price depending upon the extent of drawings and length of specification.

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## Notes & Queries

W. N. B. asks: Can I use tubes both above and below a Whitelaw or Barker wheel, and have the same percentage of power from the water which I should get if I took it only above or below? I wish to try it to counteract the pressure of water which I find when it is taken from either only. The friction on the step is so great that it will not stand, as, if taken from below, the wheel cannot be held down without great loss of power. I intend to try it under a head of 220 feet with a wheel of 4 feet diameter, with openings for discharge pipes of 3x4 inches. How many horse power can I get using 68 per cent of the water? How many revolutions will the wheel make?

P. G. asks if oyster shells, standing in a heap for a number of years, are as good as new shells for making lime for building purposes.

S. A. D. says: In eating canned fish one frequently finds the vertebræ and large bones holding their form and crushing under the teeth like wet chalk; while the smaller bones are completely absent. By what process are the small bones thus robbed of their bony structure and destroyed?

C. D. R. asks where paper or pulp is being made from palmetto leaves.

H. H. asks: What kind of varnish or paint should be used for coating the back or metallic part of covered cloth coat buttons, so that the short edge can be turned without breaking or cracking the varnish?

N. C. says: I have a great deal of trouble every year in branding my cattle. I have to lasso and throw them down, tieing them fast; then I heat an iron and burn the brand in the hide. Could not some of our scientists invent some acid that would leave a mark on the hide, preventing the growth of hair and save the torture to the animal by burning?

W. L. says: I am troubled with a hissing noise in my left ear, the result of cold caught last fall, I think. Do any of your readers know of a remedy, or of anything that will alleviate the noise?

S. N. G. would like to know the process of making crystal or sponge gold for dental purposes.

J. L. C. asks for a preparation that can be used (in liquid form) for cleaning and removing heat stains from hot finished work, such as cylinder heads, steam chests, etc.

B. F. B. asks if there is anything in the manufacture of articles made of malleable cast iron, which renders them liable to rust. "I have had trouble with things made partly of common cast iron and partly of malleable cast iron, from the malleable parts rusting."

B. F. B. says: I have tried the process given in articles, by placing the articles in an iron kettle with bituminous coal and setting the kettle on a fire, and I cannot make it work. Should the cover of the vessel be luted on, and should any particular coal be used, and how long should the baking continue?

W. S. asks how best to cut glass tubing into various lengths.

W. M. McD. asks: Is there anything which will kill coal tar on wood, so that the latter can be painted in light colors without danger of the dark hue coming through again?

F. A. S. asks for directions for constructing a stove for drying fruit, etc., which will not change the color.

A. B. W. asks how to make logs durable. They are placed underground, to conduct water.

A. B. W. asks: What is the best method for hardening gold, silver, and brass pin tongues, links, and eyes for sleeve buttons, etc.?

A. J. B. asks for the best means of separating the base metals from silver and gold ores.

B. F. B. says: I find need of a portable lamp for car use, and am engaged in getting one up, but am troubled as to what to burn in it. Is there any oil except whale oil that will burn without a chimney, or is there any device for burning kerosene without a chimney, which is successful?

## Answers to Correspondents

P. P., Jr., will find directions for black enamel on iron, on p. 303, vol. 28.—C. T. S. and E. B. T. will find a recipe for gold lacquer on p. 299, vol. 28.—P. B. can blue his steel articles by using the process described on p. 10, vol. 25.—J. W. will find a waterproof cement for leather described on p. 119, vol. 28.—J. C. M. will find directions for thawing out frozen water mains on p. 366, vol. 26.—C. T. S. should read the last few numbers of our journal, in which full directions for tempering steel for all purposes are given.

J. H. says: We are desirous of coating the inside of a wrought iron stand pipe, of 126 feet hight, with some material for preventing rust. The use of soluble glass has occurred to me; will it answer, for any length of time? Answer: If the pipe is subjected to changes of temperature or to sudden shocks, the glass coating would be liable to crack and break off. Probably the best coating for your pipe would be that used by the cities of New York and Brooklyn and largely employed in England. Heat coal tar pitch (from which the naphtha has been distilled, and which has the consistency of wax when cold) to a temperature of 300° Fahr., and dip the pipe into it, retaining it there until the metal has acquired the same temperature. The pipe must be free from rust and perfectly clean, before dipping. It is well to cover it with linseed oil, before coating it with the coal tar pitch.

V. W. K. asks: Will a machine have the same power if driven by a 10 inch pulley that it now has, being driven by a 20 inch pulley, face speed of both pulleys being the same? Answer: Yes, if the belt does not slip any more, after the change is made, than it did formerly.

G. Van H. says: I have a bored well 200 feet deep, 5 inches in diameter, which has 50 feet water in it. I propose putting in a pipe 1¼ inches in diameter with a cylinder 3 inches in diameter. I shall use a wind mill to raise the water. Now how deep shall I place the cylinder in the well to get the best result? Answer: Put your pump within 20 feet of the level at which you are always sure to have water.

S. asks: Are there any glasses made which will enable a shortsighted eye, now able to read ordinary type at a distance of 3 inches without glasses, to read at 2 feet or more? Can such glasses be used in spectacle frames? Answer: You can probably get such glasses from a good optician. They could be used in spectacle frames, but if they were very thick, the ordinary frames would not answer, and a special form would be required.

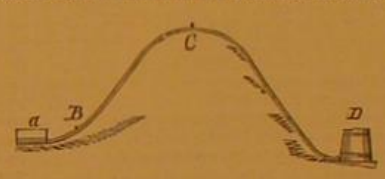
E B. asks: Can you inform me how I can rid a house of cockroaches? Answer: Arsenic in the form of Paris green, placed in the crevices of the floors near the sinks, is much used for the purpose. It is sure death to the roaches—and other members of the family who swallow it.

C. B. U. asks: Can you inform me of any method or liquid to dissolve or clean hard polish, such as piano varnish, from carvings, without sand papering or otherwise scratching the wood? Answer: Try alcohol, or a mixture of alcohol with chloroform or ether.

J. N. J. asks: Why is it that farms on the lakes that were high and dry fifty years ago are now abandoned, and water standing on them? Does the water rise higher now than it did then? Answer: Careful observations of the coast line for a series of years have shown that there is a regular depression of the land going on in one section, and a steady elevation in another. The cause of this is ascribed by many to the internal cooling of the earth, causing expansions and contractions.

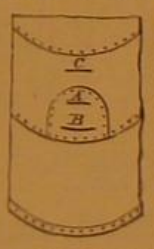
J. E. says: I have a cistern from which the water is pumped through a leaden pipe running to the bottom of the cistern. What can be attached to the end of the pipe in the cistern to act as a filter? The water at certain seasons tastes badly; can this be remedied by any thing used to pass the water through? Answer: Put the end of the pipe into a barrel filled with charcoal. This will filter the water very well; and unless the water is unusually dirty, it will work for two or three months, when it will require to be cleaned out.

A. W. S. asks: Will you please explain the cause of the following? A line of pipe for the purpose of transporting oil is laid from a, a pumping station, over




an elevation of 300 feet, at C, to the iron tank at D. The pump at a has a 12 inch steam cylinder, and a 4 inch oil cylinder, and 24 inch stroke. It is driven by a boiler of 50 horse power, which carries 80 lbs. of steam. The pipe is made of wrought iron, with a lap weld, and has an inside diameter of 2 inches. When pumping at the rate of 100 barrels per hour, the pressure at B, as shown by the gage, is 800 lbs., while that at C is 400 lbs.; and yet the pipe frequently bursts at the highest point of elevation, and seldom shows a leak at the point where gage shows highest pressure. Please explain this seeming paradox. Answer: The pipe is split by the impact of the oil. If the pump is stopped, the oil will fall away at either side from the highest point. On starting up, the oil may separate at the highest point, creating a vacuum there. The following oil will rush in with great velocity, and, its motion being suddenly arrested, will react upon the pipe, either splitting it at once, or weakening it so much that it will afterwards break. Water pipes in houses are frequently burst in a similar manner, the motion of the water being arrested by suddenly closing the supply cock.

J. B. E. says: Suppose that car oil is fired under an old boiler of poor iron, and the boiler springs two leaks [see diagram] A B, in the second sheet, shortly




after the oil is fired; and suppose that the boiler runs (during more than a year) sometimes for seven weeks without cleaning. The iron was apparently all right one evening, and the night man allowed steam to run down to 10 lbs. and then fired car oil to get up steam. The next day, when extra fire was necessary, the boiler sprung a leak at C. The boiler had been cleaned two weeks before, but scraping and brushing the rivets and edge of sheet around the first patch was not done. This edge always leaked considerably after brushing out all the corners. 1. Was it the mud or the firing of the oil that caused the leak? 2. Is it true that, as long as the fire agitates the water in a boiler, the mud is almost equally distributed throughout the boiler, leaving the bottom as clear as any other part under water? Thus, if a boiler runs for four weeks and more, one fifty-sixth of the water is blown out twice a day, and there will always be nearly the same amount of mud in the boiler, excepting the scale which adheres to the bottom. In twenty minutes after blowing off steam, pulling out the fire, and opening the manhole, the water is settled as clear as it appeared before entering. Is it a positive fact that mud settles on a leak after it is sprung, or does mud settle to a certain place as long as the iron is solid and the temperature even and high enough to agitate the water? Answers: 1. We do not know what our correspondent means by car oil, unless it is one of the hydrocarbons; but whatever it is, it could scarcely cause the leak, which must be attributed to the mud or scale. 2. Unless the circulation is unusually good in a boiler, or unless the boiler primes, most of the mud will be at the bottom. When a boiler leaks, a current is created in the direction of the leak, and the mud will be drawn to that point.

H. B. asks (1) which will require the most power to saw a board 12 inches wide, a circular saw just large enough to reach through it, or one large enough to saw 24 inches with the same feed. 2. Will a 54 inch saw with 40 teeth require any more power than one of the same size with 28 teeth? Answers: 1. A saw just large enough to cut through a board will require less power than a saw larger, the number of teeth, speed and the thickness being equal in each. 2. The more teeth, the more power, provided the thickness, speed and feed are equal. There is, however, a limit, or a point where a few teeth will not answer the place of a larger number. The thinner the saw, the more teeth will be required to carry an equal amount of feed to each revolution of the saw, but always at the expense of power.—J. E. E. of Pa.

A. C. S. asks: Which is the strongest bevel gear: 6 feet 6 inches diameter, with 8¾ inches pitch and 12 inches face, or 6 feet diameter with 4 inches pitch and 10 inches face? The pinions in each case are nearly 1 to 2. Answer: If the pinions have the same relative size in each case, and the power applied is the same in both cases, the larger gear will be the stronger.

P. P. Jr., asks how to dissolve india rubber so as to run it in a mold and then harden it, and if plaster of Paris would answer to make a mold with. Is there any other material that would answer the same purpose as india rubber and be equally elastic? 2. Is there any convenient way of taking the fluid contents out of a barrel and putting the same into a can without using a pump, supposing the barrel to lie on the floor and the top of the can to be about 7 feet from the floor? Answers: See answer to S. J. N. in No. 24 of our volume XXVIII. 2. There are several kinds of lifting pumps made for this purpose. If you want to take out only a small quantity at a time, say a quart or less, you can take a piece of tin leader or tubing and have it made to taper almost to a point at each end. On putting it into the cask it will fill up to the level of the surface of the liquid; then stop the upper end with your thumb and you can safely lift out the tube and contents. Small apparatus of this kind made of glass are used by chemists under the name of *pipettes*, and are so graduated as to act as measures at the same time.

E. J. M. says: There is a difference of opinion as to which side of a gum belt, the inside or outside (as usually put up in coils) should be next the pulley. The minority holds to the outside plan, the majority to the inside. "Our army swore terribly in Flanders;" had the SCIENTIFIC AMERICAN been in existence then, "our army," I opine, would have done as we of Texas do, swear by it. Answer: This seems to be one of those rare cases in which both majority and minority are right. As ordinarily made, the outside and inside of a rubber belt are precisely alike, so that it can make no difference which side is next to the pulley. We are much obliged for our correspondent's good opinion of the paper, which is only one of the many kind testimonials we are constantly receiving.

X. Y. Z. asks why it is that large files are cut coarser than small ones. "I will say that they would be much better if cut fine, as they would do more work and do it better. 2. Would it not benefit a large class for industrial fairs to give premiums for the best method of filing saws, the saws to be filed to do the best work with the least power? I find it rare for even a first class workman to know anything about the principle of filing a saw to do nice work. In twenty years experience, I do not recollect seeing more than two or three that could do it, and I see no reason why this should be so." Answers: 1. It is more difficult to cut a large file finely than a small one; though if there was much demand for the kind of files mentioned by our correspondent, they would probably be manufactured. 2. The idea of offering a premium for the best method of filing saws is a good one, and would be productive of useful results, if carried out. Perhaps those of our readers who are experienced in saw filing will favor us with communications.

A. B. W. asks what is the best mode of fastening lamp globes to the burners? Answer: Cement with plaster of Paris.

J. L. G. says: Some time since a gentleman buried a large amount of gold in this neighborhood, and went away. While absent he died; but before dying, he gave a description of the place, the amount, and the manner in which it was buried. We have made several ineffectual efforts to discover it according to the description of the place and directions furnished by the deceased. We feel sure that it is buried there, and desire to ascertain of you whether there is any scientific mode by which it may be discovered, or that would aid us in the search, and at what cost, and where it may be procured. Answer: Dig until you find it. Science shows no royal road to golden treasures.

G. B. M. says: 1. Please give some method for preserving leaves and flowers in their natural colors 2. What is the capacity of the Croton aqueduct and the estimated water supply to the city of New York? 3. What are the standard works on mineralogy and where can they be obtained? Answers: 1. Flowers can be preserved by dipping them in melted paraffin. This applies however, better to white than colored flowers. For colored ones, the paraffin should be suitably colored. 2. The Croton aqueduct is capable of conveying 120,000,000 to 130,000,000 gallons of water per day. The amount consumed is about 90,000,000 per day, or over 30 gallons to each man, woman, and child. The largest reservoir in the Central Park has a capacity of 1,000,000,000 gallons; the old reservoir near it contains 150,000,000 gallons, and the miniature distributing reservoir at 42nd street holds only 20,000,000 gallons, or enough to last about 6 hours. 3. Dana's "Mineralogy" is the very best work extant. It sells for $10. There are smaller works, such as Professor Eggleston's "Lecture Notes," which are convenient for reference; but "Dana" is the best.

G. L. R. asks for the best authorities on the subject of preservation of timber, and the effects of chemicals on wood generally. Answer: You will find an excellent article on this subject in Wagner's "Handbook of Chemical Technology," translated by Crookes. Several exhaustive articles on this subject, by Dr. A. Ott, appeared in the *Engineering and Mining Journal*, November 22, 1870, and *Journal of Applied Chemistry*, October and November, 1870. Colonel J. T. Crane, United States Corps of Engineers, made a report, on the 9th of September, 1870, to the Chief of Engineers, United States Army. This was published in the *American Chemist* for February, 1872. In this report, tabular results are given showing the comparative time which ties, etc., lasted when treated in different ways, more especially relating to creasoting.

J. H. asks for our opinion on the following matters: 1. I am using an engine 7x30, running at 60 revolutions per minute. The boiler is nearly new, of 30 inches diameter, with 26 tubes 9 feet long and 3 inches diameter. The steam pipe from boiler to engine is 28 feet long and of 2 inches internal diameter. When all our works are on, 30 lbs. on the boiler more than drives our engine at full speed. How much power should that pressure give? The pipe and the engine are left bare. 2. I am using, for this amount of power, an enormous quantity of coal, and I want to know if I cover the steam dome pipe to engine, the engine, and the feed water pipe from steam heater to boiler (24 feet), how much saving of coal would there be? 3. Would it not be well to slow the engine nearly half, driving the shaft same as now; then I could get about 50 lbs. to the inch on my engine before the governor would close, instead of 20, 25, or 30 lbs. as at present? 4. How much coal

should we really use to get the above power? 5. My engine is a plain slide valve in very good condition. At how much cut-off should the slide valve be set? Answers: 1. Our correspondent does not state the point at which steam is cut off, so that we cannot tell what power the engine is developing. 2. Considerable saving of fuel would be produced, by felting the pipes; possibly as much as ten per cent. 3. Instead of reducing the speed of the engine, it would be better to cut off the steam at an earlier point of the stroke and increase the initial pressure. Questions 4 and 5 show that this is a case where it would be well to consult a good engineer, who would probably suggest improvements which would result in great saving of fuel.

B. says: 1. I have, in a 40 horse power five flue boiler, 60 lbs. of steam; the boiler is half full of water, when the water is cooled down to 60°. What will be the pressure on the outside of the boiler (presuming the boiler to be airtight)? 2. When I begin to get up steam, should I let out the air in the boiler as fast as the pressure will force it, or keep it confined? 3. Will the corrosion around rivets that leak become dangerous? What is the easiest way to stop such leaks? Answers: 1. The pressure outside the boiler will be about 14·2 pounds per square inch. The pressure inside the boiler, above the water, will be about ¾ of a pound per square inch. Below the water line the pressure per square inch will be the weight of a column of water of one inch cross section and with a hight equal to the depth of the pressed surface below the water level. 2. In raising steam, the best plan is to keep the safety valve open until steam is formed. 3. Yes. If the leaks cannot be stopped by caulking the heads of the rivets, the rivets must be cut out and replaced by new ones.

W. A. B. says: 1. Will nitrate of silver do for making silver solution for electro-plating? I mean the lunar caustic sold in drug stores. 2. Will a piece of wrought or cast iron do for one of the poles of the Bunsen battery, instead of carbon? 3. Is there any difference between cyanide of potassa and cyanide of potassium? 4. How much silver and cyanide of potassa does it take to make one gallon of solution? 5. Does it make any difference if the vat, in which you place your solution of cyanide of silver, be made of cast iron? Answers: 1. Lunar caustic, or coin and silver scraps dissolved in nitric acid, may be employed in making cyanide of silver for electro-plating. 2. Iron will not answer instead of carbon, but platinum will. You can obtain large pieces of gas carbon gratis from any gas house when they are cleaning out retorts. It is very hard, but can be sawn with a fine saw, if you have patience. 3. Cyanide of potassa is incorrect; it should be cyanide of potassium. It is very poisonous and requires care in using. 4. Dissolve 3½ ozs. of cyanide of potassium in 1 quart of distilled water; and in this solution, dissolve well washed chloride of silver (precipitated from nitric acid solution by hydrochloric acid) until a saturated solution of cyanide of silver is obtained; then dilute with an equal bulk of water. 5. An iron vat will cause the silver to be deposited upon it unless lined with paraffin, asphalt or other non-conductor.

## COMMUNICATIONS RECEIVED.

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

On Using Water as Fuel. By A. W. T.
On the Southern Canal. By P. K. McM.
On Life Saving Inventions. By J. C., and by L. S.
On Asiatic Cholera. By C. McD.
On the Ponca Fossil Remains. By C.W. P.
On Psychic Force on the Slate. By S. C. D.
On the Million Dollar Telescope. By T. M. P.
On a Transatlantic Balloon Voyage. By C. R.
On Screwing in Studs. By J. W. T.
On Slivers. By J. M.
On the Australian Water Cooler. By O. C. W.
On Corundum in Pennsylvania. By W. K. S.
On Metallurgy. By J. T.
On Deep Sea Soundings. By —.

Also enquiries from the following:

A. M.—L. G.—A. G. J.—A. H.—R. W. Co.—O. A. M.—C. R.—E. M. H.—W. K. C.—J. H. P. & Co.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

# Index of Inventions

FOR WHICH

**Letters Patent of the United States**

WERE GRANTED FOR THE WEEK ENDING

## June 3, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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| Stamp holder, adhesive, S. V. Beckwith | 139,492 |
| Staple, blind slat, C. H. Palmer | 139,516 |
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| Wrench, pipe, J. Rigg | 139,550 |

## 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:

25,237.—HORIZONTAL WHEEL.—A. Andrews *et al.* Aug. 13.
25,343.—STOVE.—E. M. Manigle. August 20.
25,373.—PAPER BOX MACHINE.—S. B. Terry. August 20.
25,434.—COTTON SCRAPER.—J. H. Mitchell. August 27.
25,506.—LAMP.—H. Halvorson. September 3.
25,544.—TRY COCK.—J. F. Cook. September 3.
26,243.—WATER CLOSET BASIN.—W. Boch, Sr. Nov. 12.
30,201.—FREEZING APPARATUS.—F. P. E. Carre. August 13.

## EXTENSION GRANTED.

24,304.—IRON MOVING MACHINE.—C. Hewitt.

## DISCLAIMER.

90,973.—STEP LADDER.—C. G. Udell.

## DESIGNS PATENTED.

6,694.—HAT AND COAT HOOK.—A. D. Judd, New Haven, Con.
6,695.—STRIPED FABRIC.—C. H. Landenberger, Phila., Pa.
6,696.—NUBIA.—J. Phipps, Philadelphia, Pa.
6,697.—HEATING STOVE.—J. Beesley, Philadelphia, Pa.
6,698.—WATCH HANDS.—B. A. Goodell, Waltham, Mass.

## TRADE MARKS REGISTERED.

1,286.—PETROLEUM.—Brown Brothers, Erie, Pa.
1,287.—WATCHES.—Courvoisier & Co., New York city.
1,288.—SHIRTS.—W. A. Farr & Co., Boston, Mass.
1,289.—CHAIR SEAT, ETC.—Gardner Manufacturing Company, Glen Gardner, N. J.
1,290.—TOOTH BRUSHES.—S. L. Mintzer, Philadelphia, Pa.
1,291.—SOAP.—J. Oakley & Co., New York city.
1,292 to 1,294.—WHISKIES.—Walsh & Co., Cincinnati, O.
1,295.—GRINDING MILLS.—A. W. Winall, Cincinnati, O.
1,296.—MEDICINE.—C. C. Zimmerman, Shoemakersville, Pa.
1,297.—WHISKEY.—J. T. M. Orendorf, Baltimore, Md.
1,298.—BEVERAGE.—S. F. Stowe, Providence, R. I.

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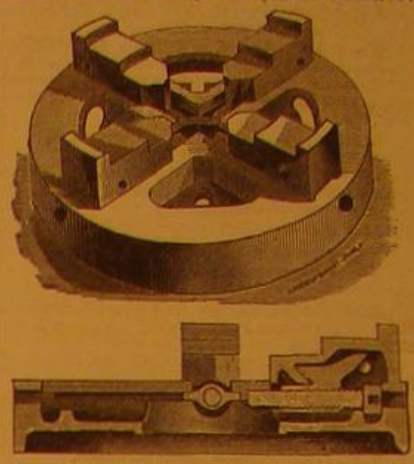
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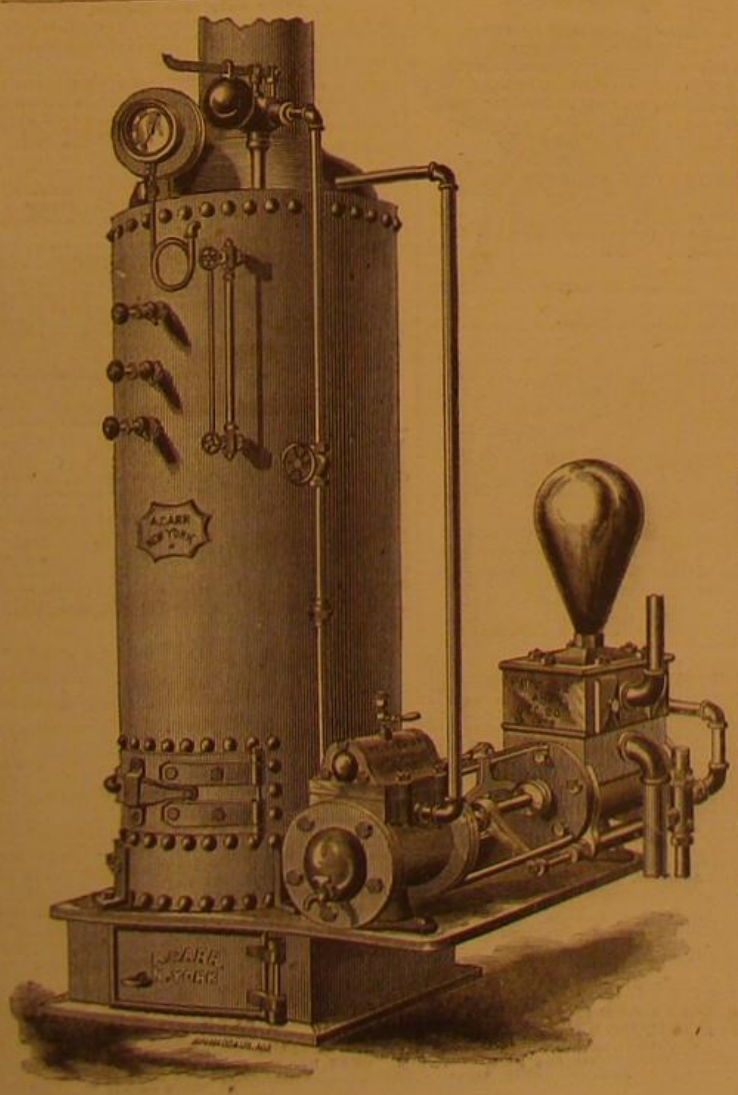
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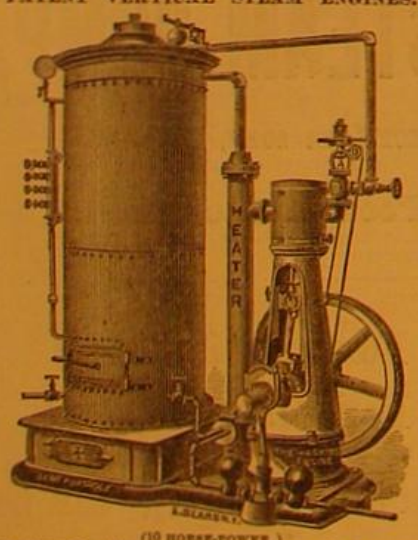



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# SCIENTIFIC AMERICAN

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

Vol. XXIX.—No. 2. [NEW SERIES.] NEW YORK, JULY 12, 1873. [$3 per Annum, IN ADVANCE.


## STEAM PLOWING BY DIRECT TRACTION.

With some modifications in its construction, and which do not impair its usefulness as a hauling engine, the well known road and farm locomotive of Messrs. Aveling & Porter, of Rochester, England, has been successfully applied to direct traction steam plowing.

Although there can probably be no question that the double engine rope system of steam cultivation, as practiced in Great Britain, is more thorough and comprehensive in its application than any form of direct traction steam plowing, yet the large cost of the machinery necessary for working the first named principle, seems to preclude the probability of its general adoption in this country.

The requirements for an expeditious and economical means for tilling the land by steam power are, however, far greater in the United States than in Europe, and in view of the numerous inquiries for steam plows suitable to the wants of our agriculturists, Messrs. Aveling & Porter have, for a long time, given much attention to the subject and, after repeated and careful trials, have adopted, with some alterations, the Fowler balance plow as being the best form of implement to use in conjunction with an engine which has to travel over the land to be plowed.

The difficulties that have presented themselves in the many attempts at direct traction steam plowing have, it is claimed, been overcome by using the balance plow; which, it is stated, avoids the necessity and consequent loss of time in turning the plow at headlands, decreases the liability of breakage, and insures perfect control of the plows both with regard to steerage and depth of furrow. From repeated trials on heavy land, it has been found that an engine, weighing a little more than five tuns and working a four furrow balance plow, can accomplish eight acres a day, cutting a furrow from eight to ten inches deep and ten to twelve inches wide. Thrashing, hauling, and a variety of other duties can also be performed by the same machine.

The engine above referred to and illustrated does not materially differ in construction from the Aveling & Porter road and farm locomotive, which gained the first prize given by the Royal Agricultural Society of England, in 1871.

The engines have single cylinders, placed on the forward part of the boiler and surrounded by a steam jacket in direct communication with it. Engines having single cylinders and reversing gear, when connected to the driving axle by means of Aveling's usual gear, have proved themselves to be thoroughly efficient, more powerful, less complicated, and in every respect better adapted for general traction purposes than engines with double cylinders. They have tender and tank for an ample supply of fuel and water, and a steerage eminently simple and perfect in action. The compensating motion to the driving wheels of Aveling & Porter's engines is of malleableized iron, the use of which, although more costly than ordinary cast iron, greatly increases the strength of the working gear. One man only is required for the entire management of the engine. The boiler is horizontal and multitubular, and is a more economical consumer than upright boilers. It is made of "best best" Staffordshire plates, and the fire box is invariably of Lowmoor iron. It is lagged and felted, and proved to a pressure of 200 lbs. to the square inch. The daily expense of working a six horse power Aveling & Porter engine is approximately $6. The increased cost of using such an engine, in conjunction with the steam plow, would be simply the wages of one additional man.

To this time Messrs. Aveling & Porter have built more than 900 road locomotives, many being successfully in use in the United States and can be seen at work within a few miles of New York.

Mr. G. W. Dick, of Ross, Ohio, who has a six horse power Aveling & Porter engine, writes:

"We have used our engine for almost all possible purposes—on the gravel road, for drawing logs out of the wood, for thrashing grain, and are now hauling pork in the streets of Cincinnati, over a boulder pavement.

"On the macadamized road we draw from Hamilton to Venice, including wagons, 25,000 lbs. of coal in one load—a distance of eleven miles. For logs in the wood, it is unequaled; we detach the engine from the wagon, and roll the tree on to the wagon, an inch at a time if we choose, and hold it there—a feat that horse power will not perform. All who see it at this work are amazed at the power we possess, and say that it seems to be a thing of life.

"We have thrashed nearly 40,000 bushels of grain with it since harvest, and have found no place that we were unable to reach, no matter what the grade or how deep the mud. Its facility for taking itself and thrasher away makes it a great favorite with the farmers, who have been bored with hitching their horses to a heavy steam engine, and spoiling them with the over load. Our greatest gain is in time, moving from place to place. In five minutes after the last sheaf is through, we are on the road; and we once moved 600 feet and were thrashing again in ten minutes from the time the last sheaf was through at the last place (by a watch held on us by a friend)."

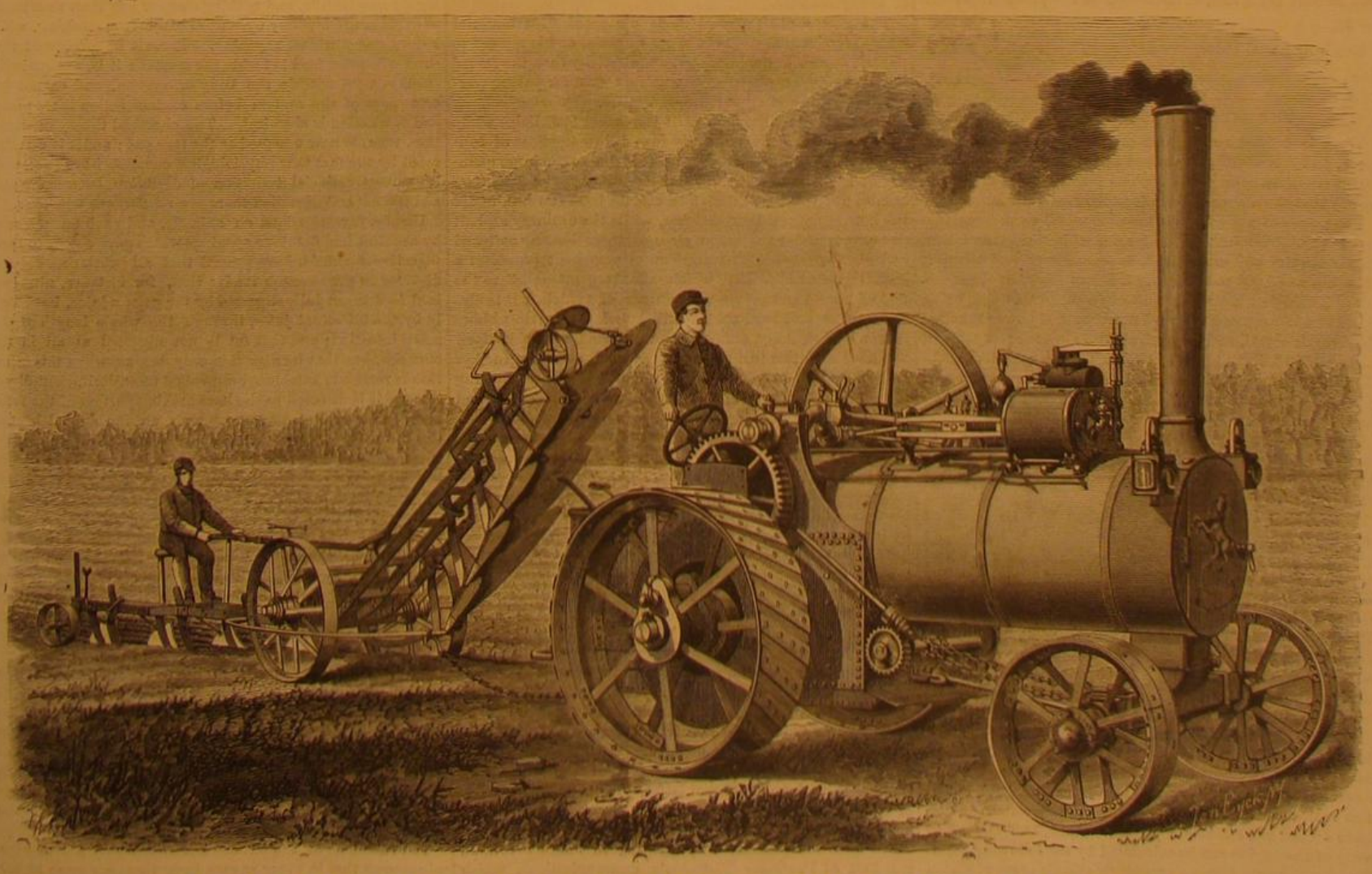
To the tests of these machines, made during the autumn of last year by Professor Thurston, of the Stevens Institute of Technology, we have already alluded in detail. During their progress, with one six horse power engine, the enormous load of 63,400 lbs., made up by a train of ten loaded wagons, was hauled up a long grade of one in nineteen, at the rate of two and a half miles an hour, the wheels showing no signs of slipping.

Messrs. Aveling's engines are often constructed with a steam crane attached to the fore part of the boiler, and at this time two of them are employed at the Vienna Exposition in unloading and removing packages from the trains as they arrive. By simply removing the road wheels and replacing them with ordinary flange wheels, the engine may be converted into a tramway engine.

We are informed that the machine may soon be seen in actual operation, cultivating the land on the Ogden farm, the property of Colonel G. E. Waring, Jr. The agent of Messrs. Aveling & Porter in America is Mr. W. Churchill Oastler, 43 Exchange place, New York city

## Iron-Clad Vessels.

The invention of iron plates to protect vessels is far from being of as recent date as is generally supposed. During the 12th century, the Normans covered their ships, from the water line up, with an iron casing, terminating in a ram on the bow. Still earlier they had adopted a system of protecting the upper works with metal shields. In 1534, Peter of Arragon ordered his ships to be iron-plated in order to protect them from the burning missiles then in common use. In 1530, the squadron of André Doria contained a vessel built by the Knights of St. John, which was armored with several thicknesses of iron. At the battle of Lepanto, several ships protected their batteries with bars of iron. For two centuries, no progress seems to have been made. In 1782, at the siege of Gibraltar, an engineer officer constructed six ships, which were the types of the modern iron-clads. They were covered with an armor of hard wood, leather, and bar iron. It is said that they resisted the fire of the forts for a long period, but were finally sunk by red hot shot.



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VOL. XXIX., No. 2 . . [NEW SERIES.] *Twenty-eighth Year.*

NEW YORK, SATURDAY, JULY 12, 1873.


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## PUBLISHERS' NOTICE.

All new subscriptions, or renewals of old ones, will be commenced with the new volume, July 5, unless a request to commence at some other date accompanies the order.

The volume from January to July, consisting of twenty-six numbers, may be had in sheets, by mail, at the regular subscription price, namely, $1.50, or in substantial binding, at the office of publication, for $3, or by mail, including postage within the States, for $3.75. The first volume of the SCIENTIFIC AMERICAN for 1873, in sheets, and a copy of the SCIENCE RECORD, for either 1872 or 1873, will be mailed on receipt of $3, or a volume of the SCIENCE RECORD for each year and the last or coming six months of the SCIENTIFIC AMERICAN (optional to the subscriber) will be sent for $4.50.

Bound volumes of the SCIENTIFIC AMERICAN from January to July, 1873, and the SCIENCE RECORD, either for 1872 or 1873, will be forwarded by mail or express, free, for $5. Copies of the SCIENCE RECORD for 1872 and 1873, and the first volume of the SCIENTIFIC AMERICAN for 1873, bound, will be sent for $6.50, or delivered at the publication office for $6.

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## THE MEASUREMENT OF POWER.

Work is defined to be force or pressure acting through space, and it is usually expressed in foot pounds. Thus if a resistance of 40 pounds is overcome for a distance of 10 feet, we say that the amount of work is 400 foot pounds.

The power of a machine is the amount of work done in a given time. The unit of time for a machine is usually taken, in this country and in England, as one minute, and the unit of work, as 33,000 pounds raised 1 foot high, or 1 pound raised 33,000 feet high—the unit of power in this case being called one horse power. The French unit of power is called the *force de cheval*, and is equivalent to a power capable of raising 4,500 kilogrammes 1 meter high in a minute, or 32,549 pounds 1 foot high in a minute. Hence the French unit of measure for the power of a machine is about $\frac{1}{73}$ less than the English.

The simplest way to test the power of a steam engine is to see how high it will raise a given weight in a minute, and this is readily accomplished by means of the friction brake, often called the Prony brake, from the name of the inventor. The fly wheel of the engine is covered by a strap, which has a lever attached to it, on which weights are hung. By tightening this strap, the friction between it and the wheel may be made to take all the useful power of the engine, the amount being measured by the number of pounds in the weight and the number of revolutions of the engine per minute. Suppose, for instance, that the engine makes 100 revolutions a minute, and maintains the lever of the brake horizontal when it has a weight of 50 pounds attached at a point that would move a distance of 30 feet in each revolution of the engine, if it were free to revolve. Then the useful work of the engine per minute will be $50 \times 30 \times 100 = 150{,}000$ foot pounds, which is equal to $150{,}000 \div 33{,}000 = 4{\cdot}5+$ horse power. The steam engine indicator can also be used to determine the power exerted by the engine. By means of an indicator diagram, the mean pressure exerted on the piston during one stroke can be ascertained, and the horse power of the engine can be calculated by the following formula: Horse power = mean pressure × effective area of piston in inches × twice length of stroke in feet × number of revolutions per minute ÷ 33,000.

The indicated horse power will always be greater than the amount determined by the brake, because by the use of the indicator we obtain the total power exerted by the engine, including that necessary to overcome the friction of the moving parts and other prejudicial resistances. The difference between the indicated and effective horse power varies in different machines from 10 to 50 per cent of the whole power exerted by the engine. By throwing off all the work from the engine and taking a friction diagram, the amount of power required to overcome prejudicial resistances can be approximately determined. It must be evident, however, that the test with the brake is the most accurate, as the friction of the moving parts, which increases with the pressure, is greater when the engine is doing useful work.

In practice, the friction brake must be constructed with efficient means for cooling, as a great amount of heat is developed by the friction between the fly wheel and the strap. The most perfect form of brake is that used by the Royal Agricultural Society of England in their tests of portable engines. This is arranged with compensating levers, which ease or tighten on the friction strap automatically, keeping the lever which carries the weight always horizontal. With this form of brake, all the power exerted by the engine is overcome by friction. Cases frequently occur in which it is desirable to measure the amount of power transmitted by a shaft or pulley, and here the friction brake cannot be employed. Recourse must then be had to transmitting dynamometers, which measure the power exerted by registering on a scale the amount of force necessary to keep the pulley from turning on the shaft, or to keep the shaft from turning in its coupling. In the use of a transmitting dynamometer, the pulley is loosened on the shaft, and is clamped to a portion of the dynamometer that is securely fixed, the connection being made by weights, springs, or levers. In transmitting the power, the pulley will turn on the shaft until the tension of the spring or resistance of the weight is equal to the force necessary to drive the machinery; and the amonnt of this force being registered on a scale, the calculation for the power is made in the same manner as with the friction brake. None of the transmitting dynamometers, in use at present, are free from objections; and they require frequent testing, and very careful application to make the results reliable. For these reasons, the indicator and friction brake are generally employed, when their use is practicable. In a future article, we may have some remarks to make about the importance, to owners and users of steam power, of frequent and accurate tests.

## THE COMING PAVEMENT.

Recently there has been laid down on Fifth avenue, at its intersection with Broadway in this city (24th street), a trial specimen of the new Grahamite asphalt pavement. The example in question covers the street for half a block, and is placed just where it will receive the severest tests, from the wheels of omnibuses, ice carts, and throngs of vehicles of all sorts. If the new pavement can stand the racket here, no other test will be required. So enormous is the travel in this part of the city that the cross-walks, made of thick granite slabs, are soon grooved with ruts, cut by the wheels of heavy vehicles.

The new asphalt pavement is composed of a material termed Grahamite, found in West Virginia, and is alleged to possess more cohesion, tenacity, and elasticity than the famed *Val de Travers* asphalt, so extensively used for paving purposes in Paris and other European cities.

Grahamite does not fuse until it reaches 800° Fah., while the ordinary asphalts generally fuse below the heat of boiling water. The higher fusing point is due to the large quantity of asphaltene which the Grahamite contains. The Grahamite pavement will therefore remain hard and firm under the hottest natural temperatures, while the ordinary asphalt pavements under the same circumstances became softened and disintegrated. The Grahamite pavement possesses a high degree of elasticity, which affords great relief to the feet of horses and prevents the wear of vehicles; it is also so tenacious and hard that it will stand the heaviest blows from a sledge, only suffering compression at the surface. We have seen this test repeatedly applied, and have further noticed that the heaviest vehicles roll over it without making the slightest impression. It presents an even surface and forms, in every outward respect, a most admirable pavement. If the example now under trial shall prove, on the lapse of time, to be as really good as it now is, we have no doubt that our citizens will be glad to give it a general introduction. Wood pavements are a failure, and granite blocks are dreadful to travel upon. It may be that Grahamite is the coming pavement.

The pavement question deeply concerns every city and town in the land; and if anybody wants a subject to study upon, with a view to devising improvements, here is a grand one.

## LETTERS FROM COMMISSIONER THURSTON.

Among the select number of scientific experts appointed by the President to examine and report upon the different departments of the Great Exposition was Professor R. H. Thurston, of the Stevens Institute of Technology, Hoboken, N. J. On the eve of his departure, we requested him, if time permitted, to favor the readers of the SCIENTIFIC AMERICAN with an occasional letter, giving an outline view of the most interesting matters that might come under his observation, and he kindly consented to do so.

We have the pleasure of presenting in another column the first of Professor Thurston's communications, which contains a variety of interesting matter, including an account of preceding expositions, indicating also some of the points to which his attention will be specially directed during the present World's Fair at Vienna.

In all that relates to practical science, especially the mechanical branches, Professor Thurston is eminently qualified as a judge and observer. He will enjoy the best opportunities for obtaining information, and his letters will have a peculiar value.

## THE DIGESTIVE APPARATUS.

In a former article, we described the digestive channel from the mouth to the stomach. We will now trace the metamorphosis of the food into living tissue, which takes place after the food has reached its proper receptacle, the stomach.

The main agent in this process is the gastric juice, of which a healthy human stomach secretes not less than about 70 ounces (4¾ pints) every day. As the muscles are those portions of the body most subject to waste, every motion of a limb requiring a consumption of fibrin, a large portion of gastric juice is consumed in making fibrin for muscular repair; it has been ascertained that, in average muscular action, the consumption of fibrin is about 60 grains per day, requiring nearly 60 ounces of gastric juice for the formation of new substance to replace it. The food, after reaching the stomach, forms a kind of pulpy mass, subject to an intermittent slow rotation by the alternate contraction of the fibers of the exterior muscular coat; in this, the respiratory movements assist greatly. If the contents contain too much liquid, a large portion of this is directly absorbed, by endosmose of the coats of the stomach, and enters the circulation at once, so that the mass remaining may have the consistency proper for the performance of this rotatory motion. The exterior portions of this pulpy mass, which have undergone complete treatment by passage and friction along the interior coat of the stomach, ooze out into the intestines through a valve (called the *pyloric*) in a semi-fluid state, apparently homogeneous, called *chyme*. Its formation requires from one to four hours, while the muscular movement of the intestine propels it forward to the duodenum, where it is mixed with the pancreatic juice secreted by the pancreas, the enteric juice secreted by Brunner's glands, and the bile secreted by the liver.

Several erroneous theories formerly prevailed in regard to the digestive power of the stomach. One was that digestion was simply a mechanical operation, and that the food was ground up fine; but this was disproved by inclosing meat in small hollow silver balls, full of holes, attaching them to a string, and causing them to be swallowed by a dog; when, after a few hours, they were withdrawn, the meat was found fully digested, which could not be due to any grinding power, as it was fully protected against this. The other theory was that digestion was due to nervous agency, because it was much interfered with when the pneumogastric nerve was divided; but then it was proved that this simply paralyzed the motion of the stomach, and prevented the rotation and expulsion of the food, while the secretion of gastric juice and its action on the food was in no way interfered with. A third theory was that the food was vitalized in the stomach; that is, by means of some mysterious change, it was made to share in the vitality of that organ; but such a theory is highly unscientific, and nothing more or less than an attempt to explain the mystery by a word of obscure meaning, while it does not elucidate anything. It must be considered that even when the food is inside the stomach it is, anatomically speaking, yet outside the body or system, and cannot become part of the system before contact action takes place; and this action is chemical. The chemical theory of digestion, then, is now accepted as the true one; and it is corroborated by the fact that physiological chemists have succeeded in perfect artificial imitation of digestion, between which and the natural digestion there is no difference whatever.

Careful investigations on animals, and even on men who by accident had fistulous openings which gave access to their digestive channels, have proved that all substances are not digested in the stomach itself: that, for instance, nitrogenized food is not fully digested by the gastric juice, but chiefly by the intestinal juice, through the whole length of the small intestine; and that fat is not digested at all in the stomach, but that its digestion only begins when this intestine is reached; this has been called the calorifacient digestion, as it is directed to the heat-making portion of the food, and has for final result the keeping up the animal heat of the body. The length of this portion of the digestive apparatus is about 20 feet, and its surface some 3,500 square inches, being much greater than those portions of the digestive channel devoted to nutrition. The latest view in regard to the calorifacient digestion is that of M. Bernard, who has published experimental evidence proving that the digestion of fats consists simply in bringing them into the condition of an emulsion, by means of the pancreatic juice; and so they enter into the circulation of the blood and, while there, are in a continuous state of slow combustion, combining with the free oxygen which the blood has absorbed in the lungs, and is always carrying through the system.

The emulsion of the fats with the pancreatic juice, mixing with the chyme from the stomach and other ingredients, is absorbed by the ends of the lacteals, called *villi*, which are delicate tubes with which the interior of the intestines are lined, and which convey the metamorphosed substances of the food, now called *chyle*, through the mesenteric glands into the lacteal tube, which discharges the chyle upward into the veins just before they discharge their blood into the lungs.

The functions of the lacteals and *villi*, which are of such minuteness that in every square inch there are some 10,000

of them, are coincident with the operation of the lymphatics. We have here two separate systems, the lacteal and lymphatic, which ramify from the intestines all over the body, and of which the anatomical and physiological actions and relations are at present an important subject of investigation for modern biologists, and not yet fully understood.

It is evident from the preceding that the blood vessels, which have received the material from the digestive apparatus, contain two distinct liquids, the original venous blood and the chyle; this mixture makes its way through the portal vein to the liver, which is a double structure, of which one function is to cause this mixture to undergo an enormous change, consisting in the formation of young blood cells, and the other is the economizing of the mineral ingredients of the disintegrated blood cells, which are also eliminated by the liver and of which iron is the principal ingredient.

The above outline may serve to give the general reader an idea of the highly elaborate complexity of the diverse operations belonging to the mysterious process by which foreign organisms are changed into the living tissues of our bodies, which tissues, by interstitional repair, take the place of the old ones; they do this so thoroughly that we may safely assert that, in the course of only a few years, not a single material atom is left of those of which the body originally was made up. In order to comprehend the truth of this, we have only to consider that the average amount of solid food required for each human being is 800 lbs. per year, of drink 1,500 lbs. and of oxygen, consumed from the air, 800 lbs., a total of 3,100 lbs., surpassing the weight of the body more than 20 times. The most wonderful fact to contemplate is that, with all this continual change of the material of which our bodies consist, we do not lose our identity.

## MORDANTS FOR ANILINE COLORS.

While aniline dyes are remarkable for the ease with which they attach themselves to animal fiber, whether silk or wool, they are difficult to fix upon cottons and vegetable fiber in general. For this purpose albumen, the bichromates and other mordants have been used or recommended. The number of such mordants is not a small one; but the important question at present is which can be employed to the greatest advantage, and which will produce the most beautiful and cheapest colors. This cannot be answered by a series of experiments conducted on a small scale, but only by operating upon large quantities and in a practical workshop. The dyer in fine colors will not usually have an opportunity to decide which is the most suitable mordant for cottons. In this question, the value of the bath after the operation and its capability of being turned to account must be considered, and in all calculations, its value must be deducted from the total cost of the materials employed.

To discuss at this time all the different methods employed in fixing aniline colors would lead us too far; almost all have been superseded by the methods in which tannin is employed. This is especially adapted to fuchsin and iodine green. Both of these dyes produce, with tannin, brilliant colored compounds which are totally insoluble, so that tannin most completely fulfils the ends required of a mordant. Tannin is, however, quite expensive, and hence we must seek some substitute which either renders the use of tannin entirely unnecessary or at least makes a saving in its use. The substances previously suggested, such as oleic acid or stearic acid, do not sufficiently fulfil the requirements, and it seems probable that a substitute for tannin, which shall entirely replace it, will be difficult to find. A long series of experiments on a large scale have lead to the conviction that tannin, either pure or in sumach, is, in the mean time, still indispensable.

A German, named Austerlitz, has recently observed that a considerable saving of tannin can be effected by combining it with glue before using it, so as to employ both glue and tannin simultaneously as mordant. Under these circumstances, much less tannin is required to produce a given shade with fuchsin, iodine green or any other aniline color; in fact, the same results may be obtained with half the quantity of tannin required when no glue is used. Austerlitz says: "I have established this by a series of experiments on a small scale, using weighed quantities of tannin with varying quantities of glue. A piece of cotton goods was first mordanted in a bath of tannic acid, and then cut in two, one half being drawn through a weak solution of glue or gelatin, the other immersed directly in a dye bath of known concentration at a given temperature. The half which had been through the glue bath was then dyed in a bath of precisely the same sort, and the two samples compared. The cotton on which glue had been employed was far more thoroughly dyed and of a deeper shade. It was also proved that the tannic acid bath might be much weaker, if followed by a glue bath, than when used alone. The amount of tannin saved in this way is not small.

By gradually diluting one of the tannin solutions and continuing the series of parallel experiments with tannin and glue and with tannin alone, a point is finally reached where both methods produce the same shade. When this point is arrived at, a comparison of the concentration of the two tannin baths will show how much is saved. This quantity, of course, depends greatly upon the quality of the tannin, so that my experiments have not given a result which can be expressed in figures. Samples from different sources gave different results, so that in some cases more was saved by the glue bath, in others, less."

The cause of these phenomena have not yet been ascertained, but it is probable that a compound of tannin and glue is formed, which has an action upon aniline different from that of tannin alone.

## FISH CULTURE BY FARMERS.

Why should not farmers and others raise fish for the market and for their domestic uses, as well as cattle, fowls or any other living stock? For so staple and healthy an article of food, it seems as absurd to be dependent upon chance capture in a wild state as it would be to rely for our poultry upon the fortune of the hunter or for our vegetable supply upon the finding of suitable esculents in localities in which a knowledge of botany may tell us they ought to grow. The efforts of the fish commissioners in this and other parts of the country, in stocking the waters with the spawn of valuable species of fish, will undoubtedly largely increase the numbers of the finny denizens of our rivers and streams; but the labor of securing an abundant and readily obtainable supply is thus only begun, and it seems to us that it may be continued by every dweller in the rural districts having the simple facilities requisite for the construction and maintenance of suitable fish receptacles.

Artificial incubation and the stocking of private ponds are of course no novel idea. History tells us of the vast sums expended for such purposes during the decline of the Roman empire; and pisciculture, especially in the monasteries, seems to have flourished through the middle ages. The success which has attended all modern efforts in a similar direction, even in the propagation of the trout and other delicate species, leaves little doubt but that, at a very moderate outlay of time and money, every farmer could provide himself with a well stocked pond, which he would find a constant source of valuable remuneration.

Dr. J. H. Slack, the New Jersey Commissioner of Fisheries, writes to the *Tribune* a letter containing many useful hints relating to this subject. Referring to the preparation of the ponds, he says that two points must not be overlooked: proper proportions of the banks and freedom from surface water. For the former, with ordinary loam, the following proportions will be found correct: Let the base of the tank equal three times its hight, and let the width of the top equal the hight. Thus, if the tank be 10 feet high the base should be 30 feet and the width at the top 10 feet. The sluices and overflow should be made of stone laid in cement. Wood, it is stated, will rot very rapidly and prove of no value. The services of a competent engineer may be employed to advantage, and the money expended for such supervision will save much trouble and vexation. Surface water is a fertile source of trouble, as it carries with it brush and leaves, which clog the screens, allowing the contents to overflow and permitting the escape of the fishes. In most cases, a series of ditches, entirely surrounding the ponds, will carry off the surface water, a gate being placed at the head of the ponds with an opening only allowing as much water to enter as can be readily conducted away. At the sluice gates screens of wire gauze must be placed to prevent the egress of the fish. These should be made of galvanized wire if of large mesh, and of copper if fine. A screen of coarser mesh, placed a few inches up stream from the fish screen, will arrest much of the floating trash and prevent clogging. This second screen, called the leaf screen, should be placed at an angle of about 60° that a greater surface may be exposed to the water.

As regards stocking the tanks, it can hardly be expected that every farmer can enter into the careful operations of trout culture, but there are plenty of other varieties of fish suitable for food which may be easily and profitably reared. The ordinary cat fish (*pimelodus*) will thrive and breed in almost stagnant water, and is hardy and enduring. The female takes care of her young, which, for some weeks after they are hatched, follow her about as chickens do a hen. For large ponds, through which a gentle current can be made to flow, the best fish for the south is the southern bass (*grystes salmoides.*) It has a variety of names and is known also as the yellow and black bass, trout, chub, and growler. The adult fish is of a greenish brown color with a bluish black spot upon the gill, the young having in place of the spot from two to four longitudinal bars; the back fin is spinous and high, and the tail is similar to that of the trout. Besides the above two varieties mentioned as examples, there are scores equally valuable as food, some indigenous to northern, others to southern waters, which will probably suggest themselves to our readers interested in the subject.

The temperature of the water in the tank is an important matter, as fishes respire not water but air mingled with water. At the temperature of 50°, six cubic inches of air are contained in each gallon of aerated water, while at 212° none is present. With a supply of 1,000 gallons per minute at a temperature of 50°, fish could be maintained in a tank of about 8,000 cubic feet sufficient for a small village.

If the pond be well supplied with aquatic insects and plants, the fishes will need no food; but generally overstocking is the case and hence a certain quantity is required. Any kind of animal food, cooked or uncooked, is suitable; the entrails of fowls, lights of beef, oxen and hogs, if thrown in in small pieces, will be eaten with avidity. Curd or "smear kase" should only be given with animal food, being apt to cause disease. For the small fry of trout, the larvæ of the common mosquito are stated to form excellent nutriment, a better utilization, by the way, of that tormenting insect than the Yankee project of capturing them in large quantities and using their bodies as manure. It is estimated that about two barrels of rain water will be required for each thousand fry, the insects being strained out from time to time as fast as they are developed, and thrown into the trout pond.

A SHOWER of frogs, which darkened the air and covered the ground for a long distance, is the reported result of a recent rain storm at Kansas city, Mo.

## THE RECENT ARCTIC EXPEDITION.

Secretary Robeson's report of the official investigation regarding the Polaris expedition, based upon the testimony of the survivors rescued from the ice floe, has at length been given to the public. As far as the record of the voyage extends, the account is substantially the same as that already published in detail in our columns. Considerable information, however, has been elicited regarding incidental topics and that bearing upon the mysterious portion of the recital, notably the death of Captain Hall; while that relating to the separation of ship and crew is of especial importance and interest.

The circumstances attending the decease of the commander are fully detailed, and as far as possible the statements of the witnesses reconciled and carefully compared. From all the testimony, the examining officials are inclined to reject the poisoning theory, so eagerly grasped by sensational journals, and arrive at the unanimous opinion that the death was due to natural causes. This view is qualified by the statement that none of the survivors are capable of giving an accurate account of Captain Hall's symptoms, nor of his last illness, and consequently the true state of the case must remain indefinite until the return of the Polaris. There seems little doubt but that the breaking adrift of the ship was purely the result of accident. The vessel was suddenly beset by a tremendous pressure of ice, which was driven against her from the southward, throwing her on her beam ends. To ease her, the provisions, stores, etc., were being removed when, during the darkness of the night and in a fierce gale, she parted her hawsers and disappeared. The sighting of the Polaris on the next day and her non-response to the signals of the abandoned crew, even when, from the distance intervening, they must have been clearly seen, are carefully considered. It is believed that, from a dispassionate point of view, the apparent indifference of those aboard must be ascribed to both inability and caution. The vessel had been so roughly handled the night before that both captain and crew might readily believe she would be lost; hence the removal of articles to the floe was attempted. Then when she broke adrift, her steam pipes, valves and connection were solid; and she was for hours without steam, unmanageable amid the floating ice. Moreover she was leaking badly and totally destitute of boats, so that it appears to have been the duty of the commander, Buddington, to get her in a place of safety, such as was the shelter of Northumberland Island, as speedily as possible. Furthermore, he knew that the ice party had boats and consequently could have believed their safety assured; and at all events, whatever his doubts might have been, a severe gale decided the question, driving the ice floe out of sight of ship and land. From this array of considerations, the final judgment is reached that the entire circumstances of the separation were accidental and unavoidable.

The Polaris, it is stated, had a broken stem and was leaky. She had plenty of provisions but not much coal, and probably remained in winter quarters at Northumberland Island. There is a difference of opinion as to whether she will be able to reach Upernavik or Disco under sail if she gets free this season, and it is believed that she will need assistance to escape from the ice.

The scientific results of the expedition are better than first imagined. The records of the astronomical, meteorological, magnetical, tidal and other departments are extremely full, and extensive collections of objects of natural history have been made. Specimens of drift wood were picked up near the shores of Newman's Bay, in which walnut, ash, and pine were recognized. The dip of the needle amounted to 45° and its duration to 96°, being less than at Port Foulke and Rensselaer Harbor, as given by Drs. Kane and Hayes. Auroras were frequent but not brilliant, consisting sometimes of one arch and sometimes of several. Streamers were quite rare and shooting stars almost constantly visible. The average of the rise and fall of the tide was about 5½ feet, and the greatest depth of water noted 100 fathoms. The existence of a constant current southward was also noted, its rapidity varying with the season and locality. The winter temperature was found much milder than was anticipated, the minimum being 58° below zero in January, though March proved to be the coldest month.

The open polar sea of Kane and Hayes was found to be a sound of considerable extent, and, it is believed, communicates with Francis Joseph Sound, and thus defines the northern limit of Greenland. Its length was not ascertained.

Pursuant to the recommendations of the investigating committee, the Secretary of the Navy has completed the purchase of the sealing steamer Tigress, the vessel which rescued the party on the ice field, and has ordered her prompt fitting out for a voyage in search of the Polaris. The Tigress is constructed especially for encountering the heavy ice of the arctic regions, and will be equipped in the most thorough manner so as to be ready for sea by the early part of July. She will be commanded by Commander James A. Greer, a well known officer of the navy. The Juniata, another naval vessel, has been got in readiness with the greatest rapidity and has sailed for Disco to carry supplies of coal and provisions for the Tigress, and also to seek information regarding the Polaris. The ship was fitted out at the navy yard in Brooklyn, and is heavily sheathed with iron. It is expected that she will return during the autumn, bringing the latest news and leaving the Tigress to penetrate to Northumberland Island.

"THE PIG IRONISTS IN COUNCIL" is the heading of a report, in the New York *Herald*, of the proceedings of a convention of gentlemen engaged in the iron trade, lately assembled at Cleveland, O. Rather a scaly sort of irony, that.

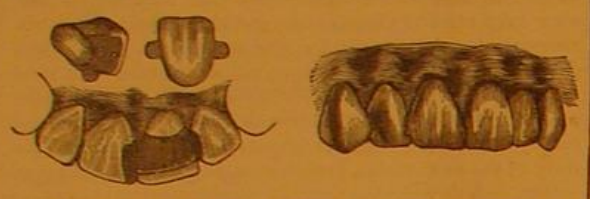
[Dental Cosmos.]

### A Device in Dentistry.

The insertion of a porcelain tooth without a plate or clasps, and where no root remains, and where the remaining teeth are firm in their sockets, may be considered permanent when inserted as here illustrated. About two years ago an operation somewhat of this character was described in the *Dental Cosmos* by Dr. B. J. Bing, then practicing in Paris, now in London.

A patient who disliked the wearing of a plate, and desired something different, presented, when the operation now to be described was decided upon and performed. After forming appropriate cavities in the proximate surfaces of the teeth next the space left from the loss of the natural tooth, an impression was taken and a plain porcelain tooth selected, fitted to the parts and backed with gold, a portion of the backing extending from each side about one and a half lines, for insertion into the cavities prepared for them in the adjoining teeth. A small gold plate was then formed to fit upon the gum, covering as much of it as would embrace the neck of the natural tooth were it in position. The backing when riveted to the porcelain was then adapted to the position in which it was to be placed; and while the whole rested on the small plate upon the gum, the backing and plate were so secured by a cement that they could be removed intact, and, after the usual preparation, soldered. The surface of the extended sides of the backing was roughened, so that the gold would better secure them when filled into every part.

This being done, a thin piece of rubber coffer dam was placed on the adjoining teeth and over the gum upon which the porcelain, with the gold attachments, was to rest. The rubber occupies but little space, and, when ligated to the teeth adjoining, so presses up the gum that its thickness is more than compensated for. The porcelain, with its attachments, was then placed in position, and secured firmly by the solid impactation of small pieces of light cohesive gold foil around that portion of the plate extending into the cavities.



The parts when in position appear as here illustrated, the gold backing and fillings showing plainly on the palatine surface, while on the labial no gold is exposed to view, excepting a small portion of the filling in the lateral incisor. The porcelain and gold attachments as prepared for insertion are also shown. It will be seen that the cavity in the central incisor was formed to the cutting edge of the tooth. This was done to gain access to both sides of the plate extended into the cavity, which could not otherwise be done unless a portion of the labial surface were cut away, which would have been objectionable in consequence of the exposure of gold. In the lateral incisor this was deemed necessary, because, being smaller than the other, it was thought best not to cut it away in the same manner. It was so arranged, however, that though the filling can be seen, it is not conspicuous.

### A Curiosity of Old Times.

In the *Mechanic's Magazine* of January, 1824, we find the following curious communication:

PROPOSAL FOR INCREASING THE STRENGTH OF GUNPOWDER.

A D is a longitudinal section of a great gun; C, the cartridge; B, the ball; E, a hollow metal sphere, similar to a




bombshell or hand grenade, with a hollow neck or tube, G, which screws into the breech of the gun: F, the touch hole.

The design is that the ignited powder in the shell shall throw a quantity of flame suddenly into the gun, and explode every grain of the cartridge powder. It is not, however, meant that preventing any of the powder from being blown out unignited is to give the additional force; on the contrary, it is certain that the expansive power of explosive mixtures is as the quantity of flame suddenly formed by them, particularly in confined situations, where the flame is supplied with matter from the combustible substance itself only. In proof of this, let flame be communicated to the powder of a charged gun, by firing a pistol containing powder only into its touch hole, and the result will be found to be, that the momentum of the ball from the gun will be much greater than if the same quantity of powder as that fired from the pistol had been added to the cartridge in the gun, and the whole exploded in the customary manner. This I ascertained by experiment nearly ten years since. The thing is now put beyond all manner of doubt, from the discharge of guns being effected by detonating copper caps. Sportsmen, using the same, declare that a less quantity of powder produces an equal effect to a greater quantity without these caps. It may be necessary to add, that trials are indispensable to ascertain the maximum of the size of the shell, E, and of the quantity of powder it should contain to be safe and most efficient.

*Query.*—Might not the guns of forts be constructed so as to slide backwards and forwards on *fixed* but *centered* carriages, by which much fatigue would be avoided by the men?

Chatham. J. H. PASLEY.

### THE MECHANICAL PIGEON.

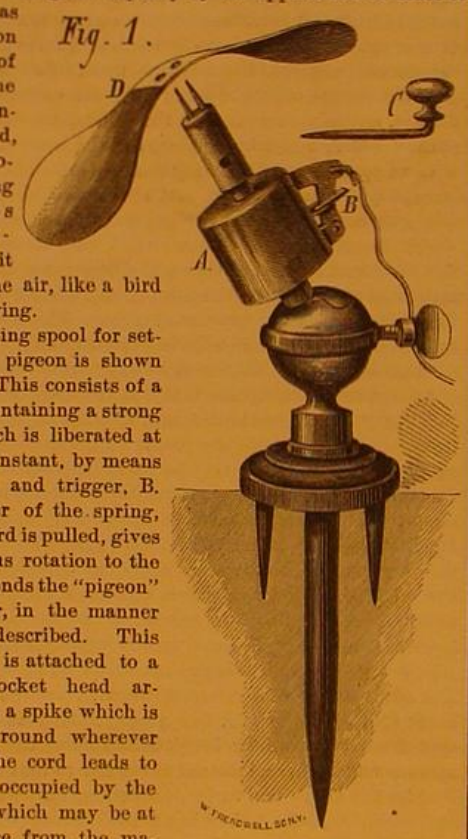
To attain dexterity in the shooting of birds upon the wing, it has been the practice of sportsmen to make use of live pigeons, which are placed in suitable cages, from which, by a string, they are liberated at the desired moment, to be needlessly shot down by the gunner. The great cruelty of this sport has led to the invention of what is termed the mechanical pigeon, the construction and operation of which is illustrated in the accompanying engravings.



The mechanical pigeon consists of a thin strip of sheet iron, six inches or more in length, having wings bent somewhat like the blades of a screw propeller, as shown at D, Fig. 1. When rapid rotation is given to this propeller, it rises high in the air, the wings are seen to flicker or vibrate, and its whole appearance resembles a flying bird.

To effect the aërial flight of the mechanical pigeon, two methods are employed. One of these, shown in Fig. 2, consists of a spool, A, mounted on a handle, thei spool being turned with great rapidity by the application of force to the cord, as shown. Upon the forks of the spool the pigeon is centered, and, when a proper rotating velocity is communicated, away it sails into the air, like a bird upon the wing.

Fig. 1.

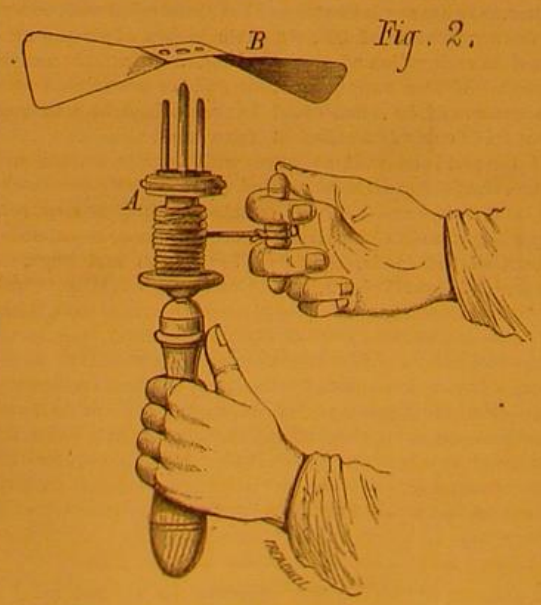



A self-acting spool for setting off the pigeon is shown in Fig. 1. This consists of a barrel, A, containing a strong spring, which is liberated at the proper instant, by means of the cord and trigger, B.

The power of the spring, when the cord is pulled, gives instantaneous rotation to the forks, and sends the "pigeon" into the air, in the manner previously described. This spring spool is attached to a ball and socket head arranged upon a spike which is set in the ground wherever desired. The cord leads to the position occupied by the sportsmen, which may be at some distance from the machine, as shown in Fig. 3.

When the trigger is pulled, the mechanical pigeon flies and

Fig. 2.




the sportsman fires, thus enjoying the best of gunnery practice without cruelty to innocent birds. If a shot strikes the mechanical pigeon, its direction is changed, and it falls to the ground. This contrivance has become an extensive article of sporting merchandize.—*Science Record for* 1873.

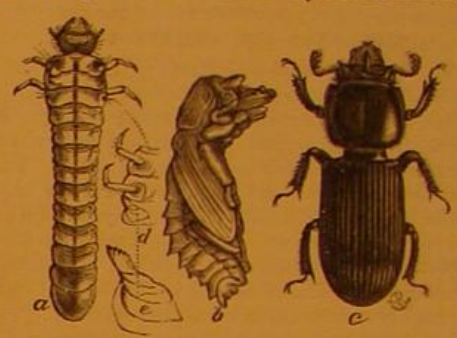
[From the Fourth Annual Report of Charles V. Riley, State Entomologist of Missouri.]

### THE COMMON BEETLE.

Many an one will doubtless recognize, in the insect illustrated herewith, the bug with which he or she, as a child, was wont to play at "oxen," the curved horn on the head forming such an inviting projection on which to hitch, by means of a thread, small chips and other diminutive objects, to be dragged by the rather awkward beast of burden. Every pioneer in this Western country, as he rolled over huge decayed logs, in the work of clearing his land to make it ready for the plow, must have become familiar with this highly polished coal-black beetle. Every woodsman who has split or grubbed an old stump will be likely to recognize in this horned bug an old acquaintance. Every entomologist who has dug into or pulled to pieces old rotting stumps, in search for other treasures, must time and again have seen this lazy, clumsy *passalus* tumbling down with the loose and crumbling dust and excreta of its own making, and expressing its disapproval of such summary disturbance, in the plainest manner, by emitting a peculiar half hissing, half creaking noise. And though met with at almost every step in his forest rambles,

Where wild birds sing beneath the leafy bowers,

the inquisitive student has no doubt found himself repeatedly examining specimens, not only to admire the elegance and beauty of form, but to ascertain the means by which the peculiar noise is produced. A sufficiently careful examination




The Horned Passalus—*Passalus cornutus*, Fabr. (Coleoptera, Lucanidæ.)

will end in the knowledge that it is caused by the rubbing of the rather horny terminal joints of the abdomen, known as the *pygidium*, against the inside of the hard wing covers.

This insect cannot be considered injurious in any sense of the word, and might with propriety be introduced in the section of "Beneficial Insects." It is never found in sound or green wood, but invariably in that which is decaying, and it very materially assists and hastens the reduction of stumps which might otherwise remain treble the length of time, to occupy valuable ground and serve as an eye sore to the careful farmer in wooded countries. Unseen and unheard it carries on incessantly the good work of converting useless timber into mold which enriches the soil; and this has been its office in all the past ages of its existence. A decaying, moist condition of the wood is necessary to its development, and it will be found most common on low moist ground, and in oak, hickory, and sweet gum logs or stumps.

Common as is this beetle, its larva and pupa are rarely seen, and seem to be unknown even to most entomologists, while no good figures of them have been published.

The larva, *a*, is of a very exceptional character, being the only one in this country which possesses but four well developed legs, for though many butterflies in the imago state have the front pair functionally impotent, no other insect than our *passalus* exhibits a similar feature in the larva state. Indeed the only other larvæ in the whole class of insects which are similarly characterized are those belonging to the same genus in other parts of the world. The third pair of legs really exists, however, in a rudimentary state, as shown at *d*. This larva is of a bluish white color with the anterior joints broader and flatter than the rest. It transforms in the fall of the year, within the wood it inhabits, to a whitish pupa, *b*, in which the front pair of legs is thrown forward under the head, and the horns of the future beetle show plainly on its top. The pupa lasts but about a fortnight, when, throwing off the pupa garb, it becomes a perfect beetle. At first the parts are all beautifully white and delicate; then the head, thorax, and limbs gradually become amber brown, and lastly the wing covers assume this color. The whole body then deepens very gradually so that many days elapse before the coal black color is acquired; and in the month of August the beetle is as often found brown as black. As larvæ only half grown are found in company with those that are full grown, they require at least two years to mature.

### Progress of Plated Ware Manufactures.

By many the plated goods are preferred, not only on account of the difference in cost, but because the designs and appearance of the goods are nearly identical with the solid ware. The Meriden Britannia Company confine their attention mainly to the manufacture of nickel silver and white metal silver plated goods. The company was established in 1852, at West Meriden, Conn., where they now occupy five acres of ground, and have eight factories, the largest of which is seven hundred feet long, presenting an imposing appearance. The capital invested is more than $2,000,000 and the capacity of the works about $4,000,000 yearly. The company employ 700 men.



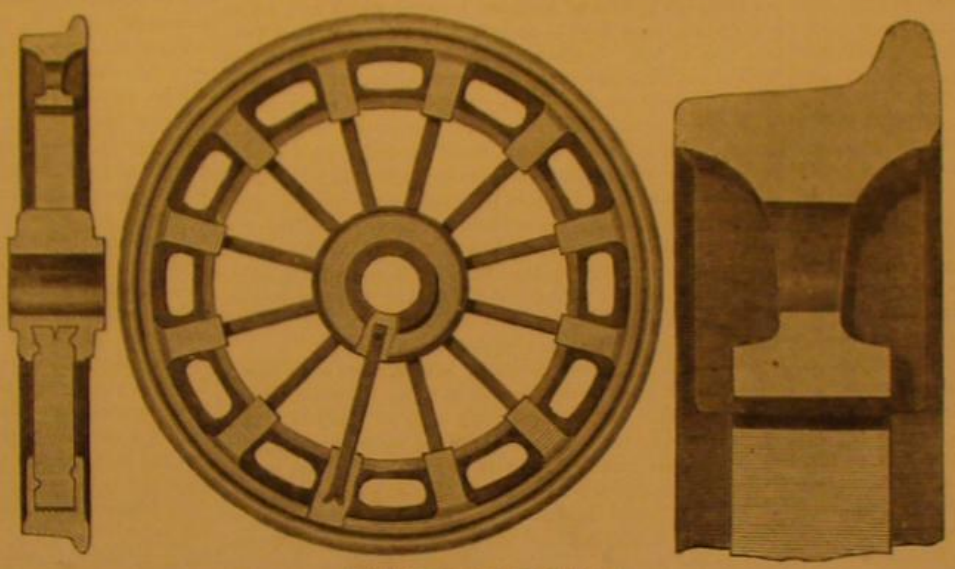

## NOTES FROM THE VIENNA EXPOSITION.

LEATHER MANUFACTURES.

The display of leather and leather goods at the exposition is very large, and many countries are represented. Turkey has a fine representation of leather articles in great variety, also Austria, France, and the German states. The American display is small; but the exhibition of hand and machine sewed boots and shoes, from Lynn, Mass., is declared to be the best of anything of the kind in the exposition.

LUDWIG'S RAILWAY WHEELS.

We illustrate, herewith, a somewhat novel construction of chilled cast iron railway wheels with wrought iron spokes, of which a pair are exhibited at Vienna from C. I. Bergmann's foundery and iron works, of Graz, Styria. These wheels, which have been designed and patented by Mr. Ludwig, the manager of the above works, are intended as substitutes for the chilled cast iron disk wheels in use to some extent on Austrian and German railways, and their construction will be readily understood from our engravings. The rim is cast in a chill, and from its form it can, without risk, be cast of harder iron than is usually employed. The rim and boss are connected by wrought iron spokes, as shown, and the wheel is stated to be capable of being broken only with great difficulty. One hundred and sixty pairs of these wheels have already been running about a year on the Graz-Koflacher railway, and they are stated to have given good results. We are indebted to *Engineering* for the illustration.



LUDWIG'S RAILWAY WHEELS.

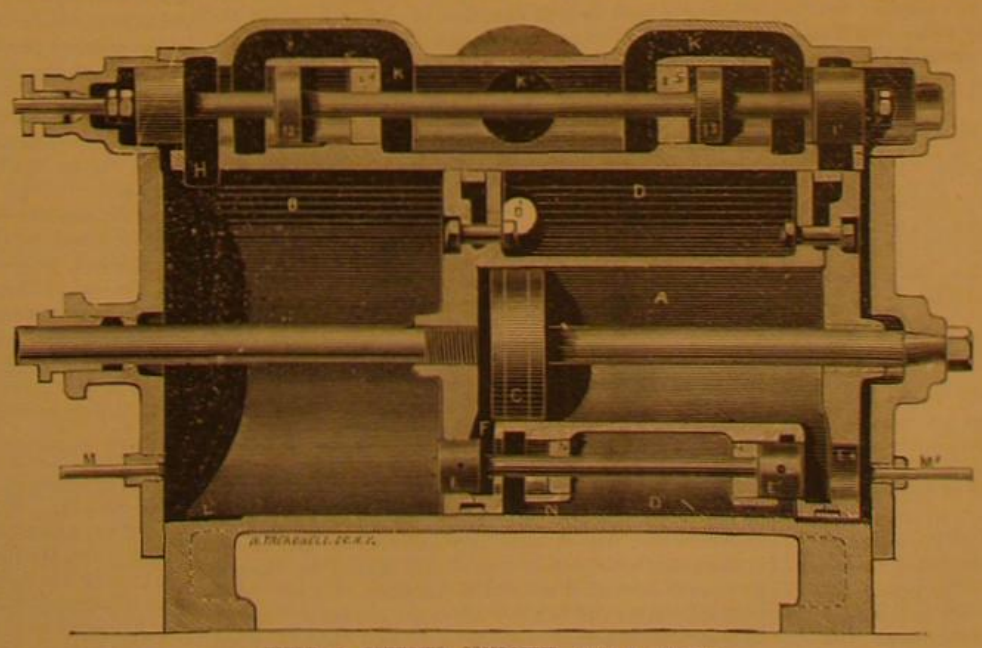
NEW COMPOUND ENGINE.

Messrs. Edward Field and F. M. Cotton, of Chandos Chambers, Adelphi, London, England, exhibit a model of a direct expansion compound engine, of which we give an illustration from *Engineering*. The arrangement consists essentially of a high pressure cylinder placed within the low pressure cylinder, and moving backwards and forwards upon a fixed piston; the annular space around this high pressure cylinder is always filled with steam direct from the boiler, which passes into the cylinder through the ports on the lower side, the admission being regulated by the piston valves shown in the engraving. By means of these valves, also, the steam from the smaller cylinder enters the low pressure cylinder, while at the end of each stroke a small quantity of steam passes from the annular reservoir into the low pressure cylinder, to serve as a cushion and to move the valves. Piston valves, on the top of the low pressure cylinder, regulate the communication between it and the exhaust.

In the section, A is the high pressure cylinder, the flange and covers of which serve as a piston to the low pressure cylinder, B; the fixed piston is shown at C', and D is the annular high pressure steam chamber or reservoir in direct communication with the boiler by the pipe, D', surrounding the cylinder, A, and moving with it. The piston valves belonging to this cylinder are shown at E E', and are connected by a spindle, $I^4$ $I^5$. They work in cylindrical passages bored out of the lugs, N N', and cushions, M, are introduced as shown to receive the blow from the valves at the end of each stroke. The valves for opening and closing the exhaust of the low pressure cylinder are shown at I I': they are also connected by a spindle, and cushions similar to those just mentioned are provided at $I^4$ $I^5$, for the cushioned valves, $I^2$ $I^3$, to strike against. The exhaust opening is shown at K'. At each end of the low pressure cylinder is formed a small groove, L and L', which admits steam from the annular chamber into the low pressure cylinder at the end of each stroke, for the purpose of throwing over the valves, E E', and of forming a cushion for the moving high pressure cylinder. Small spindles, I, M and M', are provided, the former at the end of the exhaust valve chest, and the latter at each end of the low pressure cylinder, in a line with the center of the valves, E E', in order to move the latter if necessary.

Taking the position of the high pressure cylinder at the end of its stroke, as shown in the section, it will be seen that the valves, E E', are thrown forward, so that steam from the annular chamber is admitted through the port, F, to the forward side of the fixed piston, C; at the same time the motion of the valve, E', has opened the exhaust port of the cylinder, A, the steam from which passes into the low pressure cylinder. But before this takes place it is necessary to move the valves, E E', which is effected as follows: The cylinder, A, in coming to the end of its stroke, passes over the small grooves, L, before mentioned, and admits steam from the annular chamber, D, which, passing into the small space in the low pressure cylinder, behind the end of the high pressure cylinder, acts at once upon the back of the valve, I', which it throws over, opening the communication between the low pressure cylinder and the exhaust, and also upon the valves, E E', which are moved into the position shown in the section, Fig. 1. The steam from the chamber then passing into the cylinder, A, and that from the same cylinder being exhausted into B, both act simultaneously in the same direction.

The arrangement just described and illustrated is adapted especially for working pumps direct, and steam is admitted into the high pressure cylinder during the whole of its stroke. By a modification, however, the engine may be connected to a crank shaft, and any desired degree of expansion obtained. The proportion between the cylinders is five to one.



FIELD & COTTON'S COMPOUND STEAM ENGINE.

THE GREAT RUSSIAN NAVAL GUN.

In the matter of great guns and other ordnance, it seems to be admitted that the Russians take the palm at Vienna. The great Russian naval gun is one of the largest breech-loaders ever made. It weighs forty tuns, and cost sixty-seven thousand dollars. It is made entirely of cast steel. The bore is 12 inches, and the core is composed of a solid tube, 29 inches in diameter at breech, tapering towards the muzzle, the tube being reinforced by steel rings shrunk upon it and upon each other, four layers of rings being used; the entire diameter of the gun at the powder chamber being a little more than 4 feet 9 inches. In the rifling there are thirty-six grooves. The charge of powder is 113 lbs., the expected initial velocity of projectile 1,398 feet per second. The gun has not yet been fired. It is designed for service on the war ship Peter the Great.

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IT is proposed to turn our Alaska possessions to account as penal settlements

### Interesting Electrical Experiments.

At a recent soiré of the Royal Society, Mr. Willoughby Smith's discovery of the effect of light upon the resistance of selenium was illustrated experimentally by Mr. Latimer Clark. A piece of selenium was inclosed in a test tube connected at each end to platinum wires, and the tube was placed in a box with a sliding cover so as to admit any desired quantity of light. The resistance was balanced on a Wheatstone bridge, and with the aid of a Thomson galvanometer; the movement of the spot of light of course would follow any variation in the resistance of the selenium. With the box closed, the resistance of the selenium remained constant; but immediately the box was opened, the light index upon the scale began to move.

Another very interesting experiment was shown by Mr. Tisley, to prove the effect of magnetism upon ordinary electrolytic action. Water being decomposed in the ordinary manner, the gases were at once set free; but on connecting the electrodes of the battery with an electro-magnet, the gases commenced to revolve around the magnetic poles. A small bath was placed over the magnet, the bath itself forming one electrode and a plate, in the acidulated water of the bath, the other electrode. When the coil was magnetized, the evolved gases immediately commenced to revolve round the center plate at considerable speed.

### Electrical Transmission by Cables.

As the first application of current to a cable is to charge it, it is evident that, before any employable electricity can issue from the further end, the corresponding charge must be completed. We may therefore assume that the time required by a wave to charge a cable, and the retardation on the time required for a wave passing from one end to the other to reach a given amplitude, are identical. Mr. Varley is of opinion that the electric current commences flowing out of one end of a cable at the very instant that contact is made with the battery at the other end, but that it is a considerable time before it reaches an appreciable strength; that it then goes on augmenting in strength, never absolutely attaining its maximum force. This may be so; but whatever the nature of electricity may be, it is difficult to imagine the total absence of inertia to its propagation. It is more probable that the velocity of electricity is the same in all conductors, whether submarine or overhead, or in any other form, and that it is very great, but that the resistance and induction of the circuit combine to prevent the wave reaching an appreciable strength for some time after it has commenced to flow out. This is a question, however, which can never be settled experimentally, because we can only recognize the issuing wave after it has attained strength enough to perform some mechanical effect.—*Robert Sabine, C. E., in the Telegraphic Journal.*

### Scientific Immortality.

No doubt, says F. Papillon, there is no contradiction in conceiving of a perfect equilibrium between assimilation and disassimilation, such that the system would be maintained in immortal health. In any case, no one has yet even gained a glimpse of the modes of realizing such an equilibrium, and death continues, till further orders, a fixed law of Fate. Still, though immortality for a complete organism seems chimerical, perhaps it is not the same with the immortality of a separate organ in the sense we now explain. We have already alluded to the experiments of M. Paul Bert on animal grafting. He has proved that, on the head of a rat, certain organs of the same animal—as the tail, for instance—may be grafted. And this physiologist asks himself the question whether it would not be possible, when a rat, provided with such an appendage, draws near the close of his existence, to remove the appendage from him, and transplant it to a young animal, which, in his turn, would be deprived of the ornament in the same way in his old age in favor of some specimen of a new generation, and so on in succession. This tail, transplanted in regular course to young animals, and imbibing at each transference blood full of vitality, perpetually renewed, yet ever remaining the same, would thus escape death. The experiment, delicate and difficult, as we well see, was yet undertaken by M. Bert, but circumstances did not allow it to be prolonged for any long time, and the fact of the perpetuity of an organ, periodically rejuvenated, remains to be demonstrated.

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THE Great Eastern finished laying the new cable on June 27.

## THE GREAT EXPOSITION.—LETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON.

NUMBER I.

At sea, latitude 53° 3′ N., longitude 36° 17′ W.: That is to say, at very nearly the half way point in the great circle course which has been taken by our "skipper" in running from New York to Glasgow, after clearing the Newfoundland coast.

June 1, 1873.

We are *en route* to Vienna in great haste, and yet in a somewhat roundabout course. The object to be attained is to learn as much as possible of the industries of the world, as illustrated at the great *Welt-Ausstellung*. This route has been chosen with the intention of obtaining a glimpse at some of the principal establishments which have produced the marvels of the exposition, and to learn something of the methods adopted and facilities possessed by British and continental manufacturers, and thus to learn how to imitate as well as what to copy from them. We shall find much to learn, undoubtedly, and as certainly shall be able to find many points in which our Yankee practice excels that of our friendly rivals across the Atlantic. Our time is limited, yet we hope to be able to acquire a valuable stock of interesting and valuable information before the equinoctial gales shall meet us on our return.

These great international exhibitions are becoming, as they should be, most powerful agents in the work of advancing civilization. Bringing together all nations in generous emulation, they lay before them the fruits of the labor of man in every part of the globe, presenting to each the *chefs d'œuvre* in art, of every country, the national productions of every clime, and every variety of manufactures from the whole civilized world.

The Vienna exhibition is the last of a series, of which the British exhibition of 1851 was the first.

In 1851, the whole world was at peace; even the threatenings of the storm, which so soon after burst upon the Crimea, had not attracted attention. There had been, for some time previous, exhibitions of British products, at more or less regular intervals, which had gradually increased in magnitude and importance, until their managers finally concluded to attempt the experiment of a "World's Fair." The experiment was quite successful, and it was, for several years, referred to as a display, marvelous in extent and wonderful for its varied attractions. America competed successfully with Europe, although her distance and the novelty of the scheme, as well as the comparatively short time allowed for preparation after its announcement, prevented as full contributions as would otherwise have been made.

Other "World's Fairs," including that in the Crystal Palace at New York, were attempted during succeeding years; but the next really important and truly international exhibition was also held at London. This was in 1862.

The area occupied was something more than half a million square feet, and the exhibition was a very successful one. The United States were quite well represented and our exhibitors had little cause to complain in the distribution of awards.

Five years later came the Paris exposition, in some sense the greatest triumph ever achieved by the late Emperor of the French. It can never be known how far Napoleon III. was influenced, in proposing this great plan, by a desire to acquire "victories of peace" for himself and for the French people, and how far by the necessity which he undoubtedly felt, even then, of taking every possible method of distracting the attention of his people from the schemes of domestic enemies, and from the work in which they were evidently actively engaged—that of fomenting internal dissensions. Bismark, the shrewdest and most skillful statesman and diplomat living, was quietly but not unsuspectedly perfecting his plans for the humiliation of France and the "unification" of Germany, and for the creation of a new empire; and the French Emperor could not but be fully aware that France would require perfect unity and all her strength to command success in what he must have known to be an irrepressible conflict.

Thus the Paris exposition preceded the French and German war of 1870, as the World's Fair, at London, in 1851, preceded the war of the Crimea of 1854.

It was a wonderful display of the manufactures and productions of the world. It covered an area of a million and a half square feet, and every civilized country on the face of the globe was well represented, while even the most distant islands of the Pacific and the most barbarous tribes visited by either missionary or trader, in the "uttermost parts of the earth," contributed rude weapons or yet ruder domestic utensils and industrial implements.

America distinguished herself at Paris as she had never done before. The American section was not remarkable for its extent, but our most important manufactures and productions were well represented, and our exhibition of labor-saving machinery, of machine tools, and of those apparently minor yet really important "notions," which so largely constitute the details of our material civilization, was far more remarkable in variety and in excellence than could have been expected, even by ourselves. The juries acknowledged the preëminence of Yankee ingenuity by the large proportion of awards made to American exhibitors. This exhibition was attended by an officially delegated commission, appointed by the United States Government to report upon the progress of foreign and domestic industry as there presented. The result of the labors of that commission was the production of a valuable series of papers, which were afterward published by the State Department, and which embody a vast amount of precisely such information as the American people most needed and most desired. The report of Dr. F. A. P. Barnard, upon the machinery and processes which it was his province to examine, is, of itself, a large volume, and contains matter of great value and material which can nowhere else be obtained. The reports of Commissioners Hewitt, Beckwith and others were also of great value, and embodied new and important information relating to their several departments.

The "Grand Exposition of 1867" was Napoleon's last success. The well laid plans of the Prussians were aided by the increasing discontent of the French people, and, in a desperate endeavor to save his shaking throne, the Emperor, while still unprepared, declared war with Prussia. Then the world saw what had seldom, if ever, been seen before. The country from which came the declaration of war was invaded by a better prepared enemy. The war was as short, sharp and decisive as the Austro-Prussian war, which had so lately preceded it, and the victories of the first Napoleon were again avenged, in the misfortunes which accompanied the downfall of the second empire. It has been remarked, and probably with truth, that the weakness of the French and the strength of the Germans were well exhibited in their respective sections in the exhibition of 1867, and that the result of the inevitable war could have been, indeed was, predicted by the careful observer who made even a cursory comparison of their relative exhibits in the arts of both war and peace. As has been well shown by the events of our own late civil war, supremacy in pure science and in the arts of peace gives as great advantage in the contest as superiority in purely military sciences and arts.

The Paris exposition of 1867 revealed, also, to their British, as well as to their French competitors, the fact that the thorough system of technical training which had, for so many years, been kept in operation by the far sighted Teutons was, at last, yielding a splendid return. Even Great Britain was evidently threatened with the loss of her leadership as a manufacturing nation; and the lesson was promptly read, for immediately there arose a powerful movement, in which the great engineer J. Scott Russell took a prominent part, for the establishment, in Great Britain, of technical schools, and for a change of the existing standard curriculum that should enable the student to readily and effectively apply the principles which he had been taught to the useful and telling work of every day life. The Germans have, however, a quarter of a century the lead, and whether British supremacy in manufactures is to be maintained on the Eastern continent remains a doubtful question.

Our own people, while teaching others, were also themselves taught many useful lessons at Paris, the most important being that which the British were so ready to learn. We had already taken some steps in the right direction, and since that time technical, that is to say, in the best sense, practical education has become a subject of paramount interest in the United States. Our venerable institutions of learning are modifying their courses of instruction, in deference to the general demand, and are founding chairs of mechanical and civil engineering, and of applied sciences, while wealthy citizens, in almost every State, are exhibiting a noble patriotism and a real benevolence in applying some portion of their superabundant treasure in the foundation of new technical schools. We owe much, both directly and indirectly, to the Paris exposition of 1867.

Now another international exposition, on a still larger scale, is just taking shape, and the *Welt-Ausstellung* at Vienna, in 1873, promises, in spite of the delays and unfortunate accidents which have attended its opening; to be a far more extensive and complete exhibition of the *matériel* of civilization, from all parts of the world, than was even that of Paris in 1867.

The area assigned for the purposes of the exhibition is over eight millions of square feet, five times that covered by that of the Exposition of 1867. The immense buildings, which have been so well described in earlier issues of the SCIENTIFIC AMERICAN, were designed by John Scott Russell, the projector and designer, with Brunel, of that marine monster the Great Eastern. They are not specially remarkable, excepting, always, the colossal dome which rises above the *Industrie-Pallast*, to the hight of 250 feet and with a diameter of 118 yards. Of the exhibition itself we shall have much to say when we reach Vienna. Its opening has been attended with unfortunate accidents and delays, and our own department has been particularly unfortunate; but it is to be hoped that all difficulties have arisen at the beginning, and that all will now work smoothly and pleasantly to the end; and that, unlike the great exhibitions which have preceded it, this *Ausstellung* may not be followed by a less peaceful strife among nations.

We have taken passage for Glasgow for our little party, on a steamer which, only a half dozen years ago, was admired as the latest and best on the line. A ship 390 feet long, 33 feet wide, and of 20 feet draft of water, displacing over 3,000 tuns and driven by engines of the power of more than 800 horses, was considered then a wonder only excelled by the Great Eastern. Her speed, 10 knots an hour in smooth water, was thought very satisfactory; and accomplishing this with 35 or 40 tuns of coal per day was thought an equally successful attempt at economy of fuel. Other steamers, larger and faster, were, even then, afloat, but their success was generally deemed somewhat problematical.

To-day the "crack ship" of the line stands before the public much as did the one just described a few years ago, but how great the change! Her length is over 360 feet, her breadth of beam more than 40 feet, and ship and cargo together, ready for sea, weigh over 6,000 tuns. She is driven by compound engines of 1,000 or 1,500 horse power, at a speed of 14 knots, about 16½ statute miles, per hour, and yet consumes but 50 or 55 tuns of coal per day. The ship first described cost about $350,000, the last is worth something over a half million. Larger vessels than even the last are already building and some are afloat in the transatlantic trade, and it seems not at all improbable that the Great Eastern, whose dimensions, if memory serves, are 680 feet long, 80 feet beam, and nearly 30,000 tuns displacement, will, before many years, be looked upon as a ship of not at all remarkable size. Even now we think her a slow craft, for she only steams 12 knots at best.

Contrasting these leviathans with John Fitch's steamboat, which was the first to make regular trips, 80 years ago, on the Delaware, a little craft of sixty tuns, which paddled along in smooth water between Philadelphia and Trenton at the rate of six miles an hour, and with John Stevens' or with Robert Fulton's boats of a little later date, we can hardly conceive what will be the size, shape, or structure that shall be conjured up when, a century hence, some later Vanderbilt shall paraphrase Longfellow:

"Build me swift, O worthy master,
Staunch and strong, a goodly vessel,
That shall laugh at all disaster,
And with wave and whirlwind wrestle."

R. H. T.

### Street Nomenclature.

One of our correspondents, writing from London, says: New Yorkers have substantial reason for exercising their powers of brag over their less fortunate neighbors in the English metropolis in some respects. A stranger in London is continually put to his wits' end not only by the different names given to what is substantially a single street, but by the very obscure manner in which the name of the street is indicated. Starting for a walk in "Leadenhall street," he will not have proceeded far ere a dingy sign on a dingy wall says "Cornhill;" and almost before he comprehends how that can be, another sign tells him that he is in "Poultry," and, without his knowing how, he gets out of Poultry into "Cheapside," and presently the dingy sign says "Newgate street," and next it says "Skinner street." After Skinner street comes "Holborn Hill," and "Holborn," and "High Holborn," and then "Oxford street"—most respectable in length—and after that "Uxbridge Road" and "New Road." And these twelve different names are applied to one long though not very straight street. And so "Marylebone" and "Euston" and "Pentonville" and "City" and "Grand Junction" roads are the several names of another single street. Nor are these exceptions. Go where you will in London, you will find streets that are long enough and bustling enough, but you might grow gray before you could master a knowledge of their names, and then find your lesson but half learned. Woe to him who seeks to thread the mazes of London by night! He cannot, by any device other than dependence upon such chance information, determine the name of the street in which he walks. The street names, dingy by daylight, are now utterly invisible. Could our New Yorkers appreciate the advantage which they enjoy of street names so placed as to be distinctly visible by night as by day, they might derive from it—as a Londoner would say—"no end" of satisfaction.

### The Sun Cholera Mixture.

"More than forty years ago," says the New York *Journal of Commerce*, "when it was found that prevention for the Asiatic cholera was easier than cure, the learned doctors of both hemispheres drew up a prescription, which was published (for working people) in the New York *Sun*, and took the name of "The *Sun* Cholera Mixture." Our contemporary never lent its name to a better article. We have seen it in constant use for nearly two score years, and found it to be the best remedy for looseness of the bowels ever yet devised. It is to be commended for several reasons. It is not to be mixed with liquor, and therefore will not be used as an alcoholic beverage. Its ingredients are well known among all the common people, and it will have no prejudice to combat; each of the materials is in equal proportion to the others, and it may therefore be compounded without professional skill; and as the dose is so very small, it may be carried in a tiny phial in the waistcoat pocket, and be always at hand. It is: Tinct. opii, capsici, rhei co., menth. pip., campho.

Mix the above in equal parts; dose, ten to thirty drops. In plain terms, take equal parts tincture of opium, red pepper, rhubarb, peppermint, and camphor, and mix them for use. In case of diarrhœa, take a dose of ten or twenty drops in three or four teaspoonfuls of water. No one who has this by him and takes it in time will ever have the cholera. We commend it to our Western friends, and hope that the receipt will be widely published. Even when no cholera is anticipated, it is an excellent remedy for ordinary summer complaint."

We can fully endorse the remarks of the editor of the *Journal of Commerce* in reference to the excellence of the above remedy. Many years ago, when the office of the SCIENTIFIC AMERICAN was in the *Sun* newspaper building, Fulton street, the cholera prevailed to an alarming extent; this remedy was then employed at the *Sun* office for treatment of compositors, pressmen, carriers, newsboys, or whoever happened to be attacked with the disease in the neighborhood, and the number of cases was quite large. The remedy was always used with success if administered in time, and we then formed a high opinion of its value. It is now well known among the druggists here and, by most of them, kept on sale.

A NEW acid, termed acid of alorcine, has been extracted from aloes by M. Weselsky.

## Correspondence.

### On the Bodies Associated with Biela's Comet.

*To the Editor of the Scientific American:*

Did the different bodies moving nearly in the orbit of Biela's comet (1826 I) enter the solar system as a single mass, or as a cometary group? The former alternative has been hitherto assumed. The latter, however, may perhaps be found at least equally probable.

The hypothesis of a primitive cluster was proposed, with some hesitation, in *Nature*, May 1, 1873. Let us now consider, somewhat more in detail, the principal facts by which it is supported.

1. It has been shown by M. Hoek, of Utrecht, that certain comets, which have approached the sun singly, existed as cometary systems in the interstellar spaces. Meteors and aerolites are also believed to have sometimes entered the terrestrial atmosphere as clusters. There is, therefore, nothing improbable in supposing the bodies of the Biela group to have been distinct and separate masses before their orbits were changed into ellipses.

2. As there seem to be at least three comets and two meteor clouds now moving in orbits nearly identical, it is highly probable that their united masses would have formed too conspicuous an object to have entirely escaped observation.

3. Was the first comet of 1818, as suggested by Dr. Weiss, connected in its origin with that of Biela, and, if so, can any previous return be identified? The computed elements of the comets, 1772, 1818 I, and 1826 I, are as follows:

| Perihelion passage. | ☊, perihelion | Ascending node. | Inclination. | Perihelion distance. | Eccentricity. | Direction of motion. | Date of discovery. | Discoverer. | Duration of visibility. |
|---|---|---|---|---|---|---|---|---|---|
| 1772, Feb. 8 | 97°·21′ | 263°·24′ | 17°·39′ | 0·911⁸ | 0·8769 | D | 1772, Mar. 8 | Montaigne | 3 w'ks |
| 1818, Feb. 7 | 93°·7′ | 250°·4′ | 20°·2′ | 0·7832 | 1·0000 | D | 1818, Feb. 22 | Pons | 4 days |
| 1826, Mar. 18 | 109°·45′ | 251°·28′ | 13°·23′ | 0·9025 | 0·7466 | D | 1826, Feb. 27 | Biela | 8 w'ks |

The elements of the first are by Gauss, and were obtained by direct calculation, without any assumption in regard to the period. The observations, however, as well as those of 1818 I, were very imperfect, and hence the elements are liable to considerable uncertainty. The resemblance is so striking as to render it highly probable that the comet of 1818 is intimately related to that of Biela. It is also probable that the comet of 1772, which has been regarded as a former return of Biela's, is really identical with that of 1818. The two dates of perihelion passage correspond to a mean period of 2,400 days. The question may be decided by calculating the perturbations between 1772 and 1806.

4. The comet whose discovery on the 2d of December, 1872, is due to Klinkerfues and Pogson, may be regarded as still another member of the same family. Its perihelion passage occurred nearly three months after the time predicted for that of Biela—a lengthening of the period which it is impossible to explain by any known disturbing cause.

5. When several bodies with slightly different periods revolve in orbits nearly coincident, collisions must sometimes occur between the various members of the group. If Biela's comet overtook, or was overtaken by, another of the same cluster in 1845, their separation after partial impact may have been the phenomenon observed at that epoch. The meteoric showers derived from this zone are the following: 1798, December 7th; 1830, December 7th; 1838, December 5th—7th; 1850, November 29th; 1872, November 27th. These dates appear to indicate the existence of two meteor clouds; the first, third, and fifth showers having been derived from the one, the second and fourth, from the other. The division of the comet may have resulted from its collision with one of these meteoric masses.

6. If we trace back the positions of Jupiter and Biela's comet, we shall find that they were in the vicinity of each other about September, 1734. This is the most recent date, previous to the apparition of 1772, at which they could have been in close proximity. That the members of this cometary cluster were at that time thrown into their present orbits seems probable from the fact that they have not yet become widely separated, as must have been the case if they had made a considerable number of revolutions. It is also worthy of remark that the earliest observed star shower derived from this source occurred less than 80 years since; whereas the meteors connected with the comets 1866 I and 1862 III may be traced back to the ninth century of our era.

Bloomington, Ind. DANIEL KIRKWOOD.

### Professor Haeckel on Embryology.

*To the Editor of the Scientific American:*

In your issue of June 7, 1873, is a criticism upon Professor Haeckel's investigations concerning the embryology of man. Your correspondent, in his article, says, "certain theories" of Professor Haeckel's; while the Professor, in his article, uses the words "the following facts," etc. It is evident that J. L. has not a right understanding of the Professor's ideas, or, if understanding them, has an utter want of toleration. The Professor says nothing of "forming quorums, or nominating committees." But in a clear and concise manner, he sets forth the results of his investigations. J. L. may be very witty or keenly sarcastic when he speaks of "monkeys and winged individuals clothed with hair or feathers as the case may be," etc. But if he will look at the works of creation, he will find that the immutable laws of Nature invariably grow hair or feathers where "circumstances demand it." But there are exceptions to all rules, and in some cases there is a demand for common sense which Nature has failed to supply.

There must be evidence before belief, and there must be scientific investigation into the unknown, theory, before facts can be established. It does not follow that scientists do not acknowledge the Supreme Being because they do not use His name in every other line they write. The scientific man sees certain actions of the elements around him, which action begins in the yet invisible; and, as it emerges to the vision, it takes the form of man or monkey, according to the combination of the element producing the form visible. In the investigation, the scientist finds that everything in Nature works harmoniously. And because he will not deny what he can see, and look for the cause of causes, which he might do *ad infinitum*, J. L. flies to the rescue of theology, evidently thinking that of more importance than a right understanding of the laws of creation, through which knowledge, only, can we ever have a correct understanding of our being and our Creator. If every scientific investigator on the globe were to acknowledge God as the prime cause of all created things, it would not strengthen their deductions in the least, or give the facts any firmer foundation.

The cell theory has been under investigation for fifty years, by learned men of all countries; and such investigation has established the fact that all matter is made up of cells or atoms. In the last few numbers of your paper, it has been conclusively shown by our honored Agassiz that the cell theory is correct.

One glance through a good microscope ought to convince the most skeptical. It is possible that J. L. might become an unreasonable person should he look through the microscope and see what the investigations of fifty years have brought to light. I have read of an instance where a person (I suppose "reasonable") refused to look through a telescope, lest he should see what he had denied to be true. The same spirit has followed the scientific investigator from Galileo down to the present day. All matter is governed by immutable law, and every created form is of necessity formed to suit the circumstances of the thing created; different combinations of the elements producing different forms. J. L. claims that, "if the same elements which form the monkey and plants combine to form man, we should look for the original reasoning power in them." It is claimed by some that man is an epitome of the universe. I should infer from that that all the elements are combined in man. A want of the same combination makes the monkey. The very laws of combination forbid the reasoning man to look for complete reasoning faculties in anything below him; but, in proportion as the elements which make the reasoning faculties are combined with the other elements, these reasoning faculties are observed. There are born human beings that have less reason than monkeys. As all matter is made up from the elements, it is self evident that every form is a combination of certain elements. I have no doubt that the chemist will be able, in the future, to show why such a difference exists between a Daniel Webster and the idiot Emerson, and why the same elements should produce a man or a monkey. In the chemical laboratory, the chemist finds that the same combinations invariably produce the same whole. Common alcohol is composed of $C_4\ H_6\ O_2$, while $C_4\ H_4\ O_4$ produces acetic acid. Thus an exchange of two parts, between H and O, makes a different body.

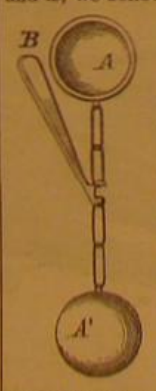
I fail to see, in J. L.'s letter, one word of argument, supported by fact, against the facts of Professor Haeckel. In this age of reason, railing at men of science or the expression of thought only serves to bring contempt upon him who indulges in it. J. L.'s article has failed to show even a microscopical proof against the article of Professor Haeckel.

Bridgeport, Conn. A. M. W.

### Deep Sea Soundings.

*To the Editor of the Scientific American:*

In your issue of May 31, you describe an invention for deep sea sounding without a rope, made by the brother and nephew of the late Professor Morse, and you add the following remark: "This sounding instrument requires no line, and is, we believe, the first of the kind ever invented."




In 1833, the writer invented and made an instrument, for deep sea sounding, to operate without a line. It consisted of two metallic balls, the one, A, hollow, the other, A', solid. They were each provided with a few links; and to those of the solid ball a lever, B, was attached by which the two balls were readily connected or disconnected. When connected and descending in the water, the long, thin, and broad end of the lever, B, would be raised to a position that would keep the balls connected; but when the solid ball reached the bottom, the lever would fall and disconnect the upper ball, which would return to the surface. The depth would be determined by the time required for the ball to sink and return to the surface. It was my belief that the apparatus would descend at a uniform rate of speed after the first yard or two, and that the light ball would return in like manner. It would only be necessary to know how much time is required for an hundred feet, to know how much would be required for a thousand or ten thousand feet. I experimented with the instrument, so far as I could in a country place, to determine this theory, which I believe to be correct. The invention was noticed at the time by a local paper, the York (Pa.) *Gazette*.

Springfield, Ill.

THE yearly meeting of the British Association for the Advancement of Science, under the presidency of Mr. Joule, takes place at Bradford, England, on the 17th of September next. The American Association, Joseph Lovefield, President, meets at Portland, Maine, August 26th.

### SUCCESSFUL LAYING OF THE FIFTH ATLANTIC CABLE.

The submergence of the fifth telegraph cable under the Atlantic ocean was begun on Monday, the 16th of June, 1873, by the departure of the Great Eastern from the coast of Ireland, for Heart's Content, Newfoundland, which port she reached June 27, paying out the cable over her stern as she proceeded. Only eleven days were occupied, during which seventeen hundred nautical miles of telegraph cable were laid. This is rapid work. The experience gained within the past few years in the construction and of laying submarine cables and the facilities afforded by novel machinery, relieves the business of all substantial difficulties. Telegraph cables can now be laid under the ocean with apparently as much ease and certainty as land lines can be erected.

Eleven days is not a long trip for a passenger steamer in crossing the ocean.

The success of the Great Eastern suggests the possibility of providing our ocean steamers with means of constant telegraph communication with the land throughout their voyages. From day to day, during the recent passage of the Great Eastern, the public was supplied with intelligence of the ship's progress, and this while she steamed along as rapidly as many of the Atlantic steamers are accustomed to do. Is it beyond a reasonable probability that some ingenious inventor will yet discover a method of making an extremely light but strong cable, which any vessel may easily carry and unreel or take up as she sails? We commend the subject to those who are desirous of obtaining fame and fortune by the exercise of their mental comet-seekers in this direction.

The first Atlantic cable was laid down by the British war ship Agamennon and the American ship Niagara in 1858. Each vessel took on board one half of the cable, sailed to mid-ocean, spliced ends, and departed, one for Ireland, one for Newfoundland. The cable was successfully laid, but its construction was defective, and it ceased operation after a few messages had been exchanged.

The second cable was laid by the Great Eastern in 1865; but before the voyage was completed, the cable broke and was lost.

The third cable was laid in 1866 by the Great Eastern with success, and the second cable was, by the same vessel, also picked up and completed.

The fourth or French cable, from Brest in France to Newfoundland, was laid in 1869 by the Great Eastern.

The fifth cable, as already stated, is the one just put down. The cable consists of seven fine copper wires, insulated in gutta percha covered with jute yarn, and sheathed with wire and hemp, which is passed through Clark's silica compound, an excellent preservative.

### The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of May, 1873:

During the month, 1,044 visits of inspection were made, and 2,165 boilers examined, 2,024 externally and 910 internally; 210 were tested by hydraulic pressure. The number of defects discovered in all was 973, of which 210 were regarded as dangerous. The defects in detail were as follows:

Furnaces in bad condition, 38—4 dangerous; fractured plates, 68—37 dangerous; burned plates, 51—14 dangerous; blistered plates, 174—32 dangerous; deposit of sediment, 161—18 dangerous; incrustation and scale, 141—19 dangerous; external corrosion, 63—13 dangerous; internal corrosion, 28—13 dangerous; internal grooving, 33—4 dangerous; water gages defective, 28—4 dangerous; blow-out defective, 12—4 dangerous; safety valves overloaded, 21—16 dangerous; pressure gages defective, 167—13 dangerous; boiler without gages, 1—dangerous; deficiency of water, 11—6 dangerous; braces and stays broken, 46—14 dangerous; boilers condemned as unsafe to use, 10; mud drum condemned, 1.

### Hiram Powers.

The most celebrated of contemporary American artists, Hiram Powers, died at his residence in Florence, Italy, on June 27, aged 68. He was a native of Woodstock, Vt.; and, believing in his own ability as an artist, he quitted a mechanical trade and obtained an appointment at a museum at Cincinnati, where he remained seven years. By the liberality of Mr. Nicholas Longworth, he was enabled to travel to Florence to study; and his career there was first signalized by the production of his statue of "Eve," a work which at once placed him in the front ranks of the world's genius. His "Greek Slave," exhibited at the London Exhibition of 1851, is probably the best known of his works, not only for beauty of expression, but for the vivid animation with which the marble was endowed. His productions are numerous, and have been eagerly sought for by the art patrons and amateurs of both worlds.

Mr. Powers was also an ingenious inventor. Among other devices produced by him was a sculptor's file, in which were arranged, between the serrated cutting edges, holes through which the marble dust could pass away so as not to clog up the tool.

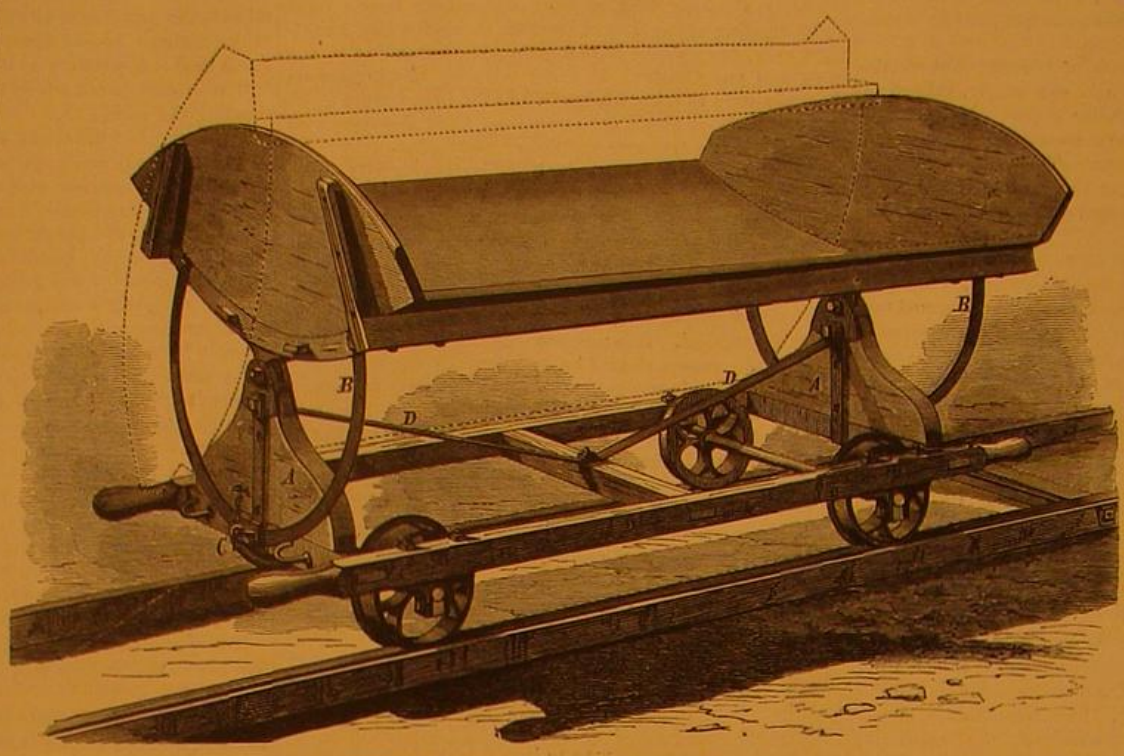
A COLORADO paper gives a very graphic account of the descent of Clear Creek, through the cañon, with its cliffs two to three thousand feet high, by a couple of boys in an open boat. They are reported to have made a distance of one hundred and forty miles in two hours' time, shooting over falls and rapids of from ten to sixty feet in hight, finally bringing up safe on a sand bar, with the boat half full of water.

## IMPROVED PORTABLE DUMPING CAR.

Our illustration represents a recently invented portable dumping car, which possesses the advantages of simplicity, capacity, and ready facility of transportation. It is adapted to carrying earth from excavations, or for the building of embankments, or any similar purpose necessitating the carriage of material from one locality to another.

The containing portion is constructed to hold one cubic yard of earth, and is pivoted, by central lugs upon its ends, to the slotted metal extremities of the bolsters, A. Attached to either end of the receptacle is a segmental shaped bar or plate, B B, which passes through a guide, C, on the bolster, and is secured therein, holding the car in an upright position by means of a pin. The bolsters are attached to the quadrilateral frame, which is supported upon trucks, and has handles formed upon the ends of its two longitudinal bars. Suitable metal braces, D D, extending from the cross piece to the bolsters, are provided to insure strong construction. The trucks are designed to carry the device over ordinary portable rails which may be laid down wherever desired.

In using the apparatus, a large number of cars may be coupled together, by the hooks shown, and drawn by a single horse, their light construction and small weight enabling a great quantity of material to be thus transported. From any point on the route the car may be lifted from its track, by hand, by the aid of the handles, and thus carried bodily to any required locality. To dump the load, it is only necessary to withdraw the pins which confine the curved bars, B, when the body is readily pushed over on its pivots to either side of the track into the position shown by the dotted lines. The lower portion of the receptacle, when thus turned, rests against and is supported by one side of the bolsters.



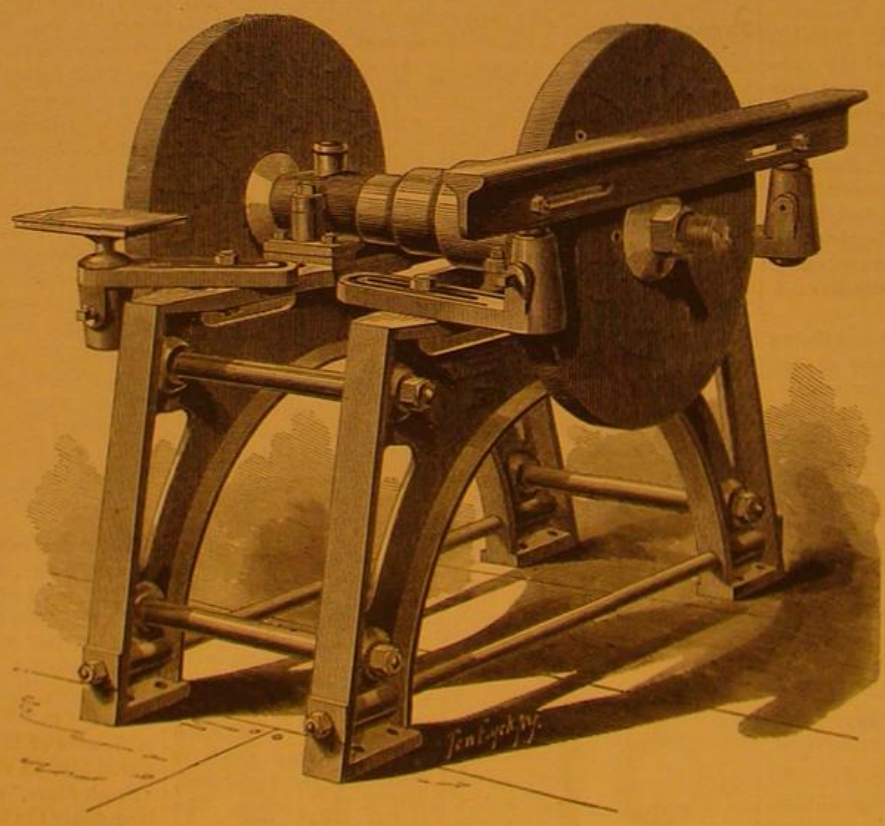

PETERS' PORTABLE DUMPING CAR.

Patented April 15, 1873. For further particulars address the inventor, Mr. Henry J. Peters, Box 253, Quebec, Canada.

## THE TANITE COMPANY'S EMERY GRINDER "E."

This is claimed to be the largest, heaviest, and most solid emery grinder yet put on the market, which, while running such large wheels, attains proper speed without jar or tremor. The special advantage due to the use of large wheels is illustrated in the engraving, which shows wheels 24 inches in diameter, with a stove rest across the side of one of them. This use of a long rest across the side of a wheel of large diameter enables the workman to accurately edge on square large plates or long bars. The rest arms, the reversibility of which is shown in the engraving, allow of the rests having unusual variation in hight.

The feature which especially distinguishes the Tanite Company's emery grinder "E," from others is that the frame, instead of being composed of one solid casting, consists of two side frames, strongly arched, and connected by heavy iron bolts. This allows of the machine's being constructed of any desired width. The grinder is made in various forms—to carry one wheel, centerhung, two wheels overhung, five or more large wheels hung between boxes, and also with side frames set four feet apart, wheels so separated that two men can use the same machine at once, handling large stove or other plates without interference. This device is manufactured by the Tanite Company, Stroudsburg, Pa.



THE TANITE COMPANY'S EMERY GRINDER "E."

### Overhead Telegraph Cables.

One of the things which attract the attention of a New Yorker visiting London is the telegraph cable stretched over the roofs of the houses in many directions. There are few of the single wires which are so common in New York, and none of those street nuisances the telegraph poles. Many wires are packed together with insulating material, and thus formed into a cable; but as the wires are slender (and presumably of copper), and the insulating material is soft, the cable requires support at short distances. To this end a steel sustaining wire is first put up, and from this the cable is suspended.

### Experiments with Ice.

If two lumps of ice be pressed together, they will be welded at their points of contact. Faraday having communicated this observation to Tyndall, the latter took a hollow steel cylinder, put in some snow, which he compressed with a piston fitting tight, and thus obtained a cylinder of transparent ice. In the same way two pieces of solid ice, if subjected to pressure in a mold of any shape, will come out in that precise form. Professor William Thomson explains this by saying that by pressure the points in contact are liquefied, that the water thus produced has rendered latent a portion of the caloric of the surrounding ice, whereby the temperature falls below zero; and that, consequently, as soon as the pressure ceases, this water freezes again. Both M. Helmholz and Professor Tyndall accept this explanation; only the latter finds it so far insufficient that it does not take into account the air contained in the water. He also describes the following experiment of his: Having put a lump of ice into hot water, he submerged it by pressing it down with another piece of ice. Notwithstanding the all but infinitesimal pressure exercised, the two lumps instantly froze together. Again, it is well known that two floating bodies wetted with water will attract each other. Now, if they be two lumps of ice swimming on hot water, they will join and coalesce at once. When the bridge thus formed has melted away, they will again separate, then meet and freeze together again, and so on, as long as there is any ice left. He concludes with mentioning an experiment made by M. Duppa, the upshot of which is that ice may be pressed into any shape—that of a statuette, for instance; a plaster cast may then be taken of it; and when the ice has melted away inside, there remains a hollow mold into which any metal may be poured. Professor Helmholz replies that the non-conducting property of ice is an objection to the supposition that the caloric set at liberty by pressure can spread into the ice, and that great obscurity still prevails on the question.

THE price of nails, by the keg, has lately fallen from $5.50 to $4.75.

### The Resources and Productions of Morocco.

Under this heading we find, in the *Bulletin du Musée*, the following interesting facts regarding the above mentioned country, derived from the minutes of the Artistic, Literary, and Scientific Club of Antwerp:

As regards mineral wealth, gold is often found superficially disseminated, united with quartz and limestone, sometimes in grains but generally in thin scales. Native silver is obtained in the province of Soos, with the gold, and also with galena. The Sultan has absolutely forbidden the extraction of either of the above precious metals, and reserves the right for his own benefit; but in spite of the restrictions and severe penalties, the Arabs succeed in stealing large quantities. Copper is very abundant, notably in the suburbs of Tetuan and Taroudant; the inhabitants work the mines with great ability, notwithstanding their rude and primitive methods. Iron exists in immense deposits, there being a mountain, Djibel Hadrid, said to be formed entirely of the ore. Lead is found principally in the state of galena, and tin has been discovered in small amounts, both metals being obtained from the mountains of Tedla. Rock salt is derived from the same locality, and large quantities of marine salt are obtained, almost without labor, on the shores of the salt lakes. Niter is also found to a small extent, and a peculiar kind of clay called *ghasoul* exists in the northern part of the country, which is largely employed as a substitute for soap.

Gum is exported to Manchester, England, for cloth-printing purposes. In the textile industries, the American agave or aloe furnishes a material for the manufacture of cord and various tissues. Attempts made to grow cotton have succeeded, but for some reason have not been continued, the inhabitants preferring to purchase their fabric of this substance from English makers. Wool is probably the staple article of Moorish commerce, amounting to one quarter of the entire export of the country. The best varieties are those of Dar-El-Berda and Rbat, where the French have a monopoly of the industry. Seventy to eighty dollars per 2,200 pounds is the usual selling price of the best wool, of which, with the exception of that used for making the magnificent carpets for which Moorish looms are celebrated and the "haïk" or Arab cloak, very little is employed in the country.

Goat skins, under the name of "morocco," are exported all over the world, and serve an innumerable variety of purposes. Within the country, they are employed solely in the manufacture of the peculiar shoes of the people. The skins are sold principally during the months of May and November at from 3 to 6 dollars a dozen, according to size.

Leeches, for medical uses, are largely found in ponds between Tangier and Rbat. They are in color either green or black, the latter selling at six dollars and the former at five dollars per thousand; they are forwarded to the markets in boxes of wet sand, containing five thousand each.

The remainder of the productions of the country include ox hides, wax, honey, and ostrich feathers, about a quarter of a million dollars worth of the latter being yearly sold at Mogador.

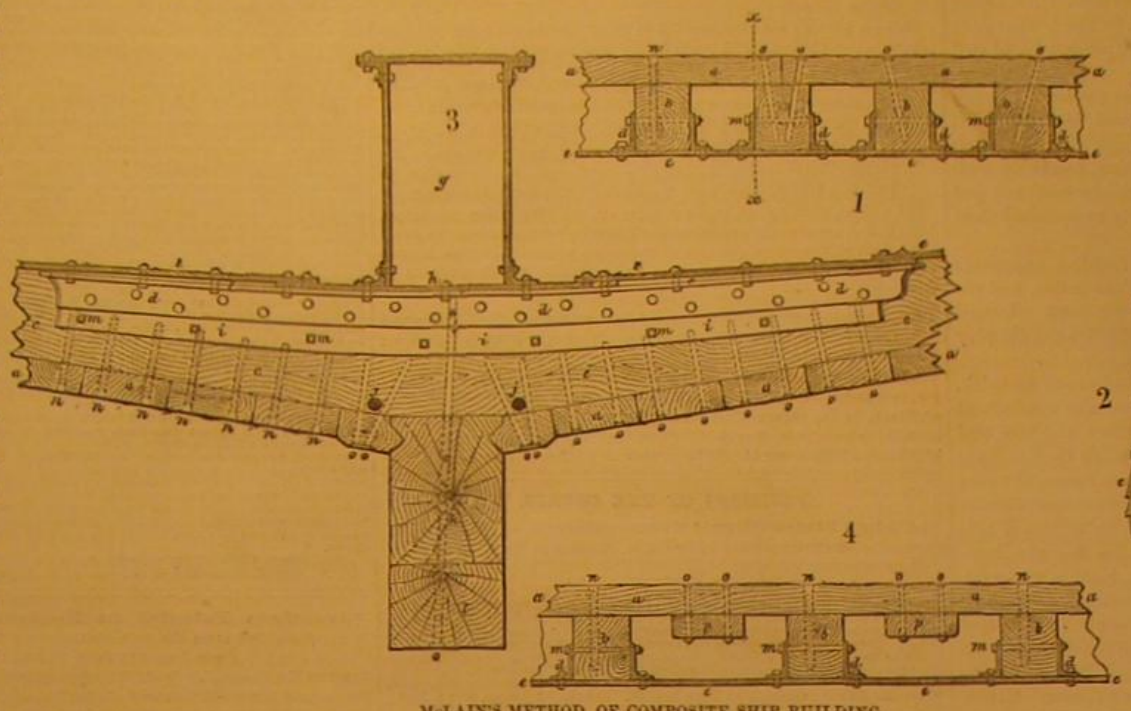
### The Dead Preserved like Wax.

The Brunetti method for the preservation of the dead consists of several processes: 1. The circulatory system is cleared thoroughly out by washing with cold water till it issues quite clear from the body. This may occupy two to five hours. 2. Alcohol is injected so as to abstract as much water as possible. This occupies about a quarter of an hour. 3. Ether is then injected to abstract the fatty matters. This occupies two to ten hours. 4. A strong solution of tannin is then injected. This occupies for imbibition two to ten hours. 5. The body is then dried in a current of warm air passed over heated chloride of calcium. This may occupy two to five hours. The body is then perfectly preserved and resists decay. The Italians are said to exhibit specimens which are as hard as stone and retain the shape perfectly and are equal to the best wax models.

A more simple form of preparation for injection, well suited for anatomical purposes, consists of glycerin, 14 parts; soft sugar, 2 parts; nitrate of potash, 1 part. It is found that, after saturation for some days in this solution, the parts become comparatively indestructible, and change neither in size nor figure.

## COMPOSITE SHIP CONSTRUCTION.

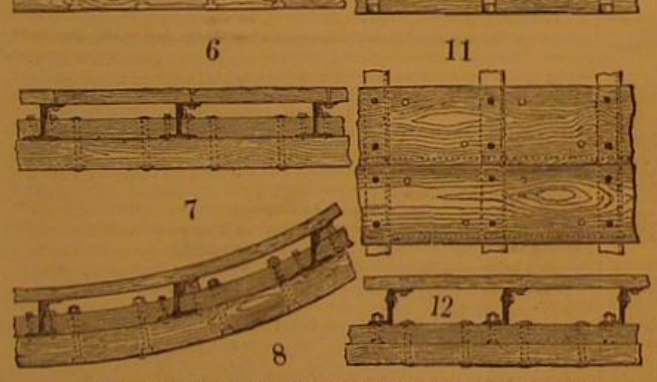
Having already presented a brief outline of the process of iron ship construction, extracted from the pages of Wilson's "Ship Building," recently published by Messrs. John Wiley & Son, of this city, we again revert to the same work for the following interesting particulars regarding the construction of vessels on the composite system. The chief object of this method is to combine the strength of the iron ship with the capacity of being coppered afforded by the wooden vessel. Special attention is required to see that the iron is completely insulated or cut off from electrical communication with the copper used in the structure; and owing to the difference in the expansion of wood and iron by heat, it has been found best to make all pieces which lie fore and aft of wood, and all those resting athwartships, vertically or diagonally, of iron.




McLAIN'S METHOD OF COMPOSITE SHIP BUILDING.

JORDAN'S SYSTEM

of composite ship building is that most generally practiced. The whole outer skin, including keel, stem, sternpost, and planking is of wood, arranged as in the skin of an ordinary wooden ship, and the framework inside is of iron. The bolts fastening skin and frames together are of galvanized iron, and their outer ends are countersunk in holes of such a depth that the iron bolts can be electrically insulated from the copper sheathing by plugging the holes with pitch or other suitable non-conductor.




SCOTTS' METHOD OF CONSTRUCTING COMPOSITE SHIPS.

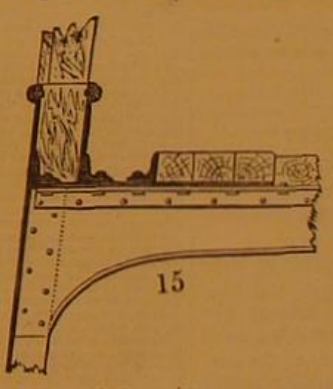
McLAIN'S SYSTEM

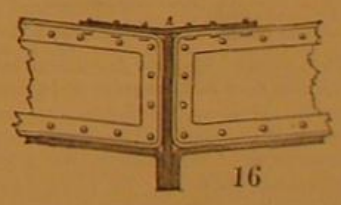
differs from the foregoing in that the keel, stem, sternpost, frame, and outer plating of the ship are the same as those of an ordinary wooden vessel, but instead of the ceiling or inside planking being composed of wood, it is constructed of iron, united all round at the bottom and ends of the structure, and made thoroughly water-tight, forming a complete inner skin.

Figs. 1, 2, 3, and 4 are sections of a composite vessel built on this principle. *a a a a* is the outer wooden packing, *b* the frame timbers, *c* wooden flooring inserted between the frames, *d* the angle iron frames riveted all round to the outside of the iron ceiling, *e*. Fig. 1 is a horizontal section of broadside, Fig. 2 a vertical section of the same at *x*, Fig. 3 a transverse section of keel, etc., and Fig. 4 a horizontal section of the broadside.

SCOTT'S SYSTEM

consists in making the frames of T iron instead of angle iron, all fore and aft the ship. Being stronger they are consequently spaced further apart. Betwixt the frames are fitted chocks of teak bolted with iron bolts and caulked throughout. Over these chocks and over the frames is wrought the outside planking, which is fastened, as shown in the engravings, Figs. 5 to 8, by brass bolts, which pass through the chocks and planking. With existing appliances, the frames fore and aft are somewhat more difficult to set to the figure of the ship than frames of angle iron; but, on the other hand, the number of frames to be set is less than in the ordinary method of building composite ships. Thus in a vessel 200 feet long, the number of frames would fewer by at least twenty. Fig. 8 shows the construction in an extreme case, and Figs. 9 to 12, referring to other systems, are added for the purpose of comparison.

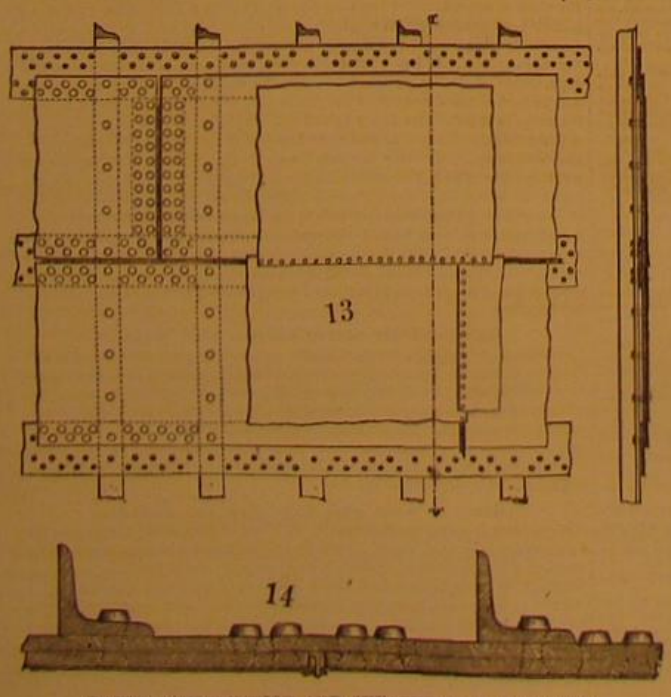



DAFT'S METHOD OF SHEATHING IRON SHIPS,

with copper, mixed metal, or zinc, is as follows: The inner layer of the iron skin consists of narrow strips of plate merely wide enough to make lap joints with the outer layer, and to leave a groove, between the edges of each pair of outer plates, about as wide as the plates are thick. Into this groove is placed a filling of teak or ebonite, a compound of india rubber and sulphur. Outside the plating is a layer of tarred felt about one quarter of an inch thick, upon which the sheathing is laid and fastened with sheathing nails of the same metal, driven through the felt into the fillings. Intermediate fastenings are obtained, if required, by inserting ebonite plugs into holes drilled in the iron plates and driving sheathing nails into them.

Fig. 13 shows this arrangement, the black lines being the filled portions between the plates. Fig. 14 is an enlarged section through a sheathing nail.

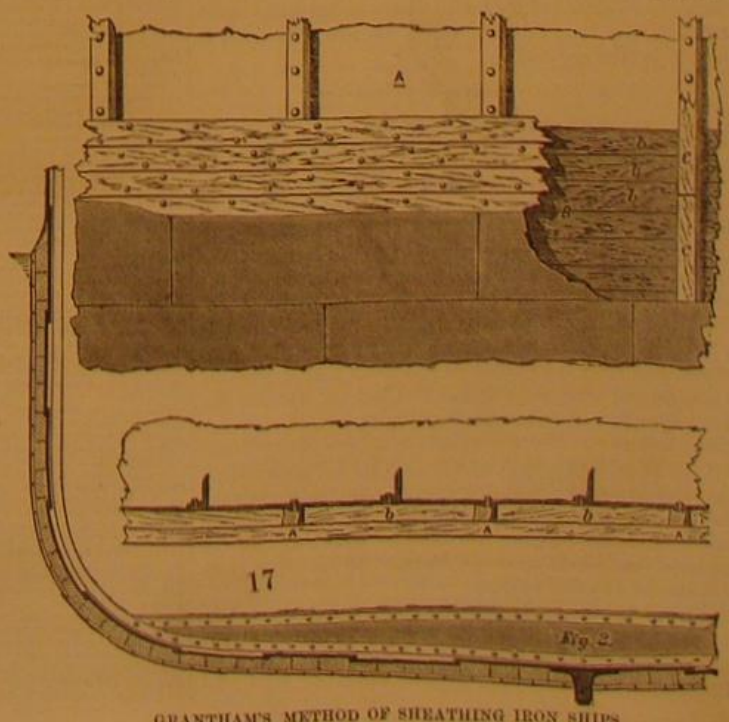



DAFT'S CONSTRUCTION AND SHEATHING OF IRON SHIPS.

GRANTHAM'S METHOD OF SHEATHING IRON SHIPS

is as follows: Outside the iron skin are riveted angle iron ribs, the projecting flanges of which are dovetail in section. The inner skin is coated with pitch, and the spaces between the dovetail flanges are filled by packing and wedging into them short pieces of plank. The outside ribs, with their wooden filling, rise to a short distance above the water line, and the upper edge of the filling is guarded by a longitudinal angle iron. The outer surface of the filling having been payed with pitch, a complete wooden sheathing, about one and a half inches thick, is put on and fastened to the filling pieces with mixed metal nails, which should not pass through those pieces. This is also pitched and afterwards sheathed with copper or mixed metal in the usual way, care being taken to keep the metal sheathing two or three inches from any exposed piece of iron.

Figs. 15, 16, and 17 show different sections of a vessel thus sheathed.




GRANTHAM'S METHOD OF SHEATHING IRON SHIPS.

## Domestic Economy of Fuel.

Captain Douglas Galton, in an interesting article in the *Journal of the Society of Arts*, calls attention to the need of new inventions in devices for cooking, whereby the great waste of fuel now experienced in the best of our stoves and ranges may be prevented.

The question of saving fuel for cooking purposes, he says, is even more important than economy in warming; because cooking is an operation required every day in the year, and the waste of fuel in cooking is even more considerable than in warming. To realize the question of economy of fuel, it is necessary to consider, in the first place, what a given quantity of fuel is capable of doing.

One pound of coal should raise from fifty to sixty gallons of water from 45° to 212°; and, when raised, very little fuel is required to maintain it, in a properly constructed boiler, at that temperature. The total amount of water, at such a temperature, used daily in an ordinary middle class house, does not exceed thirty or forty gallons; and therefore, if the boiler were made so as to absorb as much heat as possible, the hot water used in an ordinary middle class house, with a

family of ten or twelve persons, ought not, with thorough economy, to consume more than one sixth of a tun of coals in the year. Count Rumford shows in his treatise that 25 lbs. of bread ought to be baked with one pound of coal, and that 100 lbs. of meat should be cooked with 2½ lbs. of coal. If, therefore we fully utilized our fuel, it is clear that, in the preparation of our food and hot water for domestic purposes, ½ lb. of coal per head of the population ought to be a sufficient daily allowance, which would be equivalent to one twelfth of a tun per annum; and in large households even less than that quantity ought to suffice. I do not suppose that we shall ever attain to this minimum of consumption, but it is well to consider what the standard is, so that we may not rest satisfied till it has been much more nearly approached than hitherto.

The three main parts of the ordinary cooking apparatus are the oven for baking and roasting, and the boiler, and the hot plate. If the boiler is to be of the form most effectual in saving fuel, the flame and gases from the fire should play under and round every part of it.

Then, as regards the oven. The baker's oven of firebrick, in which the fire is made inside the oven and the whole heat retained in and reflected back from the sides and top and bottom, is a very economical instrument when in continual use. With iron ovens, attached to a kitchen range, the case is different. An oven which roasts requires a temperature of from 400° to 450° at least. Therefore, to maintain this temperature, the gases must pass off into the flue at a temperature even higher; when the oven is a roaster, a considerable volume of air is being continually passed through it to carry off the steam from the meat. This air, if admitted cold, as is the case with many ranges, acts so as to cool down the interior, and therefore additional fuel has to be consumed to counteract this cooling down process. Hence, it is desirable to utilize some of the heat, which passes off, at above 450°, into the flue, for the purpose of raising the temperature of the air to be admitted into the oven.

The hot plate is the third of the most important parts of the modern close cooking range. In its present shape, the hot plate wastes an enormous amount of heat. It is wasteful, because it radiates the heat largely; because the application of heat to the saucepans is only through the bottom of the saucepans, and the bottom of the saucepan is not always in immediate contact with the flame, but is frequently allowed to receive the heat through the medium of the cast iron hot plate, which is a very moderate conductor of heat. Just consider what the difference of effect is. The heat of the flame, if directly acting on the bottom of the saucepan, would be 1,200° Fahr.; but, unless the hot plate is red hot, probably not above 450° will pass through, but the heat in the flue which heats the hot plate will be at 1,200°, and the spare heat from the flame will be wasted up the chimney.

It is evident from the foregoing that, although hundreds of stove and range inventions have been made, there is still room for a new and better series of devices whose merits are to consist in their economy of fuel.

## A NEW THERMO-ELECTRIC BATTERY.

When a bar of bismuth is soldered to one of antimony in the form of a ≺ and the point of junction warmed, an electric current is set up, which may be increased by augmenting the pairs of the combined metals.

A new form of this battery, recently invented by Mure and Clamond, consists of 60 pairs, made of iron and lead, and the electro-motive power is equal to two Bunsen elements. By the use of 39 gallons of gas, about 2 drams of copper were precipitated in an hour, the surface of the electrodes being 11 square inches, and their separation from one another 0·4 inch. The cost of depositing 2⅔ lbs. of copper by this battery, in Paris, where gas is sold at 3 cents per 35 cubic feet, would be $2.36.

The largest battery which has been as yet constructed upon this plan consists of 150 large pairs, and has an intensity equivalent to 5 Bunsen cells of medium size. A battery of 500 small pairs arranged for tension have an intensity equal to 60 Daniell cells. In both cases, the gas consumed is about 210 gallons per hour.

## THE SOUTHERN CANAL.

A correspondent, P. K. McM., alludes to Professor Colton's lecture on a proposed canal to connect the Mississippi with the Atlantic, printed on page 376 of our volume XXVIII, and asks:

"Has your attention ever been called to the fact that the head waters of the Tombigbee are only 8 miles from Bear Creek, a large stream that runs into the Tennessee?

From Fulton, Atawamba county, Miss., to Bear Creek is only 8 miles, over an undulating country; from thence to the Tennessee river is 15 miles, down a creek that is nowhere less than 50 feet wide, with from 2 to 3 feet of water in the summer time and no fall worth mentioning.

Please look at it. We are agitating it now down here; and if the West wants as great a market for her productions as the Georgia canal would give her, at one tenth the cost, let her turn her eyes this way. By this route, too, corn could be laid down in Montgomery for 16 cents a bushel. All the advantages that would accrue to Alabama by the other route would also be afforded by this.

This canal would supply the richest part of Alabama (the cane brake belt) with a direct line to the West. It is also to be noticed that Bear Creek enters the Tennessee below Muscle Shoals."

## NEW BOOKS AND PUBLICATIONS.

LANDSCAPE ARCHITECTURE, as applied to the Wants of the Great West; with an Essay on Forest Planting on the Great Plains. By H. W. S. Cleveland, Landscape Architect. Price $1.50. Chicago: Jansen, McClurg & Co., 117 State Street.

We have here an excellent treatise on an interesting and important subject, which may be read with profit by all who are building, planting, and laying out gardens and parks. The second part of the work, on the subject of forest planting, is especially valuable, the question of the effect of forests on the humidity of the climate being well explained and commented upon.

COMETS AND METEORS, their Phenomena in All Ages, their Mutual Relation, and the Theory of their Origin. By Daniel Kirkwood, LL.D., Professor of Mathematics in Indiana University, and Author of "Meteoric Astronomy."

The author, well known to all readers of the SCIENTIFIC AMERICAN, *Nature*, and many other contemporary journals, has here given the world some light on the vexed question of the origin of comets, which, coming from an undoubted authority, will be welcomed by all students of astronomy.

THE SPECTROSCOPE AND ITS APPLICATIONS. By J. Norman Lockyer, F.R.S. Price $1.50. New York and London: Macmillan & Co.

This elegant little volume contains three lectures, delivered by Mr. Lockyer, in 1869, before the Society of Arts, and carried down, by considerable additions, to the present time. The book is copiously illustrated, and is intended as an introduction to the whole science of spectroscopy, which has been exhaustively treated in the large work of Professor Roscoe.

## DECISIONS OF THE COURTS.

### United States Circuit Court--District of Maine.

PRESERVED GREEN CORN PATENT.—JOHN W. JONES *et al. vs.* R. K. SEWALL, Administrator.

CLIFFORD, *J.*:

Inventions lawfully secured by letters patent are the property of the inventors, and as such the franchise and the patented product are as much entitled to legal protection as any other species of property, real or personal. They are, indeed, property, even before they are patented, and continue to be such, even without that protection, until the inventor abandons the same to the public, unless he suffers the patented product to be in public use or on sale, with his consent and allowance, for more than two years before he files his application for a patent. (5 Stat. at Large, 123; 5 Ibid., 354.)

On the 8th of March, 1858, Isaac Winslow, of Philadelphia, filed in the Patent Office an application for a patent for "a new and improved mode of preserving green corn. The application was rejected by the Patent Office, which for nine years persisted in its erroneous decision. *

On the 18th of February, 1872, the inventor filed in the Patent Office a new application for a patent, referring to the fact that his prior application, as modified, was rejected, and renewing the prayer that letters patent might be granted to him for the entire improvement. *

Four several letters patent were granted * as follows: 1. No. 34,923, dated April 8, 1862, for a new and useful improvement in preserving Indian corn in the green state. 2. No. 35,274, dated May 13, 1862, for a new and useful improvement in preserving green corn. 3. No. 35,548, dated May 20, 1862, for a new and useful improved process of preserving green corn. 4. No. 36,226, dated August 26, 1862, for a new and useful improvement in the process of preserving green corn. *

The method of manufacturing the product is substantially as follows: Select a superior quality of sweet corn, in the green state; remove the kernels from the cob by means of a curved and gaged knife, or other suitable means; pack the kernels in cans, and hermetically seal the latter so as to prevent evaporation under heat or the escape of the aroma of the corn. When packed the cans of corn are to be exposed to steam or boiling heat for an hour and a half, then puncture the cans, and immediately seal the same while hot, and continue the heat for two hours and a half longer. Afterward the cans may be slowly cooled in a room at the temperature of seventy to a hundred degrees Fahrenheit. Indian corn thus packed and treated, the patentee states, may be warranted to keep in any climate. Being preserved in its natural state, as near as possible, it retains the peculiar sweetness and flavor of fresh green corn right from the growing field, and it is only necessary to heat the corn in order to prepare it for the table, as it is fully cooked in the process of preserving. What the patentee claims in that case is—

The described new article of manufacture, to wit, Indian corn, when preserved in the green state without drying the same, the kernels being removed from the cob and packed in cans hermetically sealed and treated substantially in the manner and for the purpose set forth in the specification.

The second patent purports to embody an invention for a new and useful improvement in preserving green corn, or, in other words, the patented invention is for the process of manufacturing the new product described and patented in the first mentioned letters patent.

Two other patents are set forth in the bill of complaint, but it is clear that the patents are each for the new and useful improvement in the process of preserving green corn, and that they severally embody substantially the same invention as that described in the second patent. *

The third and fourth patents described in the bill of complaint are void. More than one patent for the same invention cannot be legally issued by the Commissioner, but the irregular issuing of the second patent cannot impair the right of the patentee under the first patent, if it was valid at the time it was granted. Tested by these rules of decision, it is quite clear that the bill of complaint as to the third and fourth patents must be dismissed, but that the complainants are entitled to a decree for an account and for an injunction for the infringement of the first and second patents, unless the defenses, or some one of them set up by the respondent, are sustained.

The first defense is that the patentee is not the original and first inventor of the respective improvements. *

Evidence was introduced by the complainants, of the most satisfactory character, showing that the patentee, Isaac Winslow, of Philadelphia, discovered the patented process of preserving green corn early in the year 1842, and that he made successful experiments in reducing his invention to practice at Westbrook, in the State of Maine, during the latter part of the summer or in the early part of autumn of that year, leaving no doubt that the process discovered was the same as that described in the second patent, on which the suit is founded. *

Much examination, in detail, of the parol proofs introduced by the respondent, to show that the patented process was known or used in the United States before the early experiments made by the patentee, may well be omitted, as it is not pretended, nor can it be, that any other person, resident in this country either before or since that time, ever invented such a process; and a careful scrutiny of the evidence given by those witnesses as to what was in fact done by the several deponents will show that no one of them ever preserved any green corn, in the mode of operation substantially described in the specifications of the patents, until the witness, in some way and to some extent, became acquainted with the process of the patentee, either from rumor or from some one who had assisted the patentee in making those experiments, and in most cases not until years after the invention was made, and in some cases long after the patentee had filed his application for letters patent in the Patent Office. *

Beyond all doubt, the patentee was the original and first inventor of the process in the United States, and sufficient appears, even in the proofs introduced by the respondent, to convince the court that the first knowledge which those witnesses ever had of the patented process was procured, directly or indirectly—as by report or rumor—from persons residing near the place where the experiments of the patentee were made, or who had at some time been the employees of the inventor and had assisted in his experiments. *

Next the respondent insists that the process described in the English patent to Peter Durand supersedes the invention of the assignor of the complainant as a prior discovery and for the same improvement. Vegetable substances intended to be subjected to that process, the specification states, are to be put into the vessels selected for the purpose, in the raw or crude state; but the patentee, in enumerating the articles to be preserved, does not mention green corn, nor does he state whether the kernels are or are not to be removed from the cob, or, if to be removed, whether the removal is to be effected in a manner to leave the kernels unbroken or by means of a gaged knife, as in the mode of operation described in the complainant's patent, nor is any mention made of preserving green corn or any other vegetable substance in the natural juices of the article, as in the mode of operation set forth in the patent mentioned in the bill of complaint. *

It is quite clear that a careful comparison of the descriptions given of the inventions in the respective specifications, fully justifies the opinion of the learned expert examined by the complainant, that the two patents are essentially and substantially unlike, to which may be added that persons having no other knowledge of the complainant's process than what they derive from perusing the specification of the other patent, would never be able to preserve green corn by that mode of operation. *

Patents otherwise valid may be avoided in a suit for infringement by proof that the invention was in public use and on sale more than two years, with the consent and allowance of the patentee, before he filed his application for a patent, which is the next defense presented by the respondent. *

Nothing short of proof that the invention was on sale or in public use, with the consent and allowance of the inventor, for a period exceeding two years, will support such a defense, as the party charged with infringing the rights of an inventor must bring himself fairly within the words of the act of Congress, which justify the acts charged as an infringement. *

If the sale or use is without the consent or allowance of the inventor, or if the use is merely experimental, to ascertain the value, utility, or success of the invention by putting it in practice, that is not such a sale or use as will deprive the inventor of his title. *

Tested by those rules, as the case must be, it is quite clear that the defense under consideration must be overruled, as there is no evidence in the record to show that the inventions, or either of them, were in public use or on sale more than two years before the inventor applied for a patent, or for any shorter period, with the consent and allowance of the patentee, or that he had any knowledge of any such sale or public use at the time it was made. *

Inventors have a right to employ all means necessary and proper to enable them to perfect their inventions and to reduce the same to practice, and it is clear that no such experimental act can justly be viewed as legitimate evidence to support the defense of a prior unauthorized public sale or use of the invention, or a use inconsistent with the right to apply for a patent to secure the exclusive authority to make and use the invention, and to vend it to others to be used, as provided in the patent act. *

As pleaded, the defense is that the inventor abandoned the invention to the public before he filed his application for a patent. His first application was filed on the 8th of March, 1858, and he filed the second application on the 18th of February, 1862, which it is conceded is substantially the same as the first one, which is still on file in the Patent Office. Evidence of an affirmative character to show that the inventor ever uttered a word or did an act signifying his intention to abandon his invention to the public before he filed his first application for a patent is entirely wanting, nor is there any circumstance introduced in evidence to support that theory, except the mere lapse of time from the discovery of the invention to the filing of the application, and it is settled law that the mere forbearance to apply for a patent during the progress of experiments, and until the party has perfected his invention and tested its value by actual practice, affords no just grounds for any such presumption.

Apply that rule to the present case, and it is clear that the proofs furnish no ground for such a presumption before his first application was improperly rejected by the Patent Office. Such an adverse decision operates as a great discouragement to an indigent inventor, as was strikingly illustrated in the case of the inventor of the improved mode of manufacturing wool, who, in consequence of such a decision, was kept out of the enjoyment of the fruits of his genius for forty years.

Abandonment or dedication of an invention to the public, being in the nature of a forfeiture of a right, is not favored in law, and Mr. Justice Nelson decided that such a defense could not be sustained, unless the acts of the party invoked for the purpose were corroborated by some declarations manifesting such an intention; but it is not necessary to apply that rule in this case, as the evidence fails to disclose either any act or declaration to support the theory. Argument to show that the inventor was entitled to a patent at the time his first application was rejected is unnecessary, as the proposition stands confessed by the Patent Office. Nothing beyond the decision of the Office reversing their former action would seem to be required to establish that proposition. * Truth was crushed for the moment, but, happily for the cause of justice, the reasons given for the erroneous decision remained on file, which enabled the Office, at a later period, to correct the error and to do justice to a meritorious inventor. *

Delays in the Patent Office, which an inventor cannot prevent, will not impair his title to his invention, nor can any use of the invention during such delays, if without his consent and allowance, afford any evidence to support the issue that the inventor abandoned the invention to the public. *

All must agree that he did not intend to dedicate it to the public, as his application for a patent was then pending in the Patent Office, and the evidence shows that he continued to press it, with confident hopes of success, until the adverse decision was announced. Nor does the record exhibit any evidence to show that the invention got into public use with the consent and allowance of the inventor, or through any negligence or improvidence on his part, as it appears that he visited the Patent Office as often as it was necessary, to ascertain whether the opinion of the Commissioner had undergone any change, and that he presented his second application for a patent as soon as he could obtain any hope of receiving a decision in his favor. *

(*Wm. Henry Clifford*, for complainants.
*R. K. Sewall, Bradbury & Bradbury, A. A. Strout*, for respondent.

## Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From June 6 to June 11, 1873, inclusive.

CASTING ROLLS.—G. G. Lobdell, Wilmington, Del.
HYDRAULIC HOIST.—T. Stebins *et al.*, San Francisco, Cal.
ENGRAVING MACHINE, ETC.—H. D. Sedgwick, New York city.
GAS BURNER.—T. Clough, New York city.
IRON FURNACE.—G. E. Harding, New York city.
LOCOMOTIVE ENGINE.—H. Fairbanks, St. Johnsbury, Vt.
PRESERVING IRON.—W. H. Sterling, San Francisco, Cal.
RAISING COAL, ETC.—A. Lawton, Elizabeth, N. J., *et al.*
REFINER.—W. Nell, San Francisco, Cal.
REFRIGERATOR.—T. D. Kingan, Indianapolis, Ind.
ROLLING MILL.—W. Sellers, Philadelphia, Pa., *et. al.*
UMBRELLA FRAME, ETC.—A. and I. Herzberg, Philadelphia, Pa.
WASHING DISHES, ETC.—A. Fischer, New York city.

## Recent American and Foreign Patents.

### Improved Sewing Machine.

Lebbeus W. Lathrop, Philadelphia, Pa., assignor to Lathrop Combination Sewing Machine Company, of New York city.—This invention, which was fully described and illustrated in the SCIENTIFIC AMERICAN for October 26, 1872, relates to improvements in sewing machines, and it consists, first, in a combination of a rotary looper and an oscillating looper with a spool carrier and needle, the rotary looper being so constructed that the loop will not only be extended so that a commercial spool may be employed for introducing the locking thread to avoid the winding of bobbins for shuttles, now necessary in the common lock stitch machines, also much of the friction due to shuttle machines, but it is also so contrived that a chain stitch, also a combined lock and chain stitch, can be made. The second part of the invention consists in an adaptation of the revolving loop opener, and application of a shifting pin thereto, for so adjusting the loop as it is opened for passing the locking thread spool through it, that a chain stitch will be formed by the upper thread, the lower thread being dispensed with; also so that a combined chain and lock stitch can be made, the lower thread being included. The third part of the invention consists in an arrangement of operating gear for working the loopers; also the feed, the revolving looper, together with the bulged palate for holding the discharged loop to avoid kinking. The fourth part of the invention consists in a construction of the metal case of the machine or cover for the working parts in sections, and jointing them together in such manner that by swinging the jointed parts the work below may be exposed readily at any time for inspection, oiling, and adjusting, while the plate on which the sewing is done remains stationary.

### Improved Offal Drier.

Matthew Anderson, Chicago, Ill.—For drying and deodorizing the offal of packing houses rapidly and efficiently, it is proposed to have a jacketed cylinder, to be heated with steam, in which the offal will be inclosed, the said cylinder containing an agitator to stir the offal rapidly, and having air-pipes for discharging heated air throughout the mass at the same time. The air is heated in a coil surrounding the steam jacket, which connects with the shaft of the agitator, which is hollow, and conducts the air, which is to be forced in by a pump or blower, to perforated tubes on the agitating blades, from which it is distributed so as to circulate thoroughly through the substance to be dried, and then allowed to escape through a pipe to carry off the odor to a fire, if preferred, where it may be burned.

### Improved Apparatus for Freezing Liquids.

Francesco Sajno, of Milan, Italy.—This invention is an improvement in the class of apparatus for freezing liquids wherein a horizontally arranged hollow rotating cylinder is employed. An outer cylinder is jacketed with a non-conducting material to protect the freezing mixture from the heat of the atmosphere. It has contracted ends, which are provided with screw caps, which close the openings so that the water of the freezing mixture will be held in the space below the joints as the cylinder is revolved, so that it cannot leak out. The inner cylinder, for holding the liquid to be frozen, is permanently attached to one end of the outer cylinder, so that the cap of that end opens and closes the passage to it only; also so that, in case the water rises as high in the outer cylinder as the joint, it cannot leak into the liquid to be frozen. Longitudinal plates divide the space between the cylinders into several compartments to confine the freezing mixture equally. A stationary rod in the axis of the inner cylinder has a scraper and kneader on it to scrape the frozen liquid off the surface where it freezes before the middle portion, and stir and knead the mass to facilitate the equal and uniform action. This rod can be removed with the cylinders when taken out o the bearings.

### Improved Revolving Cotton Lint Room.

William T. Crenshaw, Burton, Texas.—This invention consists of a lint receiver of two or more compartments or rooms arranged so as to revolve on a vertical axis. Each compartment is provided with inlet passages for lint and doors for taking out the same, so arranged that while the inlet passage of one room is at the gin stand, where the lint will be delivered into it as it comes from the gin, the door of another room will be at the press, whereby the ginning and pressing may be carried on continuously without the hands being exposed to the dust.

### Improved Axle and Axle Box for Vehicles.

Friederich Hunsinger, Morrisania, N. Y.—This invention consists in the improvement of axle boxes. Grooves or recesses are made in the bearing surface of the box, which operate as reservoirs for the lubricating material. The box is fitted to a collar, and a nut is so fitted to the axle that when turned up it makes a joint with the end of the box, and confines the oil or other lubricating material. The ends of the box will become worn after a while so that more or less of the material will escape, but the axle will still be lubricated from the material retained in the grooves and retarded by a shoulder or offset.

### Improved Ribbon Block.

William Obrist, New York city.—The object of this invention is to furnish to manufacturers and importers of silk and other ribbons an improved ribbon block. This invention consists of a cylindrical tube, rolled of a cylindrical strip of cheap straw or other paper, the layers of which adhere by the application of some cheap mucilage or paste. This tube is strengthened sidewise by wooden disks, forming therewith a strong cylindrical ribbon block.

### Improved Wardrobe Bedstead.

Edward Hunter and Daniel Van Sickle, Chicago, Ill.—This invention belongs to the class of folding bedsteads designed to form, when folded or not in use, a compact ornamental article of furniture; and it consists in the arrangement of the foot legs to serve as an upper side finish of the imitation bureau formed by the bedstead when folded, and also to lock or secure the two parts thereof together.

### Improved Combined Umbrella and Cane.

T. R. Lambert Chevers, Hoboken, N. J.—This invention has for its object to furnish an improved device which shall be so constructed that it may be readily adjusted for use as an umbrella or a cane, as may be desired, and which, when adjusted for use in either capacity, shall show no indication of any other use. The invention consists in the hollow handle provided with a detachable cap and a detachable ferrule to adapt it for use as a cane.

### Improved Mortar Mixer and Grinder.

Edward Spaulding, Keene, N. H.—This invention consists of a series of rotary mixers suspended in a mixing vat from a reciprocating carriage, on which they are moved forward and back across the vat, and, at the same time, revolved for mixing the lime and sand. The invention also consists of another vat by the side of the mixing vat, with a grinding mechanism at one end, into which the lime and sand, after being mixed, are discharged to be worked through the grinder, while another batch is being prepared in the mixer. The machine is designed to be arranged on wheels, to be moved from place to place conveniently, and will be arranged for being worked by horse power or in any preferred way.

### Improved Sole Channeling and Heel Burnishing Machines.

Caroline Vrooman, Boston, Mass., administratrix of Henry S. Vrooman, deceased.—The first invention consists in the improvement of machines for channeling the soles of boots and shoes. The pattern upon which the leather sole is laid to be channeled approximates nearly to the shape of the sole, so that soles varying somewhat in size and shape may be channeled on the same pattern. The edge of the pattern is a cogged rack, which gears with two small spur wheels, and is held in gear by means of a roll which bears against its inside. The roll revolves on a pin in a slide, which is forced up by a spiral spring, and the spur wheels are revolved by suitable means. For the removal of the pattern the roll and slide are forced back by means of a lever. A movable arm which projects over the bed may be moved laterally. A suitably arranged lever on the side of the arm carries a roller on its front end which bears upon the sole and keeps it down firm on the pattern. Attached to the back of the movable arm, by means of a hinge, is the adjustable guide, which is forced outward from the arm by a spiral spring, and bears against the edge of the sole as the pattern is revolved. By the pressure of the foot communicating motion to a cord, the arm is swung back for the removal of the pattern and placing the sole. The knife or channeler and the groover are also adjustably attached to the end of the roll lever. The knife and groover partake of the movement of the roller, and are raised and lowered by means of a cam lever. To operate with the machine the cam lever, which lifts the knife, groover and roll, is pressed down. Then, by pressing with the foot on the treadle, the arm is swung back, or to one side. The sole is then placed on the pattern and the treadle released, which allows the guide to press the sole. Then the lever, which throws down the roll and knife, is lifted, and by turning the crank the sole is revolved, and the channeling is completed. The top of the pattern is cross serrated, with spurs therein to hold the sole. The same inventor has also devised an improved machine for burnishing and polishing the heels of boots and shoes. The frame or bench consists of two stands and connecting plate. A spindle is hinge jointed, and slides in a threaded tube. The latter is adjustable in the socket of the stand, and clamped at any point of adjustment by a screw passing down through said socket. The spindle is in two parts, hinged together, so that one part can be turned one side to facilitate the putting in and taking out the shoe. A hand wheel nut works over the externally threaded tube, and against a shoulder on the spindle, to force the latter forward into the shoe and the shoe against the heel piece. When the shoe is placed in the machine it is given a revolving motion of about two thirds of a revolution by turning a crank, which can be increased or diminished, and the shoe turned more or less, as may be desired. The burnisher is adjustably attached to the end of a beam, to which is given a longitudinal motion. By bearing down on a suitably arranged treadle the outer end of the box and burnishing beam are tipped down, which raises the burnisher from the heel. A cavity in the burnisher is connected by means of a hole with a gas burner for heating the burnisher, if a high temperature is desired, but the burnisher is readily removed and heated and replaced, if required.

### Improved Lamp Bracket.

George Jones, Peekskill, assignor to Thomas J. Fisher, New York city.—This invention consists in forming on the ring a projecting ear with double steps, and a similar projecting ear on the arm, so that, when the two ears are placed together, with their steps overlapping each other, a pin may be placed through the two ears to firmly lock the parts of the bracket together.

### Improved Fireproof Roof.

Niels Poulson, New York city.—The object of this invention is to construct a strong, durable, and fireproof French roof of cast metal, for the purpose of avoiding the combustible material of which they are built at present. The invention consists of cast iron plates of suitable size, joined firmly together by means of outside ribs or caps and interior bolt arrangement, representing an elegant front, impervious to atmospheric influences and absolutely fireproof.

### Improved Fly Protector.

Isaiah Daugherty, Rocky Station, Va.—The invention consists in a box-like case of suitable dimensions, with common or wire gauze for the admission of air and light, an entrance door, and a lounge or bed, book case, table, chair, and other pieces of furniture placed therein, the whole, movable on casters, forming a safe retreat against flies, mosquitoes, or other insects.

### Improved Machine for Moving Logs.

George M. Hinkley, Milwaukee, Wis., and Alexander Rodgers, Muskegon, Mich.—This invention is an improvement upon the log turning machine patented to A. Rodgers on March 19, 1872, and consists in the application of a jointed push bar and certain actuating devices to the turning apparatus heretofore used for turning logs on the carriage, and whereby the logs may be rolled from the log way on to the carriage of a saw mill by power.

### Improved Machine for Cutting Webbing.

William A. Rice, Bristol, N. H.—This invention consists of a shears for cutting webbing mounted on a stand with one blade fixed and the other movable, and worked by a foot motion, the stationary blade being provided with small nicks across the edge to prevent the webbing from slipping, the movable blade being held against the stationary one by an elastic washer surrounding the pivot bolt, and compressed against the blade by it.

### Improved Instrument for Cleaning Gun Barrels.

William E. Turner, Fort Snelling, Minn.—The object of this invention is to provide ready and efficient means for cleaning and burnishing the inside of gun barrels; and it consists in an instrument formed of a tube and movable central rod, and an expansible cluster of wire or similar material, the latter being expanded and adjusted to fit barrels of different caliber, or to give more or less friction to barrels of the same caliber by means of a screw thread and nut on the rod.

### Improved Eye Glass.

Arthur D. Ansell, Hartford, Conn., assignor to Lazarus, Moses & Co., New York city.—The object of this invention is to improve the arrangement of springs on an eye glass so as to obtain a firm hold on the nose and bring the diameters of the lenses in line with each other when they are worn. The invention consists in connecting the glass frames with the bridge by suspension springs, so that the use of pillars, clasps, or spiral springs will be dispensed with, and so that the points of said springs will hug the glass frames when the latter are closed.

### Improved Grain Drill.

George A. Pursley, Pittsfield, Ill.—This invention relates to a combination of springs and adjusting devices for graduating the force with which the flukes or seed tubes are pressed into the earth. By suitable arrangement the downward movement of a bar compresses springs and causes them to press upon the draft rods, and thus hold the flukes down to their work with a yielding pressure, so that said flukes may be held down with a greater or less pressure by moving the bar down or up. In triangular plates, which are pivoted at their angles to the side bars of the frame, are formed cam slots to receive pins attached to the bar so that the said bar may be drawn down by moving the said plates upon their pivots. The plates are connected and caused to move together by a pivoted bar.

### Improved Soldering Compound.

Cary Cox, Covington, Ga.—The object of this invention is to improve and simplify the cost of soldering tin, copper, and similar wares; and it consists in a compound for soldering, composed by combining muriatic acid, sal ammoniac, sulphate of copper, zinc, and water. The solder is preferably used in the form of wire, the end of which is dipped in the compound, and applied to the heated surface of the article to be soldered. By this process no soldering iron is required. The heat is applied by means of the flame of a lamp or heated iron upon the opposite side.

### Improved Carriage Spring.

Thomas H. Wood, New York city, assignor to J. B. Brewster & Co., of same place.—This invention relates to an improved arrangement of transverse springs on light wagons, and has for its object to combine, in a wagon supported on single transverse springs and side bars, the advantage of elasticity, double elliptic transverse springs, and of the deep setting of the body obtained at present by using the single springs. Upon the axles are fastened the middle portions of transverse springs, the ends of which are secured to side bars. These side bars are made of hickory wood or other material, and aid, with whatever elasticity they may possess, in making the support of the body yielding. To the under side of the carriage body are secured transverse springs, the ends of which connect by suitable couplings with the side bars. The springs can be made of metal or wood or other material, and are semi-elliptic or flat springs, in contradistinction to the full elliptic springs heretofore used as direct supports for carriage bodies on their axles.

### Improved Children's Photograph Chair.

Mark H. Prescott, Jr., La Crosse, Wis.—This invention consists of a vertically adjustable head rest at the back of a child's chair, in combination with an adjustable back and band for waist, for supporting small children steadily, so that they can be photographed clearly and accurately.

### Improved Blast Furnace Alarm Apparatus.

Edwin Davis, Millerton, N. Y.—This invention has for its object to improve the construction of hot blast furnaces, to enable the escaping gases to be more effectually utilized for heating the air before it is driven into the furnace, and to indicate when the furnace is ready for another charge. The invention consists in the employment of a cover for closing the part of the furnace top outside of the air-heating chamber. To the forward edge of the cover is attached a chain, which passes over a guide pulley pivoted in the upper part of the flue, and to its other end is attached a weight, which so nearly balances the cover that said cover may be readily raised and lowered. A small weight is attached to the lower end of another chain, which chain passes up through a hole in the cover, passes over a guide pulley, pivoted in the upper part of the flue, and its other end is attached to the weight, so that, as the weight descends when raising the cover, the other weight may be drawn upward out of the way when charging the furnace. The small weight is designed to rest upon the ore in the furnace, and descends with said ore, straightening out another set of chains, so as, when the ore has descended so low that the furnace requires another charge, said charge will sound a gong to notify the attendant.

### Improved Automatic Fire Alarm.

Henry L. Brown, Middletown, Conn.—It is proposed to have a small tube of lead, or other substance easily destroyed by fire, running throughout the building, where it will be exposed and burn off in case of fire in the building, and connecting with a collapsible air holder, inflated and connected with a lever and a spring, so that when the tube is burned and the air escapes the spring will move the lever and cause it to release a bell hammer of an alarm mechanism to allow it to be set in motion by its actuating spring to sound an alarm.

### Improved Automatic Fan.

Jacob Lehner, Galena, Ill.—The object of this invention is to furnish an adjustable fan attachment for bedsteads, cradles, etc., by which the fanning is accomplished by the motion of a rocking chair, which may communicate to a cradle also the rocking motion. By attaching the fan arrangement to a cradle and placing the same on a bottom frame with lateral grooves, connecting the rocking chair by a rod with the cradle, the operation of fanning and rocking is accomplished at the same time, without the least inconvenience to the attendant.

### Improved Grain Raker and Loader.

George S. Dudley, Dixon, Cal.—This invention consists in the improvement of harvester rakes. To the rear end of the machine is attached a series of parallel inclined bars, which at their lower end are slotted longitudinally to receive rake teeth. The teeth are pivoted to a cross bar attached to the bottom of the rear end of the frame, and are rounded off upon their forward lower sides to enable them to pass readily over any obstruction or unevenness of surface. By pressing a suitably arranged loop down into a vertical position, the rear ends of the teeth will be depressed, raising their forward ends away from the ground for convenience in turning or passing from place to place. Guide rods are inserted in the upper forward part of the teeth, and work up and down freely as the teeth move upon their pivots. The forward part of the machine is supported upon caster wheels, and its rear part upon wheels, one of which revolves loosely upon one journal of a cylinder or drum and the other is rigidly connected with the other journal of said cylinder, so as to carry said cylinder with it in its revolution. To the cylinder are attached rows of radial arms which are made of such a length that their outer ends, as the cylinder revolves, will sweep through the spaces between the teeth and guide rods without coming in contact with the ground or the framework of the machine. The cylinder has ring grooves formed in it, midway between the arms, for the passage of the prongs of the endless belts which pass around rollers pivoted in bars, which ride upon the cylinder, and the under sides of which have longitudinal grooves formed in them, which, in connection with the ring grooves in the cylinder, allow the pronged belts to pass, while the said ends rest upon the said cylinder. A shaft revolving in the forward part of the top of the frame is actuated by a band from the wheel that drives the cylinder. To the other end of the shaft is attached a pulley, with belting which connects with a shaft to the inclined carrier frame. The upper end of the carrier frame rises so high, and projects so far, that the grain may readily pass from it to the wagon. To the upper end of the carrier frame is pivoted a shaft around which passes an endless apron to which cross slats are attached to prevent the grain from slipping upon said endless apron. By this construction the grain is raised from the ground by the teeth, and from said teeth by the radial arms, the guard rods keeping it from slipping from said arms while being raised. As the arms pass a vertical position the grain falls upon the pronged belts, by which it is carried to the carrier, by which it is deposited upon the wagon.

### Improved Sewing Machine Caster.

John H. Plank, Bloomfield, Iowa.—This invention consists of two pairs of bars having a foot rest for a sewing or other machine leg and two casters at one end and lapping each other at the other ends, where they are connected by a clamp screw, so that said foot rests can be adjusted to or from each other for machines of different sizes. These bars are to receive the machine in the said foot rests, so that it can be rolled about and the machine taken off and its legs set on the floor, when it is to sit firmly for use.

### Improved Treadle Movement.

John Evans, Rosenhayn, N. J.—This invention consists in causing a spring, slotted at the upper end and applied to the treadle and crank pin, to act as a brake, to prevent the wheel from running backward and bring it always into such a position that it will start forward when turned, without being carried some distance with the hand.

### Improved Liquid-Sealed Valve.

Louis Winterbauer, New York city.—This invention relates to barrels or casks of fermented liquors on draft; and consists in allowing the ingress of air to fill the vacuum made by the withdrawal of liquid while the egress of the gases is prevented. A plug or spigot is designed to be driven into a hole in the upper side of the cask or vessel, and which is made with a projection or arm upon each side for convenience in drawing it out when required. A channel leads up from the inner end and out through one of the arms of the said plug, which arm is so formed as to receive the end of a small rubber tube. The other end of the tube is connected with the case of the valve, which case is made with a detachable bottom which is secured air and water tight. A small tube is connected with a hole in the bottom and extends up to a convenient hight along the side of the body of the case, and its upper end is left open. The hole in the bottom is covered with a small rubber flap, upon which is placed a weight and which is made exactly flat upon its lower side. In using the valve the case is half filled, more or less, with water, or other suitable liquid, so as to closely seal the valve.

### Improvement in Coloring Metals.

Joseph Kintz, West Meriden, Conn., assignor to himself and J. P. Clark, of same place.—For coloring cast iron and other metals a dark brown color, the iron is first blacked, then coated with a sizing substance, which is partially dried. Then pulverized black lead is put on and brushed to produce a polish. The succeeding operations are to coat the lead with lacquer, and, lastly, to heat the iron, which produces the desired dark brown color. The blacking is mainly to hold the size.

### Improved Beer Cask.

Michael Seitz, Williamsburgh, N. Y.—This invention has for its object to prevent the heads of large beer casks or tuns from being started or sprung by the pressure of the beer in working, and thus prevent the consequent leakage and loss. The invention consists in the combination of the rod having a head upon one end, a nut upon the other end, and screw threads of the same pitch and running in the same direction upon both ends with the cross bars and the heads of the casks. By this construction the threads of the said rod sinking into the wood of the said heads and bars prevent any beer from leaking out around the rod.

### Improved Automatic Vent Opener for Air Springs.

John Walther, Brooklyn, E. D., N. Y., assignor to Calvert B. Cottrell, Westerly, R. I.—It is desirable to have a vent, in connection with the air springs used on printing presses, to stop the table, by which the air may be allowed to escape from and enter the cylinder freely when the press is running slow at starting and stopping; also when it is being turned over by hand for adjusting, cleaning, or any other purpose; so that the moving of the press will not be obstructed by the compression of the air in front of the pistons in entering the cylinders, or by the partial vacuum formed behind in withdrawing from the cylinders in consequence of the leakage past the pistons in compressing the air. It is also desirable to have the vent so arranged that it be opened automatically when the press stops running, and closed in the same manner when it starts, to avoid the attention and labor necessary to do it by hand. This invention consists of a valve which is automatically opened by either gravitation or by the suction of the piston of the air springs, or by the same and gravitation, and closed by the air compressed to form the spring, without the aid of intervention of any apparatus for actuating it.

### Improved Oil Can.

Henry Keller, Sauk Center, Minn.—This invention consists of a cylindrical body with flat ends, arranged horizontally on legs, with a filling tube the top, the spout on one side and a stationary handle on the other, and swing handle on the top side of the cylinder. The object is to have a can which will not be subject to the wear, as the ordinary cans are, on the bottom, and will be less liable to turn over when full in consequence of being top heavy, and will not cause its contents to spurt out on the ground.

### Improved Journal Box.

John A. Althouse, New Harmony, Ind.—This invention relates to the construction of journal boxes for shafting and similar purposes, and consists in the mode of tightening the box to the journal when, from wear or other cause, it has become loose. It consists of the base, the cap, and two adjustable side sections. The base may be the plate of the pillow block, or it may be a separate plate. The cap fits on to the top of the pillow block and journal in the ordinary manner. The adjustable side sections are made with the back of each section recessed or cut away, with flanges which fit on the ends of the pillow block, and with the projecting lips which inclose and hold the adjusting screw. The back side of the section is cut on an incline. The adjusting screw is attached to a movable block with inclined face, and is provided with a collar. The block is allowed play up and down; and the inclined surfaces of the section and block being reversed and placed in contact with each other, and the screw stationary longitudinally, it will be seen that, as the screw is turned, the block will be moved up or down, according to the direction in which the screw is turned, and will act as a wedge.

### Improved Furniture Caster.

Cevedra B. Sheldon, New York city.—This invention consists of a collar on the under side of the horn which is formed on punching the pin hole, which gives the requisite thickness and strength to the horn at that point, and enables the stamping or striking out the horn from sheet metal. It also consists in a flanged socket, stamped or struck up.

### Improved Stop Cock.

George W. Eddy, Waterford, N. Y.—This invention consists in the improvement of stop valves. It is proposed to pivot the two valves by ears to a cross head, which screws up and down the valve stem, and to arrange the pivot pins in inclined slotted round holes, which are so inclined that when the disks cease their downward movement the further down movement of the crosshead will force the disks against their seats, and at the beginning of the up movement draw them away from the seats. Cams or dogs are also pivoted to the crosshead on the same pins that are used for pivoting the disks, and have an eccentric face acting on the back of the disks, and a projection extending to within a short distance of the valve stem so as to be acted on by a collar on its lower end. By this arrangement, when the crosshead is screwed down on the stem till the stems of the cams are brought against the collar, it will, by its action on said stems, force the cam faces powerfully against the disks, and thus greatly aid the pivot pins and the slots in pressing the disks against their seats, both to close them tightly and to strongly resist any impulses of the water against them. The cams are arranged in slots in the crosshead, by which they are placed in the plane of the axis of the disks and the valve stem. The right hand threaded part of the stem screws through a nut in the cap below the stuffing box when the stem has endwise motion, to raise the lower end of the stem above the water way when the valves are open, and return it to the working position when the valves are closed, while the raising and lowering of the disks with the cross head are effected by the steam, by reason of a reversely threaded part which moves the crosshead down by the same movement that screws the stem down, and up by the same movement that raises the stem.

### Improved Apparatus for Assorting Nails.

John Coyne, Pittsburgh, assignor to himself and Robert Chessman, Etna, Pa.—This invention has for its object to provide a simple device for assorting cut nails. This apparatus is constructed somewhat on the plan of certain screw feeders in use in this country and in England—that is to say, of inclined plates so arranged with a central angle plate as to form slotted or open channels or gutters between them, through which the refuse metal and headless nails will pass, and thus be ready for removal for economic purposes. To adapt the apparatus for separating nails of different sizes, as carpet tacks from shingle nails, etc., or for analogous purposes, the inclined side plates are made laterally adjustable.

### Improved Breech Loading Fire Arm.

John Sidney Heath, of Thomas Street, London, England.—These improvements are exclusively applicable to breech loading fire arms, more especially those in which fixed ammunition is employed. The object of the invention is, principally, to prevent the premature or accidental discharge of fire arms; and it consists in the provision of sliding bolts for locking the firing pins, the same being operated by a thumb lever arranged to project through the gun stock.

### Improved Washing Machine.

Elisa M. Hodgson, Stanhope, N. J.—This invention is an improvement in the class of washing machines having a fixed and swinging or vibrating presser board. The improvement relates to the construction of the face of the presser boards, the same being grooved longitudinally and transversely to form rectangular projections or blocks, and perforations being formed in the grooves in such a manner that, when the boards come together, the blocks of one board will strike against those of the other, and the horizontal and vertical grooves in one board will come opposite those in the other, and the water be expressed through the holes.

### Improved Loom for Weaving Piled Fabrics.

Edward Pickford, New Brunswick, N. J.—For withdrawing the wires used in weaving pile fabrics, a hook is provided with a guard on one side of it to wear against the side of the wire head, to which the wire is attached, to prevent the hook from shifting so far over as to engage the next wire at the same time, and to insure the hook against shifting in the other direction, so as to slip off from the head of the wire. The face of the hook, and also the face of the shoulder of the plate or head of the wire with which the hook engages, is made like a half dovetail, beveled, and relatively arranged with the guard so that they are locked together, and all liability to disconnect during the operation of withdrawing the wire is avoided.

### Improved Rotary Churn.

George Walker, Whitley's Point, Ill.—In this invention, the dasher shaft the vertical ribs and inversely inclined arms. By this arrangement, as it is revolved forward, the tendency is to force downward the milk, which, by the bottom and sides of the churn and by the angles between said bottom the sides, is thrown into violent agitation, bringing the butter in a very short time. The churn body can be readily detached and set in a tub of cold water to cool the milk in warm weather, and in cold weather it can be set in a tub of warm water, or upon the stove, to warm the milk, thus enabling the milk to be readily brought to the proper temperature.

### Improved Lubricator.

Henry V. Aiken, Gibsonburg, Pa.—In this invention, a large drip cup is arranged on the standard of the lubricator, below the middle oil chamber to secure the drip from above, whether escaping from the blow-off cock leaking or overflowing from the reservoir; the object being to economize the oil and prevent it from soiling the engine. For packing the cocks, a flexible packing jacket is provided, arranged with a tubular follower which is pressed firmly against a washer by a cap to pack it oil tight against the cock; and inside the follower is a spring, to press it snugly into its seat, but not so as to bind.

### Improved Musical Instrument.

Marsena Cannon, Salt Lake City, Utah Territory.—This invention is an improvement in the class of musical instruments provided with coiled wires arranged to be struck by hammers, and thus act as substitutes for the wire strings usually employed in pianos. The improvement consists, mainly, in the arrangement of keys and coiled wires, so that the former act on the latter directly, or without the aid of intermediate mechanism.

### Improved Hatchway.

George Follett and Adolphus Brummel, Brooklyn, N. Y.—This invention consists of an arrangement of gearing, in connection with sliding hatchway covers, whereby the elevator carriage is caused to automatically open the way for passing through and to close it after passing, so that all danger of accidents by falling through open hatchways will be avoided, and the keeping of them closed to prevent draft in case of fire will be insured. The essential feature of the invention is one or more toothed wheels on opposite sides of the elevator way next to the guides in which the elevator runs, gearing with the sliding door by a rack or racks, and a rack or racks on the top of the elevator carriage, which connect with said wheel or wheels sufficiently in advance of the carriage to throw the door or doors open by the time the carriage rises to the passage, and corresponding rack or racks on the lower end of the carriage connecting with the wheel or wheels, as soon as the carriage arrives above the passage, in such manner as to reverse the action and shut the way.

### Improved Water Wheel.

Samuel T. Teachout, Troy, N. Y.; assignor to himself and Joel C. Peck, of same place.—This invention consists in a guide rim with annular recess, and in combining flaring flanges with the buckets. An annular flange or rim projects downward from the under side of the top plate as far from the periphery of the disk as the width of the upper part of the buckets. At a point about half way from top to bottom, this flange turns from the vertical line, forming an inverted frustrum of a hollow cone. The buckets are attached there to this flange and flare outward to the lower ends, making a considerable increase in the width. The upper parts of these buckets are so inclined to the radial lines of the wheel as to range at right angles to the line in which the water moves, in passing through the spaces between the the guides so as to get the best results from the impact; and, as to width, they are in such proportion to the spaces between the guides that the water does not spread laterally in coming against them, by which no loss is incurred on that account. By the widening of the lower parts of the buckets, a greater quantity of water can be discharged with buckets of the same pitch or angle than could otherwise be, by which the capacity of any wheel will be considerably increased after the limit in the width of the buckets has been reached, said limit being about one seventh of the diameter.

### Improved Carriage Spring.

Thomas Murgatroyd, Hiawatha, Kansas.—This invention consists in improved means for re-enforcing carriage springs. The frame of the carriage is composed of two longitudinal curved rods, laterally connected by metallic cross pieces. The mainsprings, consisting of three or more pairs, are placed longitudinally between the parallel rods and connected with the cross pieces by loops and links. Every pair of springs is applied to wooden seat rests, on which the body of the wagon rests. For the purpose of strengthening and stiffening mainsprings, every corresponding pair is connected about half way between the links and rests by horizontal brace springs, which are applied to the mainsprings by means of buckles and pins. The buckles are fastened to the mainsprings in such a manner that the larger part of the same is placed on the upper side of the springs, and perforated ears are bent under at right angles downward for the reception of links or pins. Into the latter are linked the brace springs by means of upturned loop-like bends. Resting centrally on the brace springs and fastened to them is the cross piece, of wood or other material, which furnishes, by means of vertical rods applied to the outer seat rests, additional supports to the body of the carriage, and by brace rods to the middle rest piece of the same. The foot rest of the body of the carriage is furthermore braced by two or more metal rods, which are applied by screws or otherwise to the lower side of the cross piece, and are adjustable thereon.

### Improved Breech Loading Fire Arm.

Agostino Marelli, Milan, Italy, assignor of one half his right to Sante Marelli, of same place.—This invention refers to a breech loading fire arm for rapid firing. The operator places his finger on a guard lever under the piece, bringing it down, when the breech block is moved so as to open the breech of the barrel, thus permitting the extraction of the exploded cartridge and the insertion of a new one. The hammer being caught by a tooth on a projecting stationary appendage is turned on a pivot, thereby compressing a spring, when it is caught by the nose of the trigger; thus the downward motion of the guard cocks the gun, and consequently, after a fresh cartridge is introduced and the guard replaced, the trigger may be pulled, when the firing of the gun takes place. By the former of these movements, the breech block is placed again behind the barrel breech; and by the latter the hammer, being freed from the trigger stop, is thrown forward by the spring and strikes the fulminate in the cartridge. The exploded cartridge is extracted by the down motion of the guard through two angular levers placed in grooves of the box sides and capable of turning on a pivot. In order to ascertain at any time from a mere outside inspection whether the arm contains the cartridge and the hammer is cocked, two indicative pointers are used.

### Improved Bed Bottom.

Edwin L. Brockett, Nelson, Ohio.—This invention consists in constructing a compound slat without any additional spring, and supporting it upon a continuous crank wire at the head and foot so as to form a neat cheap, and comfortable bed bottom.

### Improved Shoe Last.

Jno. A. Hechenbach & Anton Haertle, Mayville, Wis.—This invention relates to the spring lock bolt that fastens together two sections of a last, and consists in the application thereto of two plates and a hook whereby it becomes unnecessary to cut so near to the upper surface of the last, to make the bolt so long, or to use the ordinary transverse pin by which the last hook is enabled to unlock the sections.

### Improved Tin Roof.

Patrick Wall, Allegheny, Pa.—This invention consists in corrugated tin sheeting for roofs, with a plain and smooth portion near each edge, whereby the lap and joints between adjacent sheets may be easily and conveniently made, while the corrugations give the desired stiffness and strength, allow for contraction and expansion, and avoid the tendency of the metal to buckle.

### Improved Boot and Shoe Packing Case.

Matthew Kuhler, La Moille, Ill.—This invention consists of a case, rectangular and oblong in form, and provided with a series of transverse shelves or partitions placed at such distances apart as will form a series of compartments adapted to accommodate medium or large size books. Each of the compartments thus formed is subdivided into two compartments by means of an inclined partition which is so arranged that the cubical space of the compartments on one side of it equals in the aggregate that of the compartments on the other side. On one side of the partition, the smallest or shortest compartment is at the bottom of the case and the largest at the top, while on the other side the arrangement is reversed, the smallest compartment being at the top and the largest at the bottom. Thus constructed, the box answers as a shipping and packing case in which the boots or shoes cannot become disarranged or abraded by friction against each other, and in which the salesman can select the size he requires without the loss of a moment's time.

### Improved Tanning Compound.

John B. Hite, Guyandotte, West Va.—This invention relates to means for preventing the formation of an incrustation upon the surface of leather which is being tanned, whereby it is often rendered hard, inflexible, and, to a great extent, impermeable to the tannic acid. This invention causes the hide to become rapidly saturated with the tanning liquid, thoroughly softened, and also rendered tough.

### Compound for Destroying the Cotton Worm.

William B. Royall, Brenham, Texas.—This invention relates to compounds for killing bugs and insects that infest, eat and damage the leaves of growing vegetation. It consists in combining a poisoned adhesive and a diffusive ingredient in one and the same compound.

### Improved Electro-Magnetic Telegraph.

George D'Infreville, New York city.—The invention consists mainly in so connecting a telegraph apparatus at two stations that messages may be sent simultaneously from opposite directions over the same wire, and also at different times. There is one main wire between two stations, connected with similar poles of the two batteries. When one of these batteries alone is set in action by the depression of the key near it the current passes from it over the wire; when the other battery only is brought into play the current will pass in the opposite direction over the same wire. Thus far all is plain. Now comes into play the invention, which allows the transmission of messages simultaneously in opposite directions over the same wire—not the transmission of simultaneous opposite currents, but of messages. This object is obtained by so connecting the local battery with the relay at each station that it will be set to work and give an impulse to the sounder by the cessation of the current over the main wire. The operator will thereby be enabled to receive a message partly by the main current, if uninterrupted, partly by the induced current when the main is interrupted. Thus, if two parties, A B, telegraph each other, at once, over the same wire, and both depress the keys at once, A will, by B's local induced current, receive a signal as long as B depresses his key; as soon as A raises his key, B's being still depressed, the main current from B's station will go to A and continue the signal, the same as the local gave it to him before. The same will be the effect on B's side. While both keys were depressed, B too received a signal by his local, which was put in action by the very absence of the main current toward him; and he too will receive signals, *via* main current, when B raises his key from the main wire. In other words, the local current is in action when the main wire is interrupted, and gives, therefore, a sort of negative message—that is to say, it records at one station the interruptions of the main current produced by the attempt to send a main current from the other station, but only records such interruptions when the same are occasioned by a simultaneous depression of both main keys. Thus simultaneous messages can be sent in opposite directions over the same wire. When the main current only is started at one station, both relays will be magnetized so as not to allow the local batteries to come into play.

### Improved Trunk Catch.

Henry C. Faber, Utica, N. Y.—This invention has for its object to furnish an improved catch to take the place of straps usually employed for holding the cover or lid down to the body of the trunk to relieve the lock from having to sustain the strain. It consists of an improved trunk catch formed by the combination with each other of a top plate provided with a tongue having a slot formed in it, a bottom plate having a wide transverse slot into which is fitted a bar which is hinged at one end, and is provided with a spring at said hinged end to throw it open when unfastened, a spring, and a latch with a spring attached. Upon the inner side of the free end of the hinged bar is formed a catch hook, to enter a notch in the latch and fasten the said bar when closed down. The latch is bent to pass around the lower end of the tongue, and its lower end is pivoted to the lower plate. It is held up by a spring attached to the plate. A stem which passes through a slot in the side flange of the plate is attached to or formed upon the upper end of the latch and has a thumb piece formed upon its outer end for convenience in operating the latch to release the bar. Upon the inner side of the hinged bar is formed a lug to pass through the tongue and thus fasten the parts together.

### Improved Corn Planter.

Daniel F. Taft, New Bedford, Mass.—This invention consists in the improvement of corn planters. The seed hopper is secured to the rear side of the axle. To the bottom of the hopper is pivoted or hinged the forward end of the spout, which is curved downward and rearward, and in which is formed the hole through which the seed escapes to the ground. To the spout, a little in front of the discharge opening, is attached the standard of the plow for opening a furrow to receive the seed. The rear side of the standard of the plow is concaved, to adapt it to serve as a channel to guide the seed to the furrow. The standards of the covering plows are attached adjustably to the sides of the rear end of the spout, so that they may be adjusted to cover the seed to a greater or less depth, as may be desired. Arms are attached to the rear end of the spout to which are pivoted the wheel by which the soil is pressed down upon the seed. One part of the face of the wheel is so formed as to mark the hills. The dropping slide moves back and forth in the rear part of the spout to drop the seed. The rear part of the slide, made with an offset, is connected with the arm, so that the said arm may serve as a guide to the slide in its movements. A pin at each revolution of the wheel strikes against this offset and moves the slide forward. As soon as the slide is released from the pin it is moved back by a spring. By suitable arrangement of shafts and gear wheels or equivalent cranks, the two wheels will be made to revolve exactly alike, so that the hills will be planted directly opposite each other, enabling the planting to be done in accurate check rows.

### Improved Wheel Plow.

Isaac B. Green, Gillespie, Ill.—This invention consists in the improvement of wheel plows. In connection with the usual mechanism, a pendent standard and guide are arranged under the axle and combined with a two barred plow beam. By this construction, by operating a lever, the plow may be easily raised from the ground for convenience in turning or passing from place to place. The lower end of the standard passes through a slot in the frame, and is secured in place by a wedge key driven through it below the said frame. All the parts by which the plow is connected with the frame may be moved laterally toward or from the furrow wheel to adapt the machine to be used with a two three or four horse team, as may be required.

### Improved Hub Band for Vehicle Wheel.

George H. Johnson, Bridgeport, Conn.—This invention consists in the improvement of trimming bands for wheel hubs. The iron band of the outer end of the hub of the carriage wheel, to which the ornamental trimming band of ductile metal is to be applied, is cylindrical, or it may be of flaring or bell shaped form. A cylindrical band of brass or other soft fine metal capable of being spun and of being polished brightly is formed so as to fit in the iron band, and is provided with a collar at the inner end, the collar being made to fit against the end of the hub. At the outer end of this band it is provided with a flange, bending back parallel with the part to fit on the outside of the iron band, making a deep annular groove. To attach the band the inner surface of the main part, also the outer surface of the flange, is coated with a solution of Spanish whiting to protect it from the solder or other composition for uniting the bands, and then dipped in a bath of melted tin metal, to coat the surfaces to be united with the iron band. A coat of solder is next applied. The two parts are then placed together, melted solder is poured into the cavity, which fills the said cavity and rises up between the flange and the iron band, and unites with the coated surfaces of each, and secures them firmly together.

### Improved Railroad Frog.

James Brahn, Jersey City, N. J.—This invention has for its object to furnish an improved railway frog, made of ordinary rails. Bars, which extend along the sides of the point and between said sides and blocks of wood or metal, are secured in place by bolts, that pass through the said point, its supporting blocks and the guard rails and also by rivets. At or near the extreme end of the point the ends of the bars are bent outward, are bolted to the guard rails that connect the rails of the track with the rails of the frog, and are made U shaped, their bend being toward the frog. Each of the U shaped bars is secured in place by one long bolt that passes through it near its bend, through the rails of the frog, and through the outer bars of the joints. The arms of the U shaped bars are secured to the rails and to the outer bars. The U shaped bars thus act as fish plates in forming the joints, and they also act as braces to hold the rails in their proper relative positions.

### Improved Stock for Drilling or Tapping Instruments.

George Bunch, Bonnot's Mill, Mo.—The object of this invention is to furnish a convenient device by which nuts may be rigidly placed on and taken off the bolts; also for the purpose of threading nuts and bolts, and for similar purposes. The invention consists of a forked handle frame, having applied between its prongs a cog wheel set in motion by a crank, and meshing into a pinion placed on a hollow cylindrical shaft, with two projecting trunnion heads which are applied to the nuts or, by insertion in dies, thread the nuts or bolts. By setting the crank in motion in the direction required, the nuts may be loosened or tightened, or the bolts or nuts threaded.

### Improved Running Gear for Carriages.

Rufus Kline and Robert M. Jack, Pottstown, Pa., assignors of one third their right to Fortunato G. Pompeji, of same place.—In this invention, the main part of the axle is formed of the inverted U shaped bar, arched in the middle. Spindles or journals, made of separate short bars, with a shank behind a collar, are adapted to fit in the ends of the bar. A thin plate extends from collar to collar under the part, and is either welded to the shanks of the spindles or fastened by a stud pin and socket and a clip. This bar or plate is so adjusted as to length that it holds the collars firmly against the ends of the main part of the axle, and its tensile strength is brought to the aid of the main part of the axle in support of the load. The bars of the perch or reach, of which there may be one or more, are made in the same form in cross section as the part of the axle, employing filling pieces at the ends, welded in to attach the clips for connecting the bars to the axle and the bolster. The bolster is also made of an inverted U shaped bar of the same kind as employed for the axle and the reach, with a thin flat plate upon the bottom fastened to it by clips.

### Improved Self-measuring Oil Tank.

Jacob Schalk, Jr., Guttenberg, N. J.—The invention consists in the improvement of self-measuring oil tanks. A number of measuring compartments are filled from a tank in any convenient manner by means of a tube or tubes, or the liquid may be discharged into one compartment and run from that into the others. When any one of the compartments is emptied or drawn off, a suitably arranged valve may be raised to fill it, so that they may all be kept full and ready at all times. By this arrangement the exact quantity required is always measured out and ready for being drawn off, and may be drawn into measuring vessels or directly into the vessel of the customer. In the bottom of the opening is a drip pan, the cover of which is perforated. The tank is made preferably of wood lined with metal, and presents a neat and handsome appearance.

### Improved Knife Cleaner.

Timothy Gingras and Louis Gingras, Buffalo, N. Y.—The object of this invention is to furnish a practical instrument for families, boarding houses, and hotels, by the use of which knives and forks may be quickly cleaned without dust. An outercase is connected by screws and suitable brackets to the wall. An inner box is made movable therein and may be taken out to be used on a table. A drawer and button contains the polishing powder. Above the drawer is a horizontal board divided into two parts by a projecting piece, to which are applied lids fitting exactly into the parts of the board. The inner sides of the lids as well as of the board are lined with strong buff leather pieces glued and riveted to them, so as to adhere rigidly thereto. The polishing powder, with moistening material, is placed on one side and dry polishing powder on the other. The knives are placed between the leather surfaces and first rubbed in the moistened powder slightly, then in the dry powder till perfectly clean and polished. The box is slightly drawn open, so that the escaping powder may drop therein. The lids are not closed when forks are polished, the rubbing of their prongs being sufficient.

### Improved Turning Lathe for Wood.

Anderson R. Park, Columbia, Texas.—This invention consists in the improvement of machines for turning saddle trees. The work and pattern carrying spindles are mounted in the heads of a slide, and they are coupled, detachably, with the shaft, which is splined in and slides lengthwise through its driving wheel to move forward and back with the slide, also to turn the spindle. Between the housings the said spindle carries the different patterns used for controlling the action of the cutter wheel through the medium of the guide wheel, the said guide wheel and cutter disk being both mounted on the shaft, which is mounted in the swinging end of the frame which is mounted at the lower end in the axis of the driving shaft. The blanks or pieces of wood to be dressed are carried between the face plate and the tail center on suitable carrier plates or forms, either attached to the said face plate or fitted on an elongation of the spindle, and differing in form according to the different kinds of work to be done.

### Improved Sample Holder for Displaying Boots, etc.

Jacob Closs, Decatur, Ind.—The object of this invention is to supply to the trade a sample holder by which shoes and other samples may be exhibited on the outside of the boxes containing the goods, to be easily attached and detached, and holding the samples firmly thereon. The invention consists of a spring holder of strong wire, bent in such a manner that the same can be rigidly connected to the box, and at the same time the samples quickly be placed on the holder or be taken off, the spring action preventing any accidental detaching of the samples.

### Improved Breech Loading Fire Arm.

James Aston, of Hythe, England.—This invention relates to that class of breech loading fire arms which are provided with vertically sliding breech blocks; and the principal feature consists in the provision of devices for cocking the hammer ready for firing simultaneously with the descent of the breech block. The devices employed for accomplishing this result consist of a bifurcated claw lever, located within the breech chamber, and provided with a swivel or forked stirrup at its rear end, which engages with a hooked rear prolongation of the hammer, so that, when said claw lever is depressed by means of an external lever handle applied to its fulcrum pin the breech block will be lowered for exposing the rear of the barrel, and the hammer brought to a full cock by means of the stirrup on the claw lever, in which position it is retained until the breech block is elevated when it is disengaged for exploding the charge by means of the ordinary trigger.

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## Notes & Queries

J. N. F. asks: Is there any cheap white metal, of which castings can be made, that will not melt and that can be furnished as cheaply as common gray iron? Something similar to white wire clothes line is wanted.

E. E. M. asks: If a glass tube ¼ inch in diameter contains 1 lb. of mercury, what would be the pressure on a piston fitted to such a tube for every degree of heat applied?

J. F. C. says: I wish to kill some large trees before cutting them down. What solution can I use for the purpose?

R. H. A. says: An oscillating piston, 2 feet long by 1 foot wide, vibrates on a rock shaft within a properly constructed chamber. Where, in its length, is the location of its average power? The speed, of course, is an element in the calculation, but does not vary the point of average delivery, be it much or little.

G. J. says: I heard a man say a few evenings since that he was the party sent by a firm in England to fit up the first self acting lathe, drill press, and slotting machine that was in any of the Eastern States. What makes me doubt him is that he is a man not over 50 or 55 years of age. Can you give the name of the party who first had the above-mentioned in that section of the country, where they came from, and who fitted them up? [We must ask some of our readers to answer this question for our correspondent, and thereby settle a question about which there is a great deal of dispute. There are many claimants even for the invention of the slide rest. It was described in a patent by Sir Samuel Bentham of England, in 1793, but is claimed to have been first introduced by Mr. Henry Maudsley.]

## Answers to Correspondents

S. asks what is the best and simplest mode of measuring power? Answer: There are quite a number of dynamometers in the market, for measuring the power transmitted by a shaft or pulley. Where it can be applied, the ordinary Prony brake is the best. The power of an engine can be determined quite accurately by the use of the indicator. As you do not give particulars, we cannot tell what is the best method for you to employ.

C. H. A. asks: Should a tightening pulley be placed as close as possible to the driving pulley, without regard to the relative size of the driven pulley, or near the smaller of the two pulleys, whichever that may be, in order to increase the amount of contact? It is conceded that, in case of the driving pulley being the larger and the belt being liable to slip on the smaller, the tightener should be put about midway between them. But it is asserted that it consumes more power when placed near the driven than when close to the driver. Is it so, and, if so, why? Answer: The loss of power occasioned by the use of a tightener is the power required to bend the belt under that pulley, and to drive the pulley. It would appear, then, that by placing the tightener near the smaller pulley, there is a greater loss than when it is close to the larger, since the belt requires to be more bent in the former case. This would indicate that the best place to put a tightener is as close to the larger pulley as it can be arranged, to have it work satisfactorily.

J. B. T. asks: Why is it that engineers, firemen and conductors, jumping from moving trains, invariably jump in the direction of the moving train? I say that there would be less danger in jumping in a contrary direction from a vehicle whose speed is equal to that at which a man might jump, which, by the way, is greater than most people are aware of. Supposing I am able to jump at the rate of 10 or 15 miles per hour; if I jump from a moving vehicle of the same rate of speed, in a contrary direction to the moving train, one motion destroys the other and gravity brings me in a vertical line to the earth. Answer: Our correspondent forgets that, although he might be able to jump at the rate of a moving vehicle if starting from a position of rest, it would be very different, if he were to attempt to do the same thing from the vehicle when it was in motion. His body would then be in motion, and it would be necessary to overcome the inertia or resistance to motion in a contrary direction. The amount of work necessary to be overcome would be half the mass of his body, multiplied by the square of the velocity of the vehicle. We imagine that it is because they have found, by experience, that they cannot make one motion destroy the other that conductors and others jump off in the direction of the moving vehicle.

R. A. C. says: 1. Last fall, while riding along in West Tennessee by a black locust thicket, I observed that the trees were killed, root and branch. Not a living sprout did I see. I enquired of the owner how he did this. He stated that on June 22 and 23 he skinned round the trees, taking the bark from the body of the trees all round, leaving a bare space about 12 inches long. He also said that willow trees could be killed in the same way. I chopped around some honey locust last August; and where the work was well done, the trees are dead; but I am still waiting to see if it is a fact that they are killed root and branch. Is this so? 2. How many lbs. of Pittsburgh coal will do the work of one cord of good oak wood, all things being equal? The object is economy in fuel. 3. Is the coal more liable to injure a heavy 2 flue charcoal iron boiler than wood? 4. What is the best known remedy for bleeding at the nose? Answers: 1. It is generally supposed that winter is the best season in which to girdle trees to kill them. We would be glad to hear from some of our readers who have cleared land by girdling the trees. 2. About 1,500 lbs. 3. The coal is not more liable to injure the boiler than the wood is. 4. Probably every one thinks his own remedy is the best, and we must ask our readers, who know of efficient remedies, to favor us with communications. The best remedy of which we have heard is for the person who is afflicted to lie down on his back, without a raised support for his head. Of course, this might not prove to be a universal cure, as specifics are exceedingly rare.

A. L. B. asks: 1. Is there any industrial school in your city or vicinity that prepares men for mechanical engineers without their taking full collegiate, scientific, or classical courses, and of a not very expensive character? 2. Can a man in New York earn sufficient money during the first year at the machinist's trade to support himself? 3. Is there any market in this part of the country for scrap tin? Answers: 1. You may take a free course in mechanical engineering at the Cooper Union, but the instruction is given in the evenings only. At the Stevens Institute, Hoboken, they take special students in mechanical engineering, as also at the Polytechnic College, Market St., Philadelphia. Write to any of these for catalogue and list of studies. 2. Probably not, if you are an apprentice and just beginning to learn the machinist trade. If acquainted with the trade, yes. 3. Yes.

N. J. F. asks: 1. What is the amount of power to be obtained from a flow of water through an orifice 1 foot square? The water is to be taken out of a canal whose surface is 13½ feet above the river, into which the water used for power is to waste. 2. What is the difference between fixing the measuring orifice (1 foot square) at the top of the flume and at the bottom of it? 3. Is the manufacture of red cedar into buckets or pails generally considered a paying business? 4. Is *arbor vitæ* timber as suitable for that purpose as the juniper of the Dismal Swamp? Answers: 1. With the measuring orifice at the top, the useful effect of the water will be about eight horse power. 2. When the orifice is at the bottom of the flume, more water will be discharged through it, and the useful effect of the water will be much increased. 3 Yes. 4. You can only tell by constructing a bucket of *arbor vitæ* timber, and trying it. Generally, the *arbor vitæ* tree is too small to be worked profitably for such purposes.

E. H. B. asks: 1. What is the commercial value of pyroligneous acid and of tar produced by burning charcoal in kilns? 2. What is the best method of securing and storing it for market? 3. What gases are generated by the slow combustion of wood in coal kilns? 4. Can clay pipes, burned like ordinary brick, be rendered sufficiently non-porous to hold and convey water under pressure: and what would be the best material to render the joints watertight? Answers: 1. It depends upon quality and distance from market. 2. When charcoal is burned in heaps, the acid cannot so easily be secured. Retorts are best adapted to the preparation of pyroligneous acid, but kilns or ovens built of brick, with a pipe for carrying off volatile products of distillation, can be employed. In Russia the wood is heaped up on a plot of ground which is somewhat elevated above the level of the soil, and is funnel shaped, the whole being constructed of clay and lined with roofing tiles, on which the tar collects and flows off into a vessel placed in the vault beneath. The wood, generally of coniferous trees, is heaped in 6 to 8 inch layers, and is first covered with hay or dung, next with a layer of a few inches in thickness of sand or earth. The wood in the heap is ignited at the bottom, where 40 to 50 apertures are left in the covering; these apertures being closed with wet sand as soon as the combustion of the wood becomes active and has spread through the whole heap. After 10 or 12 days the tar begins to collect and is removed daily. The smouldering continues 3 to 4 weeks, and the quantity of charcoal obtained is very small. Illustrations of the various forms of kilns employed will be found in Wagner's "Chemical Technology." It may be converted into acetate of lime before sending it to market. 3. The gaseous product of dry distillation is a mixture of inflammable gases, the most important of which are marsh gas and olefiant gas. Where wood is very cheap, illuminating gas is prepared in this way. 4. The chimneys are probably thicker in one place than in another. Try annealing by placing in cold water and slowly heating to boiling; and after boiling some time, cool slowly. 4. By glazing them in the usual way before burning, or by coating with water glass or asphalt, they will be rendered water tight. Try the experiment on a short distance first. Use hydraulic cement for the joints.

S. L. D. asks what is the best, cheapest and most easily applied substance for blasting. "The rock I want to blast is inside a mill; 20 feet above are machinery, millstones, etc.; the space is 10 x 40 feet, and is enclosed by strong stone walls. I have heard dynamite spoken of as cheaper, more powerful in its effects, and quite as safe as powder. Please inform me if this is so; also how to put it up. Should it be in waterproof cartridges? How is it operated, what quantity is used and how is it fired? Where can it be obtained? Answer: We cannot recommend dynamite as safer or better for your use than powder. It is put up in cartridges, but we are unable to designate dealers to whom you should apply. See notice under "Communications Received."

W. O. D. asks what preparation can be used to remove varnish from the surface of an oil painting without injuring the picture. "I know that it can be done." Answer: In order to remove the cracks often observed in old pictures, and which we presume to be your object, Van Pettenkofer has suggested exposure to the vapor of alcohol at the ordinary temperature of the air, the picture being placed in an air-tight box, at the bottom of which is a tray containing alcohol. In some cases, however, it is unsuccessful. One of the best solvents of dried paint and of boiled oil varnishes is a mixture of alcohol and chloroform.

T. W. S. asks what will prevent flour paste from getting sour, or arrest fermentation? Answer: Flour paste will not sour or ferment if a little alcohol be added to it. Carbolic acid will also preserve it, but to many people the smell of the latter is so objectionable that they prefer the more expensive alcohol.

M. W. B. says: I wish to know what will clean and polish the brass work on a locomotive better and quicker than the oil and emery generally used. Answer: Use oxalic acid, in the form of powder, applying it with a piece of dry waste. This is a poisonous compound.

W. S. J. asks: 1. Can I melt old rubber boots in a mixture of pitch, asphaltum and shellac; that is to say, will the rubber be dissolved when boiled in this mixture? 2. Can waterproof clothing (such as has been waterproofed with alum and sugar of lead) be ironed when damp to take out the wrinkles without spoiling the waterproof quality? Answers: 1. No; the rubber must first be dissolved in bisulphide of carbon, and as the quantity of rubber required is very small, it would be cheaper to purchase the crude caoutchouc before it is vulcanized. 2. No doubt it can.

W. & R. say: How shall we learn what the Whitworth screw thread is, so as to be able to make it with precision? Answer: See editorial pages of last week's issue.

W. M. W. would like to know a way of removing sperm (such as is used in making candles) from clothing. Answer: A hot iron and a piece of brown paper will soon extract the sperm. Benzine will also remove it, but it occasionally affects the color.

W. H. B. asks: Which is the most accurate, a long or short bubble in a common spirit level? Answer: The best length of bubble depends somewhat on the length or curvature of the tube, a short bubble being required for a tube with small radius of curvature, and increasing regularly in proportion with the increase of the radius of curvature.

N. S. asks: Is it dangerous and, if not dangerous, is it advisable to pump water into a boiler during the process of blowing off? Answer: It is not dangerous, under ordinary conditions; but it is not generally considered advisable to blow off while feeding a boiler, because, as feed and blow pipes are usually arranged, the clean water that is forced in by the pump is blown off, not having time to mix with the other water in the boiler.

T. J. says: Does water offer less resistance to one large ship than to an equal bulk comprised in several smaller ships of the same shape? Answer: The resistance of the water is made up of resistance to greatest immersed cross section and skin resistance, the latter depending upon the amount of wet surface. The large ship, having the bulk of several smaller ones could probably be arranged with less cross section and less wet surface than the sum of cross sections and immersed surfaces of the smaller vessels. You can readily make the calculation for any assumed dimensions.

M. J. S. asks: 1. How is the nitrate of gold produced, which is employed in electro-plating? Is it gold leaf dissolved in *aqua regia*? If not, what is it? 2. I have a very fine meerschaum pipe of which the amber is broken, and I cannot get one to fit it. Is there anything with which I can cement it or otherwise fix it? Answers: 1. A solution of gold in cyanide of potassium is used for electro-plating. When gold is dissolved in *aqua regia*, the chloride of gold is formed. Dissolve 7 grains of very fine gold in *aqua regia*, evaporate the solution to dryness on a water bath, and dissolve the residue in distilled water, then add to this solution some cyanide of potassium. (See also answer to W. A. B. in last week's issue.) 2. Ordinary glue, or a cement made as follows: Soak white glue in hot water; warm the jelly formed, add enough pulverulent slaked lime to give it consistency. The object to be cemented is to be slightly warmed. Another cement is shellac dissolved in borax.

F. E. C. asks: 1. How can I make a crucible for melting brass? 2. How can I make a mold for casting brass? 3. How can I cast lead pipes? Answers: 1. You can make the crucible of clay, and line it with fine coal dust. 2. Use ordinary molding sand, and either a metal or wooden flask. 3. For short pieces of pipe, use wooden molds and wooden cores. Make the core in two pieces, cut at an angle, so that it can be withdrawn from the casting.

H. H. asks: What is the best and surest means of cleaning old boiler flues from dirt and scales without removing them from the boiler? Answer: Our correspondent does not state the nature of the scale; but in ordinary cases we would advise the use of tannate of soda, which is highly recommended by many who have tried it.

P. T. R. asks: What kind of lenses and how many are used in a magic lantern, and how are they arranged in the tube? Can there be a lantern or camera made which will show any opaque object, such as a common photograph, a steel engraving or a coin, upon a screen, in its natural colors? If such a camera can be made, please give a description of it. Answer: One double convex lens is required in the tube. The magic lantern will show images of opaque objects with their colors on the screen, and beautiful effects are produced if the objects are strongly illuminated.

L. H. asks: How can I make a small engine to drive on a common road? How large a boiler and engine will it take to carry two persons? If one could be made, would it be against the law to drive it in the road? Answer: The engine and boiler should be designed to give a useful effect of about one horse power. Road steamers have occasionally been used in this country; and we believe no objection has been made by the authorities, probably on account of their novelty. You will find a very interesting paper on road steamers, by Professor R. H. Thurston, in the *Journal of the Franklin Institute*, for January, 1873. An abstract of the paper has been published in the SCIENTIFIC AMERICAN.

MINERALS.—Specimens have been received from the following correspondents, and examined with the results stated:

J. N. M.—Iron pyrites and sulphate of lime are the minerals you send—of no value. If a stream flows from the spring you can, by means of a water ram, send up water into your house, thirty feet high or more. Apply to prominent booksellers for works on cultivation of trees.

J. G. W.—It is galena or sulphide of lead, a rich and valuable ore, containing about 86 per cent of lead.

J. H. S.—Chiefly iron pyrites.

A. G.—Iron pyrites.

G. B. B.—Red hematite and sulphur. The value of the latter depends on its distance from a market.

J. J. T.—Red hematite, an ore of iron, valuable if not too far from coal mines and transportation.

G. R. E. G.—One specimen contains some iron pyrites, quartz, etc., but nothing of value. The others are magnesian limestone and iron ore.

G. C. P.—The soft substance had become quite hard by the time it reached us, and most of it was infusible and insoluble, like quartz. It also contained some organic matter.

### COMMUNICATIONS RECEIVED.

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

On the Solar System. By G. W. T.
On Propelling Fire Engines. By C. A. M.
On Plow Points. By P. F. B.
On Inserting Screws in Plaster. By W. A. A.
On Kingfishers and Fish. By D. S. H.
On Boiler Explosions. By J. E. E.
On Creeping Rails. By J. H.
On the Location of the Great Telescope. By S. H. M., Jr.
On the Value of Science. By J. M.
On the Purification of Rivers. By J. J. L.
On Tidal Action. By J. A. B.

Also enquiries from the following:

J. T. R.—J. M. W.—C. T. S.—G. M. V. P.—J. H.—E. C. D. J. T. B.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

# Index of Inventions

FOR WHICH

**Letters Patent of the United States**

WERE GRANTED FOR THE WEEK ENDING

## June 10, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

| | |
|---|---|
| Alarm, letter box, A. Taylor | 139,833 |
| Annunciator, electric, G. W. Shawk | 139,836 |
| Annunciator, speaking tube, D. Rousseau | 139,813 |
| Bale tie, E. P. Jones | 139,675 |
| Bale tie, cotton, A. S. Armstrong | 139,754 |
| Bale tie, cotton, F. Cook | 139,777 |
| Bath tub, electro-medical, S. Russell, Jr | 139,819 |
| Bedstead crib attachment, B. Snyder | 139,829 |
| Bedstead fastening, C. Wolf | 139,844 |
| Bell pull, W. T. Munger | 139,687 |
| Bit stock, A. D. Goodell | 139,607 |
| Boiler feed regulator, automatic, B. Brett | 139,762 |
| Boiler, sectional steam, T. E. McNeill | 139,724 |
| Bolt, J. F. Carlin | 139,707 |
| Bolt for doors, flush, S. D. Arnold | 139,647 |
| Boot stretcher, D. Harris | 139,671 |
| Boots, crimping leather for, S. W. Jamison | 139,717 |
| Boring machine, earth, W. H. Bouser | 139,761 |
| Bottles, box for, J. Matthews | 139,722 |
| Box for spices, etc., E. Norton | 139,688 |
| Burner, gas, I. Simmons | 139,828 |
| Butter, refining, G. W. Kirchhoffer | 139,796 |
| Butter worker, J. McBride | 139,723 |
| Button fastening, M. Ormsbee | 139,808 |
| Canal boats, propelling, W. F. Miller | 139,727 |
| Cap setting and extracting device, E. S. Holmes | 139,674 |
| Car axle box attachment, D. A. Hopkins | 139,791 |
| Car axle box, railroad, R. Brewer | 139,655 |
| Car trucks, etc., connecting, C. D. Tisdale | 139,835 |
| Car indicator, railroad, C. H. Coffin | 139,771 |
| Car, railroad, I. G. Macfarlane | 139,680 |
| Car starter, G. Lowden | 139,721 |
| Carpet, printed pile, T. Crossley | 139,706 |
| Carriage curtain fastener, H. Drake | 139,663 |
| Carriage spring clip, D. W. Baird | 139,648 |
| Cartridge box, S. McKeever | 139,846 |
| Cartridge box, S. McKeever | 139,847 |
| Casting chilled rolls, G. G. Lobdell | 139,798 |
| Chair, folding, A., C. O., & N. Collignon | 139,776 |
| Churn, reciprocating, G. P. Coan | 139,628 |
| Clock, illuminated, E. Wade | 139,839 |
| Coach or carriage, J. Allgaier | 139,753 |
| Coffee mill, L. Schulz | 139,824 |
| Coffee steeper, J. D. Adney | 139,645 |
| Conductor's check box, J. F. Gaunt | 139,783 |
| Corn for grinding, preparing, W. Standing | 139,743 |
| Cotton gin, P. C. Sawyer | 139,820 |
| Cradle, automatic, Van Dervort & Walker | 139,838 |
| Cultivator, cotton, C. Zocher | 139,730 |
| Cultivators, draft hook for, A. Adams | 139,752 |
| Curtain fixture, A. E. Lazell | 139,719 |
| Curtain hook, H. L. Judd | 139,676 |
| Cutter, peach, W. J. Hill | 139,714 |
| Digger, potato, H. M. & W. W. Dowd | 139,709 |
| Distillation, treating grain for, A. Woolner | 139,749 |
| Ditching machine, C. M. Brown | 139,765 |
| Dress, lady's, H. & E. S. Judson | 139,677 |
| Ear cover, M. Stone | 139,831 |
| Ejector, W. B. Mack | 139,799 |
| Engine, rotary, S. P. Ochiltree | 139,807 |
| Engine slide valve, steam, N. Johnson | 139,796 |
| Explosive compound, T. P. Shaffner | 139,738 |
| Explosive compound, T. Varney | 139,746 |
| Fire place, F. Proudfoot | 139,813 |
| Fire tongs, C. Swett | 139,832 |
| Flooring, wood blocks for, Doubrava & Staib | 139,662 |
| Fringe or border, knit, J. Phipps | 139,810 |
| Fruit parer, Turnbull & Webb | 139,837 |
| Furnace and steam generator, O.W. Ketchum | 139,795 |
| Furnace, heating, Porter & Davis | 139,812 |
| Furnace, metallurgic gas, J. Thomas | 139,834 |
| Furnace, puddling, J. Heatley | 139,788 |
| Furnace, reverberatory, H. McDonald | 139,683 |
| Furnaces, etc., valve for cupola, W. H. Ward | 139,693 |
| Fuse, electric, G. M. Mowbray | 139,686 |
| Gas by electricity, W. A. Pitt | 139,811 |
| Gas lighting apparatus, electrical, J. Vansant | 139,692 |
| Gas purifier tray or grating, J. L. Cheesman | 139,702 |
| Gate, automatic, C. E. Gillespie | 139,717 |
| Glove fastening, D. A. Cooperr | 139,708 |
| Granulating cocoanuts, T. & G. M. Mills | 139,804 |
| Harrow, rotary, B. Rakestraw | 139,814 |
| Harvester, W. Harrison | 139,787 |
| Harvester, B. W. S. & C. H. Ressler | 139,817 |
| Harvester cutter, Wellings & Soules | 139,695 |
| Hat pressing die, J. Desper | 139,708 |
| Heater, feed water, C. E. Frazier | 139,665 |
| Horse collar, J. N. Schmitz | 139,822 |
| Horse collar, etc., lining for, D. Curtis (r) | 5,443 |
| Horse power, H. I. Marnette | 139,681 |
| Horse power, J. Milbourn | 139,725 |
| Horses from vehicles, detaching, J. McNeill | 139,803 |
| Hub, vehicle, G. L. Rouse | 139,691 |
| Hulling machine, A. Bertelson | 139,758 |
| Ice auger, W. A. Clark | 139,769 |
| Implement, H. B. Whitehead | 139,748 |
| Iron and other ores, separating, A. Goodhart | 139,782 |
| Journal boxes, etc., shaping, J. W. Cole | 139,773 |
| Journal boxes, etc., grinding, J. W. Cole | 139,772 |
| Knapsack, G. H. Palmer | 139,731 |
| Knob, door, Rebstock & Ottner (r) | 5,445 |
| Knobs, mold for casting, Rebstock & Ottner (r) | 5,444 |
| Ladder, extension, J. Pine | 139,689 |
| Leather splitting machine, A. F. Stowe | 139,744 |
| Lightning rods, coupling, J. H. Weston | 139,841 |
| Lock, seal, F. C. Hamilton | 139,786 |
| Lock label and seal, E. J. Brooks | 139,764 |
| Locomotive throttle valve, H. Watkeys | 139,694 |
| Medical compound, J. M. Cunningham | 139,707 |
| Mill pick, combination, Nauce & Lillard | 139,806 |
| Mower, lawn, T. Soetbeer | 139,741 |
| Nut and washer machine, W. B. Wilbur | 139,690 |
| Offal, apparatus for treating, J. N. B. Bond | 139,759 |
| Oil wells, device for steaming, T. B. Carothers | 139,656 |
| Oils, testing hydrocarbon, J. B. Blair | 139,654 |
| Ores, etc., treating, H. H. & C. J. Eames | 139,664 |
| Organ, reed, L. K. Fuller | 139,666 |
| Oven, baker's, D. McKenzie | 139,802 |
| Paper file box, J. H. Bentley | 139,653 |
| Pail, milking, G. T. Lincoln | 139,679 |
| Paint compound, H. Nelson | 139,729 |
| Pitcher, molasses, H. Wright | 139,698 |
| Plane, match, J. Edwards | 139,710 |
| Planter, corn, G. Hayes | 139,672 |
| Planter, cotton, G. Paterson | 139,732 |
| Press, cotton, D. H. Wooldridge | 139,845 |
| Printing and dyeing fabrics, T. Crossley | 139,705 |
| Pulley, friction attachment, etc., H. Cox | 139,704 |
| Pulp, reducing wood fiber to, T. B. Armitage | 139,646 |
| Pump, R. M. Lafferty (r) | 5,440 |
| Pump, R. M. Lafferty (r) | 5,441 |
| Pump and fire engine, Wetrick & Lathrop | 139,840 |
| Pump, double acting, P. M. Barker | 139,650 |
| Purifier, middlings, J. W. Wilson | 139,843 |
| Railroad crossing, R. J. Hughes | 139,716 |
| Railroad rail joint, W. Crandell | 139,660 |
| Railroad switch, C. C. Shelby | 139,827 |
| Range, cooking, J. H. Mitchell | 139,728 |
| Rein support and protector, W. N. C. Willson | 139,842 |
| Reilsher and wedge cutter, Hoskins & Howe | 139,715 |
| Rod iron holder and lifter, C. B. Pettengill | 139,733 |
| Saddle, riding, R. C. Hamil | 139,668 |
| Safe, fire and burglar proof, B. Howard | 139,792 |
| Sash holder, W. Senk | 139,825 |
| Saw handle, E. C. Atkins | 139,756 |
| Scaffold, D. Y. Miller | 139,726 |
| Scraper, A. H. Reid | 139,816 |
| Scraper, road, D. T. Hamilton | 139,669 |
| Sewing machine, J. T. Tobey | 139,745 |
| Sewing machine, button hole, S. Cleminshaw | 139,770 |
| Sewing machine platter, O. M. Chamberlain | 139,657 |
| Sewing machine presser foot, Allerton & Powers | 139,700 |
| Sewing machine table, T. W. Morrison | 139,805 |
| Sheet metal beading, C. E. Marchand | 139,681 |
| Ship building, Iron, Holmes & Bowron | 139,799 |
| Shirt bosom support, I. L. Landis | 139,797 |
| Shoe lacing, J. Harding | 139,713 |
| Soda water fountain, A. D. Puffer | 139,734 |
| Soldering machine, W. D. Brooks | 139,763 |
| Sower, hand seed, G. Hall | 139,785 |
| Spark arrester, A. W. Cram | 139,659 |
| Spiegeleisen, manufacture of, E. Baker | 139,649 |
| Spinning machine, H. Ashworth | 139,755 |
| Spinning machine quill bobbin, D. Bass, Jr | 139,652 |
| Spinning mule, Rushton & Touge | 139,737 |
| Steel, manufacture of, J. Absterdam | 139,751 |
| Steel, manufacture of, W. Dougherty | 139,778 |
| Stool or chair, H. Ocorr | 139,730 |
| Stove doors to frames, attaching, S. Smith | 139,740 |
| Stove, portable cooking, N. O. Bond | 139,760 |
| Stove, reservoir cooking, D. G. Littlefield | 139,720 |
| Stove, reservoir cooking, G. G. Wolfe (r) | 5,442 |
| Stucco ornament, A. D. Godard | 139,781 |
| Table, folding, F. W. Heublein | 139,673 |
| Tap and die, A. E. Barthel | 139,651 |
| Telegraph and circuit, printing, H. D. Rogers | 139,690 |
| Tobacco packing box, L. Werthelmer | 139,747 |
| Tobacco finisher, A. P. Southard | 139,742 |
| Tobacco hanger, E. Kempshall | 139,718 |
| Toy, M. Grebner | 139,783 |
| Try square, adjustable, C. A. Schaefer | 139,821 |
| Traction wheel, J. G. Gallet | 139,711 |
| Trap, animal, A. J. Matthews | 139,800 |
| Trap, pigeon, N. B. Tyler | 139,836 |
| Trap, waste, Shaw & Tracy | 139,739 |
| Tub, stationary wash, B. Morahan | 139,684 |
| Tub, stationary wash, B. Morahan | 139,685 |
| Twisting machine stop, J. A. H. Carroll | 139,768 |
| Vehicle spring, J. Mayer | 139,801 |
| Vehicle spring, P. Penn | 139,809 |
| Vehicle wheel, G. J. Cross | 139,661 |
| Vehicle wheel, S. T. F. Sterick | 139,830 |
| Vehicle wheel, J. Woodburn | 139,697 |
| Wagons, end gate for, J. D. Carey | 139,766 |
| Washing machine, J. Hoover | 139,790 |
| Washing machine, L. Reed | 139,815 |
| Washing machine, N. F. Reed | 139,736 |
| Watch case, J. C. Dueber | 139,779 |
| Watch, stem winding and setting, G. P. Reed | 139,735 |
| Watches, aluminum springs for, F. A. Lange | 139,678 |
| Water wheel, T. J. Alcott | 139,699 |
| Wheel dressing machine, J. W. Cole | 139,774 |
| Wheel shaping or dressing machine, J. W. Cole | 139,775 |
| Wheelbarrow, J. B. Schneider | 139,823 |
| Window screen, D. C. Kellam | 139,794 |
| Wine, manufacture of, J. C. Baxter | 139,757 |
| Wire cage, M. Grebner | 139,784 |
| Wood, composition for filling, W. Harding | 139,670 |
| Zinc white, N. Bartlett | 139,701 |

## 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:

25,295.—BOOT HEEL.—S. Dodge, Jr., B. Potter, Jr. Aug. 27.

25,442.—BOILER AND STEAMER.—D. R. Prindle. Aug. 27.

25,143.—SEEDING MACHINE.—S. G. Randall. Aug. 27.

25 747.—EMERY AND CAOUTCHOUC.—T. J. Mayall. Sept. 24.

25,484.—GRAIN SEPARATOR.—J. L. Booth. September 3.

25,499.—RAILROAD CAR SEAT.—E. Wheeler. September 3.

## EXTENSIONS GRANTED.

24,267.—ORE SEPARATOR.—W. O. Bourne.

24,402.—STEAM PRESSURE REGULATOR.—A. P. Pitkin.

24,428.—TRIP HAMMER.—B. Hotchkiss.

24,432.—ROLLING METAL FOR JEWELRY.—J. S. Palmer.

24,435.—RAILROAD BAR.—H. Webb.

## DISCLAIMER.

24,267.—ORE SEPARATOR.—W. O. Bourne.

## DESIGNS PATENTED.

6,699 & 6,700.—ALE PUMPS.—S. Lane, Jr., Englewood, N.J.

6,701.—COOKING STOVE.—G. Smith & H. Brown, Phila., Pa.

6,702.—CAPE.—M. Landenberger, Philadelphia, Pa.

## TRADE MARKS REGISTERED.

1,299.—DRUGGISTS' GOODS.—Arnold & McNary, N.Y. city.

1,300.—WHISKY.—J. Baumgardner & Sons, Staunton, Va.

1,301.—HOG PRODUCTS.—G. Cassard & Son, Baltimore, Md.

1,302.—MEDICINES.—S. De Grath, Jersey City, N. J.

1,303.—STOVES, ETC.—Hicks & Wolfe, Troy, N.Y.

1,304.—SILICIAS, ETC.—Lesher & Co., New York city.

1,305.—CURED FISH.—H. Mayo & Co., Boston, Mass.

1,306.—FLAVORING EXTRACTS.—Steele & Price, Chicago, Ill.

1,307 & 1,308.—FRUIT JARS.—Consolidated Fruit Jar Co., New York city.

1,309.—BOOKS.—D. C. Cutler, Carthage, Ill.

1,310.—RAISINS.—F. C. Lewis, Trenton, N. J.

1,311.—CHEWING TOBACCO.—Liggett & Myers, St. Louis, Mo.

1,312.—COD LIVER OIL.—H. M. Rogers & Co., N. Y. city.

1,313.—MEDICINE.—E. M. Tubbs & Co., Manchester, N. H.

### SCHEDULE OF PATENT FEES:

| | |
|---|---|
| On each Caveat | $10 |
| On each Trade-Mark | $25 |
| On filing each application for a Patent (17 years) | $15 |
| On issuing each original Patent | $20 |
| On appeal to Examiners-in-Chief | $10 |
| On appeal to Commissioner of Patents | $20 |
| On application for Reissue | $30 |
| On application for Extension of Patent | $50 |
| On granting the Extension | $50 |
| On filing a Disclaimer | $10 |
| On an application for Design (3½ years) | $10 |
| On an application for Design (7 years) | $15 |
| On an application for Design (14 years) | $30 |

# VALUE OF PATENTS,

## And How to Obtain Them.

## Practical Hints to Inventors

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

### HOW TO OBTAIN *Patents*.

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

### How Can I Best Secure My Invention?

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

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

### Preliminary Examination.

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

### Reissues.

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

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

### Caveats.

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

### Design Patents.

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

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

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

### Rejected Cases.

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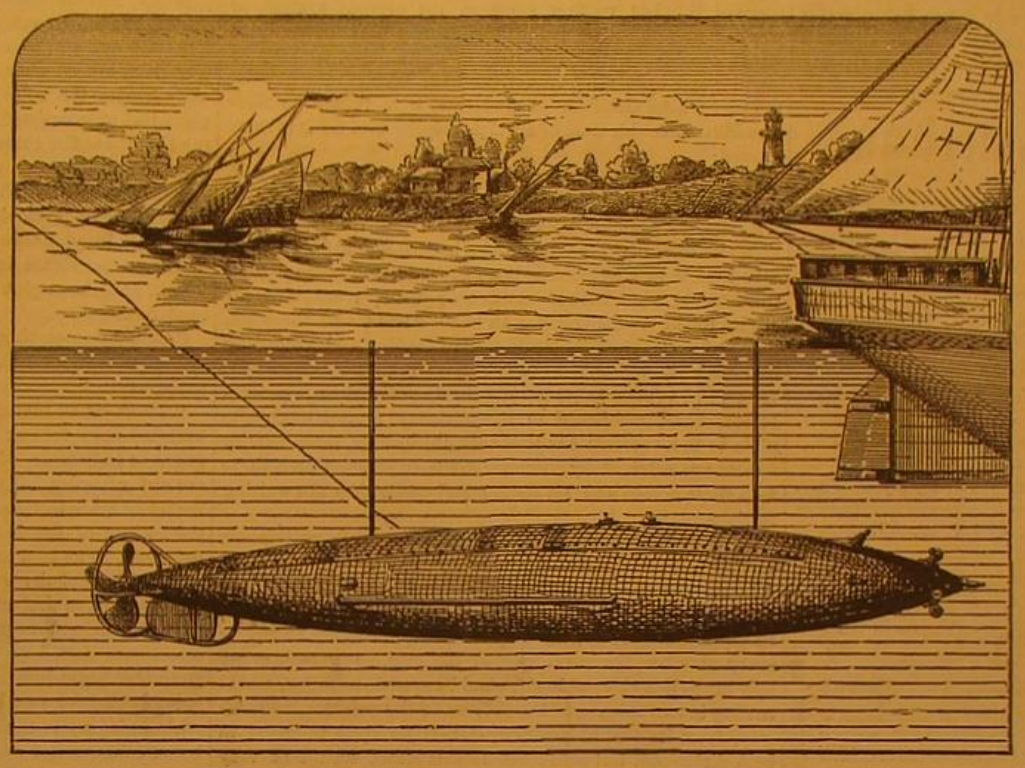
Vol. XXIX.--No. 3. [NEW SERIES.] NEW YORK, JULY 19, 1873. $3 per Annum, IN ADVANCE.


## RECENT IMPROVEMENTS IN TORPEDO WARFARE.

While foreign nations are lavishing millions upon the experimental construction of vessels, the iron decks of which will resist the fiercest bombardment, our own government is quietly testing and examining a mode of naval warfare to which the most herculean ironclad is as vulnerable as the weakest wooden ship. The submarine torpedo, as a means of defence, is already well known, and it is now but a simple matter to render a harbor impassable to hostile vessels; but while entrance to a land locked or narrow mouthed port is thus prevented, there is nothing to hinder a ship of war, lying without the roads and at a distance of several miles away, if she be armed with modern long range guns, from throwing their projectiles over all obstructions into the heart of a city or town. It is to supply this need that inventors have lately sought to combine the torpedo with a suitably constructed and submerged sea-going vessel which might be maneuvered and governed in the ordinary way, and propelled by steam or other power into the midst of an enemy's fleet, where, unseen and hence impregnable, she might proceed to sink and destroy ship after ship.

Our engravings represent two of the most formidable as well as the most recent applications of this terrible engine of war.

The first is a sketch of the Lay torpedo, which, our readers will remember, we have already alluded to as being under examination at the naval station at Newport, R. I. The hull of the craft is about thirty feet long and three feet wide, cigar shaped, and formed of water and air tight iron plates. It is divided into three compartments; one for motive power, another for machinery, and the third for electrical apparatus. The motive power consists in carbonic acid gas, compressed, in sufficient quantity to drive a pair of oscillating engines of eight horse power, and thus operate a screw for the period of half an hour, during which time the boat is designed to travel some six or eight miles. The machinery is controlled by wires leading to a battery on shore, the opening or closing of the first circuit governing the throttle, and the same on the second wire actuating the steering gear. The cable containing the wire is paid out as the boat moves, and of course there is no crew on board. The vessel is almost entirely submerged; and being painted green; is undistinguishable at short distances to the unaided eye. In the magazine are placed 500 lbs. of powder or nitroglycerin; and in the forward portion of the vessel, explosive shells are also arranged to be fired by an electric spark passing through a third wire in the cable. The explosion of the shells may be effected without injury to the boat, but that of the magazine necessarily causes her destruction.



THE LAY TORPEDO.

The illustration annexed, which we extract from the SCIENCE RECORD for 1873, affords a clear idea of the general form of the vessel and her position in attacking an enemy's ship. Experiments made at Newport, some time since, proved quite successful; but of late we note that, from various causes, such promising results have not been attained. The invention was patented by Mr. John L. Lay, on the 25th of March, 1872; but as early as 1866 he had conceived the idea, and made drawings of its working portions. In 1870, at the request of the Viceroy of Egypt, a boat was constructed from these plans and sent to that country for trial by the Egyptian Government. The examinations proving satisfactory, the inventor received payment for his design, and shortly afterwards, returning to the United States, opened the negotiations with our Government, of which the present investigations form a part. The invention has recently been made the subject of an interference suit by John A. Ballard, of Bombay, India, who claimed to have patented the device in this country as early as 1870, but the decision of the Patent Office has accorded priority to Mr. Lay.

A vessel which, although not yet launched, has already attained a world-wide fame, is Admiral Porter's torpedo boat, the subject of our second engraving. The sketch, taken from the ship as she lies unfinished on the stocks at the Brooklyn navy yard, does not necessarily aim to present the details of construction with accuracy, but serves to convey a good idea of the general configuration and shape of the vessel. She is 174 feet long, 28 feet broad, and 13 deep, and is built of thoroughly tested charcoal iron. The sheathing of the hull is from three eighths to half an inch thick, and in some portions this is increased. As we explained, in a recent article on "Iron Ship Construction," this boat is built after what is known as the English "bracket plate system," that is, two vessels may be said to be constructed, one within the other and of equal strength. Within the outside shell three longitudinals of immense strength run the entire length of the vessel and are connected with bars running in a horizontal direction by brackets. The whole is then covered with an iron plating, forming a distinct and perfectly air-tight bottom and sides. The different sections can be used and entered by manholes, which enable a person to pass between the inner and outer vessel from stem to stern, so as to effect repairs in case of injury. The compartments are all watertight, so that in event of grounding or other damage, only a small part of the vessel will fill. The decks are of fine plated steel, and of about half an inch in thickness. The new Fowler propeller wheel will be employed, the pitch of the blades of which can be altered as required, being worked on the eccentric plan; steering and propelling will thus be done by the same means, the rudder being merely auxiliary. The engines, now in process of construction at Roach's iron works in this city, are of the compound type, built in the most careful manner, and it is expected that the boat will be able to steam both astern and ahead at a very high rate of speed. Electric apparatus connects with the engine room and pilot house, from either of which points the vessel can be steered.

In the engraving, the boat is shown in fighting trim. That is, her compartments are filled with water, so that she is entirely submerged with the exception of some three feet. Her three masts are lowered out of the way, and nothing is visible on her deck except her smoke stack, low pilot house, and the heavy gun which she is to carry on her forecastle.

Although built with a "snout," ramming is only a secondary means of attack. In fact her bow is not a solid piece, but is built out some twenty feet in order to allow the torpedoes to be thrust forward well in advance of the boat. An opening, at a slight upward angle, extends clear through the stern, and through this the shell, placed on the end of a staff twenty feet long, is shoved. Of course, after the explosion, a ram given at full speed, accompanied by a shell from the heavy gun, would leave little probability of the attacked vessel remaining on the surface for a very protracted period. The two apertures or ports, shown on the broadside, one amidships and the other near the stern, also serve to push torpedoes from, and are used when the boat is obliged to range alongside a ship instead of meeting her bows-on.

It is expected that the vessel will be launched during the present month, and work is being pushed forward upon her as rapidly as possible. When completed, there is little question but that she will be the most destructive marine machine ever constructed in this country.



THE PORTER TORPEDO.

### THE ERICSSON PNEUMATIC TORPEDO.

A third novel form of torpedo has been devised by Captain John Ericsson, of Monitor fame, who has lately built an experimental example thereof. The following description is given in the *Army and Navy Journal:*

The intention is to conduct the trials at Vermland, on Long Island Sound. This estate, belonging to C. H. Delamater, Esq., has fully two miles of coast line on the west side of Long Island, thus offering admirable opportunities for testing the "aggressive" instrument. The hull of

the torpedo vessel, composed of steel plates, is quite small, being eleven feet long, thirty-two inches deep, and twenty inches broad. The midship section is rectangular, while the top and bottom of the hull are planes perfectly parallel. The sides are vertical from stem to stern, the water lines being moderately sharp at both ends. The displacement is greater than might be supposed, considering the small dimensions of the hull, 2,000 pounds being scarcely sufficient to balance the weight of the whole apparatus. The propellers are of the two bladed type, three feet two inches in diameter, with a pitch of five feet. Both propellers revolve round a common center, yet in opposite directions. The constructor put the hidden machinery in motion in our presence; the compressed air being admitted through a tubular cable attached to the stern of the torpedo, the propellers were instantly put in motion, revolving in a contrary direction with a velocity far too great to admit of the number of turns being counted.

The fact has never been published that Captain Ericsson submitted plans to the Emperor Napoleon, in 1854, of an armored, nearly submerged torpedo boat, propelled by steam, intended to run close to an enemy's ship and, by pneumatic power, project a cylindrical vessel containing explosive substances against the hull at a considerable depth below water line. This plan of projecting the charge Captain Ericsson has now applied to his submarine torpedo.


# Scientific American.

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VOL. XXIX., No. 3 . . [NEW SERIES.] *Twenty-eighth Year.*

NEW YORK, SATURDAY, JULY 19, 1873.


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Bound volumes of the SCIENTIFIC AMERICAN from January to July, 1873, and the SCIENCE RECORD, either for 1872 or 1873, will be forwarded by mail or express, free, for $5. Copies of the SCIENCE RECORD for 1872 and 1873, and the first volume of the SCIENTIFIC AMERICAN for 1873, bound, will be sent for $6.50, or delivered at the publication office for $6.

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## STREET TRAVEL.

The following is an extract from the new charter of the city of New York, which shall be the text for a few timely remarks:

"The Common Council shall have power to regulate the use of the streets, highways, roads and public places by foot passengers, vehicles, cars and locomotives."

It has been an amusing sight, doubtless, to many who have been comfortably seated at windows looking out upon Broadway, to notice the various incidents of a block of vehicles in that great thoroughfare. But the matter, practically considered, is not one for amusement, and begins to lose much of its humor when the lookers-on venture out, and essay to cross the street. The mode of formation of one of these jams is at once interesting and instructive. The wheels of two vehicles interlock, it may be, or a balky horse causes a temporary stoppage, when, at once, all the vehicles of the line press forward from up and down the street, and pour in from the cross streets, making confusion worse confounded. This seems to be the average driver's chief aim, to press into the thickest of the jam and then engage in a wordy war.

Travelers who wish to reach the ferries over the North River have experiences from which they would gladly be delivered. A jam exists, we will suppose (and it is readily supposable), on one of the longitudinal streets, and a close line of horses and vehicles is to be seen, unbroken at the crossing. As the head of the line advances a foot or so, all the followers do the same, each horse's nose being kept well up to the vehicle in front; and the impatient traveler, if he will cross, crawls under horses, through mud and mire that are appalling, at certain seasons.

This sort of thing has long ceased to be a joke, and there is plenty of room for regulation of the travel if good can come of it. Let us first examine the present system, or want of system. The principal business of a down town street, considered with reference to its vehicles, consists in loading and unloading trucks, and conveying merchandise in other trucks along it. The streets, with regard to their capabilities for this kind of service, may be divided into three classes:

1. Streets in which two trucks can pass each other with trucks on either side backed up against each curb.

2. Streets through which only one truck can pass, when both sides are occupied by trucks backed against the curbs.

3. Streets in which there is no room for the passage of a third truck, when both sides are occupied by trucks at right angles to the line of travel. In these streets, and there are many of them, the present system of loading and unloading is to back the trucks over each sidewalk, thus leaving space for a third vehicle to go between. By some strange process of reasoning, unknown to the ordinary mortal but quite plain to those eccentric individuals, the drivers, these narrow streets are selected by them as the best places in which to feed their horses and let them stand while they are waiting for jobs.

The conclusions naturally drawn from these statements will be:

I. That there are many streets in which the travel of vehicles should be permitted to take place only in one direction. Excepting Broadway, this regulation would apply to nearly every street in the lower part of the city. It is easy to see how much this rule, of itself, would expedite business, and at trifling inconvenience to the drivers of the vehicles. Broadway, from its central position, should be open to travel in both directions, but confusion in this street would be very much lessened by arranging one side for vehicles going up, and the other for those moving in an opposite direction. A division in the center, composed of short panels of low railing and equal open spaces, alternately, would keep vehicles going in either direction to their proper sides.

II. That there are many streets in which trucks should not be permitted to take positions at right angles to the street for the purposes of loading and unloading, and that in no street should these operations be carried on so as to obstruct the sidewalks. There are several ways in which loading and unloading could be readily effected without encroaching upon the streets or sidewalks: by having courts in warehouses into which the vehicles could be driven; by excavations under the sidewalks opening upon the streets and leading to vaults below, through which goods could be drawn and delivered; or by using cranes and hoists projecting from upper stories of the warehouses. Other means will probably occur to the reader, but those who would be affected by the change might well be trusted to find out the means. Only let the regulation be issued that, after a certain date, no vehicles shall be allowed to stand at right angles to the street and that no obstructions to the sidewalk shall be caused in loading or unloading, and it is easy to foresee that plans will be devised so that the business of the merchants shall not suffer. So radical a change demands, of course, the most careful arrangement of details, and nothing but a mere outline is here attempted. It scarcely admits of doubt, however, that regulations of this nature, rigidly enforced, would effect a change, in the crowded and impassable condition of our down town streets, that would excite the admiration of all our citizens and might, in time, even elicit feeble admiration from the drivers.

## INVENTION THE MOTHER OF NECESSITY.

We have always labored under the impression that the only individuals who ever reversed the old saw: "Necessity is the mother of invention," and made it read "Invention is the mother of necessity" were those infatuated geniuses who too often squander their worldly goods in fruitless efforts to carry out impracticable schemes. We have been mistaken, for we have encountered one of those instances in which the inventor, after having worked out his machine, to his satisfaction, in his brain, discovered himself placed by his invention in dire necessity for material for its physical embodiment. He was not a landsman, afflicted with chronic impecuniosity, but a sailor, and an officer of a cruising whaler. His device, which, by the way, is quite an ingenious machine for cutting up blubber as it comes from the animal, necessitated the employment of many cog wheels and other gear, for which, ordinarily, metal would be employed. But at sea one cannot carry a foundery, and besides, no iron or steel was to be had; and even if it were, no tools were probably at hand to get it in shape. Finally, after sundry trials, the huge bones of the whale were thought of, and from these, harder and stronger than ivory, by the aid of a common lathe and a few chisels, a number of cog and bevel wheels, rods, etc., were made, which, for accuracy and neatness of execution, will compare favorably with the work of many professional model makers.

The model, thus ingeniously constructed, was brought to this office a few days since, and letters patent applied for on the device. It affords fresh evidence of that persevering energy which is inherent to all inventors, and, besides, proves that a mind capable of conceiving a useful and valuable idea is never at a loss to devise means, even from the most slender and least promising of resources, for carrying the same into execution.

## BOILERS AND BOILER OWNERS.

At about 9 o'clock on the morning of June 22, a boiler, at the Old Duncan Salt Works, Bay City, Mich., exploded with great violence, injuring two men, it is supposed fatally. The part of the boiler which gave way, says our informant, was the crown sheet, over the fire box, which collapsed from pressure, and the whole front of the fire box, with the fire grates, was blown out. The boiler was of the locomotive pattern, and was almost worn out from long use. A gentleman who lives in that vicinity told us that the rivets which originally headed the bolts which held the crown sheet in its place had either rusted or burned off, and that all that held the sheet was the thread in the plate. Added to this were a corroded safety valve and the absence of anything in the shape of a gage. That there was plenty of water in the boiler there is, probably, no doubt, and the accident is undoubtedly attributable to the age of the boiler and the lack of the proper steam indicator. The building is a complete wreck, and the engine and boiler are in a sadly demoralized condition.

Commenting on this, a valued correspondent, Mr. J. E. E., of Pa., who was on the spot immediately after the occurrence, says:

"There is an invention wanted; it is a salamander and ironclad man to run old and worn steam boilers without gages or indicators, of which the safety valves and pumps are out of order. The boilers have from one half to two inches of scale internally, and a similar thickness of mud in the bottom of the boiler. All the stay rods are rusted or eaten off. The iron armor of the man must be so constructed as to withstand the weight of an ordinary steam boiler or two, as well as that of the falling *débris* of a mill; it will also be required to stand the test of being blown (with the man inside) to a hight of 100 feet in the air and the fall from that hight into the ruins of an old mill, and then of being boiled for two hours in water or steam, and all this without injury to the occupant, as it often is the case that the boiler contains hot water and steam when it goes off. Such an invention would find ready sale among the owners of old oil and salt wells, where hundreds of boilers remain idle until eaten with rust, and then they are expected to stand 150 lbs. on the inch or burst. Such an invention might have saved the lives of two men yesterday at Bay City, Mich."

## UNDERGROUND RAILWAYS IN AMERICAN CITIES.

The city of Baltimore now boasts of the possession of a splendid underground railway, the first ever constructed in this country. From all accounts, the new works are highly creditable to the city and the enterprising individuals under whose auspices they have been executed. Two distinct lines of tunnels have been made at Baltimore, at an expense of some five millions of dollars, whereby nearly all of the various railways now centering in the city have their tracks united. The conveniences of the public and the mercantile facilities of the city are thus greatly improved.

The Underground Railway consists of the Baltimore and Potomac tunnel, of which the western portal fronts on Gilmore street, whence it extends in a northeasterly direction through the city, under some twenty-nine streets and avenues, emerging at North avenue, where it joins the track of the Northern Central Railway.

The Union Tunnel extends, from tide water at the Canton portion of Baltimore, northerly and then easterly under some thirteen streets and avenues to the Northern Central Railway.

The total length of the Baltimore Underground Railways is 3½ miles, of which about two miles are closed tunnels, and the remainder open cuts, over which the streets are carried on bridges.

The tunnel arches are from 22 to 23½ feet high and from 26 to 27 feet wide, five rings of brick thick, backed with rubble masonry. Only a portion where the ground was soft and springy required the invert arch. The springs of the arches are of masonry.

The Baltimore Underground Railway passes through the finest section of the city, where the people of wealth and fashion reside; but no one is disturbed, and the streets and avenues are not in the least interfered with.

Passengers from New York to Washington can now pass through Baltimore by the new Underground Railway, thus shortening the time of transit from twenty to forty minutes. The tracks of the Philadelphia, Wilmington and Baltimore, the Northern Central, the Baltimore and Potomac, and the Western Maryland now connect with the Underground Railway.

It will be remembered that the Legislature of this State at its recent session granted concession for an underground railway in this city, to extend from the Battery under Broadway to Central Park, a distance of five miles, with a branch under Madison avenue to Harlem river, a distance of six

miles additional—eleven miles in all. The soil is admirably suited to the work, while the route is almost a straight line. This road will doubtless enjoy the largest and most remunerative traffic of any city railway in the world, as it passes directly under a thoroughfare which is at once the business heart of the city and the central line of travel. Arrangements for the construction of this road are now in progress.

## SNAKE POISONS.

Twenty thousand people, it is stated, yearly die, in Hindostan alone, from the effects of the bites of venomous serpents. It is a strange fact that this poison, so deadly and virulent in its effects, may be swallowed with impunity. Its action seems to be the complete paralyzation of the nervous centers through the medium of the blood, in which it spreads through the body with lightning rapidity. Applied to the mucous membrane it causes violent local inflammation; and absorption quickly taking place, the symptoms of general poisoning are soon apparent. The effects of the venom depend, first upon the nature of the snake, the quantity and quality of the poison, and the circumstances under which the bite is given; second, on the species, size and vigor of the living creature receiving the wound.

M. Fayrer, professor in the Medical College of Calcutta, has recently published a work on the serpents of India, in which, referring to the action of the virus upon the blood, he says that, though he has been unable to detect any change in the appearance of the corpuscles, yet there is no question but that some alteration takes place. In inferior animals the bites of vipers destroy in the blood the coagulating faculty, while, on the other hand, by the venom of colubrines, coagulation after death is not interrupted. Again, when inoculated by the poison of the cobra, the blood immediately coagulates, but remains liquid if the bite be given by the daboia. Experiments made in this country with the rattlesnake show that the effects of its venom upon the human blood are quite apparent. Dr. Burnett, in a paper read some time ago before the Boston Natural History Society, gives an account of a microscopical examination, during which the smallest quantity of poison, taken from the fangs of a large rattlesnake, was presented to blood freshly drawn from the finger. A change was immediately perceived; the corpuscles ceased to run and pile together, and remained stagnant, without any special alteration of structure, and the whole appearance was as though the vitality of the blood had been suddenly destroyed, exactly as in death from lightning. This agrees, also, with another experiment, performed on a fowl, where the whole mass of the blood appeared quite liquid, having little coagulable power.

Analyses of cobra poison have lately been made by Mr. Henry Armstrong, of London. The matter, extracted from full grown serpents, was forwarded from India in small vials, and appeared to be a brownish, sirupy liquid; from which, when the vessels were uncorked, a quantity of gas escaped. Examinations were made, first, of the crude substance, second, of the precipitate caused by the addition of alcohol, and finally of the residue obtained by evaporating the filtered spirits, with the following results: The raw poison evaporated with sulphuric acid in *vacuo* deposited a friable mass which contained 43·55 per cent carbon and 13·43 per cent nitrogen. The white precipitate dried with sulphuric acid, under similar circumstances, appeared as a pale brown substance, easily pulverized, and leaving, after incineration, a light mineral residuum. It contained 45·3 per cent carbon and 14·7 per cent nitrogen, and also 2·5 per cent of sulphur was determined. The alcoholic solution, similarly evaporated, left a light brown friable mass, composed of 43·94 per cent carbon, 12·45 per cent nitrogen, and 7 per cent hydrogen. It was found impossible to crystallize the poisonous substance, neither water, alcohol, ether, bisulphide of carbon, or any other dissolvent employed leaving the slightest trace of crystals after evaporation. Nitric acid and alcohol determined a coagulum; heat produced the same effect. The salts of copper and potash caused the violet color characteristic of the presence of albuminoid matter.

The liquor, it appeared, resisted decomposition and maintained its activity even after being kept for considerable time, and the characteristics of the poison were noted to be equally powerful in all the three states above mentioned.

M. Fayrer considers that to cobra poison may be ascribed a nature similar to that of vaccine virus, and believes that much may be discovered by extended experiment. He says that viper venom acts directly on the blood and secondarily on the nervous system, and adds that it may be that, by careful and reasonable employment, this powerful poison may be converted into a useful remedy, and that there is nothing to prove why, by extended experiment and study, a complete and prompt antidote may not be found.

From all accounts it appears that the rattlesnake (*crotalus durissimus*) indigenous to this country is endowed with a poison even more virulent than that of the cobra or viper. There is reason for belief that its action is the same upon all living things, vegetables as well as animals. It is even fatal to the snake itself; and we find it stated that, on being irritated while confined in a cage, the animal has been known, in moving suddenly, to strike its own body, and to die from the wound as quickly as would any other creature. A remarkable physiological fact is here presented of a liquid, secreted directly from the blood, which proves deadly when introduced into the very source from which it was derived. Serpent poison acting as a powerful sedative, active stimulants are probably the best antidotes. Hence, in parts of the United States infested with venomous reptiles, it is the practice to administer large drafts of whisky, or to chew and swallow tobacco. The liquor stimulates the nervous system until the depressing effect of the poison is overcome by natural curative action. Tincture of iodine externally applied and administered by hypodermic injection into the cellular tissue near the wound is said to be of considerable efficacy, and in advanced cases chloride or iodide of potassium, largely diluted with water, is given in addition. Sucking the wound immediately after being struck often delays the spread of the poison. The negroes in the South favor an odd remedy, which consists in killing a chicken, splitting it in the back, and bending the warm flesh directly over the bite. They believe that the poison attacks the fowl in preference to transfusing itself through the human body. The Mexicans and Indians use a plant which they call the *golondrinera*, which Dr. Torrey on examination pronounced a species of *euphorbium*. Botanically it is known as *e. prostrata*; and we find it described as a plant of frail, delicate appearance, somewhat like the gold thread, and having long, reddish stems that spread and interlace with each other. Its flowers, which appear from April to November, are very small and white, with dark purple throats. They are axillary, and have four petals and four sepals. All parts of the plant contain an abundance of milky juice in which the medicinal properties reside, and which is extracted by bruising the portions in a mortar. A considerable quantity of water is added and several ounces of the mixture administered to the injured person. The plant grows plentifully in dry gravelly places, by roadsides and in farm yards. The remedy, which acts as an emetic and cathartic, is said never to fail in a cure and to be attended with no danger in its administration.

## TO EUROPE IN A BALLOON.

To accomplish this has long been the favorite project of the well known aeronaut Mr. John Wise, and for the past twenty years he has kept the matter before the public. During this period, he has made a large number of balloon ascensions, and gathered, as he believes, indubitable evidence of the existence in the aerial regions, at a hight of from one to two miles above the earth, of a constant easterly wind current, and has alleged that if proper efforts were made it would be practicable, by maintaining a balloon within this current, to pass easily and speedily over from this continent to Europe. In 1859 Mr. Wise undertook a preliminary land voyage, and succeeded in moving in an easterly direction for a distance of some twelve hundred miles—to wit, from St. Louis, Mo., to Jefferson county in this State. But the results of that excursion appear to have dampened the interest of financial people, and the daring balloonist has, until quite recently, been unable to find anybody who, for the sake of science or any other consideration, was willing to risk the expense of a few thousand dollars for another trial.

We are glad, however, to be able to chronicle the fact that the Messrs. Goodsell, the enterprising publishers of the *Graphic* daily illustrated newspaper in this city, have pledged themselves to supply all the funds necessary for a new flight to Europe; and in a few weeks from the present time, as soon as the balloon can be manufactured, Mr. Wise will be again in the air.

Our readers are no doubt familiar with the form of contracts for building houses, ships, railways and various kinds of machinery; but probably they have never read the details of a contract for the building of a balloon and a voyage therewith to Europe. We will therefore give the text of the bargain between Messrs. Goodsell, the financial parties to the contract, and Messrs. Wise and Donaldson, the aeronautic directors of the expedition:

### CONTRACT FOR THE CONSTRUCTION OF THE GRAPHIC COMPANY'S BALLOON, AND ITS NAVIGATION FROM NEW YORK TO EUROPE.

This memorandum of agreement, made at the city of New York, the 27th day of June, 1873, by and between The Graphic Company, proprietors and publishers of the *Daily Graphic*, party of the first part, and John Wise, of Philadelphia, party of the second part, and Washington H. Donaldson, of Reading, Pa., party of the third part, witnesseth:

That the said The Graphic Company will build a balloon of not less than 130 feet in hight and 100 feet in diameter, and will fully equip and provide the same with valves, balance line, ropes, car and gallery, life boat or raft, and all other appliances necessary to insure strength and safety in so far as may be practicable. It agrees that the construction of the same shall be commenced at once and pushed to completion as rapidly as possible, and before the 20th day of August next if practicable; and the said The Graphic Company will furnish the use of said balloon to said John Wise and said Washington H. Donaldson for the purpose of the making of an aerial voyage therein by the parties of the second and third parts from the city of New York to some point on the eastern side of the Atlantic Ocean upon the conditions following:

First. That the said John Wise and the said W. H. Donaldson shall personally superintend and direct the construction of the balloon according to the utmost of their skill and judgment, and that in all matters connected with the construction of such balloon they shall be subject to the general direction of The Graphic Company.

Second. That the said John Wise and the said W. H. Donaldson shall not make nor participate in any other balloon enterprise, exhibition, or ascension while this agreement is in existence.

Third. That on the completion of the said balloon the said John Wise and the said W. H. Donaldson shall, on a day and from a starting point to be selected by The Graphic Company, make a public ascension in such balloon, accompanied by such other persons as may be designated by The Graphic Company; and making such ascension, that they shall, directly and without any delay or evasion, seek the elevation of the eastern air current, there to remain until land shall have been made on the eastern side of the Atlantic Ocean.

Fourth. That the said John Wise and said W. H. Donaldson shall then land said balloon as safely and expeditiously as possible, and immediately thereafter communicate the intelligence of their arrival, with full particulars of the voyage, by the most speedy means available, to the *Daily Graphic*.

(Signed) JAMES H. GOODSELL, C. M. GOODSELL,
Managers of The Graphic Company.
JOHN WISE. WASHINGTON H. DONALDSON.

The foregoing preliminaries having been duly settled, the work of construction was begun on the very next day, June 28th, and will be pushed forward rapidly to completion. The editor of the *Graphic* says: "Although it is impossible to fix definitely the day of departure, yet we are confident that everything will be in readiness before August 20 next. We have lent our aid to the undertaking in the interest of science and business, and the progress of mankind. The balloon will not be exhibited to the curious to make a sensation, but, as soon as it is finished, will take its flight. We have reason to believe that the public will not be disappointed or dissatisfied either with the method of the undertaking or the manner of its performance.

"It is needless for us to enlarge upon the benefits which will result from the success of this enterprise. They may be easily imagined, if they are not obvious at once. The discomforts, the risks, the cost, and the perils of the ordinary ocean voyage are familiar enough. The path across the ocean has been paved with human bones. Millions of treasure have gone down beyond recovery. To demonstrate the practicability of aerial navigation is to revolutionize the business and communication of the world. To demonstrate its impracticability, even, would be a positive gain; but once sail to Europe through the air in sixty hours, once acquire practical mastery of the methods of navigating the air and the difficulties of the route, and there is no telling what grand results may follow."

Of all newspaper dodges to attract interest and induce large sales, this "Balloon to Europe" affair beats all. The pictorial representations of the progress of manufacturing the great machine, its inflation, trial, and final departure, will be fruitful themes for the artist's pencil, and the voyage, if successful, will supply an extensive series of *Graphic* illustrations, of "Life in the Clouds," exceeding in interest everything of the kind before produced. The steam presses of our enterprising cotemporary will have to be several times duplicated and run night and day for many weeks in order to supply the public demand.

The balloon is now being made in the lofts of the Domestic Sewing Machine Company, corner Broadway and 14th street.

In a letter to the *Graphic*, Mr. Wise says:

"The balloon proper will be a spheroid of 100 feet transverse, and 110 perpendicular and diameter. The supplemental balloon will be a spheroid of 36 feet diameter. These, with allowance for expansion of gas, will give us a lifting power of 15,900 pounds, and a net carrying power of 9,500 pounds, and of disposable ballast, 7,500 pounds. Our floats will not lose by exosmose of gas over 15 pounds per hour, and that will enable us to keep afloat 20 days. But allowing a liberal margin for the free escape of gas in the higher and rarefied regions of the atmosphere, we may still calculate safely for a ten days' buoyant power; and, if deemed necessary, we can dispose of the boat and gallery, and thus restore a buoyant force of 1,200 pounds, which would serve us for several days more; so that, under the most adverse circumstances, we can hardly fail to reach the European shore.

"We shall carry a boat more for the purpose of providing for a contingency that may possibly arise, from any damage to the main balloon, but one that we have little cause to apprehend. The boat will be stored with water and provisions to serve for thirty days. Our kind friends are thus assured that we are not foolhardy, seeing that we shall provide against all and any contingencies that are likely to possibly arise.

"Our main reliance is on the great eastward drift of the trade wind. We do not pretend that, in this first experimental voyage, we shall be able to make a given point on land, but we have an eye to the Gulf Stream, the great warm river in the ocean, which forms above it, in the ocean of air, a corresponding aerial river that will float us to the coast of Ireland."

The editors of the *Graphic* announce that the balloon will have passenger room for eight or ten persons, and the choice few who wish to take part in the expedition may now call at the captain's office, 41 Park Place, and purchase their tickets.

We recommend those who are tired of life, who have made their wills, who have no one dependent upon them and whose friends would be glad to be rid of them, to prepare carpet bags and go. The chances of their return to earth in a condition suitable for further usefulness, we regard as extremely slim. When Mr. Wise made his great voyage from St. Louis, he had twelve hundred miles of land to pass over, and descended before reaching the sea. By starting from New York, this long stretch of overland travel will be saved, and in a very short time after cutting the rope he will be wafted out over the trackless deep, provided he seeks and gains the high easterly current aforesaid.

The balloon which he proposes will, we believe, be the largest ever made. That of M. Giffard, used in London in 1869 for elevating passengers at Ashburnham Park, by means of rope and reel, was 93 feet in diameter, and held 425,000 cubic feet of hydrogen gas. It was made of three thicknesses of linen, cemented with rubber and varnished with shellac. Cost $10,000. It was capable of lifting 25 persons besides the cable by which the balloon was drawn down after every ascent, steam power being used. The cable weighed 4,350 lbs., and was 2,150 feet in length.

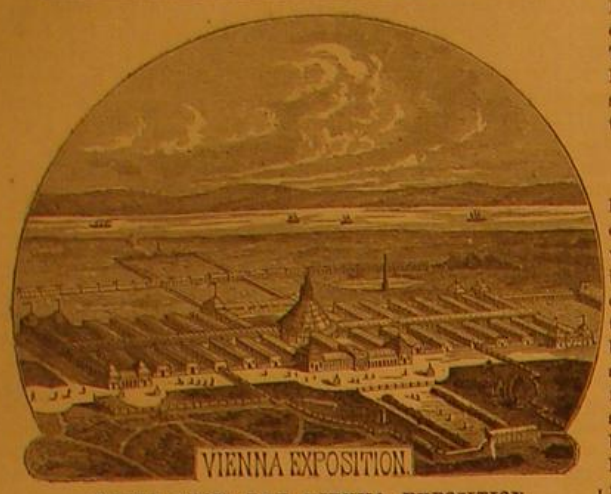
### THE GREAT BALLOON VOYAGE OF 1859.

We will now give a history of the great voyage made by Mr. Wise, in 1859, from Missouri to New York, as published in our paper at that time:

[From the SCIENTIFIC AMERICAN of July 16, 1859.]

"The veteran aeronaut, Mr. John Wise, has long entertained the idea that a successful balloon voyage across the

(Conclusion on page 41.)




## NOTES FROM THE VIENNA EXPOSITION.

### RIGHTS OF WOMEN IN VIENNA.

A correspondent of the *Baltimore American*, who is in attendance at the exhibition, speaks of an immense building, occupying a whole block, in course of erection in Vienna, on which not less than 400 persons are employed, fully 200 of whom are women. All the hard laboring work is done by women, such as making and carrying mortar in buckets on their heads to the workmen, and handling the brick. They are not allowed a moment's leisure, several overseers being on guard to keep them constantly in motion. "We found the same proportion of women at work on all the new buildings, and there must be many thousands of them today doing this species of laboring work in Vienna. There are young, middle aged, and old women, but all seem to be strong and healthy. At dinner time they swarm into the shops to purchase a piece of brown bread, and eat their dinners sitting on the curb-stones. The wages are one florin, or forty-eight cents per day, and I am assured by a gentleman resident here that most of them sleep about the building on shavings, or in barns or sheds, having no homes. It is not to be wondered at that, of the 8,000 births annually in the lying-in hospitals of Vienna, less than 500 are of children born in wedlock."

### PLATE BENDING ROLLS.

Among the metal working appliances is found a plate bending machine, shown, by the *Chemnitz Werkzeug Maschinen-Fabrik*, of which we give an illustration selected from *Engineering*. The rolls are 7 feet 4·58 inches long and 9·84 inches in diameter; and the pulleys are arranged so as to drive, through double gear, backwards and forwards. The uppermost roller is raised by a very ingenious arrangement. The hand wheel, shown in both views of our engraving, communicates motion through a pair of bevel wheels to a horizontal spindle traversing the whole length of the rolls. This spindle has two worms on it which give motion to the worm wheels, one of which is seen in the end view on the outside of two columns lying underneath the gudgeons of the roller. The rotation of the worm wheels raises the roller (shown in its lowest position in the engraving) by means of internal screws. The machine, the workmanship of which has been highly spoken of by some cotemporaries, is intended to bend plates up to three fourths of an inch in thickness.

### POTASH SALT.

The mines from which this product is obtained are very valuable, since there is no competition in the market. There are only two of these mines, one of which is in Germany, at Leopoldshall and Stassfurt, and the other in Austria, at Kalusz. Mr. Kustel writes, to the *Mining and Scientific Press*, from Vienna, that a very complete exhibition of potash and its productions can be seen at the Vienna Exposition. He says, in referring to the mines mentioned above, that it is the belief that these potash deposits are the result of the evaporation of former remainders of large seas, concentrated in a few favorable localities. The formation of these deposits, under such peculiar and lucky circumstances, indicates that little prospect for new discoveries exist in this line, but it is not impossible that such deposits may be found in the United States, in districts where salt rock is known to exist. Although the potash was known and used in many branches of industry long ago, its large and extensive application in practical life is not older than the discovery of the Stassfurt deposit (twelve or fifteen years ago). Formerly, the potash salt that covered the salt rock bed was considered a nuisance; it was not utilized; its value not known; and now, not the immense bed of salt rock, but the above nuisance is considered the wealth of Stassfurt. Eight millions of thalers were offered for that part of the deposit which is in Stassfurt, but the offer was not accepted. The total extraction of this salt in 1872, at Stassfurt and Leopoldshall, was eleven millions of hundredweights. This shows what extensive use is made of this article in agriculture and trade.

### A LARGE LOCOMOTIVE.

The new Belgian exhibit, says *Engineering*, is by far the largest locomotive in the collection at Vienna, it being an engine on Meyer's system, having two steam bogies, each with a pair of cylinders 17 5/8 inches diameter and 1 foot 7 1/16 inches stroke. Each bogie has six coupled wheels, 4 feet in diameter, placed with a wheel base of 8 feet 8 3/16 inches, the total wheel base of the engine being 28 feet 7¼ inches. The boiler has a barrel of 4 feet 11 inches in diameter outside, and contains 289 tubes, 1 3/16 inches diameter outside and 14 feet 9½ inches long between tube plates, these tubes giving an external heating surface of 2199 square feet. The fire-box surface is 128½ square feet, making 2327½ square feet of heating surface in all, while the firegrate area is 33·6 square feet. The tanks carry 1760 gallons of water, and the weight of the engine is 55 tuns empty, or 71 tuns in working order. This engine is intended for service on the Grand Central Railway of Belgium, and it is exhibited by the maker, M. Charles Evrard, of Brussels, who has materially improved MM. Meyer's original design.

### RUSSIAN MALACHITE.

The malachite work is perhaps the most beautiful of anything that is peculiarly Russian in the exhibition. No one who has only seen this stone, says the New York *Tribune* correspondent, with its graceful veinings and mottlings of dark and light green, in small pieces in jewelry, can realize its beauty when used in combination with gilt in large vases, clocks, and for the tops of tables. The finest marbles or even jasper do not compare with it. The Russians alone possess the stone; but in its cutting they develope nothing original, and only copy French and Italian forms.

### RUSSIAN WAR MATERIALS.

The Russian Government makes a complete exhibit of her weapons of war, and, so to speak, shows her teeth to the world. Here are specimens of shot and shell, field artillery and mitrailleuses,

### GATLING GUNS,

and American racks of breech loading small arms (Berdan's system, an American invention), cartridges and cartridge machines, tents, ambulances, accoutrements of all kinds, uniforms, models of navy yards and iron clads—in a word, all the paraphernalia of war by sea and land.

FIG 2.

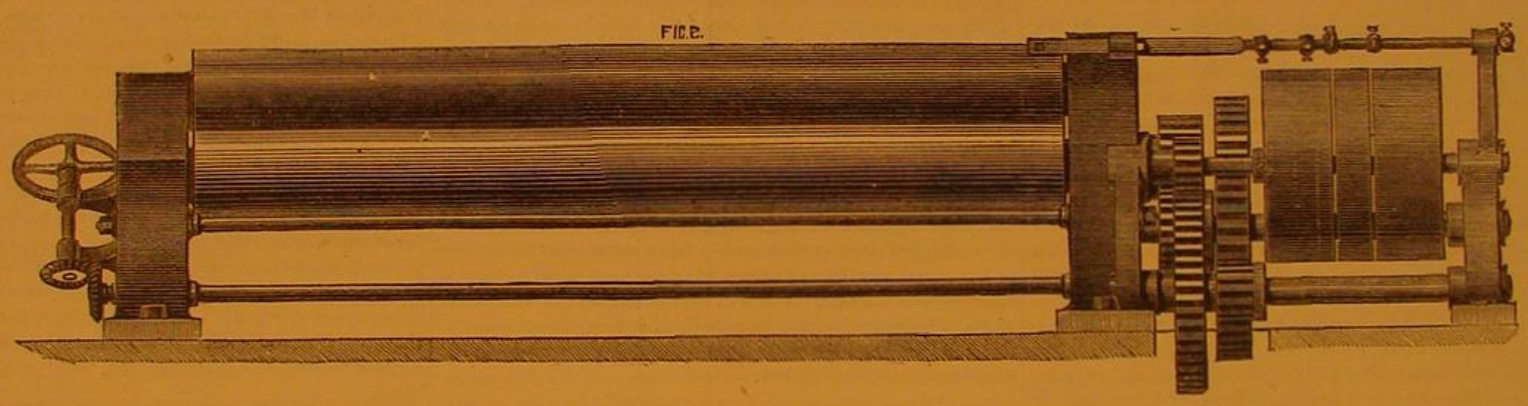


FIG 1

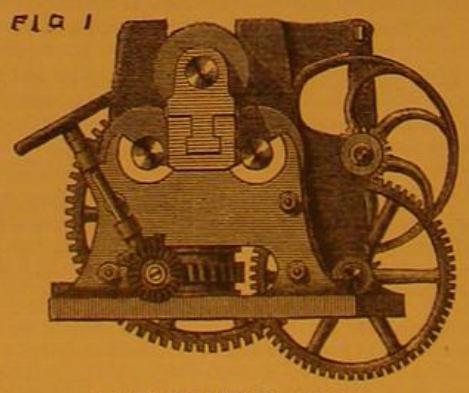
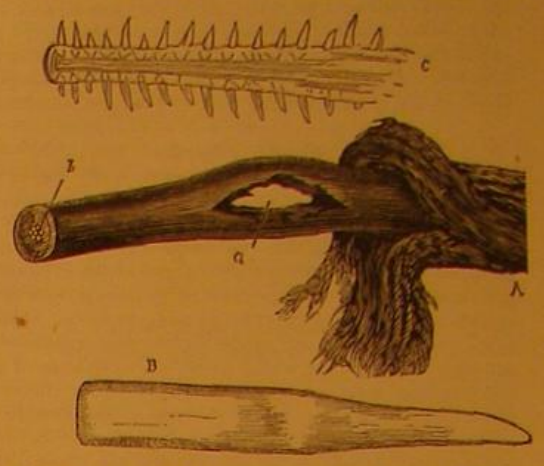


PLATE BENDING MACHINE.

## A Sawfish Cuts a Telegraph Cable.

In the SCIENTIFIC AMERICAN of February 17, 1872, we gave some account of the injury to the telegraph cable between Florida and Cuba, from the bites of sea turtles or other fish; and also of injuries to cables submerged in the China Sea, occasioned by the attacks of marine insects. Another enemy to telegraph cables has made its appearance in the shape of the sawfish, who has been guilty of using his teeth upon the Singapore and Penang cable, and thereby suspending telegraphic communication. Mr. Frank Buckland, in a recent number of *Land and Water*, gives the following interesting account and engraving:

The drawing is made the actual size of the injured portion of the cable. A hempen rope, A, is tightly coiled round the gutta percha portion of the cable. This was, of course, underneath the iron wires which formed the outside of the cable. In the middle of the gutta percha the copper wires are seen embedded at *b*. In the middle of this gutta percha there is a jagged hole, exactly the size and shape of that given in the drawing. A minute observation of the interior of the wound will show that three of the wires at this point are snapped right across, the broken ends being all thrust in the same direction, namely, away from the spectator as he examines the drawing. The remaining four wires (there




are seven at the point *b*), however, remain intact. The uninjured wires can be seen at the lower side of the wound, the weapon which made the hole having missed them.

The following information was received from Colonel Glover, R. E.: "The cable was laid on December 11, 1870, and its tests were satisfactory. It worked well until March 1, 1871, or three months afterwards, when a serious fault had developed itself, which prevented working. A vessel went out, found the fault, and repaired it on the 7th June, 1871. The fault was 222 miles from Singapore, and in thirty fathoms water, the bottom being marked sand and mud. The report which came home to us was that a bony substance had been found jammed hard in the cable through the wires, and it was supposed to have been done before laying. As we could not understand why the original tests should be good if the substance had not existed, and why failure should be sudden, I did not believe this; and on receiving the faulty specimen I went to Willoughby Smith, and we opened it together. The bony substance appeared to us a fish tooth, probably a shark's; but as no mark of the other jaw appeared, we were puzzled, and give it to you. This is all the information we possess, nor, indeed, can get more, as no persons have seen it since."

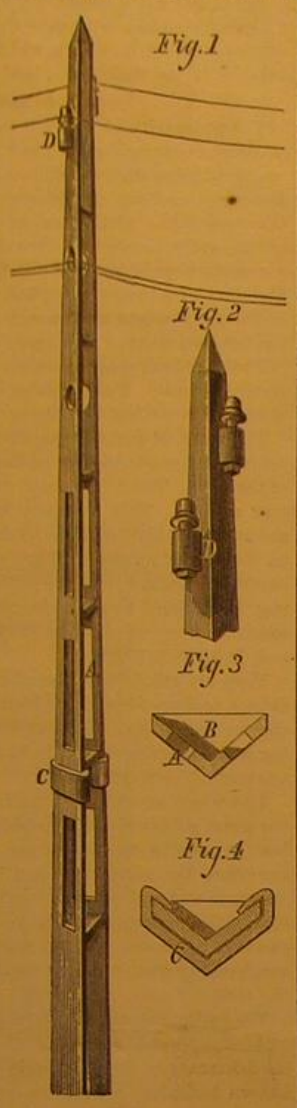
I confess I was exceedingly puzzled with this most difficult problem. The hole towards the spectator is two thirds larger than it is on the opposite side. If it had been an ordinary fish, such as a shark, there ought to have been the marks of a bite on both sides of the cable, namely, of a tooth in both the lower and upper jaws. This wound, therefore, must of necessity have been made by a fish having but one tooth, and one tooth only; but what fish is there that has only one tooth? For several weeks I placed the specimen on my mantlepiece, and was constantly thinking over the puzzle. At last one day I hit it off all of a minute. On going round my museum I observed with most intense interest a beak or saw of a sawfish (*pristis antiquorum*) presented to me by Dr. Day, Inspector of Indian Fisheries, the fish having been taken in the Andaman Islands. "That's the fellow," I said to myself, "that made the hole in Mr. Latimer Clark's telegraph cable;" so, taking one of the teeth out of the beak of the sawfish, I placed a spare portion of the telegraph cable on the table, and struck the end of the tooth with the mallet, and immediately produced a wound almost, I may say exactly, similar to that found on the Penang telegraph cable. This tooth is seen at B.

My theory is very simple, namely, that the perpetrator was a big sawfish. The cable lay at the bottom of the sea, when day a sawfish came by hunting for his dinner. The sawfish gets his food by waving his saw right and left, turning up the mud or sand in order to dislodge the delicate bodied marine creatures on which he subsists. His teeth will tell us he cannot eat hard substances. When thus engaged in his submarine diggings, he suddenly came across the telegraph cable. His beak getting entangled in it, he gave it an extra blow and a smash downwards, and finally, getting enraged, hit it so hard that one of his teeth went between the outer wires—through the hempen rope—and then through to the gutta percha, injuring the wires. These various substances probably then held the tooth somewhat tightly. The fish then struggled and broke his tooth short off, leaving a bit of it actually imbedded in the cable among the wires.

I am inclined to think that the sawfish uses his formidable weapon to stir up the mud in search of his food, because the points of the teeth in the saw, which are composed of very hard bony substance, are as sharp as the tips of a wild boar's tusk, which are kept finely pointed by constant friction.

### NEW FORM FOR METALLIC TELEGRAPH POLES.

We presume that there are few who, in common with ourselves, have not been impressed with the unsightliness of the cumbrous wooden telegraph poles which disfigure the finest thoroughfares of our large cities. Huge tall posts, often crooked, with their defects made still more glaring by a coat of white paint, far from correspond with handsome stone façades or elegant architectural adornment. Hence it may be imagined that any substitute, particularly if made of metal, such as the novel invention herewith illustrated, and of a neat and graceful design, will receive favorable consideration, both from telegraph companies, in point of its superior economy, and on account of its unobtrusive and even ornamental appearance from those charged with the improvement of our city streets.




The posts are made in sections, of either cast or rolled angle iron, and constructed of the form shown in Fig. 1, that is, tapering from the base to the top; and when made of cast metal the wide flanges have long openings or slots, A, in which pins may be inserted to adjust the wires. A horizontal section of these portions is represented in Fig. 3. The cross pieces, B, by which to climb, may be cast in the angle between the wires.

The sections are connected together by slips, C, Figs. 1 and 4, on the end of one section; between which and the extremity of said section, the end of the adjoining portion is slid in. Similar clips, or dovetailed grooved clips, D, are applied to the upper ends of the top sections, Fig. 2, for the reception of the insulators for holding the wires.

It is claimed that posts of this form are cheaper and more durable than those of any other pattern now in use. Patented through the Scientific American Patent Agency, June 3, 1873. For further particulars address McCarver, Athey & Jennings, Oregon city, Oregon.

### CUMMINGS' STEAM MOWING, REAPING, AND THRASHING MACHINE.

Some issues back, we published an engraving and description of the Hayes steam reaper, an agricultural invention of considerable merit recently introduced in England. The article attracted the notice of a correspondent, Mr. Marcellus



V. Cummings, of Genesco, Henry county, Illinois, who has lately forwarded to us the facts, embodied in the following description and illustrated in the annexed engraving, relative to a machine of similar description, invented and patented by him (May 12, 1868) over five years ago, which, he informs us, is now in actual and successful use in the above mentioned locality. Our illustration, from a photograph, will convey an excellent idea of its appearance and construction. The boiler is thirty-one inches in diameter by five feet in length, and is of the tubular pattern. There are two steam cylinders, each four by eight inches, together with a water tank holding five barrels of water, and coal bunkers containing five bushels of coal. The large driving wheels are five feet in diameter and eight inches in tread; the front steering wheel, operated as shown, is four feet in diameter, with similar tread. The grass sickle cuts six feet four inches and the grain sickle nine feet six inches.

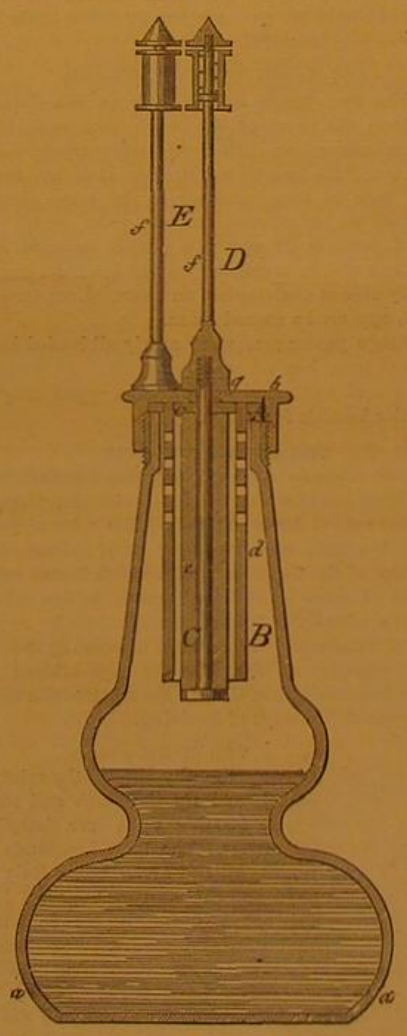
The inventor states that he drives his engine from farm to farm without the aid of horses, and that it traverses over plowed land, up hill or down, with the greatest ease. The rate of speed is about four miles per hour, and an acre of ground can be mown in twenty minutes. The grain thrashing machine is placed on a two wheeled carriage, which is coupled on behind the engine, and is thus hauled by the latter over country roads, from place to place, throughout whole counties. The entire weight of the apparatus is 4,200 lbs.

Judging from the facts transmitted to us, this invention appears of considerable importance and worthy of the attention of farmers having large tracts of land under cultivation. The patentee states that his means did not admit of his constructing more than one machine, by the aid of which, however, he has earned sufficient to build another. If, as he asserted, and doubtless with truth, its advantages, both in itself and as a traction engine, are so extended, it amply deserves a reputation much wider than it has attained.

### ELECTRIC GAS LIGHTER.

We are indebted to the Belgian *Bulletin de Musée* for the accompanying illustration and description of an ingenious gas-lighting apparatus, the invention of Dr. Klinkerfues. The principle of the device is the heating of a coil of fine platinum wire, by a weak current of electricity, to a sufficient temperature to ignite the gas.

The invention is composed of a glass vase of suitable shape, closed by a cover screwed on, and packed so as to exclude the air by a rubber plate, A. The two elements, B and C, are zinc and graphite, the former is in the shape of a tube, is pierced with several holes, and is attached to the




cover. The graphite is in the form of a cylinder and is secured as described further on. Upon the cover are the two electrodes, D and E, consisting of rods of brass at the upper extremities of which are spring clamps which hold the spiral of platinum wire. One electrode, D, is attached directly to the cover, the other, E, carries the graphite cylinder, and is isolated at its point of contact with the cover by a rubber envelope.

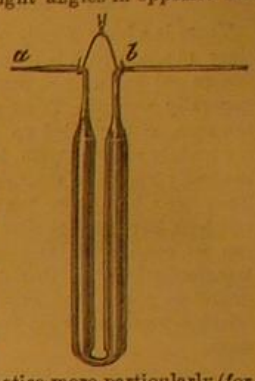
The liquid contained in the vase is composed of three parts chromate of potash, four of sulphuric acid, and eighteen of distilled water. To use the apparatus it is only necessary to slightly incline the vase so that the liquid is brought in contact with the elements. A current is established which heats the platinum by which the gas is lit. On returning the device to its vertical position, the fluid rests at the bottom and the current is interrupted.

The same inventor has arranged a similar plan for the automatic lighting of jets, the apparatus being placed upon the burner. During the day, while the pressure of gas is low, or when the supply is partially or wholly turned off, the liquid is not in contact with the zinc and graphite; but on admitting a greater pressure, the fluid is forced up and a current established. This device, hardly so practical in form as that above described, was fully explained on page 393 of our volume XXIV.

### SPECIFIC GRAVITY INDICATOR.

Dr. Hermann Sprengel says, in the *Journal of the Chemical Society*: "I have, for a number of years, availed myself of pipette shaped vessels in preference to the usual specific gravity bottle, the following being a short description of my method:

"The form of my instrument, Fig. 1, is that of an elongated U tube, the open ends of which terminate in two capillary tubes, which are bent at right angles in opposite directions. The size and weight of this instrument should be adapted to the size and capability of the balance in which it is to be weighed. The instrument which served for my determinations had a length of 7 inches, and was made of a glass tube, the outer diameter of which was $\frac{7}{16}$ of an inch. It hardly need be mentioned that the U shape is adopted for the sake of presenting a large surface, and so rendering the instrument sensitive to changes of temperature. The point, however, which I wish to notice more particularly (for reasons explained below) is the different caliber of the two capillary tubes. The shorter one is a good deal narrower (at least towards the end) than the longer one, the inner diameter of which is about ·02 of an inch. The horizontal part of this wider tube is marked near the bend with a delicate line, *b*. This line and the extremity of the opposite capillary tube, *a*, are the marks which limit the volume of the liquid to be weighed.

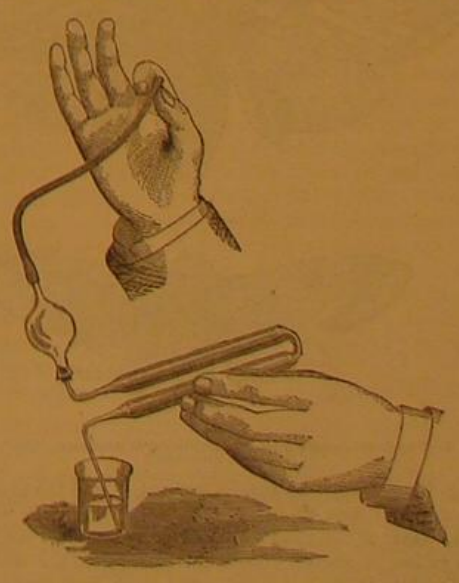



The filling of the instrument is easily effected by suction, provided that the little bulb apparatus (as represented in Fig. 2) has previously been attached to the narrow capillary tube by means of a perforated stopper, that is, a bit of india rubber tube, tightly fitting the conical tubulus of the bulb. On dipping the wider and longer capillary tube into a liquid, suction applied to the open end of the india rubber tube will produce a partial vacuum in the apparatus, causing the liquid to enter the U tube. As this partial vacuum maintains itself for some time (on account of the bulb, which acts as an air chamber), it is not necessary to continue the suction, if the end of the india rubber tube be timely closed by compression between the fingers. When bulb and U tube have about equal capacity, it is hardly necessary, during the filling, to repeat the exhaustion more than once. Without such a bulb, the filling of the U tube through these fine capillary tubes is found somewhat tiresome. The emptying of the U tube is effected by reversing the action and so compressing the air.

"After the U tube has been filled, it is detached from the bulb, placed in water of the standard temperature almost up to the bends in the capillary tubes, left there until it has assumed this temperature, and, after a careful adjustment of the volume, it is taken out, dried, and weighed.

"Particular care must be taken to insure the correctness of the standard temperature, for a mistake of 0·1°, causes an error in the 5th decimal, making 100000 parts 100001·4 parts.

"A peculiar feature of my instrument is the ease and precision with which the measurement of the liquid can be adjusted at the moment it has taken the standard temperature; for it will be found that the liquid expands and contracts only in the wider capillary tube, namely, in the direction of the least resistance. The narrow capillary tube remains always completely filled. Supposing the liquid reaches beyond the mark, *b*, it may be reduced through capillary force



by touching the point, *a*, with a little roll of filter paper. Supposing, however, that in so doing too much liquid is abstracted, capillary force will redress the fault, if point, *a*, be touched with a drop of the liquid under examination; for this gentle force acts instantly through the whole mass of the liquid, causing it to move forward again to or beyond the mark.

"As the instrument itself possesses the properties of a delicate thermometer, the time when it has reached the standard temperature of the bath may be learned from the sta-

ility of the thread of liquid inside the wider capillary tube. The length of this thread remains constant after the lapse of about five minutes.

"In wiping the instrument (after its removal from the bath) care should be taken not to touch point, *a*, as capillarity might extract some of the liquid; otherwise the handling of the instrument requires no especial precaution.

"The nicety attainable by this method is very satisfactory."

[From the Fourth Annual Report of Charles V. Riley, State Entomologist of Missouri.]

## THE GREAT LEOPARD MOTH.

There is a large family of moths, known as Arctians or tiger moths, which is rendered conspicuous by the beauty of design and boldness of contrast in color which its members generally present. There are two whose caterpillars are often seen, either rolled up cozily under some plant or crawling rapidly across a path, but which are not by any means generally known in their more beautiful and perfect states. They were both more than usually common the past year, and both have very similar habits. They neither of them can be considered injurious; but a brief account of their transformations, in this department of my report, will doubtless please and gratify many an inquisitive reader, who has wondered what the "hedge hog" caterpillars produce.

The species above named is the largest, and perhaps the most beautiful, of the family in North America.

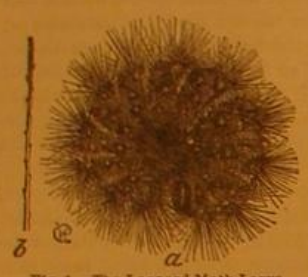


Fig. 1.—The Leopard Moth Larva.

Its larva (Fig 1) may be called the large black bear, as the hairy worms of our different Arctians are popularly called bears, and the family name was derived from the Greek word for "bear." It is often observed in the fall of the year, though few persons have ever seen the moth which it produces. This larva is black, and so thickly covered with jet black spines as almost to hide a series of roughened warts, on each joint, from which the spines spring. When disturbed, it curls itself up, and then the sutures of the joints are seen to be reddish brown, in strong contrast with the black of the rest of the body. If carefully observed, the spines will be seen to be barbed, as represented at *b*.

This worm feeds, mostly during the night, upon the wild sunflower (*helianthus decapetalus*), the different species of plantain (*plantago*), and upon willows. J. A. Lintner, of Albany, N. Y., thinks it likewise feeds on black locust, as he has often found it beneath that tree and has fed it on the leaves. It comes to its growth in the fall, and curls up and passes the winter in any shelter that it can find, being especially fond of getting under the bark of old trees. In the spring, it feeds for a few days on almost any green thing that presents itself, and then forms a loose cocoon, casts its prickly skin, and becomes a chrysalis. The chrysalis is black, and covered with a beautiful pruinescence, which rubs off almost as that covering a Duane's early plum. It has a flattened blunt projection at the extremity, armed with a few barbs and bristles.

In a few exceptional instances I have known both this and the following species to go through all the transformations and produce the moth in the fall. The chrysalis state lasts but about a fortnight, when the moth escapes.



Fig. 2.—The Great Leopard Moth. *Expastheria scribonia*, Stoll. (*Lepidoptera, Arctiadæ.*)

Fig. 2 represents the female moth at *a*, and the male at *b*. The upper portion of the abdomen is steel blue, or blue black, marked longitudinally along the middle and sides with yellow or orange. With this exception, the whole insect is white marked and patterned with dark brown, as in the figures. The male differs from the female principally in his smaller size and more acuminate wings, and by the narrower abdomen, which is also generally duller in color, with the pale markings less distinct. The markings on the wings vary in a striking manner in different individuals, the oval or elliptical rings sometimes filling up, especially in the male, so as to look like black blots. This insect is considered rare in New England, but is much more common in the Mississippi valley. It occurs still more abundantly in the Southern swamps, where the larva is dubbed "fever worm" by the negroes, under the absurd impression that it is the cause of fever and ague.

As an illustration of the wonderful power of resisting extreme cold, which this caterpillar possesses, I will quote the following experience communicated to me by Mr. Lintner. He says: "I had placed one for hybernation in a small keg among leaves, which I inserted in the ground. During my absence from home, either the thawing of the snow or the wind had overturned the keg and driven away the leaves. On my return I found the larva remaining, but stiffly frozen, with its head encased in ice and fastened to the ground. As an experiment I detached a piece of the ground with the larva, and placed it in a warm room. On the thawing of the larva and the release of its head, it was restored to activity."

## EN ROUTE TO THE GREAT EXPOSITION.—LETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON.

NUMBER 2.

LONDON, JUNE 10, 1873.

The previous letter was written while on the Atlantic, with more than one half of our voyage accomplished. The remainder of the distance was made under very similar circumstances of wind and sea. Light wind and sea, invariably ahead, or on the bow, while admirably adapted to meet the wishes of those of the passengers who were at all inclined to suffer from sea sickness, prevented our making a quick passage, and we only made the land, at the north of Ireland, after a thirteen days run from New York.

In that high latitude, the sun, at this season, does not set until late in the evening, and it rises correspondingly early in the morning; while the twilight, on a clear night, is sufficiently bright at midnight to enable us to read a newspaper without very greatly fatiguing the eyes.

It was broad daylight, therefore, when, the next morning, at about three o'clock, an unusual bustle on deck announced that they were preparing to set some of our passengers ashore at Moville, a little village in Lough Foyle, a few miles below Londonderry. A chilling breeze met us, as we stepped on deck, and would have at once sent us below again had the scenery been less beautiful.

### THE NORTH COAST OF IRELAND.

The green and fertile fields, lying on the slope which extends from the shore of the lough back to the summits of the surrounding hills, half concealed by the haze of early morning, the little hamlet of Moville close by, the larger dwellings seen at long intervals in the more picturesque spots, and an old ivy-covered, ruined castle, which we had just passed, formed, altogether, a picture beautiful intrinsically, and one which, to eyes which had been, for nearly two weeks, only able to contemplate an unvaried expanse of rolling waves, appeared a second Eden.

The steerage passengers were nearly all landed here, and the ship was soon headed seaward again. As the northern coast of Ireland was rounded, we had an opportunity to see that singular basaltic formation,

### THE GIANT'S CAUSEWAY,

where 40,000 columns are packed closely together, forming the precipitous boundary of the Irish coast of Antrim. Isolated columns stood here and there, like colossal sentinels. At one point, a vast mass stood by itself at some distance from the face of the Causeway, with which it was connected by a bridge of ropes—a rude suspension bridge which has been thrown across the fearful looking gulf by some bold and skillful fisherman. It is a most interestiag specimen of early engineering, for, like the rope bridges seen in South America and in China, this construction antedates considerably the days of Roebling.

### THE CLYDE.

From this point all the way around the coast, across the North Channel, and up the Firth and the river Clyde, our eyes were feasting upon ever changing but always beautiful scenes. The lofty headlands of the Mull of Cantire, the hills of Arran and of Holy Island, the romantic bays and the narrow mouthed lochs of the Scotch coast, afford uninterrupted enjoyment to the lover of the beautiful in nature. At one point, we obtained a fine view of the summit of Ben Lomond, enveloped in a soft purple haze, yet brought out into relief by a background of clouds illuminated by the bright golden rays of the setting sun. We took a pilot at Greenock, and, as we steamed slowly by the wharves of that old town—the birth place of James Watt—we counted nearly twenty large iron steamers, completed or in process of construction.

Just below, we had passed a great steamer, the City of Chester, next to the Great Eastern the largest in the world; and, not far above, we saw the monument erected to Henry Bell, who sixty years ago built, here on the Clyde, the first successful steam vessel which ever ran in British waters. She was a little craft of about 60 tuns burden; the City of Chester probably has a displacement of seven or eight thousand tuns. The latter is nearly 600 feet long.

Nothing could be more appropriate than that the scene of the birth and of the first great work of James Watt, and that of the earliest triumphs of Bell, should be known, to-day, as the spot where the greatest masterpieces of human constructive talent are wrought.

Just above Greenock is the famous castle of Dumbarton, where Wallace was for a time imprisoned. This, then impregnable, stronghold is built upon an enormous, steep sided, rock, which stands 500 feet high, all by itself upon the shore, and, projecting out into the tide, is a most strikingly picturesque object. Behind it is the village of Dumbarton, where the Messrs. Denny are building some fine iron ships.

The scenery becomes less striking as we go up the river; and the beautiful environed fishing villages, and the pleasant watering places, seen so frequently on the shores of the Firth, give place to isolated farm houses or elegant country seats, with smooth lawns and grounds elegantly laid out, as we progress towards Glasgow.

As Glasgow is approached, the whole work done by the "Clyde Trust" in deepening the river, reclaiming the formerly overflowed meadows which border it, and in building substantial embankments, is observed by every one.

### GLASGOW.

The prosperity of a city is seldom dependent upon local natural advantages alone; and the proximity of the iron and coal producing districts of Scotland, her experience in manufacturing, and the advantages arising from the fact that Glasgow is the birthplace of British marine engineering, could hardly have given that city her present position as the second in population (and the first in the realm in several branches of manufactures) had not her people, long ago, had sufficient foresight and energy to expend enormous sums in the improvement of the water approaches to the city.

Two hundred years ago the port of Glasgow was on the Ayrshire coast. To-day ships drawing twenty-three feet of water have reached the city wharves.

The work of maintaining and improving the ship channel below Glasgow is, by act of Parliament, placed in the hands of the Clyde Trust Company, which is controlled by Glasgow capital. This company have expended, in this work, about *twenty-eight millions* of dollars, and are still at work on their great scheme. They are permitted to levy a moderate tunnage tax, and the value of their labors, to the city, may be inferred from the increase of their income from this source. They received, in 1840, $286,487; in 1860, $443,938; and, in 1870, $493,346.

They are employing a number of immense dredging machines, and are removing about one million of tuns from the channel, annually. The registered tunnage of vessels arriving and departing annually has now exceeded the enormous amount of 5,000,000 tuns.

The wharf at which we landed was reached, after passing the great shipyards from which a large portion of all the iron vessels in the world are sent out, and after slowly threading the narrow channel left between the long lines of steamers and sailing vessels which were closely packed on each side, sometimes three or four abreast. We ran the gauntlet of custom officials and were glad to find ourselves comfortably settled in our hotel, in the small hours "ayont the twal."

We had hoped to be able to make a leisurely tour *Weltausstellung*-ward, visiting some important manufacturing establishments in Great Britain and France, and some well known technical schools *en route*, but, among the letters awaiting us, at the office of our consul, was an urgent request to appear at headquarters in Vienna during the following week. Much can be done in even the limited time allowed, if it is well employed, and our programme includes a day in Glasgow, a day in London, one in Paris and one in Munich, and at least three nights on the rail. R. H. T.

### Cultivation of Lobsters.

An interesting account of some recent experiments in the breeding of lobsters is presented by a correspondent of the Boston *Journal of Commerce*, the locality of the trial being on the New England sea coast, which is celebrated for lobster fruitfulness, even if its shores are sandy. It appears that the lobster conservatory consists of an inlet from the sea which has been enclosed by an embankment. The space enclosed contains thirty acres, and gates are provided to permit the tidal movement of the water.

"Last summer some 40,000 lobsters, of every age and condition, were let loose in the pond. Many of them were in the soft shell state, and many were unsaleable on account of a lost claw, or other mutilation. Food, in the shape of refuse from the fish market, was freely supplied to them; and a gate was put up at the entrance to prevent their escape nto the sea.

When the ice had covered the pond, holes were cut and lobster traps were put down. Good, sizeable hard shell lobsters were at once caught, and two things were proved: First, the water was deep and pure enough to keep the fish alive, and secondly, the fish were healthy, for they had taken their hardened shells, in the usual manner, and new claws had grown in the place of those lost. In the spring, eels, perch and a great many other kinds of fish were taken from the pond in liberal quantities; and now that the spawning season is well advanced, the farm has reached its final and most critical stage. Some 15,000 good, marketable lobsters have been taken out and sold. Everything is favorable so far.

The experiment is a very important one. If it succeeds it will introduce an entirely new system of lobster fishing, and do much to prevent the destruction of the natural supply. Nor is this all: for the same pond can be made to yield perch, flounders, eels, smelts, and other fish in great quantities, at no additional expense.

Mr. J. H. Johnston, of the Great Western Gun Works, 179 Smithfield street, Pittsburgh, Pa., whose advertisement has been published in this paper for some time past, requests us to state that the minimum price of his double barrel shot guns should have been published at $8 instead of $3. We take this method of calling attention to the mistake, and would direct attention to his advertisement on another page.

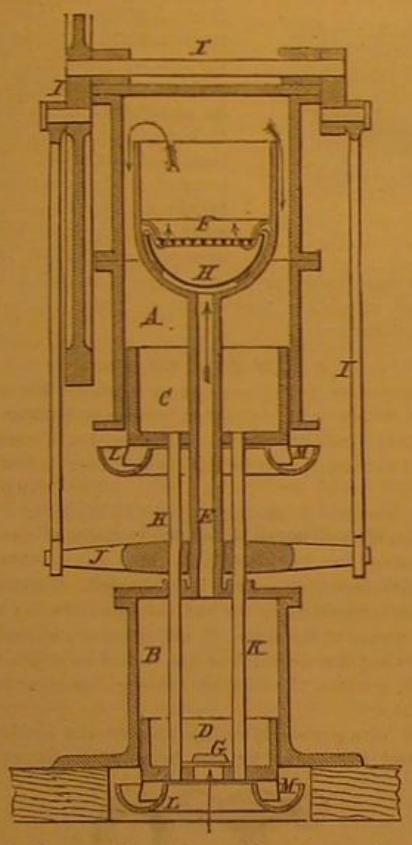
## Correspondence.

### The Hot Air Engine.

*To the Editor of the Scientific American:*

I have another modification of the hot air engine to suggest. We have had several of these engines of the Ericsson and Roper stamp, mostly of the latter, in use in this vicinity for a sufficient length of time to test their merits pretty thoroughly; and I am convinced that, when properly managed and not pressed beyond their normal capacity, they are both efficient and economical as a moderate power, say from one to four horse; but I believe that their efficiency may be largely increased by a slight change in the arrangement of their parts. The chief trouble is caused by the action of excessive heat upon their active parts; this is especially the trouble when working up to their full capacity.

In a previous letter (on page 373 of your volume XXVIII), I suggested that the trouble from over heat might be avoided, partially at least, by placing the cylinder directly below instead of one side of or above the fire; this modification and some additional ones are clearly delineated in the annexed illustration. A represents the hot air cylinder; C, its piston; B, the cold air or supply cylinder; D, its piston; F, the fire box and grate; H, the ash pan. The pistons are permanently connected together by the rods, K, and to these rods the cross arm, J, is permanently fixed. This arm transmits motion from the pistons to the parts marked I, namely, the connecting rods, crank, fly wheel, and shaft, as shown.




At each downward stroke of the pistons, the valve, G opens and admits cold air into the supply cylinder, B; and a each upward stroke, the cold air is forced through the pas sage, E, into the ash pan, H, and through the grate and fire F, thence over the edge of the fire box, down the annular space between the fire box and the wall of the hot air chamber to the cylinder, A, forcing the piston, C, downward by its expansive power; thus the operation continues while the fire lasts.

The direction of the air is clearly indicated by the arrows. It will be seen that this arrangement admits of the cylinders being open at the bottom, so that a self-lubricating device may be attached; it consists of an elastic ring, M, attached to the piston, and a circular reservoir of oil or water into which the ring dips at each downward stroke of the piston. This self-oiling of the piston, without waste of oil, is certainly a valuable feature of this arrangement, and the constant flow of cold air through the center of the hot air piston and cylinder, up the passage, E, will tend to keep down the temperature in the cylinder below a troublesome point.

The minor details, such as the exhaust valve, fuel door, regulator, etc., I have not given in the illustration, but I would recommend placing the exhaust valve at the highest point in the hot air chamber; the powerful upward tendency of heated air suggests this idea. I would also suggest making the exhaust valve and passage at least twice as large as they usually are; this idea is suggested by the low tension of hot air as compared with that of steam, and its consequent more sluggish motion.

The desire of the operators of these engines, to get more work out of them than they were designed to supply, seems to be the cause of the chief injury or trouble; and I have no doubt that there will be such a modification in the proportion and disposition of their parts as to greatly mitigate this danger from overheat, and also to largely increase their efficiency.

F. G. WOODWARD.

REMARKS BY THE EDITOR:—Our correspondent's plans for the improvement of the hot air engine seem to be in the right direction, and we shall be glad to hear from him again. The minor details he alludes to are of great importance. We shall be pleased to see his plan for feeding the furnace without stopping the engine, if he has worked up that detail.

### The Rights of Inventors.

*To the Editor of the Scientific American:*

Pardon me if I take exception to your views as expressed regarding patents, in your last issue, when replying to the queries of the Hon. Hamilton Fish; but the ground taken seems so unjust to the large body of discoverers and inventors that I cannot refrain from at least expressing my opinion.

I think that the productions of a man's brains are just as much his property as that acquired by the labor of his hands. A patent is a title to that property, given him by the government as *prima facie* evidence that he is the owner, and the same laws which govern the rights of property should apply to a patent. If, as you say, "the invention by an individual of a new device by which his fellow men are benefitted does not entitle him, by any process of natural right or natural justice, to be a monopolist over his fellows, in respect to such article," and, "on the contrary, every man in every community is bound by the strongest natural obligations freely to contribute his best powers of mind and body to promote the common welfare," it is just as reasonable to say that every dollar that he earns shall be used for the benefit of his fellow men.

Acquisitions of any kind are at the expense of labor, force, vitality, or, what is regarded as their equivalent—money, and if I have passed the best days of my life in patient study, self denials, disappointments, misgivings and failures to wrest from the secret forces of Nature that which any one else might have gained by the same means—by what right, natural, legal, moral or social, does that process, when I have acquired it, belong to any but myself, any more than the bread that I have earned by the sweat of my brow? I simply ask the question. I cannot answer it.

J. E. WILSON.

REMARKS BY THE EDITOR.—Our correspondent forgets that his person and all his possessions belong to the State. If by years of toil and study he has acquired property, the State may seize it: may take his body and compel him to service: may imprison him, or even destroy his life. Our correspondent lives in the constant experience of these facts. When the State wants money, it helps itself from our correspondent's earnings; when it wants a new road, it takes his lands, pulls down his house, and drives him away, *nolens volens*. In a community, all private interests and rights are ignored. Were it otherwise organized, society could not exist.

Let us follow out our correspondent's theory and suppose that he were the first inventor of bread. The exclusive right to make, use and sell bread would be his by natural right, transmissible to his heirs and assigns for ever, if we understand our correspondent; and all the world must starve if he or they should so will. Such reasoning is manifestly untenable.

While an individual may labor and enjoy the fruits of his labor, he cannot be permitted to interfere with others who do the same thing, unless by their consent.

Now, a patent is an interference with the rights of others; but the people consent to it temporarily, on the ground of expediency. The State wishes to encourage individuals to invent. The promise of a patent tempts men to do so. The new arts and inventions thus discovered are in due time seized by the State and become public property. A patent is simply a reward offered for a special purpose. It is a mere baited hook for the catching of inventions for the sole benefit and use of the people.

### Water as Fuel.

*To the Editor of the Scientific American:*

I observe, in your issue of April 5, some observations on this subject, to which, as the data are not fully described in the *Alta*, your editorial remarks hardly apply. In addition to the *Alta's* description, I may mention that the boiler is a small one (working under only 40 lbs. pressure), from which the steam passes through a superheater, which is a pipe bent several times at right angles to itself, and at each angle there is a flat disk against which the steam impinges. This is said to have the effect of decomposing or breaking up the steam, pretty much on the same principle as some atomizers for inhalation were arranged. The steam, then, is directed against a jet of any hydrocarbon, which is claimed to unite with the oxygen of the water, leaving the hydrogen to be consumed by contact with the oxygen of the atmosphere, thus forming a veritable oxyhydrogen blast. Of course, a fire has to be lit under the boiler to start the steam, and thus the inertia is overcome; but, the boiler and superheater being situated within the influence of the oxyhydrogen flame, when steam sufficient is generated to start the oxyhydrogen blast, no more fuel is required to keep up the steam in the boiler.

I am no believer in the slightest approach to perpetual motion, and I must say this looks very like it, with the exception of first overcoming the inertia by other means than those self-contained. I have visited this furnace several times to judge for myself; and, for the size of it, I must say it is the most powerful flame I have ever seen, and its effects are most satisfactory in smelting refractory ores. It is called here, I think, the Stevens patent.

If, as is claimed, steam can be decomposed and broken up, or, rather, broken up and decomposed, by striking, under pressure and heat, against angular projections, leaving the oxygen to combine with a hydrocarbon, and leaving the remaining hydrogen to unite with the oxygen of the air, then the invention is based upon scientific laws and actually works in practice. But if that claim is fallacious, then there must be some hitch which I have failed to detect, as the boot top experiment cannot be gainsaid; but if the thing is not based upon scientific principles, I should like to know where the hitch comes in.

I am inclined to think that the steam is volatilized, if I may use the expression, by repeated breaking up or division of its molecules, as water or perfume is broken into spray; and in that state, the union of the oxygen with the hydrocarbon is facilitated.

I have no interest in the matter other than as an inquirer and student of natural philosophy.

Oakland, Cal. A. W. T.

REMARKS BY THE EDITOR.—We will allow that the steam, by striking against the disks and passing through the superheater, becomes so intensely heated that it is decomposed; but, even in this case, there is no "hitch," and our remarks in our journal of April 5 apply with full force to this and all other cases in which water is used as fuel. The "hitch," in our correspondent's conception of the process, appears to be that he considers the steam to have acquired so much power, after being decomposed, that it is able to form the same quantity of steam, and have a large reserve of heat remaining. This would be true perpetual motion, except that the process has to be started by the use of coal. Now it must be evident that, if the steam cannot commence its decomposition without fuel, neither can it continue this disintegration without a similar amount. A very simple experiment would prove the truth of this proposition. If the decomposed steam has enough heat energy to enable it to decompose a similar amount of steam, and leave something over, we have only to cut off the supply of hydrocarbon, and the process will go on, with somewhat diminished intensity, to be sure, but still quite vigorously. If this experiment were to be tried, there would be a "hitch" indeed.

### The Proposed Transatlantic Balloon Voyage.

*To the Editor of the Scientific American:*

In regard to the feasibility of a transatlantic trip by means of a balloon, my impression is that Professor Wise understands himself and his subject infinitely better than do the public; and it is extremely probable that his success is more than possible. The fact is well known that currents of air, moving in different directions, form the aerial strata around the earth; and all that would be needed by the navigator, in order to make balloon voyaging a perfect science, would be to understand these movements. These can be determined by observation and experiment; and it may be, in future years, that we shall be as familiar with these air strata as the geologist is now with those of the rocks, or the navigator with the currents of the ocean. Fixed laws govern all matter, and we are all children in the great school of Nature, learning these laws. Where is the great danger and difficulty about balloon navigation when these currents are known? It will be a mode of navigation safer and far speedier than the ship or steamer. The ship is confined to one stratum of the atmosphere, where may prevail a terrific tornado in which nothing will live, while the balloon may rise or fall out of danger when navigators of experience control her. A well constructed balloon will be as safe as either the ship or steamer. There is no more danger of the collapse of a balloon than of a ship springing a leak or a steam boiler exploding; besides, the balloon may be divided into compartments of air chambers to insure greater safety. I remember reading a year or two since an article, written, I think, by Chancellor Livingston in 1812, in reference to the feasibility of steam carriage by rail, in which the Chancellor ridicules the idea as preposterous, and states why the project will not succeed. His reasons why are very laughable to us now, who see their fallacy. All inventions of value to the world spring not forth as Minervas, but have their babyhood, youth, and manhood. I truly hope Professor Wise may be encouraged in his grand enterprise.

New York city. C. ROWLAND.

### The Meteors of November 14 and 27.

*To the Editor of the Scientific American:*

The meteoric display whose present epoch is November 14 occurs later in the month at each successive return. In other words, its node progresses on the ecliptic, so that an interval of 33 years corresponds to an advance of one day in the date of the shower. In 1932, therefore, the periodic fall of stars will occur on the 16th of the month. On the other hand, the node of the Biela meteors has a retrograde motion. The latest showers from this source were those of November 29, 1850, and November 24 to 27, 1872. At the same rate of motion, the nodes of the two rings will meet about November 16 or 17, 1932. As these meteor clouds move in opposite directions, the double shower at that time will probably be one of unusual interest.

Bloomington, Ind. DANIEL KIRKWOOD.

### Fruit Safes.

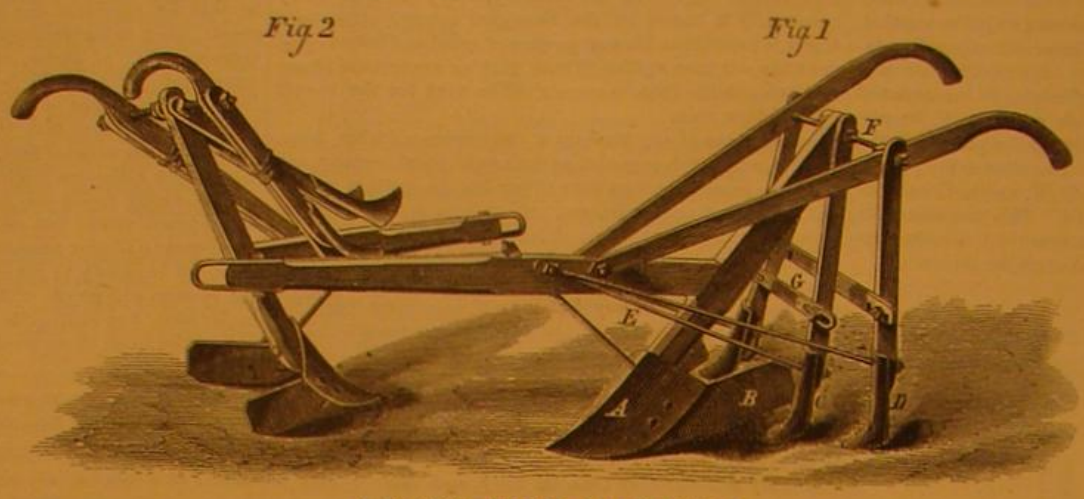
Fruit may be preserved in excellent condition the year round, provided the temperature be low and dry. It is becoming now to provide fruit safes for this purpose, and in some localities the neighbors unite to construct a suitable building, in which each subscriber is entitled a fixed share of the storage room.

Mr. Christopher Shearer, a fruit farmer near Reading, Pa., has a fruit safe fifty-five feet square, which holds, when filled, about one hundred and forty cartloads of ice and four thousand bushels of fruit. Last fall Mr. Shearer placed in it one thousand seven hundred bushels of apples, four hundred and fifty bushels of Bartlett and fifty bushels of Lawrence pears. Some of the apples are still there and as solid as when they were taken from the trees.

### IMPROVED CULTIVATOR.

Our engraving illustrates a new form of cultivator, which is constructed so as to cultivate or loosen the earth between two rows of growing crops of corn, tobacco, sugar cane, cotton, or other products. The special improvement in the machine consists in the arrangement, in connection with a single shovel plow, of a series of hoes arranged in rear of the former and adjustably secured to the plow.

The standard, Fig. 1, projects above as well as below the beam, and carries on its lower end the shovel, A, upon the back of which, and at either side, are pivoted wings, B. These are secured by bolts and nuts, as shown, and may be adjusted so as to operate to the best advantage under varying conditions of soil. In rear of the shovel are four hoes, arranged in pairs, C C and D D, and connected by the tie rods, E, to the beam. The rods to which these hoes are attached extend upwards, and are hung upon a horizontal bar, F, which passes through the handles of the standard. This rod is preferably screw threaded, and provided with the requisite number of nuts to hold the different parts in their proper relative positions. The pair of hoes, C C, are held apart by a bar, G, and the other hoes, D D, are similarly separated by a like device. These bars are clamped to the hoes by bolts and nuts, and are at those points provided either with a series of notches or with longitudinal slots so that the blades may be spread apart as circumstances may require. The hoes are turned up on one side so that by changing them from one side of the plow to the other, they may be made to throw the earth up to or away from the row of growing plants.




KROGH'S FARM CULTIVATOR.

When it is desirable to use the single shovel plow without the hoes, the latter are disconnected from the tie rods, D, which, together with the hoes, D D, are tied up or hung upon the handles, as in Fig. 2, while the hoes, C C, are swung over and carried on top of the beam. Either pair of hoes may be thus disconnected while the other pair remain in operating position.

Patented December 10, 1872. For further particulars address the inventors, Messrs. C. and P. G. Krogh, Kroghville, Jefferson county, Wis.

### AN IMPROVED HORSE COLLAR BRACE.

The weakest part of the ordinary horse collar is at the under side or throat, as it is at this point that the strain is principally applied. As a result, and especially in light collars, the article becomes worn out or breaks in this locality much sooner than in other portions. To obviate this difficulty, Dr. Edward Batwell, of Ypsilanti, Michigan, has recently patented, April 15, 1873, a metal plate which extends up some distance, and thus prevents the collar from closing on the horse's shoulder. The form of the device, which may be made of any suitable metal, together with its mode of application are readily understood from the annexed illustrations.



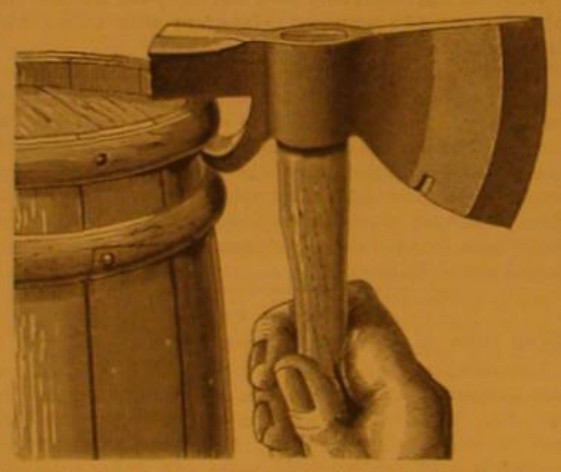

Dr. Batwell states that the invention has been fully tested, in preventing pressure and in retaining the collar in good shape, for the past two years, and that by its use he has been enabled to employ collars otherwise entirely worthless, from being broken or worn out at the throat. For further particulars regarding sale, rights, etc., address the inventor as above.

### John Stray.

John Stray is employed as an engineer in a factory at Jersey City, N. J. He is a short, thick set man of fifty years or so, with a frosted beard, and does not look as if anything very serious had ever happened to him. But he is the hero of a patriotic exploit that will live in the memories of his fellow citizens. John Stray was a private in the First New York Volunteer Engineers, at Morris Island, Charleston, S. C., during the siege of 1863. An important gun—a 200 Parrott—had been spiked by the enemy, who were then enabled to occupy rifle pits very near the gun, and prevent its use by shooting down whoever ventured to attempt the removal of the spike. Stray was known to be a good mechanic, and at last yielded to the request of the commanding general to undertake the desperate job. He straddled the gun, and for fifteen minutes drilled away amid a shower of bullets, then hitched on the primer and lanyards and dropped to the ground. The enemy thought they had hit him and sent up an exulting howl, but the flash and roar of the great gun and the showering of grape through their ranks soon showed them their mistake. Those who could do so ran for their lives, but many were killed. It was found that twenty-two bullets had struck the gun while John Stray was working his drill.

### NOVEL CLAW HATCHET.

The object of this handy little device is so clearly indicated in our illustration that little description is required. It consists, simply, in a claw, made upon the hammer end of an ordinary hatchet, which serves to grasp the top hoop of a barrel. By the aid of the handle as a lever and the hatchet head as a fulcrum, the hoop can be quickly removed uninjured, thus allowing the head of the barrel to be easily taken out. Patented Nov. 12, 1872, by Mr. D. E. Weaver, of Cheviot, Ohio.



### NEW HEEL PLATE FOR BOOTS AND SHOES.

Mr. Gideon B. Massey, of New York city, is the inventor of this device, the object of which is to prevent the unequal wearing out of boot heels and their consequent unsightly twisting over to one side. A disk of rubber is arranged of a diameter to fit within a flange on a metal plate and to project below the same, forming a wearing surface of the heel. This is attached by a fastening screw and a conical metal washer formed to fit the under side of the screw head. The latter is forced into the disk, which it pushes into the dovetail flange by which it is securely held. As the wearer turns upon his heel, the plate will partially revolve and change its position, so that the heel will wear square and the foot be thrown flat upon the ground. The use of india rubber or other elastic material prevents slipping on the ice, and adds to the gracefulness of the step, while carpets are not injured by projecting nails or sharp angles. Patented September 17, 1872.




### Progress of Astronomy in the United States.

Mr. Richard A. Proctor, the distinguished British astronomer, bears the following testimony to the progress and results of astronomical science in this country:

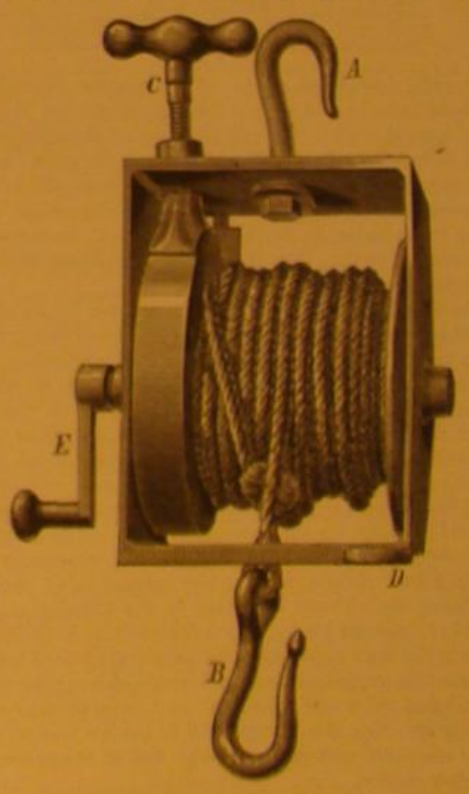
"The American arrangements for extending government aid to astronomy seem to me to afford a model which might be copied with advantage on this side of the Atlantic. We see their physical observatories attached to other government establishments, to universities, and so on. Their professors of astronomy are not only real working astronomers, but skillful mathematicians (for the most part university men) and men of admirable zeal in the cause of science. I have been struck with the abundance, I had almost said the superabundance, of labor which has been bestowed on work the record of which has recently reached me from America. Thus, in the mathematical investigations of the coming transits of Venus, a problem of difficulty has but to be suggested, to be at once attacked and solved to the utmost limits of exactness. The pictures of solar phenomena, spots, faculæ, and prominences, are the most striking and beautiful I have yet seen. Their lunar pictures are remarkable for artistic beauty, as well as scientific value, and, altogether, their work, as I have said, is a model for our astronomers."

### A NEW FIRE ESCAPE.

Our engraving represents a new portable fire escape, by means of which, it is claimed, a person can lower himself with ease and safety from the windows of a burning building, or, if necessary, may be let down by some one within the edifice.

The apparatus is attached by the hook, A, to a suitable clamp, not shown, which is readily fastened to the window sill or casing. To the lower hook, B, is hung a sling seat in which the descending person is supported. Thus arranged, the device is operated by the individual within the building, who, by means of the screw, C, which presses a chock against the revolving disk attached to the barrel on which the rope is wound, governs the descent, causing the same to be fast or slow at will.

In case of a person lowering himself, the machine is inverted and suspended by the hook, B, to the clamp, the sling being hung to the other hook. The operator then grasps the handle, D, with the left hand, and the screw, C, with the right hand, and thus regulates his downward movement. By tightening the screw, a slow descent may be effected by means of the crank, E. The invention is stated to be cheap, efficient, and not liable to get out of order. For further particulars regarding agencies, sale, etc., address the patentees, Messrs. Merritt & Sweetser, P. O. Box 2,643, North Bridgwater, Mass.




PHENANTHRENE.—This name has been given to a new hydrocarbon obtained from crude anthracene. It contains carbon and hydrogen in the same proportions as the material from which it is derived.

### An Ocean Race of Seventeen Thousand Miles.

An ocean race between an American and an English clipper ship has just been heard from. The American clipper-built ship Young America and the English La Escocesa sailed from San Francisco for Liverpool on the 27th February last, laden with wheat. Distance 17,350 miles. The Young America made the passage in 106 days, and her British antagonist in 117 days. About $20,000 was wagered in San Francisco on the result. The running time for making the same distance by our fastest Atlantic steamers, without stoppage for coaling, would be 58 days.

### Collecting Wild Animals for the English Market.

In London there are one or two concerns which make it a business to collect wild animals, in India and in other countries, which are brought to the English metropolis and kept in stock until sold to zoölogical gardens and menagerie proprietors in other parts of the world. From this source, Barnum and others recruit their exhibition stock. In a recent number of *Land and Water*, it is stated on the authority of a Singapore paper that: "For some time past an emissary from Mr. Jamrach, the celebrated proprietor of menageries, has been staying in Singapore. The business which brought him here is to purchase specimens of the *ferœ naturæ* indigenous to the Malay Peninsula and surrounding countries. The result of his exertions may be seen at the yard attached to the *Hotel de la Paix*, where are assembled the animals and birds obtained up to the present time. These of themselves form a curious and very interesting collection, that has attracted a number of visitors. The gentleman in charge most courteously exhibits the creatures to those desirous of seeing them, and the amusement to be derived from a visit more than repays the trouble involved, as will be evident from the following list: Four large male and female tapirs from Malacca, two cassowaries from Macassar, three Victoria crowned pigeons from the Celebes, two orang outangs, two black parrots, a black panther, a young female elephant, a bear from Borneo, and a pair of Borneo fire back pheasants. Of the above, the panther, which is a very snarling, ferocious looking customer, and the elephant were purchased from H. H. the Maharajah of Johore. Young Bruin is comical looking, with already a tendency to practical joking. A short while ago, he slipped his collar, and, getting into a house where were some young children, evinced his playful tendencies by a desire to rub noses with them. The timid owner of the house ran for the two revolvers he keeps beneath his pillow, but before he had time to uncase them, Master Bear's keeper came up, and rescued his *protégé* from impending destruction. The little creature looks as harmless and innocent as a puppy. We hear that these animals, with a rhinoceros or two expected next week, will be shipped for England by the next steamer of the Ocean Steamship Company; and in addition to them, Mr. Jamrach's agent has entered into a contract with two local Nimrods (Messrs. Fernandez Brothers) to hunt and buy up, within the next six months, eight live specimens of each of the following animals, namely, rhinoceri, tapirs, tigers, and black panthers, and sixteen male and female Argus pheasants. The hunters for the rhinoceri have a number of pits dug for entrapping these animals; and if they fall in, that ardent naturalist, Mr. Frank Buckland, will probably ere long have the pleasure of chronicling the birth of another cockney rhinoceros.'"

### Concrete Chimneys.

The first chimney ever built of concrete, and without scaffolding, has, according to the *Engineer*, been constructed at the Chain Cable and Anchor Testing Works, at Sunderland, England. The structure at the base is 7 feet 6 inches by 7 feet, and is carried up square to a hight of 22 feet 3 inches, up to which point no especial novelty in its construction is presented. The corners, however, are gradually cut away; and at the hight of 24 feet above the surface, the octagonal form of the tapering portion of the chimney begins. This part of the work was molded as follows: Panels three feet in hight and made of ¾ inch boards were hinged together at their outer edges in such a manner that, if the lines of the inner edges were produced, they, the lines, would come into one point at half the hight of this section of the chimney. These panels on the interior and exterior of the chimney formed shells, between which the concrete was packed. To fill up the intermediate space between the inner edges of the panels, wedges were introduced, which, as the concrete set, were gradually reduced in order to allow for the decrease in size. Stud bolts connected the wedges with uprights of the frame, and this reduction, made as above, was just sufficient to take off the holes through which the bolts passed.

When the shaft had been erected half its hight, the panels were reduced sufficiently to admit a second set of wedges of exactly the same dimensions as those first introduced, bringing the inner edges of the panels (produced as before) to one point at the center of the top of the chimney; that is to say, in a manner similar to that in which, at their original dimensions, they had been brought together at half the hight. The uprights, to which the panels were secured, were 6 feet in length; and as the latter were but 3 feet, the uprights had a continual hold of 3 feet on the completed work, thus insuring regularity of line.

The cement used was one part Portland cement to eight of gravel, and at one time these parts were increased to one to five. The chimney, when completed, was stuccoed with cement, and drawn in courses to imitate stone.

### ROBERT WILHELM BUNSEN.

The labors of the savant whose career we are about to portray belong essentially to researches which are not exclusively chemical, or exclusively physical, but appertain to both, and have added largely to that branch of science known as physical chemistry. As Berzelius will always live in our memory as the founder of the electro-chemical system, Gerhardt as the discoverer of the theory of types, and Liebig as the originator of agricultural chemistry, so will Bunsen always be remembered as the one who has most contributed to the application of chemistry to physical inquiries. Like all men of great genius, the subject of our biographical notice was less occupied with the reinvestigation of phenomena and laws already known than with the exploration of new regions and the discovery of facts which, in themselves, indicated new scientific truths.

The discoveries which have done most to extend Bunsen's renown are those pertaining to spectrum analysis; but his name will always be recalled when we speak os the theories of periodical fountain springs, or of the phenomena of the absorption and combustion of gases, or of the chemical action of the different rays of the sun.

Robert Wilhelm Bunsen was born on March 31, 1811, in Göttingen, a town in Hanover, known by its famous university, in which his father occupied one of the chairs of lan-



ROBERT WILHELM BUNSEN.

guages. At the age of seventeen he entered the university of his native town, in order to pursue physical and chemical studies; and after having passed through all the grades, he took the degree of doctor in 1833. In 1836 he removed to Cassel, in order to fill the chair of chemistry at the polytechnic school of that city, which had been vacated by Wöhler. Two years later, Bunsen was elected professor of chemistry in Marburg; and, in 1851, he removed in the same capacity to Breslau. In 1852 he was nominated professor of chemistry in the university of Heidelberg, which position he still holds.

His earlier labors were devoted to researches on double cyanides, on the various kakodyl compounds, and, in connection with Schischkow, on the gases of detonating compounds. He also discovered in the freshly precipitated hydrate of oxide of iron an excellent antidote for arsenic. In the domain of physics, we see him engaged in determining the specific weight of various bodies, in studying the law of the absorption of gases, and the influence of pressure upon the solidification of liquids. We owe to him important contributions relative to the combustion and diffusion of gases, etc. Bunsen is the discoverer of the galvanic battery which bears his name, and which is now most commonly in use, also of that wonderful instrument known as Bunsen's burner. In the summer of 1846 he undertook, with Descloizeaux, a voyage to Iceland, in order to investigate the periodicity of the fountain springs, especially that of the great geyser. The result was that beautiful theory of the geyser eruptions which was afterward illustrated experimentally by Müller in Freiberg. In 1859, Bunsen first prepared the metal magnesium on a large scale, and showed that it yields the most brilliant artificial light known, and that its photo-chemical action was one thirty-sixth of that of solar light. In conjunction with Roscoe, he determined the chemical action of the various rays of the sun.

The researches of Bunsen on spectrum analysis date from the year 1860. Since that time he has contributed a large number of exhaustive memoirs on this subject to Poggendorff's *Annalen* and to the *Annalen der Chemie und Pharmacie*, besides many special volumes.

Herr Bunsen, although now in his sixty-second year, enjoys excellent health, and is still unceasing in the pursuit of his investigations. His style of lecturing is very happy, and has always attracted a large audience. His modesty is unsurpassed; and even when speaking in his lectures on spectrum analysis, he never mentions having contributed anything to this science, but speaks only of the discoveries of his friend Kirchhoff. Among his pupils are Roscoe and Tyndall, who, as is well known, are among the most ardent laborers in the field of science.—*Science Record* for 1873.

### A New Scientific College.

A new institution, somewhat on the plan of the Stevens Institute, Hoboken, N. J., is soon to be built at Birmingham, Eng., founded on the generous endowments of Sir Josiah Mason. The institution is to be called "Josiah Mason's College," or "Josiah Mason's College for the Study of Practical Science." Regular systematic instruction is to be given in mathematics, abstract and applied physics, both mathematical and experimental; chemistry, theoretical, practical and applied; the natural sciences, especially geology and mineralogy, with their application to mines and metallurgy; botany and zoölogy, with special application to manufactures; and physiology, with special reference to the laws of health. The English, French and German languages will also be taught. The trustees have power to include mechanics and architecture and all other subjects necessary to carry out the objects of the founder. Mere literary education and instruction are excluded, as well as all teaching of theology and subjects purely theological. No principal, professor, teacher, or other officer of the college is ever to be called upon to make any "declaration as to or submit to any test whatever of his religious or theological opinions," nor are these in any wise to be considered either as qualifications or disqualification for holding any office, fitness to give the instruction required being the sole and only test. Provision is also made for giving lectures and opening classes for popular or unsystematic instruction, at which the attendance shall be open to all persons, "without distinction of age, class, creed, race, or sex." The founder's object being to promote the prosperity of the manufactures and industry of the country, the college will be open to qualified persons of all classes who have to rely on science, art, or manufactures for a livelihood, "especially the more intelligent youth of the middle class." Provision is also made, when the funds permit it, to provide instruction for females as well as males.

### Comparative Heat and Brilliancy of the Sun and the Moon.

The Earl of Rosse, in a recent lecture before the Royal Institution, gave some interesting information concerning the various experiments heretofore made to detect the heat of the moon, and then described his own efforts in this line, which are the latest that have been made known. By means of a specula-mirror, a thermo-pile, and a pair of reflecting galvanometers, made on Sir William Thomson's plan, such as are used for sending messages over the Atlantic cable, the Earl was enabled to demonstrate the presence of heat from the moon, but the temperature of the lunar surface still remains far from being determined. My calculations, he says, lead me to estimate the heat from the moon as the eighty thousandth part of that from the sun. Bouger's experiments give the brilliancy of the full moon as the 300,000th of that of the sun, Wollaston gives it as the 80,172d, Zöllner as from 618,000th to 619,000th, and Bond as the 470,980th. The maximum of the lunar heat appear to be a little before full moon; the unequal distribution of its mountains and plains, perhaps, goes to explain this phenomenon.

### Aniline Black.

BY CH. LAUTH.

Aniline black, being necessarily absolutely insoluble, cannot be fixed like another coloring matter, but must be formed in the place which it is to occupy upon the fiber. To mix, with a salt of aniline, oxidizing agents capable of producing the black, and to wash the yarn in such a bath until the color is developed, is a method which does not yield good results, because the black, instead of fixing itself upon the fiber, remains suspended in the liquid.

The improvement consists in fixing on the fiber an insoluble oxidizing agent, and passing it subsequently into the solution of a salt of aniline.

The agents in question are the higher oxides of manganese, binoxide and chloride of lead, etc. Binoxide of manganese has especially attracted my attention. To get an intense black, it is necessary to mordant in chloride of manganese at 40° B., working the cotton in this bath for an hour, wring out well and, without rinsing, pass it into boiling soda lye, at 12° B., holding lime in suspension. Or the cotton may be first mordanted in a boiling manganese bath, and then passed through cold alkali. After the fixation of the oxide, the cotton is washed in much water, and passed into a lukewarm chloride of lime bath, regulating the proportion of this agent so that it may never be found in great excess, which might injure the fiber. It is best to add the chloride of lime, little by little, till the manganese bronze is sufficiently intense.

I have endeavored to modify the conditions of fixing the manganese. I mention a single remarkable result. A tissue, mordanted with manganese and placed in a chamber filled with ammoniacal gas, is found of a deep brown when taken out, the protoxide of manganese becoming readily peroxidized under these circumstances.

Dyeing.—The yarns, charged with manganese and well washed to eliminate all uncombined matter, are steeped in a cold acid solution of aniline. The color is formed almost simultaneously. As soon as the bronze comes in contact with the aniline salt, the reaction takes place. The binoxide of manganese oxidizes the aniline, and the black formed takes the place of the metallic compound. The operation is finished in one or two minutes, but the yarn may be left an hour in the bath without inconvenience. The proportions to be employed vary according to the intensity of the black desired. When taken out of the dye bath, the cotton is well washed and passed into a boiling alkaline bath—soap or soda—to remove the last traces of acid and give the black its full beauty.

Bichromate of potash, at ¼ dram per quart, salts of copper, mercury, and chrome, and especially a mixture of chlorate of potash, a salt of copper, and sal ammoniac (¼ dram of each per quart), increases the intensity of the black. This treatment is applied after the washing subsequent to dyeing, and is carried on for half an hour at a boiling heat. It is followed by a second washing and by boiling in soap lyes. The process described gives fine, solid blacks; it is speedy, and does not injure the fiber.

Cotton cloth mordanted in this manner may be used to determine the comparative value of commercial anilines.—*Chemical News.*

## THE NEW ELECTRIC LIGHT IN LONDON.

The drawing shows the contrivance devised by Mr. C. W. Cooke for the exhibition of the electric light from the Westminster clock tower. We copy from *Engineering*. *t* and *t'* (Fig. 2) are two large binding screws, which receive the terminals. Two metallic strips conduct the positive and the negative current respectively to *d* and *c*. From *c* the negative is led through the pivot of the revolving table to the right hand hinge, *h*; the positive at *d* is in connection with a circular strip of copper, which leads it to the left hand hinge. Finally the hinges communicate with two studs, *i i*, sunk into the upper surface of *p p'*. Two regulators, *l* and *l'* (Fig. 1), are fixed to a rectangular mahogany board, *r r*, free to slide on rollers from *p'* to *p*. Each lamp carries two copper strips, so bent that the portion to the right rubs against the studs, and thus insures good contact when the flat part reaches them. Fig. 2 shows the metallic pieces of lamp, *l*, pressing upon these disks, and thus admitting the current. When it becomes necessary to change the carbons, the table, *r r*, is pushed from *p'* to *p*. The second lamp, *l'*, comes into position; its copper strips are in contact with the underlying studs, and the current passes through its carbons. The time required to effect this change is scarcely appreciable. The light can be directed to any object by means of the screw, *f*, and the worm and worm wheel, *e*. The former, *f*, enables the operator to project the beam at any angle of depression lying between convenient limits; the latter, *e*, gives him an azimuthal motion of any amplitude required. Fig. 2 also shows a vertical section. The central piece is a lens which refracts into parallelism the rays, which differ in obliquity. The prismatic portions perform an important office in reflecting the rays which make large angles with the principal axis.

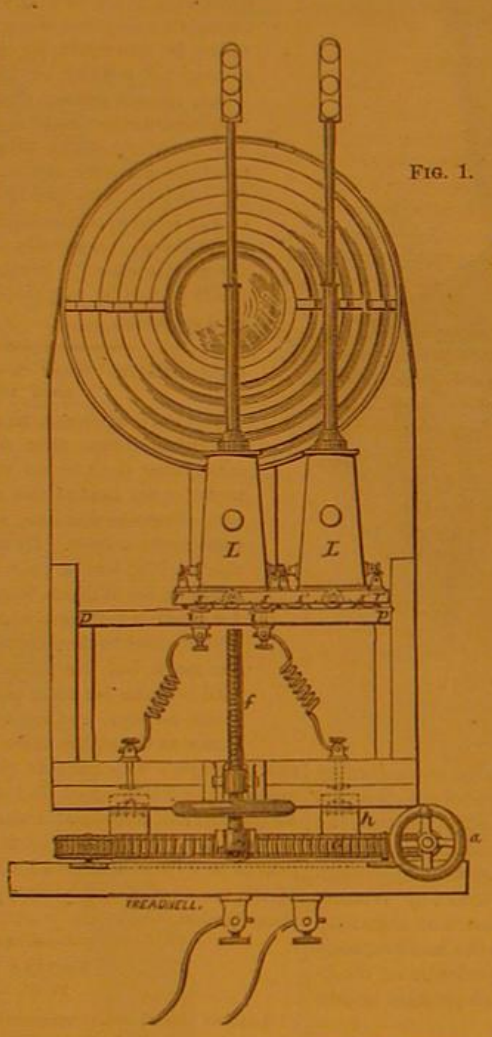



FIG. 1.

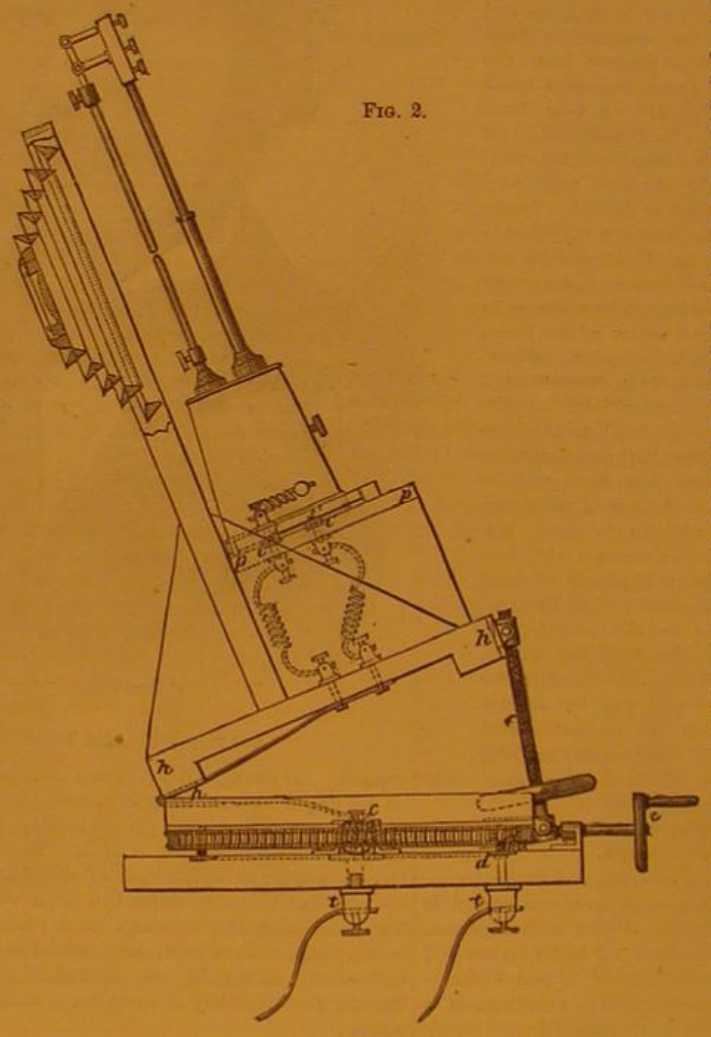



FIG. 2.

THE NEW ELECTRIC LIGHT IN LONDON.

### John W. Foster.

John W. Foster, author of a new work on "Pre-historic Races of the United States," died at Chicago on the 29th ultimo, aged 58 years. He was well known for his scientific attainments, and has made important geological surveys for the government.

### William Whiting.

We regret to announce the death, on June 29, of the Hon. William Whiting, member of Congress from Massachusetts, aged 60 years. In addition to his eminence as a patent lawyer, he occupied many important positions. From 1862 to 1865, he was solicitor of the War Department. He was the author of a work on "War Powers under the Constitution," which has passed through over forty editions.

### The Crops.

During the past month the crops in some parts of the country, the South for example, have been injured by excessive rains, while in New England injury has been done by excessive dryness. In Plymouth county, Mass., great damages from fire in the woods have been experienced, about 60,000 acres having been burned over. Eight square miles were in flames at one time.

## LIGHT AND LIFE.

The sanitary influence of light can scarcely be over-estimated. It is essential to the full development of nearly all animal and vegetable organisms. Plants when deprived of the influence of light become blanched and stunted in growth, the process of fixing the carbon in their tissues is arrested, a modification of the coloring principle takes place and they appear white instead of green. This is termed etiolation or blanching, and is applied by the gardener and horticulturist in the case of certain kinds of vegetables to improve their edible qualities.

A similar effect is produced upon animals by excluding them from the operation of light. Vitality is impaired and the development of the healthy bodily structure arrested. Naturalists tell us that in the course of healthy development the tadpole becomes a frog, but in the absence of light this transformation is prevented, and the tadpole remains a tadpole. From numerous experiments, both upon animals and vegetables, it has been proven that light is an important vital stimulant, favoring those complex changes in the organisms upon which healthy development depends. And though growth may proceed without it, there is both bodily and mental deterioration; a mental and moral etiolation, as well as a physical, occurs when the vital stimulus of light is withdrawn.

The inestimable importance of this agent upon life and health may be conclusively shown by comparing the robust forms and ruddy, bright, and happy faces of those who live among the green fields, and whose occupations necessitate regular exposure to sunlight, with the blanched, sallow countenances and emaciated, deformed bodies of those who dwell in dark and narrow lanes and alleys, and whose vocations deprive them of its health-giving and beneficial influence.

The sad effects of deprivation of sunlight are principally observed among those who are compelled to work in badly constructed shops and factories and the inhabitants of narrow streets, crowded alleys, confined courts, garrets and cellars where the light of the sun rarely penetrates. Similar consequences are observed in those who labor by night and sleep by day, as bakers and compositors connected with the daily press, whose occupation necessitates their employment during a greater part of the night.

The total exclusion of the sun's beams induces an impoverished and disordered state of the blood, favoring not only an arrest of physical and mental development, but also the generation of specific diseases. Under these circumstances the countenance becomes pallid, the membranes of the eye and lips bloodless, and the skin of a waxy color. Associated with these symptoms there is emaciation, muscular debility, and nervous excitability. The fibrin, albumen, and red blood cells become diminished in quantity, and the serum or watery portion of the blood increased, producing the disease known to physicians as anemia. The alteration of the physical composition of the blood and the enfeeblement of vital energy predisposes to the development of scrofula, chlorosis, rickets and consumption, diseases characterized by imperfect nutrition. Childhood being peculiarly a period of growth and development, it is especially important that children should have the fullest possible benefit of exposure to direct sunlight. Many of the diseases of the weak and emaciated children who are reared in narrow streets and crowded tenement houses of our large cities, are attributable to the deficiency of light and air. The sad effects of the absence of light are unfortunately not confined to those who, by the pressure of poverty, are compelled to dwell in localities and habitations where the solar rays vainly strive to enter. In many elegant mansions, whose occupants can command every luxury within the reach of wealth, we see the most ingenious means adopted for effectually excluding light, with the inevitable result of seriously impairing the health of the inmates. The nursery, where children necessarily spend so large a portion of their time, particularly during the colder seasons of the year, should be plentifully supplied with windows, and should be selected with special reference to the facility for securing the genial and cheering influence of the sun. Greenhouses are constructed so as to secure the greatest supply of light, and children require as much light as plants. Light is not only essential to the preservation of health, but is equally important in the treatment of diseases. There are a large number of disorders which may be greatly benefitted, if not cured, by free exposure to the light of the sun, while it certainly exerts an influence on the mind, favorable to recovery, which cannot be wholly explained by the mere cheerfulness and calmness it produces.

Florence Nightingale, in her admirable "Notes on Nursing," has pointed out the sanitary value of light to the sick. She says: "It is the unqualified result of all my experience with the sick that, second only to their need of fresh air, is their need of light,—that, after a close room, what hurts them most is a dark room. And that it is not only light but direct sunlight they want. I had rather have the power of carrying my patient about after the sun, according to the aspect of the rooms, if circumstances permit, than let him linger in a room where the sun is off. People think the effect is upon the spirits only. This is by no means the case. The sun is not only a painter but a sculptor. You admit that he does the photograph Without going into any scientific exposition, we must admit that light has a real and tangible effect upon the human body. But this is not all. Who has not observed the purifying effect of light, and especially of direct sun light, upon the air of a room? Here is an observation within everybody's experience. Go into a room where the shutters are always shut (in a sick room or a bed room the shutters should never be shut), and, though the room be uninhabited, though the air never has been polluted by the breathing of human beings, you will observe a close, musty smell of corrupt air, of air that is unpurified by the effects of the sun's rays. The mustiness of dark rooms and corners, indeed, is proverbial. The cheerfulness of a room, the usefulness of light in healing disease, is all important."

Dr. W. H. Hammond, in his lecture on hygiene, says: "In chlorosis, scrofula, phthisis, and in general every disease characterized by deficiency of vital power, light should not be debarred the patient. In convalescence from almost all diseases, it acts, unless too intense or too long continued, as a most healthful stimulant, both to the nervous and physical systems. The evil effects of keeping such invalids in obscurity are frequently very decidedly shown and cannot be too carefully guarded against by the physician. The delirium and weakness, by no means seldom met with in convalescents kept in darkness, disappear like magic when the rays of the sun are allowed to enter the chamber."

Sir David Brewster, in his eloquent address at the opening of the session of 1866–67 of the Royal Society, Edinburgh, uses the following language: "If the light of day contributes to the development of the human form and lends its aid to art and nature in the cure of disease, it becomes a personal and national duty to construct our dwelling houses, schools, workshops, factories, churches, villages, towns and cities upon such principles and in such styles of architecture as will allow the life-giving element to have the fullest and freest entrance, and to chase from every crypt, cell and corner the elements which have a vested interest in darkness."
—*Thomas H. Helsby, M. D., in Popular Journal of Hygiene.*

PROGRESS OF THE HOOSAC TUNNEL DURING THE MONTH OF JUNE, 1873.—Headings advanced westward, 131 feet; eastward, 126 feet. Total advance during month, 257 feet. Length opened from east end, westward, 14,084 feet. Length opened from west end, eastward, 9,540 feet. Aggregate of lengths opened to July 1st, 23,624 feet. Length remaining to be opened July 1st, 1,407 feet, being 87 feet more than one quarter of a mile.

## TO EUROPE IN A BALLOON.

[Concluded from page 33.]

Atlantic may be accomplished with a very large balloon. This question he has discussed with much plausibility in his work on the subject, published in 1850; and having discovered, in his former aerial excursions, a current of air flowing to the east at a certain altitude, he has been led to believe a long voyage to the east could be successfully accomplished. To test this idea, a person was found, in Mr. Gager of Vermont, who had the enterprise and ability to furnish the necessary funds for the undertaking; and for this purpose the monster balloon Atlantic was built by Mr. La Mountain, at Lansingburgh, N. Y., and carried to St. Louis in order to make the experimental voyage from that city to this (New York), prior to making a grand atmospheric journey across the ocean to Europe. We will now describe the results of this attempt:

On the 1st inst., the balloon was inflated with sixty thousand feet of coal gas, the expansive force of which was capable of raising more than fifteen hundred pounds into the atmosphere. It had a common basket car secured to it and a very light and strong life boat slung below. Considerable ballast of sand bags was provided; a screw steering apparatus for changing the direction of the balloon, several philosophical instruments necessary for the voyage, plenty of provisions, and a bag of papers, letters, and small parcels from an express company to their office in this city, composed the freight. At twenty minutes past seven P. M., all things being ready, Mr. Wise ascended into the basket, and Messrs. La Mountain, Gager, and Hyde (the latter of the St. Louis *Republican*), took their places in the life boat. The signal was then given for the stay ropes to be cut, when the mighty mass shot up from St. Louis into the blue ether like a rocket, amid the plaudits of the multitude. Having ascended to an elevation where the thermometer fell to 42° and the barometer to 23°, a strong eastward current was met, and away they floated towards New York. At this time Mr. Wise, having been much exhausted with the preliminary duties, resolved to have a nap, and for this purpose he bade his companions below goodnight, rolled himself in his blanket and was soon fast asleep. Near midnight he was awakened through a peculiar incident. Mr. La Mountain, who had charge of the midnight navigation, discovered that they had ascended to a considerable elevation; and the gas being thus relieved from pressure, he hailed Mr. Wise to open the valve, as the balloon had become very tense and the gas was rushing from its neck with a loud noise. Having received no answer, he suspected that Mr. Wise was smothered in the gas, and olicited Mr. Gager to mount into the basket by a rope and ee what was the matter. This was done, and the veteran eronaut was found breathing spasmodically; but a good ashaking and the removal of the neck of the balloon from his face soon relieved him. Onward the balloon sped, after this, until daylight dawned, and at five o'clock next morning they were at the upper end of Lake Erie. After some consultation it was resolved to sail over the entire length of its waters, in order to test a notion entertained by some persons that there is a peculiar affinity between balloons and water, which draws the former towards the latter, and prevents them from remaining suspended above it any length of time. For some time they moved along only 500 feet above the lake; then, when near Buffalo, they rose higher, crossed Grand Island, and proceeded towards Lake Ontario. It was here resolved to land at Rochester and let out Messrs. Hyde and Gager, after which Messrs. Wise and La Mountain were to prosecute the voyage, hoping to reach Boston, knowing they were too far north now to reach New York. In order to carry out this conclusion, they gradually descended towards *terra firma*, where they met with a terrific gale of wind, which frustrated all their plans and nearly cost them their lives. This hurricane struck the balloon with great violence, sweeping it downwards towards the water and dashing it along at an awful velocity. All the ballast and everything that could be cast away were thrown out to enable the balloon to rise, but all in vain. Messrs. Hyde and Gager ascended to the basket, but Mr. La Mountain kept his position in the boat, even while it sometimes dashed through the tops of the waves of the lake. Mr. Wise was hopeful that they would be saved, but to every appearance they were all doomed to lose their lives. At last the balloon rose about one hundred feet, but with more apparent danger still, for onward it swept towards the land, and went crushing through the tops of the trees, smashing them like pipe stems, and continued thus for about one mile, until its progress was arrested by a tall oak; and we are happy to state, although the boat, basket, and balloon were much injured, a kind Providence preserved the lives of the daring aerial voyagers, who escaped with only a few bruises.

"Thus ended the longest balloon journey on record; it was commenced at St. Louis on the evening of the 1st inst. at 7·20 P. M., and completed near Adams, in Jefferson county, N. Y., at 2·20 P. M., on the subsequent day. The distance travelled was 1,150 miles; the time occupied 19 hours; a speed compared with which, that of the locomotive is as that of a donkey to a deer. The highest point attained was a little over two miles; and it appeared to be a very pleasant voyage until the parties met with the gale, in which the balloon became perfectly unmanageable.

"Although this aerial voyage is the longest on record, it does not appear to have added to our stock of knowledge in regard to making ballooning safe and practicable."

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THE *Liberia Advocate*, of Monrovia, Africa, announces that its publication terms are: "One bushel of unhulled coffee per annum in advance." Money appears to be an unknown article among the printers of the West Coast.

## The Atlantic Telegraph Cables.

We chronicled last week the successful laying of the fifth Atlantic telegraph cable by the Great Eastern, and we now give a few additional interesting particulars:

The squadron consisted of the Great Eastern, Captain Halpin, in charge of the expedition; the Hibernia, 3,000 tuns, Captain Cato; Edinburgh, 2,300 tuns, Captain Manning, and Robert Lowe, 700 tuns, Captain Tidmarsh. The last three vessels are all screw steamships, the Great Eastern having both paddles and screw. The electrical staff was in charge of Mr. Laws.

Each of the four ships is fitted up with laying machinery and picking-up apparatus, similar in general character, but with slight variations in details in order to meet special points as regards the build and equipments of the vessels. The arrangements on board the Great Eastern, of course, serve as a type for the other ships.

The cable lies coiled in lengths or divisions in tanks filled with water; and as each length is being laid, it passes along a trough, guided at intervals by horizontal and vertical friction pulleys, to the paying out apparatus in the stern of the vessel.

This consists of a series of six wheels, having V grooves over which the cable passes, each wheel being connected with weighted levers attached to disk wheels working in the V grooves, and acting as brakes. Each of the V wheels is also connected through its shaft with a friction brake. The whole of the lever brakes can be operated simultaneously from one main shaft if necessary. The cable, after passing over this brake apparatus, takes four turns round a drum 6 feet in diameter, connected with a powerful strap brake, and is passed thence to the dynamometer, by which the strain on the cable can be ascertained at any moment of its passage through the apparatus.

From the dynamometer the cable passes over a grooved pulley 5 feet in diameter, which projects over the stern of the ship.

The picking-up apparatus is placed in the bows of the vessel, and consists of grooved pulleys projecting over the stern, and a coiling apparatus having two drums, each six feet in diameter. The coiling apparatus is worked by a small engine which takes steam from one of the main boilers. A dynamometer placed between the bow pulleys and the coiling engine completes the picking-up apparatus, which, no less than the paying out gear, is as perfect as engineering skill, guided by past experience, can render it.

The grappling ropes are of various sizes and strengths, and are adapted for heavy or light work. They are made of wire, the heaviest rope being composed of six strands, each containing six wires, and he lightest having three strands of three wires, there being two intermediate sizes.

The Great Eastern also carries eleven iron buoys of five different sizes, ranging from 11 feet diameter by 15 feet high, to 4 feet 6 inches in diameter by 5 feet high.

It may here be interesting to note the lengths of each of the Atlantic cables. That of 1865, which has recently broken, is 1,896½ miles long, and the cable of 1866 is 1,868½ miles. The French cable of 1869, from Brest to St. Pierre, is 2,557 miles in length; while the line just laid is about the same length as that of 1865. Since the latter cable broke, the French cable parted 208 miles from Brest in about 500 fathoms of water. The accident was repaired by the Hibernia, a length of 100 miles having been cut out and replaced by a similar length of new cable.

A most interesting and important work will be the grappling for the cable of 1865, which broke a few months since. It will prove interesting, inasmuch as it will determine whether the physical condition of a cable which has been submerged for eight years is such as to allow of its being raised, or, in other words, whether the outer covering will have become so deteriorated that it will no longer possess the strength necessary to resist the great strain which will be brought upon it in raising it. Of its being found and grappled there is but little doubt, the same thing having been accomplished before under less favorable circumstances and with more limited experience than in the present instance. The matter derives its importance from the fact that, if the results are successful, it will prove a great commercial gain to the enterprising company to whom it belongs. The cable has parted in about nineteen hundred fathoms of water, and, so far as has been ascertained, the bottom is of a favorable nature for grappling operations. The Great Eastern and her consorts will continue their efforts to recover the cable up to the middle of September, or even longer if necessary, for she is equipped for a four months' voyage. It is, however, to be hoped that her labors will have terminated successfully before that time, and that yet new honors will have been added to the science of submarine telegraphy.

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ACCORDING to M. Archheim, by the action of the vapor of bromide of phenylbutylene on lime heated almost to redness, large quantities of naphthaline have been obtained. The reaction is stated as follows: $C^{10}H^{12}Br^2 = 2\,H\,Br + H^2 + C^{10}H^8$.

### Inventions Patented in England by Americans.

(Compiled from the Commissioners of Patents' Journal.)

From June 13 to June 19, 1873, inclusive.

CARBURETER.—H. L. McAvoy, Baltimore, Md.

HORSE SHOE.—H. & P. Moran, New York city.

PARING APPLES, ETC.—E. Spurge, New Rochelle, N. Y.

RAILWAY CAR.—T. R. Timby, Tarrytown, N. Y.

SHIP'S BERTH, ETC.—B. Welsker, New York city.

SPIKES, BOLTS, ETC.—G. N. Sanders *et al.*, New York city.

STEAM TRAP.—L. P. Hawes, New York city.

TELEGRAPH.—G. Little, Rutherford Park, N. J.

TELEGRAPH CONDUCTOR.—W. Radde, New York city.

TELEGRAPH, ETC.—F. H. Greer (of New York city), London, England.

## Recent American and Foreign Patents.

### Improved Beer Cooler.

Jacob Gimlich, Pittsfield, Mass.—This invention has for its object to furnish an improved apparatus for cooling beer, mineral water, etc., which shall be so constructed as to thoroughly cool the beer without injuring its flavor. In the box beneath the ice chamber is placed a cask to receive the beer from a cask placed in the cellar or other convenient place. The beer is introduced into the cask through a pipe inserted in one of its ends Three or more wooden tubes pass through the cask from end to end, and are placed at different hights in said cask. The ends of the tubes that project from the heads of the cask are connected alternately by flexible tubes so as to form a continuous pipe. The lower end of a pipe is connected with the end of the lowest tube, and its upper end extends up nearly to the ice chamber. It is made funnel shaped to receive the ice water from the discharge pipe of the said ice chamber. By this arrangement the ice water is introduced into the lowest tube and escapes from the highest, the discharging end of said highest tube being provided with a short elbow pipe so that the said tube may be always full. An air chamber is placed in the box above the cask and below the ice chamber, and is connected with the said cask by a short pipe. The air chamber is designed to receive any excess of gas that may be in the cask and which might prevent the said cask from being readily filled.

### Improved Spring Bed Bottom.

Charles Gammel, Utica, N. Y.—This invention consists in improving the construction of bed bottoms. The ends of the wires that form coiled springs, at each end of said springs, are bent to form squares of a little larger diameter than the springs. The springs are arranged in rows and alternately. In the vacant spaces between the squares of the springs are placed squares of wire of such a size that their sides may be parallel with and close to the sides of the other squares. The adjacent sides of all the squares are hinged to each other by pieces of sheet metal bent so as to clasp said parallel sides in such a way that the said wires will turn freely in the said clasps or hinges. The end parts of the bed bottom may be turned up over the middle part, thus enabling the bed bottom to be folded into a convenient form for convenience in handling, storage, and transportation without straining the springs. To the lower side of the parts or sections of the bed bottom are secured pieces of Brussels carpet, or other firm thick cloth, to rest upon the slats of the bedstead and thus prevent noise when the bed is being used.

### Improved Varnish or Bronze Coating for Articles of Plaster.

Charles Rotter, East Birmingham, Pa.—The object of this invention is to furnish a durable bronze varnish in different colors for coating and protecting plaster of Paris, terra cotta, stucco, wood and iron ornaments, and busts, which may be placed outside, exposed to the weather, or inside, to be cleaned by the use of water, as occasion requires. The brilliant hue and the protecting qualities of this varnish make it specially useful for busts and plaster ornaments. The invention consists in the mixture of "mica silver" and "aurosit" with collodion, in connection with aniline and other colors to produce different tints.

### Improved Heating Stove.

Thomas H. Salmon, Brooklyn, N. Y.—This invention relates to stoves which have a down draft through the fuel, and consists in the arrangement of a plate to form that side of the hanging grate, which is opposite the smoke pipe. Through a hollow standard a pipe passes upwardly into the combustion chamber. In the latter is hung the basket grate that is provided with a removable cover through whose holes the air is drawn to produce the down draft. One side of the basket grate is a broad plate, which comes directly between the smoke pipe and the other part of the grate. By this construction, when there is sufficient heat to create a vacuum in the chimney, a current of air rushes through holes through the fuel in the grate under the plate and into the chimney. In order to moderate the strong draft which is thus produced, slides in the ash pan are moved so as to admit air.

### Improved Till Alarm.

John F. Baldwin, Nashua, N. H., assignor to himself and Miles Alarm Till Manufacturing Company, Providence, R. I.—This invention consists of one or more disks setting up in a plane parallel with the drawer front, on pivots, and having notches in the curved upper edges, which have to be brought in the line of a hook on a stationary support above the drawer by the pull rods, to allow the plates to pass the hook to open the drawer without sounding the alarm. The plates have several notches in the edge, and all but one are fitted with removable pieces, which can be shifted from one notch to the other to change the combination. When two plates are used they will swing in opposite directions, and their open notches must coincide with each other as well as the hook, to allow the drawer to be opened. When an attempt is made to open the drawer by one not knowing the adjustment, the hook will push one of the plates against the trip lock of the bell hammer and free it so as to sound the alarm.

### Improved Governor.

Elson Towns, Clene, Ill.—This invention relates to apparatus for governing the speed of machinery, more especially designed for the steam engine. A curved bar is attached to the frame with its curved end hanging over so as to support the top end of the ball spindle. A loose disk or washer moves freely up and down on the spindle, and by means of two pins it rests on the arms of the balls so that when the balls rise or fall the washer follows their motion. An adjustable disk is supported by a forked spring to which it is jointed. This spring is adjusted so that the friction wheel is raised or lowered thereby. The friction between these two wheels retards the motion of the balls. The driving shaft is confined to the stand of the frame upon which shaft is a bevel wheel. A yoke carries another wheel which meshes into the latter. This yoke is connected to a vertical shaft by a pitman. The yoke is so constructed that it turns, with the wheel, on the driving shaft, and when the speed is increased the yoke will raise the shaft and weight, but the increased speed is imparted to the spindle and will raise the balls. If more than the required speed is attained the friction wheels will be brought in contact, which will produce a counteracting effect. The difference between the extremes is the speed required, and that is varied by the adjustment of the upper friction wheel. The weight on the lever is raised by an increasing velocity, but the tendency to raise is counteracted by the friction caused by the rising of the balls. The opening the valve, therefore, does not depend upon the action of the balls, as in ordinary governors, but by the positive action of the gearing. The balls simply check or limit the action of the yoke by means of the friction produced.

### Improved Flour Mill.

Jeremiah Dean, New Baltimore, Md.—This invention is an improvement in the class of mills the runner of which is provided with scrapers or plate so attached to it as to remove the meal from an annular trough, into which it falls after escaping from between the stones. The improvement consists in a series of straight ribs applied to the under side of the runner so as to be tangential to the shaft, around which their inner ends center, while their outer ones extend beyond its periphery, and are beveled, whereby said ribs will operate to force the meal outward from the center of the stone, and also carry it around to the discharge orifice of the casing.

### Improved Dumping Apparatus.

George W. Reed, Middlesex, Pa.—The object of this invention is to construct, for use in collieries, mines, and other purposes, a dumping apparatus by which coal or ore may be conveyed and discharged over the chute by an attendant in a rapid and effective manner. This invention consists, mainly in a platform pivoted into the hoisting frame, to which the loaded car is securely locked and dumped, the doors opening and closing by suitable mechanical means. To operate the apparatus the car is secured to the platform by the stops and pin, and tipped over by the slide lever opening its door and discharging the load. The platform is then brought back to the cage, secured to it, and replaced by another, or lowered to be refilled.

### Improved Method of Adjusting Circular Saws.

Sanford W. Clemmens, Cleveland, Ohio.—It is proposed to have a loose collar or disk between the saw and the fast collar, with adjusting screws screwing through the fast collar against or into the loose collar to adjust the saw true in case the fast collar is not exactly true, or in case the saw itself is not ground true.

### Improved Wall Paper.

Archie W. Paull, Wheeling, West Va.—This invention consists in simply taking a carefully selected and artistic design, prepared on paper, wood or other material, and photographing it directly upon the wall paper. In this manner are secured as many facsimiles as may be desired of a design whose delicacy of tint, exact imitation of nature and elaborate ornamentation are absolutely impossible in the block printing process.

### Improved Piano Tuning Key.

Alexander H. Affleck, Marshallville, Ga.—This invention relates to tuning keys for pianos, and consists in one so constructed that, no matter in what position the angular top of pin may be, the key can be quickly rotated so as to give a good purchase and a convenient hold.

### Improved Automatic Gate.

Geo. C. Crum, Barr's Store, Ill.—This invention relates to that class of gates which are opened and closed automatically as the vehicles approach, and subsequently closed behind them after the passage of the vehicles therethrough. The invention consists in combining with a gate latch a vibratory lever with arms connected at the lower end with a bar inclined on its subjacent face.

### Improved Drop Light Attachment for Chandeliers.

Napoleon W. Williams, Philadelphia, Pa.—This invention consists in attaching the ball which holds the rubber pipe to the bottom of the sliding pipe and making it movable therewith, and also in a peculiar construction of the surfaces of the friction clamp.

### Improved Automatic Hatch Closer.

Edward M. Hackett, New York city.—This invention relates to means whereby the door or doors, that cover the openings in floors through which pass elevators, may be automatically closed and opened. It consists in causing a pin on the elevator to move through two spiral grooves and thus vibrate a vertically journaled shaft, which has an arm or arms that actuate the door or doors.

### Improved Ribbon Case.

Jos. K. Landis, Bellevue, O.—The object of this invention is to furnish an improved receptacle or holder for ribbons and other like fabrics, also for threads, yarns, etc., the same being adapted for use in fancy dry goods shops, also, when in smaller dimensions, in families, by milliners, seamstresses, etc. The invention consists of a polygonal revolving case, in each of whose compartments is a series of spools or shafts on which the ribbons are wound, the same passing through slits formed in the outer face of or side of each compartment.

### Improved Gas Retort.

Joseph D. Patton, Trevorton, Pa.—This invention consists of a retort protected from direct contact of heat by the brickwork in which it is set, or partly by the same and partly by another retort, in combination with one or more retorts wholly exposed to the heat of the furnace, for gradually heating the substance of which the gas is to be made; the object being to provide an arrangement whereby resin or volatile oil can be successfully treated, in which they are subjected from the beginning to the intense heat of retorts directly exposed to the heat and sufficiently hot to convert them into fixed gas, which they cannot be in the ordinary retorts.

### Improved Paper File.

Charles Mason, New York city.—The object of this invention is to furnish to merchants and business men a cheap, durable, and convenient paper filer, by which letters, bills, checks, or other papers may be quickly and neatly filed and compactly held together. The invention consists of a device bent of suitable wire or other metal in such a manner that the top part holds, in connection with the spring action of the bottom and side parts, the papers placed on file between them.

### Improved Coupling for Elastic Hose.

Thos. J. Trapp, Williamsport, Pa.—This invention consists in a tube provided with a tapered or conical end, terminating in a right angled shoulder. The elastic hose is forced over said conical end, and past the shoulder, with which latter it engages so firmly as to resist all attempts at removal by any tension to which it may be subjected short of that which will destroy, cut through, or tear it.

### Improved Furniture Caster.

Cevedra B. Sheldon, New York city.—This invention consists in the peculiar shape of the two similar and half sections, each having its half rim, its inner face, its half hub and its cup, corresponding to like parts in the other.

### Improved Combined Walking Planter and Cultivator.

George De Vany, Jr., Darbyville, O.—This invention relates to a combined single and double walking seed planter and cultivator, the component parts of which are so constructed as to permit the planter to be changed either into a three or double shovel cultivator by a simple transposition of said parts.

### Improved Chain Harrow.

George Watt, Richmond, Va.—This invention consists in a harrow, pulverizer or cultivator composed of a series of chains connected by loop links and held in position by cross bars, together with a pair of bars attached to a clevis at one end and braced intermediately by a spacer.

### Improved Clothes Line Hook and Automatic Fastening.

John G. Ames and Preston A. Ames, Baltimore, Md.—This invention consists of an automatic hook and fastening for clothes lines, consisting of a fence grapple with slot and bearings, and a line hook having journals and rear projection. These may be attached to the top of a paling or fence without nail or rivet, and, when not in use, safely stowed away.

### Construction of Iron or Brass Pulleys or Caster Wheels.

Cevedra B. Sheldon, New York city.—This invention consists in making the pulley or caster wheel in two sections, on a plane passing through rim and at right angles to the plane of axis, and in connecting the two sections together by a hollow rivet which also serves as an axle box to take up wear.

### Improved Geared Hand Carriage.

Lewis T. McGilvray, Staunton, Va.—This invention consists in combining, with a vehicle having ordinary sustaining wheels and a guide wheel in front, a series of crank shafts and intermediate gear wheels, by which power is easily and conveniently transferred from the hand to the axle.

### Improved Paint Brush.

Syranus Standish, Eureka, Nevada.—This invention relates to paint and other brushes, and consists in a novel mode of constructing and combining the handle, bristle compressor and shell, so that the bristles may be adjusted when worn, utilized almost entirely, and then replaced with new bristles, all with but little trouble and by almost any one.

### Improved Stationary Spittoon.

Wm. H. Tyrrell, Philadelphia, Pa.—This invention relates to spittoons for cars, steamers, ships or vehicles; and consists in an improved construction which allows the same to be conveniently emptied of its contents at times intermediate between the termini of route and with ease and convenience to the operator.

### Improved Mangling or Wringing Machine.

Thomas Hall and James Newton, Lawrence, Mass.—This invention consists of an arrangement of long levers and springs to obtain the pressure on the pressure roller by light and sensitive springs, which are better adapted for obtaining a wide range of movement than the strong heavy springs which are necessary when short levers are used.

### Improved Spring Bed.

Stephen Stout, Tremont, Ill.—The object of this invention is to construct a cheap and durable spring bed of simple construction. It consists of grooved lateral supports for double acting spiral springs, which are connected by slats or cane pieces, and held in position by straps passing through the springs.

### Improved Sled Brake.

Joseph Slater, Sandy Lake, Pa.—This invention is an improvement in the class of sled brakers, wherein a pivoted bar is caused to take into the snow or ice by means of a hand lever. The improvement relates to arranging a sliding rod, provided with a hook or claw on its free end, in connection with an oscillating lever shaft and a keeper and supporting guide, so that said rod may be easily and powerfully applied as a brake, and raised and supported in a horizontal position beneath the sled beams when not in use.

### Improved Ear Protector.

Moritz Isidor, New York city.—The object of this invention is to provide suitable and convenient means for protecting the ears from frost and cold; and it consists in shields or coverings for the ears, connected together by an elastic cord, and with the central fronts or outsides formed partly of cloth and partly of gauze, so that the shield will not interfere with the transmission of sound.

### Improved Hoisting and Conveying Apparatus.

George Stancliff, New York city.—The object of this invention is to hoist, convey, and lower heavy goods in an easy and expeditious manner, for the purpose of economizing time and labor. The invention consists of a truck, hoisting and carrying the weight and moving it back and forth on an inclined track by means of a windlass, wire rope, and pulley arrangement. It is intended as an improvement on a similar invention patented by Joseph Green, August 1, 1871, and which may be found illustrated in the SCIENTIFIC AMERICAN, on page 383, December 16, 1871.

### Improved Ladies' Work Stand.

Gilbert S. Manning, Danville, Ill.—This invention consists of a stand composed of legs and boxes or trays, and an inclosed revolving table top with a cover in two parts opening and closing on pivots at one end, which secure a base plate upon the covers, whereon a revolving inclosed spool stand is provided. The arrangement is calculated to provide a neat, desirable, simple, and inexpensive table.

### Improved Car Pusher.

Alva S. Bailey, Paxton, Ill., assignor of one half his right to Edward Little, of same place.—The object of this invention is to furnish to railroad employés and others a car jack, by the use of which cars may be moved on the track without being required to wait for a locomotive, horse, or hands. The invention consists of a main beam, with clutch end placed on the track, a slide lever with rack and hook at the other end being applied to the car and acted upon by a cog wheel at the end of a hand lever, so that by successive applications the car is moved on the track.

### Machines for Swaging and Finishing Horseshoe Nails.

Robert Ross, Vergennes, Vt., assignor to National Horse Nail Company, of same place.—The first invention consists of a die on the side of a vertical wall, and a horizontal reciprocating die working toward and from it below a screw feeder, and a bar parallel with it, by which the nails are fed along, points downward, to these dies, to be beveled to the required shape flatwise at the points, the movable die being so timed as to come against the points as they pass in front of it. The feed screw and bar are adjustable vertically to regulate the length of the bevel for the points. The invention also consists of a weighted lever combined with said feed devices and beveling dies to retain the nails between the dies while being acted upon. There are also a vertical stationary die and a movable punch, and a pair of holding dies, in combination with the said feeding devices, for trimming the edges or narrow sides of the nails for about half their length from the point, more or less, the nails being presented to the said trimming dies by dropping, point foremost, from the feed devices in front of the stationary trimming die and being caught at the head by the holding dies, so that the point to be trimmed is suspended in front of the stationary trimming die and held till the movable trimming die comes up and forces it through the other one and out of the holding dies. One of the said holding dies has a slight movement to open and let the nails drop in freely, and then close on them to hold them snugly till the movable trimming die acts. The invention also consists of an arrangement of the stationary beveling and trimming dies on a supporting block, which is pivoted to the frame at one end, and confined by a locking pin at the other end in such manner that by removing the locking pin the block can be readily swung over on its pivot to afford ready access to said dies for repairing them; and an arrangement of the crank shaft is provided which works the movable die stock by a crank or wrist pin, so that it can slide away from the stock readily, to allow of withdrawing the stock to grind the dies without taking them off, and a combination of a latch and collar with the shaft for holding it in connection with the stock. The same inventor has also patented a machine for finishing horseshoe nails which operates as follows: The nail is placed between two threads of a screw. The screw being rotated carries it forward until it reaches a die where the hammer strikes and points it. It then passes to and off the screw end, against which it is held by suitable devices until the pushers carry it through other dies, the head of the nail causing the holder to rise. This effectually trims the nail. If a nail is larger than those previously pointed and trimmed, the screw is drawn back, and *vice versa*, if smaller; while increased space between the nails, as they approach the die to give room for the handle, is obtained by the increasing width of thread.


# Value of Patents,

## AND HOW TO OBTAIN THEM.

## Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Larger inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

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

### How Can I Best Secure My Invention?

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

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

### Preliminary Examination.

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

### Rejected Cases.

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

### To Make an Application for a Patent.

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

### Caveats.

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

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

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### Design Patents.

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

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

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

### Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

### Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing MUNN & Co., 37 Park Row.

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

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

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

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Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a reasonable cost, the price depending upon the extent of drawings and length of specification.

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E. H. R. asks: What is Box's process for treating peat for fuel?

T. A. asks for the process of stamping and retinning tin ware.

C. H. W. Jr. asks for the best method of softening the scale on cast iron.

D. B. B. asks for a plan for an oven for annealing small steel forgings. What is the best material for fuel?

J. H. says: Can any one give a rule for determining the relative position of the frets on the finger board of the guitar?

D. B. B. asks how he may heal a natural opening in the side of a young cow's teat. There is no projection, but simply an opening from which the milk issues.

J. A. F. asks: Is it considered dangerous to use rain water for drinking and culinary purposes if it is conveyed through lead pipes? If it is, what is the best kind of metal pipe to use?

L. A. C. asks how to make a composition of metals which will be nearly or quite as hard and durable, and will make as smooth and sound a coating, as brass, which can be melted in a common iron ladle.

J. A. F. says: Our court room is defective as regards accoustics. The room is 54x63x29 (pitch of story) with gallery at one end, extending (on the sides) half the length of the room. Can anything be done to improve it?

R. M. F. asks: 1. Which is the chief cause of the surf, wind, or tide? 2. In a dead calm, would the rise, distributed through a space of several hours, cause any surf on the coast? 3. During calm weather, how does the tide affect the surf where the rise and fall of the tide is 50 feet or upwards, or on any coast where the rise and fall is great?

S. D. S. asks: In a musical wind instrument, to be blown as a trumpet, what length of the instrument makes a tone, and what length makes a semitone? What is the length in inches measured on the instrument between C and C? If the instrument be one half inch diameter in the bore, will the distance for a tone and a semitone be the same as if the bore were three fourths of an inch in diameter? Would these distances be the same on a crooked instrument as on a straight one?

## Answers to Correspondents

E. C. B. asks: 1. How does the fly wheel of the Scott and Morton revolving steam engine, illustrated in your edition of April 5, receive its motion? I don't understand how the power is applied to it from the cylinder. 2. How is it that salt is put on ice to preserve ice cream, but if it is put on ice on a sidewalk, etc., it melts it? Answers: 1. The fly wheel and cylinder are not concentric, their centers differing by a half stroke. Let A represent the position of the center of the cylinder, B the center of the fly wheel, and C the wrist pin when at the end of a stroke, the piston rod being as far out as possible. At the end of a half revolution the wrist pin will be at D, the piston being at the other end of the stroke. In the figure BC—BD, and AB— one half stroke. 2. Salt always melts ice, thereby absorbing a certain amount of heat from surrounding bodies; and since it takes heat from the cream, it cools it. On the side walk it also melts the ice, thus taking a certain amount of heat from the air, the stones, and the feet that travel upon it; hence car horses' feet are often frozen when the tracks are salted.

D ——— A ——— B ——— C

A. B. asks: What is the best method of amalgamating a large zinc cylinder for a Bunsen's electrical battery? To immerse the cylinder would require a large amount of mercury, and I cannot succeed by rubbing it on. If the zinc, after being washed in sulphuric acid, is immersed in mercury, and the greater part of the surface is not brightened in the least, and is apparently unaffected by the mercury, what is the cause and how can it be remedied? Answer: Into a flat porcelain dish containing 2 or 3 ozs. of mercury, pour half a pint of strong muriatic (hydrochloric) acid; roll your zincs in the dish, so that the acid and mercury will touch the zinc at the same time; in this way the mercury will unite (or amalgamate) with the zincs with very little rubbing. After this rinse them in clean cold water, and place them in the battery jars: pour clean water on the mercury left in the dish, until the acid is washed away, then pour the mercury into the jars, and the battery is ready for the solutions.

J. M. says: I have been trying to construct a galvanic battery, but have not succeeded. It is made on the plan of Daniell's constant battery, and consists of two copper cups each 6 inches high and 4¼ inches in diameter, with a perforated shelf near the top, ⅜ inch wide. Two porous cups 3 inches wide and ¼ inch thick, and two solid zinc rods 1¼ inches in diameter, are used. The porous cups are placed in the copper cups, and the zinc rods are insulated and hung inside of the porous cups, which are made of round drain tile. In the porous cups I placed a solution of one part of oil of vitriol in seven parts of water, and in the copper cups, a solution of blue vitriol and a little oil of vitriol. After standing awhile, I took hold of the handles but could feel no shock, nor has it worked since. What is the matter with it? Answer: The electricity from a battery of two of Daniell's cells of the size you mention could hardly be felt with the hand; but if you place the terminal wires on your tongue, without touching each other, it can be tasted. The proper way for your purpose is to allow the electricity, direct from the battery, to pass through the primary coil of an electro-magnetic machine and then pass the induced current from the secondary coil of the instruments, through your body, and it will require no great sensitiveness to feel it. The instrument will cost ten or fifteen dollars, according to power.

C. M. W. says: 1. I have an electro-magnetic machine from which, at times, I can feel electric shocks through one conductor without any connection with the other whatever. How is this? 2. Can I fix the machine in any way so that I can get the shock through but one conductor without any connection with the other? If so, how? 3. Can I charge a chair or stool with electricity, or charge myself with it, so that a person touching any of the above can feel the shock without their touching the conductor? Answers: 1. This effect is very noticeable when using the induction coils or frictional machines. While experimenting at home with a small induction coil, we have frequently illuminated a six inch Geissler tube by holding it with the thumb on one of the platina terminals, and the other terminal within a half inch of one pole of the instrument, without any apparent connection with either pole; of course there was a connection, or passage, and it was through the air, as may be easily proved by connecting the outside coating of a well charged Leyden jar with the gas or water pipes (so as to expose a larger surface for the escape); on presenting the knuckles to the knob of the jar, the shock will be felt without it being necessary to touch the gas pipe or outer coating. 2. In reality, no, but the connection may be so disguised that it will not be apparent. 3. If you stand on a stool with crown glass legs, you may be charged so that you can, with your finger or an icicle, ignite alcohol contained in a tin cup and held by some person who need not be in direct apparent connection with the other pole. In this case, the same principle is involved as in the charging and discharging of the Leyden jar, namely, that it would be impossible to charge either without a connection being established with both poles. We think the best machines, for the class of experiment in which the connection or circuit is not apparent, are those that produce very intense electricity, such as the instrument of Professor Holtz (described on page 280 of our volume XVI) or the ordinary frictional plate machine.

H. W. U. asks if the common burning gas will pass through water in a gas pipe, with the ordinary pressure. Answer: A column of water, one inch cross section and about 28 feet high, weighs one pound. Gas, to rise through a column of this hight, must consequently have a pressure of one pound per square inch; and the pressure required per square inch will vary with the hight of the column of water through which it is to pass.

A. W. asks: 1. How much horse power will it require to raise water through a tube one inch diameter from thirty to forty feet perpendicular? 2. Does condensed air press as many pounds on the inch as steam does? Answers: 1. Multiply the number of pounds of water delivered per minute by the hight to which it is to be raised, and divide the product by 33,000. This will be the horse power required, to which must be added the friction of the water in the pipe. 2. Yes.

C. P. W. asks: About how many degrees of heat will water absorb under a pressure of one hundred pounds? In other words, does not water change into steam at 212°? Answer: According to the generally accepted theory of heat being a mode of motion, water does change into steam, under atmospheric pressure, at a temperature indicated by the thermometer of about 212° Fahr.; but before it changes its condition, it requires an addition of about 967° of heat, which are not indicated by the thermometer, but can be observed by condensing the steam. This amount of heat, which is ordinarily called latent heat, is supposed to be converted into the work exerted by the particles of water in changing into steam.

F. W. asks: Will the iron radiator used for steam heating radiate as much heat in proportion to internal temperature if filled with hot water instead of steam? Answer: If the circulation is equally good, in both cases, the amount of heat radiated in proportion to temperature will be the same.

G. W. F. asks: 1. Is water compressible? If so, to what extent for a given amount of force? 2. Is there any ratio between the compressibility (if such exists) of different liquids and their specific heats? Or to put the matter conversely: Supposing an equal quantity of heat be applied to substances of different specific heat, water and mercury, for example, is the force of expansion the same or different in each case? Answers: 1. Water is compressible to the extent of about fifty millionths of its volume by a pressure of 15 pounds per square inch. 2. There is no such ratio. Generally, the most expansible liquids are the most compressible.

W. S. says: We have in a mine a pump with the discharge and suction pipes both 4 inches in diameter. From the discharge pipe we connected a 6 inch pipe for a column which is nearly 1,000 feet up a slope. 1. S. J. claims that there is no more weight of column on the pump with a 6 inch pipe than there would be with a 4 inch pipe. D. R. J. claims, on the contrary, that there is, for the reason that the 6 inch column will hold more water than the 4 inch, and this makes the column heavier. Answer: There is certainly more weight of column when the 6 inch pipe is used, but the pressure on the pump piston is the same, in each case. The pressure on the base of a column of liquid is proportional to the hight of column and area of the base, and independent of the cross section of any part of the column, other than the base.

J. J. Y. says: In a factory in this place, pressure is obtained by means of a lever or handle attached to an eccentric. How is the power obtained by it calculated? Is it done in the same way as with a simple lever, the fulcrum of which is the axis of the eccentric? If not, how? Answer: This is simply a bent lever, and the calculations are made in the usual manner.

J. H. asks: Are bristle cuttings of any value as a fertilizer? If so, how could they be prepared? Answer: Mix with wood ashes and use as a fertilizer.

R. F. says: W. B. asks for a recipe for cement that will resist oil on the joints of a tin box; I suppose he means the joint round the cover. I have proved that thick shellac varnish, made with alcohol as a solvent, applied to the inside of a leather vessel, will hold whale oil three to five months: therefore I conclude that, if W. B. makes a thick paste by dissolving gum shellac in water by heat, and applies it thoroughly to the joint and, when dry, cements a strip of paper by the same paste around the joint, he will accomplish his purpose; or if he labels his boxes, let him cover the joint. Gum shellac dissolved in water as above is the best cement I ever found for labeling on bright tin; and by using it, he will accomplish a double purpose.

J. H. M. says, in answer to W. H.'s query about foul water in a well: Let him clean out his well, take out his pipe, fasten or solder on a piece of wire screen, about one sixteenth inch mesh, on the lower end of the pipe and bore a number of half inch holes through the pipe within a foot or two of the bottom end, covering the holes also with the wire screen. Insert the pipe in the well, having it terminate in the center of the bottom of the well, and then fill up the well with clean washed gravel. The same thing can be done by using a pump log instead of pipe, and serving in same manner. I was troubled in the same manner that W. H. was, and have tried the above plan and it gives me the best water in this vicinity. It might, perhaps, be an improvement to occasionally put in a layer of charcoal when filling up with gravel, the coarsest charcoal being in the bottom of the well. Will W. H. give us the result after pumping out the water enough to clean the gravel? If the stones of the well were taken out, before filling as above it would be still better.

M. V. B. asks: Are meerschaum or other pipes made from froth of the sea? Are they not made from clay found in some parts of Europe? Answer: Meerschaum is a German word, signifying sea foam, and is applied to the mineral silicate of magnesia—of which meerschaum pipes are made—on account of the light and white nature of the substance. The best qualities come from Asia Minor.

E. J. C. asks how to burnish gilding on china. Answer: We give the following from Wagner's "Chemical Technology:" The gold employed for decorating the porcelain is dissolved in *aqua regia*, and precipitated with either sulphate of iron, nitrate of protoxide of mercury or by means of oxalic acid. In its application the gold must be intimately mixed with a flux, generally nitrate of bismuth. The article to be gilt must be thoroughly freed from grease, else the gold will not adhere. The gold powder, finely ground up with honey or sugar, or some such soluble substance, is applied with a pencil brush. The burning in is effected in a muffle. The gold is not melted during the burning, but becomes firmly set upon the article by means of the flux. After burning the gold does not at once appear bright, but requires burnishing with an agate tool. Bright gilding is effected by burning in a solution of sulphuret of gold or fulminating gold in balsam of sulphur which requires no burnishing.

J. T. D. asks what is the best work on mineralogy. "I would like to have some good work to assist me, as I find rocks that I cannot understand. 2. What would it cost to have ores of silver and lead assayed?" Answers: 1. Use Dana's "Mineralogy." 2. Assays of lead, gold, or silver cost $10 each.

J. L. S. asks: Why is it that a certain quantity of inflammable gas, burning in an ordinary gas stove gives out so very much more heat than when consumed in the common form of a light? I can easily understand how the heat is greatly increased by means of the free access of oxygen in the air, but can conceive no cause for the astonishing difference that actually exists. The same amount of gas burned in open air, even when it is bountifully supplied with oxygen, produces a sensible heat, insignificant when compared with that emitted from the gas stove. Is the heat generated in the two cases actually so different in intensity, or is it approximately the same, but only more generally diffused in the latter instance? If the last be true, why? Answer: Gas burned in a gas stove or Bunsen burner is mixed with air so as to be completely consumed; hence we have a blue flame and no light. In an ordinary batwing burner the air has access only to the outside of the flame, and the heated particles of unconsumed carbon give luminosity to the flame. In a gas stove, too, the arrangement is such as to heat as large a current of air as possible, and to diffuse the heat in all directions. You will find this fully explained in any work on chemistry or cyclopædia, under the title of combustion. The oxyhydrogen blowpipe produces a more intense heat than any stove or furnace, because the combustion is perfect, yet it does not heat a room where it is used so much as your gas stove, because it is not so arranged as to readily diffuse this heat through the surrounding atmosphere.

W. E. M. asks: Is there any process by which silicate of soda or potash, after it has been dissolved in boiling water, can be made to possess the same qualities as before dissolving? The qualities I desire are as follows: It must be nearly or quite transparent, nearly or quite insoluble in cold water, and must stand a heat of 600° Fahr. Thus far I have failed to get a satisfactory result after dissolving. I have tried chloride of calcium, which leaves an opaque silicate of lime, and does not answer. I have tried drying it in a heat of 130°, which is the greatest degree it will stand; and, after allowing it to dry in the air for three or four days and in this heat for eight hours, it would not then stand 150° without blistering. I must have it in the liquid so as to apply it in successive coats until I get a thickness of ⅛ of an inch. Would dissolving it in any other liquid which is not very costly give a better result? Answer: Try using it in a state of fusion, either by fusing the commercial dry silicate of soda, or by fusing a mixture of pulverized quartz 45 parts, calcined soda 22 parts, carbon 3 parts, and pouring the melted glass over the surface, which should be warmed also.

J. J. G. asks why vermilion turns dark, and if there is any remedy that will make the color permanent. Answer: Vermilion of commerce often contains red lead and chrome red, which blacken in an atmosphere containing sulphur. Pure vermilion can be sublimed, leaving the impurities behind. Blackening may also be due to a molecular change, difficult to account for and more difficult to prevent, since there is both a red and a black sulphide of mercury, the latter being the most stable.

J. A. H. asks: 1. Which of the elements is it that will not combine with oxygen, as stated in Roscoe's "Chemical Primer"? 2. How is it that some works on chemistry give 64 elements and others 63? Which one are they uncertain about? Is it pelopium? Answers: 1. Oxygen will not combine with fluorine. 2. Nearly all text books, including Roscoe, Barker, Cooke, Rolfe and Gillett, Gorup-Besanez, Steele, Attfield, mention but 63 metals. Pelopium was the name given by H. Rose to a metal supposed to exist in American columbite, along with columbium or niobium. He afterwards concluded that what he had supposed to be pelopic acid was only another compound of niobium. It has since been discovered that both these errors were caused by the presence of tantalum. Jargonium and nerium were also once supposed to be new elements.

C. M. P. says: I am constructing a telescope. 1. Would an instrument with a 4 inch objective be large enough to aid in the study? 2. I have devised a machine which will grind a perfect lens of any size or shape; but I do not know how to give glass the fine polish necessary. Please inform me of the process and the materials used. 3. Please inform me what would be the cost of good lenses, of the size mentioned, at the manufacturers? What would be the cost of a complete instrument? What standard work on astronomy would you recommend? Answers: 1. We should recommend a telescope of four inches aperture. The price of such a lens is $100; with equatorial mounting, complete, about $250. 2. Your device was anticipated by an experiment of Professor Boyle of this city. A local polisher of rhomboidal shape, moving in cycloid curves, was found to correct a four inches lens in twenty minutes. Directions for grinding and polishing specula are given by Professor Henry Draper "On the Construction of a Silvered Glass Telescope" (*Smithsonian Institute*, price $1.) 3. Useful standard works are, for observers: Proctor's "Star Atlas," Guillemin's "The Heavens," and Schellen "On Spectrum Analysis;" and, for students, works by Loomis and Chauvenet.

W. asks: Will zinc and lead fuse together so as to form a perfect alloy? If so, are there any particular directions to be followed? Answer: Zinc and lead will probably form an alloy. Zinc must be fused in a covered crucible to prevent its taking fire. Their melting points do not differ greatly.

W. W. S. asks: Did the supposed planet cross the disk of the sun or not, on March 21? I can in no way find out. Answer: It is stated that Vulcan was seen to cross the sun's disk on March 14, 1878 by Mr. Cowie at Shanghai, China. Its sidereal period is 34 days, 22 hours, 21 minutes. The existence of other intra-mercurial planets is inferred. A sharp lookout should be kept for them. Mr. John H. Tice of St. Louis states that, in 1859, he saw the planet pass the sun's disk.

W. S. D. asks how to cover glass with a thin coat of tin in a liquid form, in the manner that silver is put on or in any other way, so as to be bright like silver. Answer: We know of no method of coating glass with tin from a solution. An amalgam of tin and mercury is employed on mirrors, in which case the tin foil is used and the mercury poured over it.

O. M. asks: 1. Have the flame protuberances on the sun ever been seen by simply viewing them through properly colored glass and a telescope, without the intervention of the prism? 2. Are all the flames of the same color, so that all may be seen if any are? 3. Where may properly colored glass be obtained for this purpose? I think some noted English spectroscopist saw the flames in the manner indicated above, but I am not certain of this. Answers: 1. Dr. Huggins' experiments with colored media were unsatisfactory. 2. The solar prominences have been seen in a three inch a hromatic, using a direct vision spectroscope of five prisms, and magnifying the spectrum with a small telescope. Usually the light is sent through five and a half prisms of dense flint glass. In the spectroscope, the light of the protuberances is concentrated in these images at the hydrogen lines (C, F, and G, of the solar spectrum), while the general light of the sun becomes faint by dispersion. We usually look at the red image at C and photograph either the bluish green one at F or the violet one at G.

R. C. P. says: I built 2 steam boilers 26 feet by 36 inches, with a 14 inch flue in each; they were tight with 60 lbs. of steam; but fearing that they leaked (where we could not see the place) when they were hot, we tested them with 63 lbs. cold pressure; and with this test they leaked at places where they showed no signs of leaking with steam on. Did the cold pressure strain them more than the hot? If so, what is the difference? Answer: It is evident that a boiler when cold is in a different condition than when heated. Boilers may be tight in one case, which are slack in the other. Joints may be quite open, when the boiler is cold, which will be closed by expansion, when steam is raised. An article published in the Scientific American some years ago describes an excellent method of testing boilers; and as it is one that we can thoroughly recommend, we reproduce it here, as a matter of interest and importance to those who have charge of boilers: "If a boiler be filled full of water up to the very safety valves, and all apertures closed, when a fire is built in the furnace the water will be expanded and raise the valve, if the boiler is strong enough to withstand the strain; but if it is not, the weakest part will be shown, and sometimes sheets are torn out by this method. Steam is not generated from the water during this test, and if a rupture does take place in the boiler, no one will be injured by it."

J. R. says: Can a hot air engine be run by suction? If so, cannot the suction be formed by condensing rarified air? Will rarified air act with the same pressure upon the piston as condensed air, there being a vacuum produced in the receiver? If so, cannot power be gained, the action of heated air being the same in power as that of condensed air? The dense air is pumped out of the receiver through a smaller aperture than that of the receiver or rarified air pipe through which it is fed. Answer: If we understand our correspondent rightly, the same bulk of air must be pumped out that is admitted to the cylinder. The application of heat to air causes it to expand, or, if expansion is prevented, increases its pressure. Our correspondent's idea seems to be both to increase the pressure and volume of the air.

C. H. H. says: A boiler in this section was destroyed, either by a collapsed flue or by its back head giving way. It was of 40 inches diameter, 20 feet length, ¾ inch shell, with ⅞ inch heads; the flues were 14 inches diameter of heavy three sixteenths inch iron. The boiler carried 98 lbs. of steam. The boiler was thrown a distance of 10 or 12 rods and pieces of saw logs were driven into the boilers. One log was driven into one of the flues for a distance of 10 or 12 feet, tearing it open about 4 feet in length. The boiler struck a white oak stump, about 20 inches in diameter, splitting it open at a right angle with the direction of the boiler. It finally struck a large oak tree, which apparently stopped the force and changed ends of the boiler. The front head was torn out, one or two sheets being badly torn and the back head nearly all out. The force was exerted from the back head. The boiler was old. No one was injured. What caused the trouble? Answer: In the Scientific American for April 26, 1873, will be found a formula for ascertaining the pressure necessary to collapse boiler flues, made of good iron and truly cylindrical. Applying the data given in our correspondents letter, we find the pressure per square inch necessary to collapse these flues to be about 103 pounds per square inch; so that we can hardly err as to the probable cause of the present explosion. We have alluded before to the excessive working strains to which boiler flues are frequently subjected, and to the great danger of the same: and we hope that our readers will aid us, by communications, to rouse the owners of steam boilers to a sense of their criminal carelessness.

A. asks if the sun differs in distance from the earth in any parts of the year; and if so, what is the difference, and at what time does it change? Answer: The mean distance of the earth from the sun is now estimated at 91,678,000 miles. On June 30, the sun is 2,500,000 miles further away than at the end of the year, when it is nearest the earth.

E. G. says: Can you tell me why my boiler always leaks when the water is unusually high in it? It is 54 inches in diameter and 14 feet long, with 65 two and three quarter inch flues. Sometimes it will be perfectly tight for weeks; but if by any neglect the water is allowed to get 2 or 3 inches above the highest gage cock, it will leak at every joint, and sometimes troubles me for days before the leaks stop up again. Answer: It is impossible to answer a question of this kind without looking at the boiler. Still, we will advance a theory which might possibly account for the leak. The boiler may be set in such a manner that it can just sustain its own weight and that of the water which it contains when the proper water level is maintained. Raising the water level three inches will increase the weight between 900 and 1,000 lbs., and this may bring a strain upon the boiler which it cannot bear, on account of improper setting; while it might be able to withstand a much higher steam pressure without leaking, as, in this case, the weight on the supports of the boiler would not be altered.

E. B. T. says: After using a very powerful punching machine, on removing the sliding head, which had got dry, the fine cuttings dropped out and immediately took fire, or exploded like powder. The material was cast iron. Can you explain this? Answer: Substances containing carbon, when reduced to a certain fineness, and the particles (brought to a certain temperature, arranged in a certain way in respect to each other) have been known to absorb oxygen from the air so rapidly as to take fire spontaneously. Yours is evidently a case of this kind. We remember no example precisely similar.

M. says: I would advise J. N. H., who asked as to the comparative merits of a turbine and an overshot wheel, to put in the best turbine water wheel that he can buy; the advantages of a turbine over an overshot are many, some of which are that there is no trouble with back water and no trouble with ice. A scientifically constructed turbine will not vary materially (in the amount of work that it will do) from the overshot, and some well informed millwrights give a turbine the preference in quantity of work with same amount of water.

Minerals.—Specimens have been received from the following correspondents, and examined with the results stated:

J. H.—It is calx spar or crystallized carbonate of lime. The effervescence with acid is due to the carbonic acid in it. It contains no iron or sulphur. Commercial acids frequently contain iron, and prussiate of potash is partially decomposed by strong sulphuric acid, so as to give a blue color when no iron is present. Test your acids before testing your minerals. The brown specimens are limestone containing some alumina, which gives them the characteristic odor of clay when breathed on.

## COMMUNICATIONS RECEIVED.

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

On Coöperation. By J. P. M.
On Chickens and Eggs. By H. E. H.
On a Fossil Corn Shuck. By J. H. F.
On the Million Dollar Telescope. By W. W. B.
On the Navigation of the Yarra. By J. M.
On a Celestial Phenomenon. By A. S. T.
On Flying Machines. By W. M. K.
On Railroads and Life Assurance. By J.
On Attraction and Repulsion. By I. F. T.
On an Auroral Phenomenon. By G. M.
On the Zodiacal Light. By T. R. L.
On an Auroral Display. By H. P. C.
On Steam Power on Canals. By W. J. B.
On the Newtonian Theory. By J. T. W.

Also enquiries from the following:

J. T. B.—V.—M. B. O.—J. M. E.—P. E.—G. R. K. G.—W. A. B.—F. J. S.—H. E. F.—W. H. M.—C. A.—C. P.—J. M. G.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

# Index of Inventions

FOR WHICH

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WERE GRANTED FOR THE WEEK ENDING

## June 17, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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25,488.—Hydraulic Press.—M. H. Clark. September 3.
25,508.—Tailor's Shears.—R. Heinisch. September 3.
25,512.—Bung Hole Borer, etc.—J. Kirby. September 3.
25,062.—Construction of Prisons.—E. May. Sept. 17.

## EXTENSIONS GRANTED.

24,493.—Furnace Door Frame.—P. A. Sabbaton.
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24,451.—Metallic Ears for Handles, etc.—T. Evans.
24,481.—Straw for Paper Pulp.—J. B. Palser, *et al.*
24,484.—Paper Pulp.—J. B. Palser *et al.*
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26,415.—Winding Thread on Spools.—H. Conant.

## DESIGNS PATENTED.

6,703.—Lath Bed.—W. F. Burton, Chippewa Falls, Wis.
6,704.—Heating Stove.—J. V. B. Carter, Detroit, Mich.
6,705 to 6,708.—Carpets.—J. Fisher, Philadelphia, Pa.
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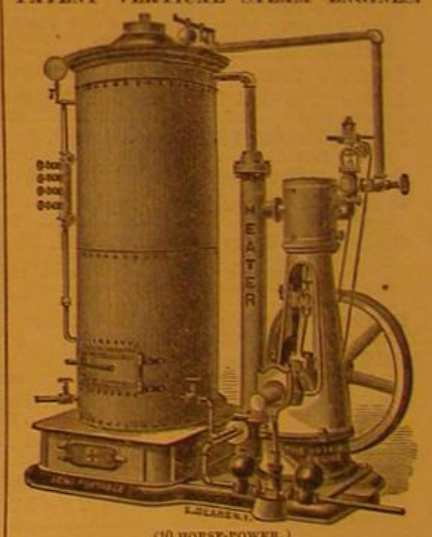


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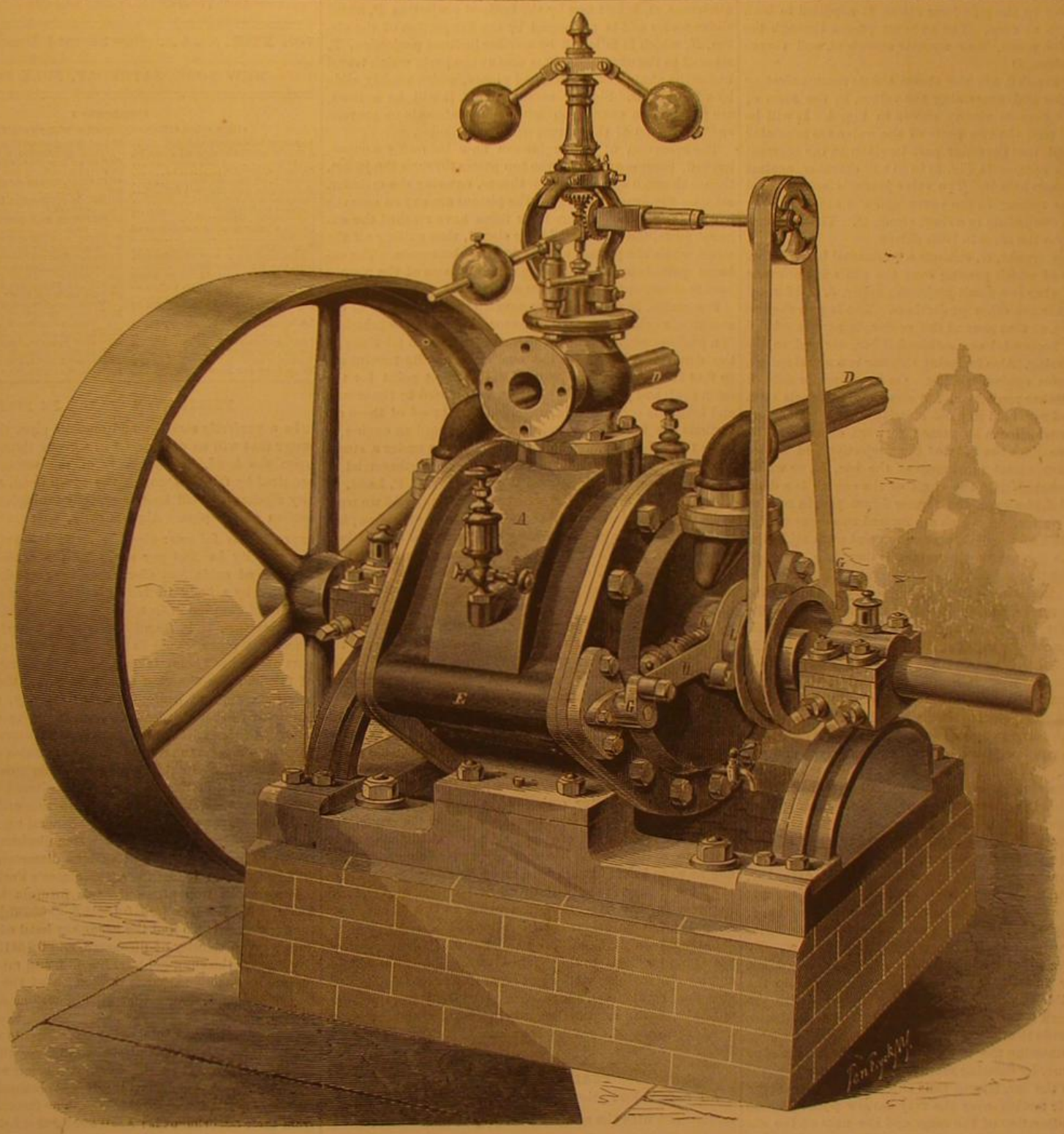
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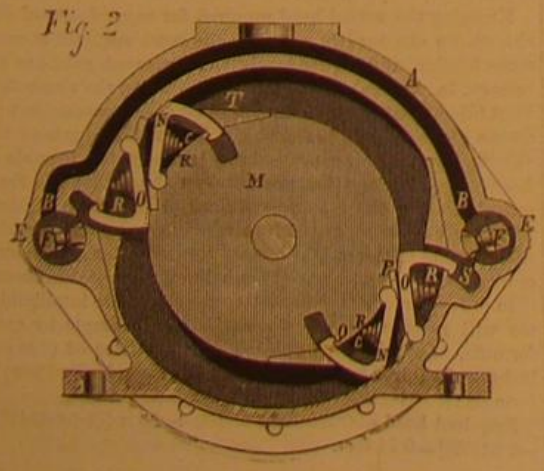



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It is hardly necessary, at the present day, to direct especial attention to the relative proportion of advantages and defects inherent to the rotary engine as a type; nor is it here needful to draw any contrast between it and the reciprocating engine. Although having the merits of compactness and lightness, and generally that of cheapness, which render it admirably adapted to certain requirements, the rotary is in comparative infancy; and hence, while, in the future, inventors will unquestionably seek to augment its advantages, at present their efforts are more particularly directed toward overcoming the practical difficulties which militate against its employment to an equal extent with its older rival.

Fig. 2




The principal obstacles to be surmounted, as we have before remarked in referring to engines of this class, are those in the way of using steam expansively with a variable cut-off and without undue clearance, and also in the reduction of frictional loss to a minimum by prevention of wear and by perfect equilibration of working parts. These, by proper means, once overcome, it is clear that an advance of no small importance will be effected, and an engine produced manifestly capable of coping with the best reciprocating machines of equal power, as regards durability, efficiency, and in point of economy of fuel.

The inventor of the device, to which in the following description we propose particularly to refer, has, he states, conceived the same with a full knowledge of the matters wherein the older forms of rotary engines have been found wanting. How he has succeeded in avoiding such difficulties is a subject for the intelligent judgment of the reader; though it is a matter of regret that the short period which has elapsed since the completion of the invention, has precluded the making of necessary competitive trials, and the consequent formation of opinion upon a basis other than that afforded by a careful examination into the construction and general operation of the machine.

Fig. 3

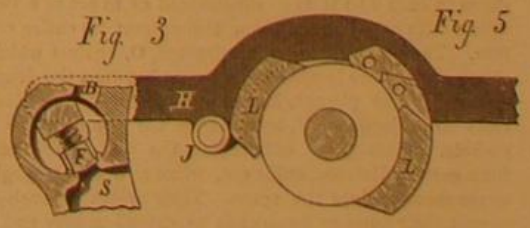
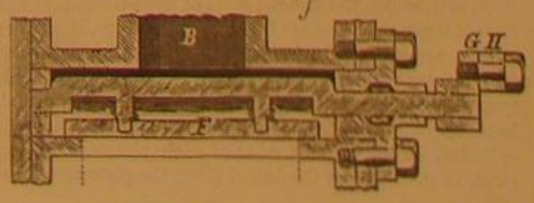



Fig. 5



Fig. 4



Referring to the foregoing engravings in illustration of our subject, Fig. 1 affords an excellent idea of the exterior appearance of the engine, and the smaller drawings, Figs. 2, 3, 4, and 5, relate to especial parts which will be adverted to as we proceed.

The concentric cylinder or casing, A, is bored out smoothly to form a perfect circle within, and is pierced at either side with induction ports, B, Figs. 2, 3, and 4, which extend across the rim, forming narrow slits of about half an inch in width. At C, Fig. 2, are shown the exhaust openings, of which there are four, two on each face, and which together aggregate in area four times that of the induction ports. A steam jacket, represented in section in the upper portion of Fig. 2, incloses the top of the case so that the steam, entering by the pipe from above, is supplied to both induction ports at once. The exhaust passes through the openings above noted, into annular chambers, and thence exits by the pipes, D.

A E, Figs. 1 and 2, are the steam chests communicating with the jacket and containing the valves, F, the form of the latter being more clearly shown in Fig. 4. It will be here observed that the two parts of the valve are separated by springs, and that the outer part is made in the segment of a circle (see section in Fig. 3) to fit the chamber, against which the springs hold it. The valve journals are arranged as shown, one resting in the cover and the other passing through and terminating in a short crank, G. The construction is of course the same in both valves.

Between the cranks, G, extends a horizontal bar, H, Fig. 1, the portion of which passing over the shaft is shown in Fig. 5. On this bar is a small projecting roller, J, and formed on its inner side are other projections. The lug on the left side of the bar, or that nearest the reader, is perforated and travels on a horizontal screw-threaded bar, secured to the head of the casing. Also inclosing this bar is a spiral spring, K, which presses against the lug. On the opposite side of the bar, H, another projection, not shown, also travels on a screw-threaded rod held in fixed standards, on which, however, are nuts which can be turned forward or back on the screw so as to limit the play of the projection and consequently the horizontal movement of the bar, H, to which the latter is secured. On the shaft of the engine is a disk, L, Figs. 1 and 5, shown in the former figure just in rear of the governor pulley, on which are formed two cams which, in the revolution of the disk, press upon and push aside the roller, J. The motion of the valves is therefore governed as follows: Rotating the disk throws the roller, J, to the left; the spring, K, is consequently compressed by the lug on the bar, H, being carried against it. As soon, however, as the cam pressure relaxes, the spring acts and, by its recoil, throws the bar over in the opposite direction, so that by this means the cranks, G, and the valves attached thereto, are moved. Referring now to Fig. 5, on the left side of the right hand cam will be noticed a number of additional pieces. These are movable blocks bolted on and easily adjustable, which serve to increase the length of the cam so as to control the points of time of opening the valves and admitting steam. When it is desirable to cut off earlier, with reference to the revolution of the drum within, more of these blocks are added; and when a more continuous supply of steam is needed, some are removed. The ready manner in which the cutting off can thus be regulated is, we think, an ingenious and novel improvement.

Through the action of the lug and nuts on the right of the bar, H, in governing the horizontal play of the latter, it is clear that the apertures of the induction ports are also thus regulated, for necessarily, if the cranks, G, are carried over a shorter distance, the valves are moved over diminished space. By this means the induction orifices can be arranged to admit steam to their full capacity, or to allow it to enter in the thinnest possible sheet, so to speak, in accordance with the power and work required of the engine. The same device can also be made to afford an extremely sensitive variable cut-off, by connecting the governor with a movable wedge which will thus, by entering more or less, shorten or lengthen the play of the bar, H, and thus automatically control the valves in their motion over the very narrow ports. These changes, the alteration of the cams and the nuts on the sliding bar, it should be noticed, are all easily accomplished in a moment, from the fact that the parts are outside the machine, and hence directly at the hand of the engineer.

In Fig. 2 the interior arrangements are clearly depicted; M, the revolving drum, is secured to the shaft, and its length is very nearly that of the case, so that its ends when rotating are in such close approximation to the latter that steam is prevented from passing between. The weight of this drum is such and it is so constructed as to act as a balance wheel with equal momentum throughout its entire revolution. The pistons, N, and abutments, O, against which the steam presses, are located in the space between the drum and cylinder. The pistons, N, are hinged by their cylindrical ends in projections, P, screwed to the drum, which form sockets. From these extremities the pistons are flattened for a certain distance, sufficient, when at a proper angle, to cause them to close the space. Their width is such as to permit their front or loose ends to extend across and completely fill the said space, while their extremities enter slots formed in the drum. These slots are provided with shoulders, at Q, which the flanged ends of the pistons take against, so that when the latter are lifted by the springs, R, under them (which are made only just strong enough for such purpose) or by steam entering beneath, they will be caught and prevented from being forced up so as to cause undue friction between their upper surface and the inner periphery of the cylinder. The wearing edge of each piston is faced with steel, as indicated by the dotted lines, the plate being screwed on and easily removable. In order to obtain access to this part of the engine for alteration or repairs, it is only necessary to remove the head of the cylinder and draw the pistons laterally from their positions by hand, an operation very quickly and easily performed.

The abutments, O, fixed on the case are arranged similarly to the pistons, their movable ends entering slots, S, and steam passing along their outer sides. It will be observed that the pistons come under these abutments, so that each moves through one half the space between the drum and cylinder, while they laterally entirely and closely occupy the chamber. All jar and consequent wear due to sudden contact is ingeniously obviated by a nice arrangement of working parts; thus, supposing the drum to turn from right to left, the abutment, O, is first met by the inclined projection, P, which slides under and is prolonged by the flat portion of the piston, N, which is followed by another inclined projection, T, secured to the drum. By this means the parts which travel under the abutment are inclined planes, which readily slide by without jar. Similar arrangements, it will be noticed, are provided in connection with the abutments to prevent sudden contact of the pistons with the cylinder.

The operation of the engine can now be easily comprehended. Steam entering at the top passes through the jacket, thence through the ports, and thence, entering the cylinder, actuates the drum. In Fig. 2 the pistons are shown near the end of the stroke. Before their faces have reached the exhaust ports, the valves will have closed, thus cutting off the steam while the pistons are passing the abutments. The exhaust ports being open, the moment the faces of the pistons pass their edges the steam exhausts.

It remains, in conclusion, to sum up the advantages of the machine, as claimed by the inventor. Of these the principal is a positive equalization of steam pressure, on all sides of the drum, at all times and at every point of its revolution, so that frictional wear is reduced to its lowest point for the main shaft and journals. The drum is balanced by the steam, and hence its oscillation is prevented. In proof of these assertions the inventor, in our presence, caused an engine of some thirty horse power to start and operate under a steam pressure of less than half a pound. From further trial of the machine at the Ridgewood Works of Mr. C. P. Ladd, of Bloomfield, N. J., where it was built, we may add we were favorably impressed with its construction and operation; but of course, in the absence of complete tests and calculations as to power, etc., we are unable to speak, with such certainty as we should desire, of its probably high efficiency.

Further points of advantage may be briefly stated as follows: Cheapness, as all the parts are simple lathe work, strictly circular, or else have flat and straight edges easily planed; compactness; economy of fuel, because the driving power is always at the same leverage from the center of the main shaft, and, through the cam, steam may be employed expansively to any extent compatible with length of stroke or size of engine, according to the horse power required for the work to be done; simplicity and ready accessibility of working parts; practically no appreciable clearance; capability, from its plane surfaces, of being packed as readily as a reciprocating engine; lastly, and especially claimed by the inventor, owing to the machine being concentric and the steam space being uniformly the same, the amount of steam used can be cubically calculated so as to institute a comparison between this and the reciprocating engine as to bulk of steam used and power developed. There are other matters, mostly of theoretical nature, also claimed to prove further advantage, but owing to lack of space we are obliged to omit their consideration.

Patented July 23, 1872, by Colonel E. P. Jones, one of the Commissioners to the Vienna exposition from Mississippi. For further particulars regarding proposals for construction, rights, etc., address the manufacturers, the Baltimore Concentric Engine Company, General Wade Hampton, President, care of Carolina Insurance Company, Baltimore, Md.


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# Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH

**TERMS.**

One copy, one year..... $3 00
One copy, six months..... 1 50
CLUB RATES { Ten copies, one year, each $2 50..... 25 00
{ Over ten copies, same rate, each..... 2 50

VOL. XXIX., No. 4 . . [NEW SERIES.] *Twenty-eighth Year.*

NEW YORK, SATURDAY, JULY 26, 1873.


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## FRICTION OF WATER IN PIPES.

In a perfectly straight and smooth pipe, the quantity of water that will be discharged in a given time depends only upon the head. The velocity of the water will be that acquired by falling through the given head, and the quantity discharged will be the velocity multiplied by the cross section of the pipe. Algebraically, these results will be expressed as follows: $v^2 = \sqrt{2gh}$, and $Q = v \times S$, where $v$ is the velocity in feet per second, $h$ the head in feet, Q the number of cubic feet discharged per second, $g$ the velocity acquired by a body in falling one second, and S the cross section of the pipe in feet.

In practice, it is found that the actual velocity with the smoothest pipes made is much less than the theoretical, part of the head being taken up in overcoming the resistance of friction. In the case of curved pipes, there is another loss of head, and consequently of velocity, at each bend. Numerous experiments have been made to determine the amount of this frictional resistance, and formulas have been constructed from the results. These formulas should always be checked by actual experiment, when great accuracy is required, as the results are greatly altered by seemingly unimportant details. Our object, in this article, is to give the best and simplest formulas for general use. Very good tables, showing the amount of water discharged under different heads from pipes of various diameters and lengths, will be found in Trautwine's "Engineer's Pocket Book."

For smooth iron pipes, Prony's formula is as follows: $h = 0{\cdot}00040085 \times L \div d[(v + 0{\cdot}15412)^2 - 0{\cdot}02375)]$, which may be thus translated: To find the necessary head of water to produce a given velocity of discharge, add 0·15412 to the velocity, square the sum, subtract 0·02375, and multiply the difference by 0·00040085 times the length of the pipe divided by the diameter, noting that all dimensions are to be taken in feet.

In 1858, some very interesting experiments were made by the Brooklyn Water Commissioners to determine the friction in pipes, the pipes experimented upon being very much corroded by long use; and, from the data so obtained, Prony's formula was modified to meet this case. The formula constructed from their experiment is: $h = 0{\cdot}00046749 \times L \div d(v + 0{\cdot}397)^2$, or: To find the head corresponding to any required velocity, add 0·397 to this velocity (expressed in feet per second), and multiply the sum by 0·00046749 times the length of the pipes divided by the diameter, in feet. For ordinary use, a much simpler formula, by Mr. Lane, will answer: $h = 0{\cdot}000625 \times L \div d \times v^2$, or: The required head equals the square of the velocity multiplied by 0·000625 times the length, divided by the diameter of the pipe, all measurements being taken in feet.

Knowing the actual head required for any velocity of discharge, we can readily ascertain the head required to overcome friction, and consequently the increased pressure necessary, in pounds per square inch. Thus, the theoretical head (disregarding prejudicial resistances) necessary to produce a given velocity is found by dividing the square of the velocity by 64·4; or, expressed algebraically, the formula is $h = v^2 \div 2g$, and the difference between the actual and theoretical head is the amount required to overcome friction. The pressure per square inch required to overcome this friction is equal to the weight of a column of water of one inch cross section, and with a hight equal to the ascertained head.

In order to render the preceding remarks more intelligible, we will assume data and work out an example by each formula. Length of pipe = 100 feet, diameter of pipe = 3 inches. Required velocity = 2 feet per second. By Prony's formula:

Required head = $0{\cdot}00040085 \times 100 \div {\cdot}25 \times [(2 + 0{\cdot}15412)^2 - 0{\cdot}02375)] = 0{\cdot}74$ feet.

By Brooklyn Water Commissioners' formula:

Head $= 0{\cdot}00046749 \times 100 \div 25 \times (2 + 0{\cdot}397)^2 = 1{\cdot}07$ feet. In this case, the pipes being very much corroded, the resistance is greater, and more head is necessary.

By Lane's formula: Head $= 0{\cdot}000625 \times 100 \div 0{\cdot}25 \times v^2 = 1$ foot. (Pipes in average condition).

A correspondent has asked us what is the difference of friction in a pipe, under 15 pounds pressure and under 150. We will use Lane's formula in making the necessary computations for the answer, though the same method would answer with either of the others.

A column of water, to have a pressure of 15 pounds per square inch, must be about 34·6 feet high. We will assume the diameter of the pipe to be 6 inches, and the length to be 500 feet. Then the formula gives: $34{\cdot}6 = 0{\cdot}000625 \times 500 \div 0{\cdot}5 \times v^2$. From which we find that $v = 7{\cdot}44$ feet per second. The theoretical velocity corresponding to a head of 34·6 feet is equal to the square root of 64·4 multiplied by 34·6, or 47·2 feet per second, and the theoretical head necessary to produce a velocity of 7·44 feet per second is the square of 7·44 divided by 64·4, or about 0·86 feet; so that the head necessary to overcome friction is $34{\cdot}6 - 0{\cdot}86 = 33{\cdot}74$ feet, and this produces a pressure of about 14·6 pounds per square inch.

In the second case, when the pressure on the pipe is 150 pounds per square inch, the head of water will be about 346 pounds per square inch; and substituting this value in the formula, we have: $346 = 0{\cdot}000625 \times 500 \div 0{\cdot}5 \times v^2$. From which we obtain: $v = 23{\cdot}53$ feet per second. The theoretical head required for this velocity is the square of 23·53 divided by 64·4, or about 8·6 feet; so that the head necessary to overcome friction is $346 - 8{\cdot}6 = 337{\cdot}4$ feet, which corresponds to a pressure of about 146·2 pounds per square inch. By comparing the velocities under the two given pressures, it will be seen that the velocity is about 3·16 greater in the second than in the first case, while the pressure necessary to overcome friction is 10 times as great in the second case. Now the square of 3·16 is about 10, and we say that friction in pipes increases as the square of the velocity of discharge. We hope we have succeeded in making this matter plain to our readers. We have given them formulas which apply to the flow of water in iron pipes under various conditions, these formulas embodying the results of the most reliable researches on the subject.

## THE ZODIACAL LIGHT.

The name zodiacal light is given to a faint nebulous appearing radiance, which, at certain seasons of the year, and especially within the tropics, is seen in the west after twilight has ended or in the east before it has begun. The light is conical in shape, the breadth of the base varying from 8° to 30° in angular magnitude, and the apex being sometimes more than 90° to the rear or in advance of the sun.

Very many theories have been adduced to account for the phenomenon. Kepler supposed it to be the atmosphere of the sun. Cassini considered it as a lenticular solar emanation, and Mairan believed it a reflection from the sun's atmosphere, stretched out into a flattened spheroid. La Place, however, founded the theory which astronomers have generally adopted, and in his *Système du Monde* he pronounced it a nebulous rotating ring, situated somewhere between the orbits of Venus and Mercury. It is unnecessary to enter into any discussion of these earlier views, as probably the best records extant which tend to explain the nature of the phenomenon are the observations of the Rev. George Jones, chaplain of the United States Japan Expedition, made on the Pacific Ocean, over an uninterrupted period of two years from April, 1853. Of these we give below the general conclusions in order that the reader may compare them with the theory of a correspondent, Mr. T. R. Lovett, which will be found, with an explanatory diagram, on another page of this issue. We may here remark that the idea therein stated, ascribing the zodiacal light to the reflection of the rays of the sun from the atmosphere, seems to us plausible, particularly as it accounts quite clearly for portions of the phenomena especially noted by Mr. Jones. The pulsations or intermittent variations in luster of the radiance, observed by Humboldt and others, our correspondent ascribes to refraction in the body of the atmosphere, or irregular motion of its surface. Mr. Jones, in referring to the same appearance, speaks of two distinct degrees of luster, a triangle within a triangle, the boundaries of which could be detected. It will be observed, on examining the explanation of the new theory, that these two triangles may be accounted for by the observer seeing both base and elevation of the spherical triangle, reflected from earth to atmosphere and thence to the eye. Again Mr. Jones states that when his position was north of the ecliptic the main body of the light was on the north side of the line, and conversely when he was south of the sun's apparent path; but when he was on or near the ecliptic, the light was equally or nearly divided by that line. Our correspondent's views agree with this, for he considers that when the spectator is in the plane of the ecliptic, that is, when the latter is perpendicular to his horizon, it is the only period when he can see the double light pyramids at east and west at the same time. Mr. Jones says that at midnight he saw the light simultaneously on both eastern and western horizons, which also agrees with the second proposition of Mr. Lovett. The remainder of Mr. Jones' conclusions ascribe the phenomenon to a nebulous ring similar to that which surrounds the planet Saturn. He considers the change of shape of the light due to change of horizon attributable to new portions of nebulous matter coming into position to give visible reflection, while portions lately visible were no longer capable of giving such reflection. The change of shape he believes based on a principle similar to that of the rainbow, the arch of which is new with every alteration of position. Hence the parallax of the light cannot be found. This may be compared with our correspondent's first conclusion.

Mr. Jones alludes to the reflection from the atmosphere theory, but does not believe that the light takes its shape from such cause, because "the lenticular elongation of the earth's atmosphere, consequent upon diurnal rotation, must be directly over the earth's equator; while the course of the zodiacal light shows not the slightest affinity for this line." The other conclusions point out that, as a nebular ray, it cannot lie between the orbits of Mercury and Venus as shown by La Place, that it must be something continuous and unbroken, that Mairan's theory above given cannot be true, that the substance of the light cannot be very remote *from* the earth, owing to its alteration of outline due to change of observer's position, and that it seems full of internal commotions.

## THE GREATEST GAS WELL IN THE WORLD.

The Newton gas well, six miles from Titusville, Pa., discovered last year, still continues to pour forth its gaseous treasures at the rate of three millions of cubic feet of gas every day of twenty-four hours. The gas issues under a pressure of from twenty to thirty pounds per square inch, and for the most part goes to waste. Pipes have been laid to Titusville, and some two hundred and fifty dwelling houses, shops, etc., are now supplied with the gas for illumination and fuel. For heating purposes it is admirable, but for illumination it requires to be passed through naphtha, as it is deficient in carbon.

This well may be justly regarded as one of the wonders of the world. If the bowels of the earth in its vicinity were transparent, and the owners could satisfy themselves of the continuity of the gas flow, we presume that pipes would be laid from the well to several of the large cities, such as Pittsburgh, Cleveland and Buffalo, distant from 130 to 150 miles.

We have heretofore published accounts of the gas wells at Painesville, Ohio, and other places. But we believe that the quantity of gas delivered by the Newton well exceeds the combined supply derived from all other wells in the country

## TO EUROPE BY BALLOON.

We publish on another page a variety of particulars concerning the construction of the great *Graphic* balloon, wherewith Professors Wise and Donaldson intend to attempt the passage of the Atlantic, starting from New York about the 20th of August next.

The only chance for a successful issue of this hazardous voyage, almost the only chance, indeed, for life which the daring aeronauts will possess, depends upon the flotant endurance of the aerial ship. To fortify the apparatus in this respect will be the paramount consideration of the navigators. Doubtless they would be glad to elongate the balloon, provide propellers and steam power, and so continue the experiments in aerial navigation ably begun by De Lôme and others. But the necessities of the present occasion forbid.

The ordinary rotund form of balloon, although unsuited for mechanical propulsion is best adapted for strength as a gas holder, and this is the form that has been wisely chosen.

Professor Henry, writing to the *Graphic*, also to Professor Wise, fully endorses the views of the latter in respect to the existence of constant easterly currents above the earth, and expresses the belief that, if the balloon can be kept afloat long enough, she may be wafted over the ocean to Europe. But he does not recommend the attempt, and, if it must be undertaken, wishes that some other person, in whom he had less personal regard than Professor Wise, were about to make the trial. He thinks that, as preliminary to this ocean voyage, Professor Wise ought to make an overland flight from the Pacific to the Atlantic, a distance nearly equal to the width of the Atlantic ocean.

To this Professor Wise replies that the easterly currents will be found steadier and safer over the ocean than above the land; and he prefers to take the risks of dropping into the sea rather than the chances of bumping against the cliffs of the Rocky Mountains.

In view of the Professor's experiences on his great voyage from Missouri to New York, in 1859, described in our last number, we think his conclusion is correct. He expects to be able to keep afloat in the air for at least ten days, while only three days will be actually required for the great "waft." To us, the probabilities of his success appear to be little better than those of an individual who, in an open boat, without sail or oars, should attempt to float across the Atlantic upon the surface of the Gulf Stream.

## A NEW SUBSTITUTE FOR RUBBER.

Daniel M. Lamb, of Strathroy, Canada, is the author of a method of producing gum from the milkweed plant, or other plants of the asclepia family, and flax and other seeds, which consists by macerating and fermenting the substances and then by evaporation reducing the resulting liquid to a thick gummy mass. The gum thus obtained may be cheaply produced, and is alleged to have many of the valuable qualities of rubber. It is insoluble in water, may be vulcanized with sulphur, etc. The price of pure rubber is now very high, and the discovery of an economical substitute is a matter of the greatest importance in the arts.

J. H. F. reports the discovery of a fossil corn shuck in Missouri. It was found 30 feet below the surface, imbedded in clay.

## SCIENTIFIC AND PRACTICAL INFORMATION.

### OXYMALEIC ACID.

M. Bourgoin gives the above name to a new organic acid which he states differs from maleic acid by 2 equivalents of oxygen, and from malic acid by 2 equivalents of hydrogen. Thus: Maleic acid $= C^8H^4O^8$, oxymaleic acid $= C^8H^4O^{10}$, malic acid $= C^8H^6O^{10}$. The new substance is solid, white, and of an odor similar to that of malic acid. It is very soluble in water, which it abandons on evaporation, under the form of very delicate, long, penniform crystals It is equally soluble in alcohol and in ether, separating itself from the latter vehicle in the shape of elongated crystals grouped in stars.

### NEW QUARRIES OF LITHOGRAPHIC STONE.

New quarries of lithographic stone have quite recently been found in Italy near the French frontier, and on the coast of the Gulf of Genoa; from these it is stated that an excellent quality of lithographic stone has been obtained. This discovery is of great importance, as of late years the supply of this stone, which has been almost exclusively, for European use, obtained from Germany, has been gradually diminishing, in proportion as the beds in that country were depleted.

### MEDICATED CRACKERS.

M. Limousin, a Prussian apothecary, encloses powders, such as quinine, aloes, rhubarb, and other drugs disagreeable to swallow, in crackers. The cracker is split and a matrix made within, in which the powder, carefully measured, is placed. The two parts of the envelope, which is quite small, are then closed together and secured. When taken, it is soaked in water for a moment until softened, then gulped down whole.

### STILL ANOTHER NEW ANILINE RED.

By allowing a few drops of chloride of sulphur to act upon 30 grammes of aniline, the mixture being continually stirred, Hamel has produced a new red dyestuff, which, in 10 minutes, became solid. This body dissolves in acetic acid with a red color, and on evaporating this solution to dryness, a black, glistening mass is obtained. Like most aniline dyes, it dissolves in alcohol, ether, and acetic acid. The study of this interesting compound has not yet been pursued far enough to ascertain its composition, nor can we yet prophesy its future.

### STEEL BOILERS.

The steamboat Mary Powell, running daily on the North river, between this city and Rondout, has recently been fitted with steel boilers. We append the dimensions and weights, which may be interesting to our readers. There are two boilers, of the form known as flue and return tubular. Each boiler has 10 flues of different diameters, 9, 15, and 16 inches, and 80 tubes of 4¼ inches outside diameter. Each boiler is 11 feet front, 25 feet long, and the diameter of shell is 10 feet. The sheets of the boiler are of steel, made by Parks Brothers, of Pittsburgh, and having a tensile strength of 70,000 pounds per square inch. The sheets are $\frac{5}{16}$ of an inch thick. Each boiler has two furnaces, each 8 feet in length and 4½ feet wide. Blowers were used with the former boilers, to promote the draft; but a novel form of steam jet is at present employed, which seems to work very satisfactorily. The grate bars are cylindrical in form on top, and are provided with mechanism so that the fire can be shaken down when it is dull, somewhat after the manner of a grate in an ordinary stove. The boilers weigh 28 tuns each, the weight of the two being 7 tuns less than that of the old boilers. The consumption of coal per round trip is about 24 tuns. The diameter of the steam cylinder is 62 inches, and the stroke is 12 feet. The engine makes 23 revolutions per minute, the steam pressure being between 35 and 36 pounds.

### The Auroral Phenomenon of June 26.

The brilliant aurora borealis of the evening of Thursday, June 26, was accompanied by the appearance of a series of bars of light moving in rapid succession towards the north and disappearing, other bars coming on at the southern end of the series. Mr. G. Meyer, of Richmond, Mich., Rev. A. S. Talcott, of Garretsville, Ohio, Mr. H. P. Cobb, of Northville, Mich., and Mr. J. D. Beck, of Liberty, Pa., have reported the singular phenomenon to us, it being visible at the respective localities under slightly various forms.

### A New Steam Organ.

Thomas Winans, of Baltimore, the well known railway contractor, machinist, etc., is building, for his private music hall in the above city, a gigantic organ. It is to be worked by steam power. It will have twenty-five bass pipes each two feet square and thirty two feet long. It is to be finished within a year, and it is expected that it will be a roarer. Compared with it, the great organ of Boston will dwindle into insignificance.

M. KRUPP has just insured his steel factory at Essen, in twelve German companies, to the amount of $5,697,912. This sum includes the value set upon only the portions of the establishment liable to destruction by fire, and not that of the steam foundery, railroads, telegraph lines, canal system, special shops, and metal stock.

PHINEAS ALLEN, JR., for many years editor of the Pittsfield (Mass.) *Sun*, died in that town on July 4. The *Sun* was founded by and preserved in the Allen family for a period of 73 years, having been established in 1800.

THE extensive collections and preparation of mosses, made by the late William S. Sullivant, were bequeathed to Harvard University.

## THE GARDNER GOVERNOR.

The invention illustrated in the annexed engravings is a new steam governor, which combines in its construction several points of advantage and merit. Among these may be noted a stop motion, by which the valve is closed down on its working seat when the governor belt breaks, instead of closing against another seat by the falling of the balls; a valve seat of hardened steel, or other durable metal, secured in a novel manner, and a facing of the valve with the same material, together with its mode of application; and, lastly, a hollow clamping or fastening stem for securing the valve seat, arranged to receive a guide stem for the lower end of the valve.

The illustrations are perspective, Fig. 1, and sectional, Fig. 2, views of the device. A is the hollow balanced valve contained in the chamber as shown. B is the inlet pipe, and C the conduit to the engine; D is the valve rod communicating with the weighted lever, E, Fig. 1, which serves to open the valve. The latter is closed by the rod, F. The fulcrum of the lever, E, consists of a tubular piece, G, fitted on a cylindrical rod secured to the plate, H, so that the tube can fall when required to do so, and will be regulated by the air cushion formed in its interior. In order to hold this fulcrum up in the required working position to cause the balls to regulate the valve, the frame is arranged so that it can turn on the plate, H, by a socket in its lower end, I, fitting over a stud on said plate. On the frame is an arm, J, which holds the fulcrum up by pressing under a flange or shoulder formed upon the tubular piece, G, Fig. 1. This arm is constantly borne in the direction to maintain the cylinder in such elevated position by the strain of the belt on the driving wheel, K, the belt being purposely so arranged.

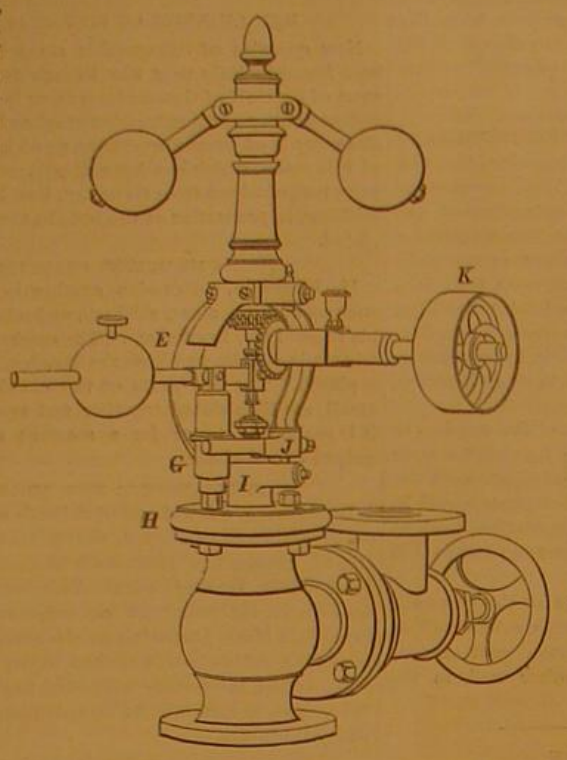



FIG. 1.

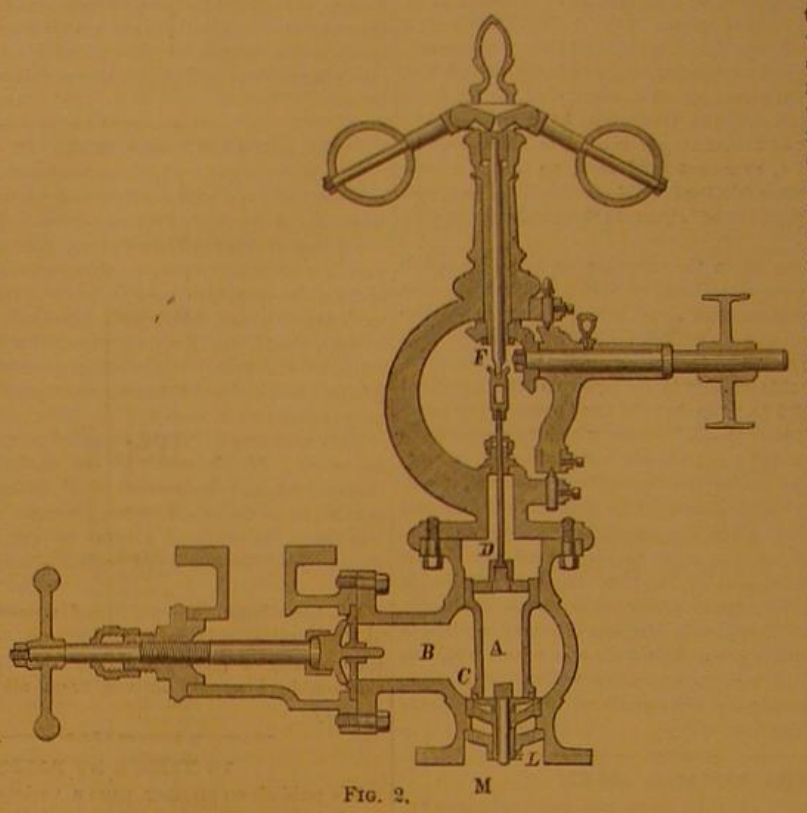



FIG. 2.

The shoulder on the tube, G, is beveled, and the arm, J, is rounded so that the gravity of the weighted lever will constantly cause the latter to swing back and let the lever fall, closing the valve, when the frame is relieved of the strain of the driving belt by its breaking or running off the pulleys. The arm may be reversed on its application to the stand of the governor frame, so that the belt may be applied from either of two opposite directions.

The valve seat is made of hardened steel or American Sterling metal, in order to resist the cutting and wearing tendency of the steam. It is secured in place without the use of screw threads by seating it in a rabbet in the casting, and clamping it therein by the spider, L, fitted in a reverse rabbet in the steam tube below. A stem passes down through the spider and is fastened by a nut at its lower end. The valve is re-enforced by a ring face of metal similar to the above, held by the clamp shown, which is screwed up by a nut on the stem, M, which is fitted in the hollow stem of the valve seat to guide the lower end of the valve. The ring may be reversed, after being worn out on one side, and a new face presented.

It is claimed that, by having the valve close for stopping the engine on the same seat with which it acts to regulate the quantity of steam, not only is the cost, of the extra seat commonly used, saved, but the opening of the valve wider before closing (together with the long movement usually made, causing the racing of the engine before its motion is arrested) is avoided. The trouble and delay due to the balls falling to the stop plane, and thus unnecessarily stopping the engine when a heavy load is thrown on with low steam, are also, it is stated, prevented by raising the valve by the weighted lever.

Patented through the Scientific American Patent Agency, May 20, 1873. For further information address the inventor and manufacturer, Robert W. Gardner, 424 Maine street Quincy, Ill.

### New Ozone Generator.

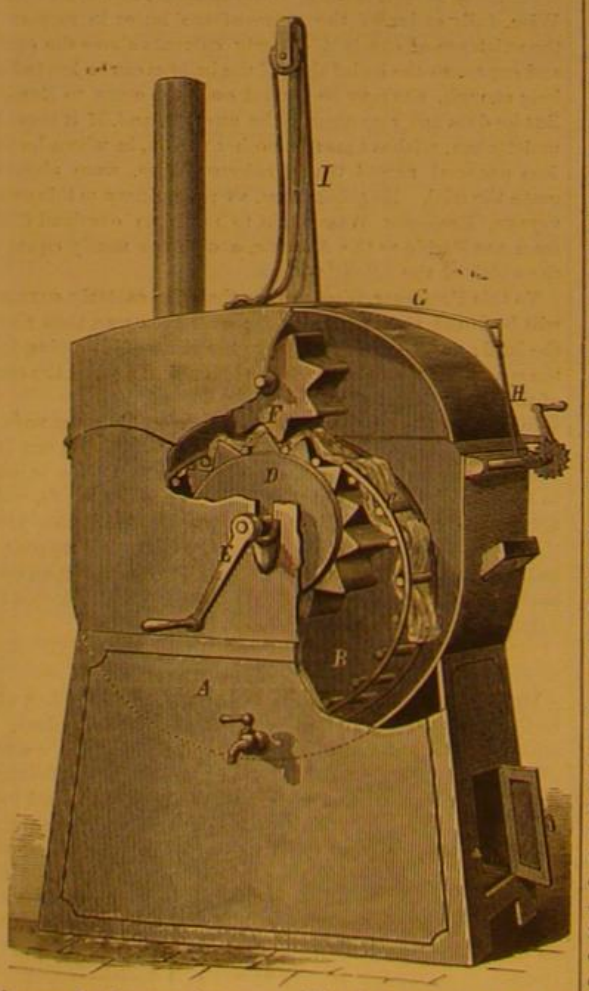
Siemens' tube consists of a piece of glass tube, with an annular coating of tinfoil on the exterior; in the interior is a carefully turned brass box, slightly smaller than the glass tube, and tinned to protect it from the action of the ozone. Through this box, a current of ice-cold water can be passed, so as to prevent the heating of the apparatus, the oxygen or air passing through the annular space between the box and the glass tube, which is fitted with caps and tubes for that purpose. The brass box and tinfoil coating are connected with the induction coil in the usual way. This apparatus yields large quantities of ozone with great ease, and appears to be more powerful than either of the other forms with the same battery power. Paraffin should be used for the joints, because, as pointed out by Sir Benjamin Brodie, that hydrocarbon is unattacked by ozone.

### Nose Bags for Horses.

In New York city and other busy places, it is common to supply horses with their necessary noon luncheon of oats by means of a canvas bag, made like a bucket and hung, from behind the animal's ears, over the nose. To secure a mouthful, the pony is obliged to give the bag an upward toss, which fills his mouth but, at the same time, throws out and wastes a portion of the feed. The aggregate waste of oats in this city alone, from the common nose bags, is estimated at fifty thousand dollars a year. A variety of devices have been invented to prevent this loss, one of the latest being that by H. D. McGovern, of Brooklyn, N. Y., who puts an additional bottom within the bag, on which the oats are placed. Under this bottom is a spiral spring. The weight of the oats compresses the spring, which expands as fast as the oats are eaten, thus keeping the supply always at the same level within the bags. The principle is the same as the spring candle holders for coaches and cars.

## IMPROVED WASHING MACHINE.

This invention is another recently patented apparatus for washing clothes, which may be used either with or without a furnace for heating the water. The clothes may be boiled, washed, and afterwards wrung out in the same receptacle.




The furnace or fire box is shown in our illustration under the washing vessel, A. The latter is circular at its lower portion, and is provided with a suitable cover. Within it is a loose open cylinder, B, which is formed by connecting two rims with transverse rods, C. B is a corrugated wheel revolved by the crank, E. F is another and similar wheel journaled in the cover, the corrugations of which correspond and engage with those of the wheel, D, from which it receives motion. The cylinder, B, is larger in diameter than the wheel, D, by which, it will be seen, it is revolved, and also broader, so that there is space for the length of the teeth of the wheels between the rims. It is supported on the bottom of the vessel by rollers, to prevent undue friction.

In this cylinder, the clothes to be washed are placed and secured by the rods, C. Thus contained, the garments are carried around between the corrugated wheels, and at every revolution are dipped into the water in the vessel, A. As they pass between the wheels, any required amount of pressure can be applied by means of the spring, G, attached to the cover. A cord, H, is attached to the end of the spring, and is secured to the ratchet wheel crank shaft, as shown.

The vessel, A, is made of metal, so that, if necessary, the water may be kept at the boiling point and even a pressure of steam may be obtained, thus quickly cleansing the clothes. Wringing is effected by turning the crank back and forth so that the articles are squeezed between the wheels and not allowed to dip into the water.

I is a stand attached to the side of the machine, which is provided with a pulley and hooks for raising the wheel and cylinder from the vessel, slots being made in the sides of the latter, which allow the journals of the wheel to be raised clear therefrom, so that the receptacle may be used as an ordinary wash tub or boiler. The faucet shown serves to draw off the water, and the pipe to carry off the smoke.

Patented by Mr. Alfred L. D. Moore, of La Grange, Fayette county, Texas, who may be addressed for further particulars.

## THE TUNNICLIFFE FIRE ALARM.

One of the simplest and, to all appearances, most effective devices for giving timely alarm, in case of fire breaking out in a building, is the ingenious little invention the name of which forms the heading of this article. It is nothing more than a cylindrical barrel some three inches long by an inch and a half in diameter, which, by a screw attached midway along its length, may be readily secured to the ceiling or any part of the room desired. An engraving of the article may be seen on the back page of this number. It is made of malleable iron, with a smooth bore, and contains, when ready for use, a small charge of powder, to which is attached an inch of fuse. This fuse is formed of a chemical mixture that will ignite whenever the surrounding atmosphere is heated to 200° Fah.; that is to say, it is kindled by merely heated air, and at a temperature less than that of boiling water. In case of fire, the heat, which ascends at once to the ceiling, quickly ignites the fuse, and causes the required explosion to take place before the flames can get beyond a point at which they may be quenched by a pail of water.

The discharge of one of these protective instruments makes a report as loud as that of an army musket loaded with a regulation cartridge, sufficiently loud to be heard all over an ordinary four story building. The alarms can be so arranged as to ring bells in any desired room in the building where placed, and have already been attached to wires connected with burglar alarms in both stores and residences.

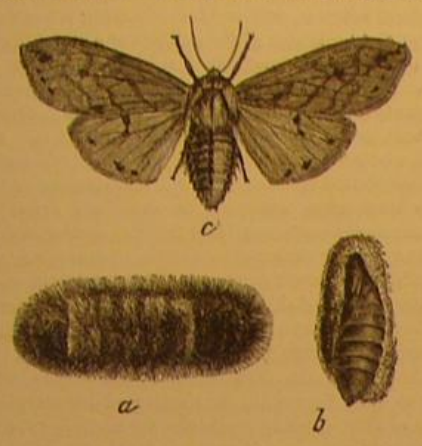
We recently took occasion to examine the working of this alarm at the manufacturer's, 697 Broadway, this city, where the alarm may be seen in operation any day; and by testing the degree of heat with a thermometer, we found that the fuse exploded and fired the instrument as soon as the specified limit of temperature was attained. We were assured that neither charge nor priming deteriorates by age, and that the explosion was unattended with either danger or marring of the wall. Many officers of insurance companies have recommended the adoption of the device as a preventive against fire. From an inspection of its operation, we are inclined to consider the invention as of considerable utility and merit. Its employment in the localities where many of the greatest conflagrations have originated would doubtless have been the means of timely warning and thus have prevented the vast losses which ensued.

From the Fourth Annual Report of Charles V. Riley, State Entomologist of Missouri.]

## THE ISABELLA TIGER MOTH.

The larva of this insect, *a*, is very common with us, and is familiarly known as the hedgehog caterpillar. It is thickly covered with stiff black hairs on each end and with reddish hairs on the middle of the body. These hairs are pretty evenly and closely shorn so as to give the animal a velvety look; and as they have a certain elasticity, and the caterpillar curls up at the slightest touch, it generally manages to slip away when taken into the hand.

It feeds on plantain, clover, dandelion, grasses, and a variety of other plants, and after passing the winter in some sheltered spot, rolled up like a hedgehog, it comes out

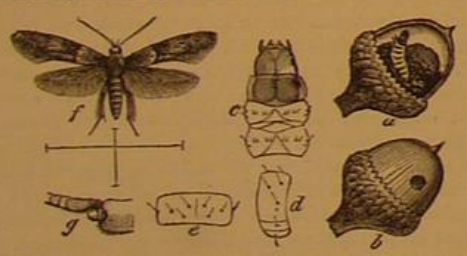



The Isabella Tiger Moth—*Arctia Isabella*, Smith.—(*Lepidoptera, Arctiadæ.*)

in the spring to feed upon the first herbaceous vegetation, and finally spins its cocoon (*b* represents one cut open, giving a view of the chrysalis) and goes through its transformations. The cocoon is composed principally of the caterpillar's hairs (which are likewise barbed) interwoven with coarse silk. The chrysalis is brown with tufts of very short golden bristles, indicating the positions of the larval warts, and with a tuft of barbs at the extremity. The moth is of a dull orange color, with the front wings variegated with dusky, and spotted with black, and the hind wings somewhat lighter and also with black spots.

### THE ACORN MOTH.

The mast, which is so valuable to the swine breeder in the oak land sections of Missouri, is often very seriously affected and greatly diminished in quantity by the workings of the larva or grub of a species of long snouted nut weevil (*balaninus rectus*, Say.) The female, with her long bill, pierces a hole in the young acorn, and deposits therein an egg which gives birth to a legless arched grub with a brown head. This grub devours during the summer the contents of the acorn, and in the autumn drops, with the rifled fruit, to the ground, where it soon gnaws its way out through a circular hole and buries itself for the winter. It becomes a pupa in the spring, and eventually issues as a beetle.




The Acorn Moth.—*Holcocera glanduiella*, Riley.—(*Lepidoptera, Tineidæ.*)

After the original depredator has vacated its tenement, a little guest moth comes along and drops an egg into the already ruined acorn. The worm hatching from this egg grows fat upon the crumbs left by the former occupant, rioting amid the refuse and securing itself against intruders by closing, with a strong covering of silk, the hole which its predecessor had made in egress. In the winter time, or in spring or early summer, the farmer, who notices three fourths of the acorns under his trees infested, as they have been for the past two years, by this worm, is very apt to consider it the true culprit, whereas it is rarely if ever found in acorns that have not first been ruined by the weevil above mentioned, or injured by some other insect, or in some other way.

This after comer is of a yellowish or grayish white color, often with dark marks on the back, a light brown head, and a horny piece of the same color on the first and last joints, and small hair-emitting dusky points over the body, *c d e*. It is, withal, easily distinguished from the weevil larva by its full complement of six true and ten false legs. It changes to the chrysalis within its borrowed domicile, and the chrysalis gives forth the moth by first pushing partly through the silken door.

The moth, *f*, is ash gray in color, and characterized chiefly by two distinct spots near the middle of the front wings and a transverse pale stripe, well relieved behind, across their basal third. The male differs from the female by the basal joint of his antennæ being much flattened and articulating with the stalk by means of a nodule, *g*. The moths issue all along from the end of April till September. They vary much in size and conspicuity of design.

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JOHN E. LAUER, of New York city, produces the acid phosphates for yeast powders by treating bone black first with sulphuric acid and afterwards with muriatic acid.

# Correspondence.

[For the Scientific American.]

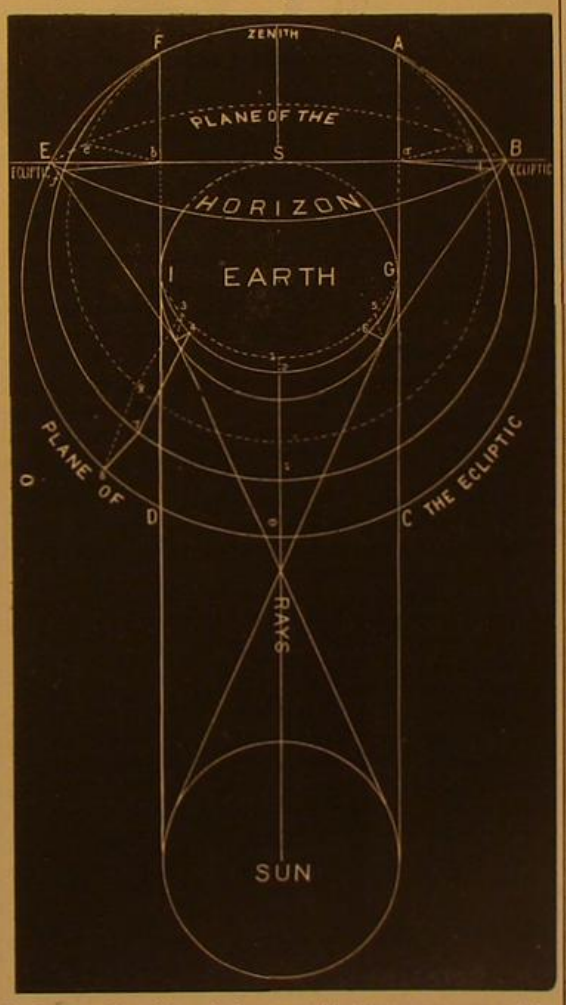
### Explanation of the Cause of the Zodiacal Light.

What is known as the zodiacal light is an optical phenomenon caused by the reflection of the rays of the sun from the earth, upon the atmosphere and thence to the spectator.

For the purpose of illustration I have taken the case of the "double light" (a pyramid in the east and one in the west at the same time), as a knowledge of the principle involved in the formation of the double light includes that of the single pyramid.

The most favorable condition under which the zodiacal light can be seen is when the spectator's position is in the plane of the ecliptic, and this is probably the only position from which the double light can be seen at all, the plane of the ecliptic being then perpendicular to the spectator's horizon.

The figure annexed is a representation in perspective of the plane of the horizon (the spectator's station being at S, the earth), showing the lune, G 1 I 2, from which the rays are reflected, as regards the spectator; the atmosphere, A B C D E F, showing the portion illuminated by reflection from the lune, 4, 7, 8, 9, 3, being a section in the plane of the spectator and the sun. The portion of the illuminated atmosphere which alone will be visible to the spectator, at S, will be those parts illuminated by the reflection from the portions of the lune included in the spherical triangles, 5 G 6 and 3 I 4, all the rest being below the plane of his horizon; the reflected rays, 5 *c*, 6 *d*, 3 *e* and 4 *f*, are omitted to avoid confusion in the lines. The visible parts will, therefore, appear to him in the form of the two pyramids, A *a d* B *c*, and F *b f* E *e*, their bases, *a d* B *c* and *b f* E *e*, resting on the horizon, and their apices being limited by the thickness of the atmosphere, *a* A and *b* F. It is evident, therefore: (1) That any deviation of the position of the spectator from the plane of the ecliptic would be attended by a simultaneous change in




the form and position of the pyramids, in consequence of the change in the form of the lune. (2) The double light could only be seen at, or about, midnight, as at that time the spectator is directly on the opposite side of the earth from the sun, and the lune, therefore, is perfect. (3) The intensity of the light would vary according to the nature of the portion of the surface of the earth from which the rays were reflected at the time, as land, water, etc. (4) The brightest part of the pyramids would be the center of the base, on account of the greater thickness, as regards the spectator at S, of the illuminated portion of the atmosphere through that part, that is, along the lines *a* B and *b* E. (5) On the same principle, the moon should also give a zodiacal light. The most favorable time would be when the spectator's position was in the plane of the moon's orbit, a short time before her rising or after her setting, and about the time of the full moon. The moon, however, could not give the double light, because, she being much smaller than the earth, the cusps of the lune would not embrace the whole of the semi-circumference of the earth, and therefore the reflection could not reach that part of the atmosphere above the plane of the spectator's horizon.

The pulsations noticed by some observers are, without doubt, the effect of refraction, either in the body of the atmosphere, or perhaps caused by the irregular motion of its surface (atmospheric waves).

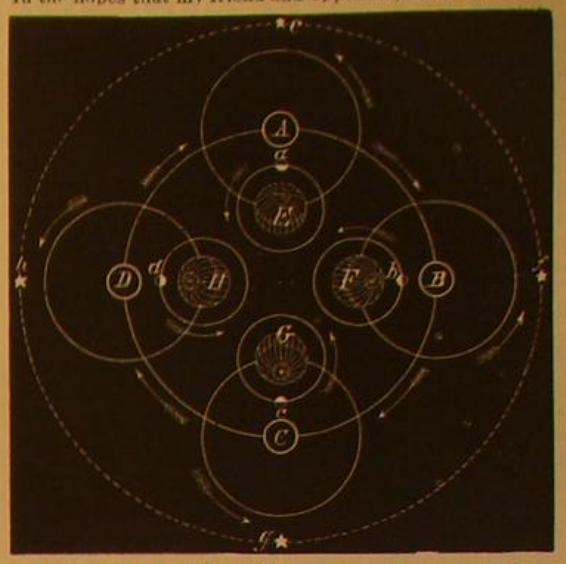
Query: May not the tails of comets be accounted for upon similar principles? In the case of some comets, the enormous length and rapid changes of these supposed appendages appear to indicate the earth's atmosphere as the medium of the second reflection. The question can only be decided by observation. T. R. L.

Mount Airy, Philadelphia, Pa.

### Retrogressive Motion of the Sun.

*To the Editor of the Scientific American:*

In the hopes that my friend and opponent, C. H. B., would




have favored me with his full name, or at least would have replied to me privately, I withheld sending you my diagram showing how precession of the stars is produced by the retrograde motion of the sun. But as he has not complied with my wish, neither opposed me, so far as I know, publicly, and as other astronomers have expressed much surprise at my views and doubts as to their truthfulness (one actually predicts my defeat in case C. H. B. replies): I now present my diagram; and if it fails in one single iota to come up to all the demands of Nature, so far as precession of the stars and recession of the equinoxes is concerned, I will be more than obliged to C. H. B., friend Swift, or any one else to point me to that defect. Instead of a defeat on my part, I am sure of success, and that, no doubt, C. H. B. is beginning to see, or else I am far mistaken; and so will all competent judges, when they study the subject as it deserves.

A B C D in the figure represent the sun in four points of his retrogressive orbit, 90° apart from each other; E F G H represent the earth invariably at her summer solstice, as she is carried backward, as it were, in her orbit, by virtue of solar motion; and *a b c d* represent the moon at four different points of her orbit, also 90° apart from each other, where she will eclipse the sun; *e f g h* represent stars in the ecliptic, or in a circle surrounding the pole of the ecliptic, also 90° apart from each other. The dotted circle represents the ecliptic, the larger ring the orbit of the sun, the lesser rings the orbit of the earth, and the smallest ones the orbit of the moon, and the arrows the direction of movement, respectively, of sun, earth, and moon.

From this it will be seen at once that as A (the sun) retrogrades toward B, the star, *e*, together with all the others, will, as it were, advance eastward; and their rate of apparent motion will be in proportion to that of the sun's real motion. For instance, when the sun reaches B, he will have completed one quarter of his orbit, or 90° of it, and so the stars will have advanced 90°. To move from A to B will take the sun about 6,467 years, and the same time to move from B to C; and so on all around, completing his orbit in 25,868 years. For every ninety degrees the sun retrogrades, ninety degrees is cut off the earth's orbit, as it were. In other words, for every quarter of an orbit the sun completes, the earth comes to her equinoxes one quarter of a year sooner than she would do if the sun were standing still, or if he were pursuing a straight forward course. And so, for every full orbit he makes, the year of the earth is completed 365¼ days sooner than it would have been had the sun been fixed in space. Thus we have 25,868 solar years in 25,867 sidereal years. The truth stands then that, as solar time is prolonged to the amount of one day (less 20 minutes and near 23 seconds) by the motion of the earth direct around the sun every year, so solar time is shortened to the amount of one day in 25,868 days and to one year in the same number of years, by the sun's retrogressive movement in space.

It will now be seen that the so called retrograde "wabble" of the earth is not a gyration, as Newton supposed and as his followers still imagine, but that it is simply a change in her parallelity of polar position, gradually and surely brought about by the retrograde motion of the sun. Precession of the stars and recession of the equinoxes is not therefore peculiar to the earth; but is alike common to and performed in the same length of time by all the planets of our system.

Will C. H. B. or any other interested astronomer be kind enough to examine this theory fairly and minutely, and then answer "yea," or "nay" to it, through the SCIENTIFIC AMERICAN, and they will very much oblige its humble author? JOHN HEPBURN.

Gloucester, N. J.

### Location of the Million Dollar Telescope.

*To the Editor of the Scientific American:*

Mr. Alvan Clark, in a letter to *Appleton's Journal*, calls attention to the main difficulty attending the use of great

telescopes, namely, the "everlasting commingling of warmer and cooler portions of atmosphere between the object glass and object."

This atmospheric disturbance may be very much lessened by selecting a proper place for the observatory.

Professor Young finds the air at Sherman station, U. P. R. R., to be much clearer than at the Eastern seaboard, and those who have visited the parks of Colorado will remember the great brilliancy of their star light.

It is only necessary to immolate, in the interest of science, a sufficient number either of gentlemen of the Signal Service or volunteers, each on his mountain top, from Pike's Peak to the Himalayas, to find localities where Professor Tyndall himself could not object to the want of optical purity in the atmosphere.

The telescope being once established on its distant peak among the upper trade wind currents, and adjusted for pho tography, we may all look at once, by using ordinary and well known processes. Each photographic picture, as taken, is to be sent all over the world by copying telegraph, and published next morning in the newspapers. The operations are as follow:

1. A negative is taken, either with instantaneous or very short exposure, and either photo-lithographed, or copied by a gelatin relief print.

2. The print is electrotyped or pressed.

3. The electrotype is gradually cut away by the sharp pointer of a copying telegraph, and simultaneously engraved on a steel cylinder, by a similar machine at each receiving station. This cylinder may then be printed from, or treated as any other engraving.

The great accuracy of workmanship required for these relay engraving engines may be readily attained by milling machines with shaped diamond cutters. S. H. M., JR.

### The Kromschroder Gas.

Several new methods of producing gas for illuminating purposes have of late been brought before the public, and among others is the process invented by Mr. Kromschröder. This consists in simply passing air through the vapor of a light hydrocarbon, the two combining and forming a gas of high illuminating power. The process has been in operation for about three months at Great Marlow, in Buckinghamshire, where we had the opportunity of examining it on Saturday last. The town of Great Marlow, however, has only been lighted regularly with the new gas for the past three weeks, its previous use having been intermittent and experimental, the ordinary coal gas having also been used. So successful, however, were these experimental trials that the Kromschröder gas is now regularly consumed, and the manufacture of coal gas is discontinued. The apparatus for the production of the gas is of a very simple character, and is erected in the gas works of the town. It consists of a sheet iron chamber 5 feet long, 4 feet wide, and 3 feet 6 inches high, the lower portion being 2 feet wider than the upper part for a hight of about 12 inches. In the upper chamber is placed a valve arrangement driven by clockwork and by which atmospheric air is forced into the lower or enlarged portion. Here it is made to pass through a mass of open fiberous material, the lower part of which is kept immersed in a liquid hydrocarbon. The air in its passage combines with the vapor of the hydrocarbon in the proportion of 70 parts of air to 30 of the vapor. In this condition the gas—for such it has now become—is conducted from the mingling chamber by a pipe into a receiver, capable of containing 100 cubic feet of the gas. As soon as this receiver is filled, its contents are discharged into the gas holder which was formerly used for the storage of coal gas, and which has a capacity of 6,000 feet. The reason for having the intermediate receiver is that the incorporating apparatus, although of ample power for producing the required quantity of gas, does not give sufficient pressure to lift the large holder, which is 30 feet in diameter. The time required to fill the large holder, or, in other words, to manufacture 6,000 feet of gas, is five hours. From the large holder the gas is supplied direct to the town, there being no purifiers or other apparatus required. The four main requirements in a gas for illuminating purposes are quality, cheapness, permanency, and capability of travel. As regards the first point, it was shown by photometric experiments that, with a burner consuming 3½ feet per hour, a light equal to twenty candle gas was obtained, which is charged to consumers at 3s. 3d. per thousand feet, and this solves the second point. The permanency of this gas has been proved by allowing it to remain for three weeks in a holder subjected to the various temperatures, when a loss of 33 per cent was found to have been sustained. Lastly, it has been made to travel through 4½ miles of pipes, and from its nature there is no doubt that it will travel any reasonable distance. The success of the gas is stated by its inventor to be due to the exact proportioning of the air and hydrocarbon vapor, a result he has only arrived at after several years of careful experimental research. Those proportions are, as already observed, 70 parts air to 30 of the vapor. To insure this result a hydrocarbon of constant specific gravity is used, that gravity being 6 70. Mr. William Bruff, C. E., is interesting himself in this invention, and it is from his experiments that the foregoing conclusions are deduced. The photometric experiments were witnessed and checked by ourselves. In the evening a drive round the town enabled a very satisfactory opinion to be formed of the gas as an illuminator, which opinion was strengthened by the use of the same gas at the hotel where the party of engineers and scientific gentlemen who had been inspecting the gas dined. Mr. Kromschröder, who explained the process of manufacture, observed that the gas is designed not so much to supersede coal gas in large towns as to afford a means of cheap gas light where coal gas could not be had. So far as the experiments go, the Kromschröder gas would seem well adapted to this purpose, and we wish its inventor success.—*Engineering.*

### NEW TURKISH BATH.

The Turkish bath, as commonly practiced, consists in placing the patient in an apartment heated by stove or pipes to a temperature of 110° to 120°; in a short time, as soon as the pores begin to open, the patient passes into a still hotter chamber, where there is a temperature of from 150° to 210°. Here he remains until profuse perspiration is induced, and then, if he desires, enters a room heated still higher. He then passes into a wash room having a reduced temperature, is washed with warm water, then cooled with the spray bath; he then plunges into a swimming bath at the ordinary atmospheric temperature, which completes the ablutions.

The Turkish bath is a beautiful luxury and has but one discomfort, to wit, the highly heated atmosphere of the perspiring chambers. This is very oppressive to many persons; and to provide a portable bath as well as to overcome the difficulty just mentioned is the object of the present improvement, made public in the British *Medical Journal*:

A is the carriage upon which the bath rests, the wheels of which are so arranged that the whole apparatus can be turned completely round in a space little more than its own length. B, the frame and spring mattrasses fitted with centers to the carriage A, and forming the bottom of bath. C, enamelled metal cover, hinged to the frame B, forming chamber for heated air. D, waterproof and airtight apron




to prevent escape of heated air at the top of the bath. E, cistern for shower bath. F, pillow, with hinged head board to turn up when the bath is not in use. G, rack and pinion for raising or lowering the bath to the level of a bed, for use of an invalid. H, heating apparatus.

This invention is designed to supply to the public a portable Turkish bath in a complete and simple form. The advantages of the patent over the ordinary public Turkish bath are these: The heat can be raised in less than ten minutes to 180° Fah., and to the full temperature of 220° Fah. in fifteen minutes. The heat is obtained from gas, spirit, or other suitable means; it is under perfect control, and can be maintained at any degree, up to 220 Fah., that may be required. A shower bath is attached, by means of which a copious discharge of tepid or cold water can be obtained, suddenly or gradually, at the pleasure of the bather or attendant.

The head may, if required, be kept out of the bath in cool air. The bath offers in this respect one of the advantages of the sand bath, in which the entire body, with the exception of the head, is covered. It is probable that the therapeutic effects of the bath, with and without the exposure of the head to the heated air, may be very different.

### Heating Power of Different Fuels.

A practical method of determining the heating power of fuel has recently been given by E. Seidler in the *Zeitschrift für Zucker Industrie.* The object is attained by first drying some 100 lbs. of the fuel at 1,000°, and noting the loss in weight; then by burning a measured amount, 2,000 lbs. for instance, weighing the ashes and cinders, and, after allowing ¼ per cent for ashes carried off by the draft, calculating the amount of combustible in the fuel; for example, supposing the fuel was found to stand as follows: Water, 40·75 per cent; ashes and cinders, 17·0 per cent; ashes carried off by draft, ·25; total, 58·0 per cent, leaving 42 per cent of combustible in the fuel; 2 per cent may be subtracted from the percentage of ashes and cinders for the coal which falls between the bars of the grate. For peat, multiply the percentage of combustible thus formed by the factor 7, and deduct from that the percentage of water in the fuel, to arrive at the amount of water in pounds which will be evaporated by one pound of the fuel; for example, in the above case, 0·42 × 7 = 2·94, which —0 4075 = 2·5325. A tun of such fuel then will evaporate 2000 × 2·5325 = 5065 lbs. water at 0°, deve'oping 5065 × 640 = 3,241,600 heat units. If the water used is run into the boiler at a higher temperature, 20° for example, the amount that can be evaporated by one tun is

$$\frac{3,241,600}{620} = 5228 \text{ lbs.}$$

### EN ROUTE TO THE GREAT EXPOSITION.—LETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON.

NUMBER 2.—Continued

LONDON, JUNE 10, 1873.

The day in Glasgow afforded time to visit the great shipbuilding establishment where Randolph and Elder did so much toward the introduction of the "compound" engine and of iron ships, and to see the University of Glasgow where James Watt worked as a repairer of instruments, and where he made himself a name more enviable than was ever won by the sword, and not less enduring.

#### GLASGOW UNIVERSITY

has just been driven from the old structure which has so great historical interest, and is just becoming reëstablished in a noble pile of buildings at the summit of a high hill at the extremity of a beautiful park, at the west end of the city, where its surroundings are quite in keeping with the architectural beauty of the edifice itself. The new university buildings will, when completed, have cost about one and a half millions of dollars. Something more than one half the sum was contributed by the public spirited citizens of Glasgow. The floor space amounts to about six acres. The buildings are as convenient in their interior arrangements as they are beautiful on the exterior, and the visitor is compelled to admire alike the intelligence which has sustained and encouraged the growth of this noble institution and that which conducts its academic course. (We published an engraving of this structure on page 179 of our volume XXVII.)

The old model of the Newcomen steam engine, which, when sent to Watt for repair, first attracted his attention to the defects of then existing machines for applying the power of steam, and prompted him to make the intelligent investigations which led him to its improvement, is carefully preserved here; and we stood by it a long time, examining with interest its every part, and enjoying, with rarely equaled pleasure, the many historical associations which it brought to mind. We were pleased to learn that nothing, among the large and interesting collections of the University, attracts more attention from visitors than this battered and discolored old model.

#### THE LATE PROFESSOR RANKINE.

The University has met with a serious loss during the past year in the death of Professor Rankine, who will be ever remembered as one who, at the time of his death, had done more than had ever been done before in the application of science to practical investigations, and, particularly, as the first to give practical shape to the known scientific principles involved in the construction of steam and other heat engines, and in naval architecture. The city of Glasgow should build a monument to his memory, nobler than any of those which now adorn St. George's Square.

#### SHIPBUILDING ON THE CLYDE.

In our journey to and from Govan—the village just below the city, in which the shipbuilding establishment of Elder & Co. is situated—we counted some fifty iron steamers, in all stages of construction, and probably one third more might be laid down in the yards. Business has been severely checked by the recent rise in price of stock and labor, in consequence of strikes here and in the iron and coal producing districts. Very little new work is projected, and the consequences of the movement seem likely to be a serious loss of trade and much consequent suffering among the working people who are daily being thrown out of work. Iron which, a year ago, was worth fifty or fifty-five shillings a tun to-day costs a hundred, and all other expenses have risen greatly, and sometimes proportionally. Contracts are therefore made elsewhere, and Glasgow workmen must suffer at home, or must emigrate to some busier spot, unless a change for the better takes place here.

Elder & Co. now employ some 2,500 men, and have facilities for employing 6,000 or more. They are building seven or eight ships, and have room to lay down a half dozen more. Their new engine shop is one of the finest in the world, and is splendidly arranged for their work. Traveling cranes, radial drills, steam riveting machines, and very large planing and slotting machines are well placed, and small tools in considerable variety, but not equally creditable in design and construction, are placed out of the way on lofts, above the larger tools.

This firm began many years ago the construction of the compound engine, and were among the very first to make it a specialty. They were a long time pushing it into use, but the introduction of surface condensation in sea going vessels, and the gradual rise of steam pressure which succeeded, enabled them to exhibit more and more convincingly the economical superiority of that plan, and they are now reaping the harvest which they fully deserve. They do more work by far than any other firm on the Clyde.

A large amount of capital is invested in Glasgow in other branches of industry, one of the most important being the manufacture of chemicals. Her manufactures and her commerce have, together, produced rapid growth in wealth and population. The city now contains nearly 600,000 people.

> "See what a change trade's golden wand can do!
> As if by magic, make a village spring
> To all the glories of a capital."

We were able to spend a few hours in Edinburgh, and there visited the old castle, the history of which is so familiar to every school boy. Thence we came to London by night train. It was by no means a comfortable ride, for the managers of the road have not yet exhibited a very strong desire to make their patrons comfortable, and have not introduced sleeping cars. R. H. T.

## ON GIRDERS AND FLOOR BEAMS.---THE EFFECT OF CROSS-BRIDGING.

MASON CITY, IOWA. June 5, 1873.

MESSRS. MUNN & CO., New York city:

*Gentlemen:*—A building having joists 28 feet long, 2 inches x 12 inches, has a stringer 20 feet long, 6 inches x 8 inches, running crosswise and under the joists, supported at each end vertically. How much greater weight, if any, would it support at the center—weight being made to bear on two joists only—by having the stringer securely fastened to each joist, without weakening the joists or stringer? The joists are common pine; the stringer is of yellow pine. The joists are 16 inches apart.

There is a great difference of opinion; please give yours as fully as will explain the above. Very respectfully,

A. S. CHINES.

REMARKS BY THE EDITOR.—In the examination of this question, it is evident that if the "joists" or floor beams are so disconnected that when the load is applied it deflects only the two beams upon which the load rests, then attaching the "stringer" or girder to the other beams will increase the strength, and consequently the load upon the floor may be safely increased.

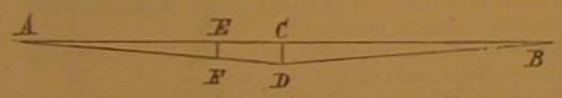
This will be apparent upon a consideration of the relation between the load and its resistance. The resistance to the downward movement of the load is that possessed by the timber. Timber has a limited power of resistance to deflection. The load it will carry is measured by the measure of this resistance.

Now the girder has a certain amount of resistance, and each of the floor beams has its resistance; and it is evident that, as the whole is greater than a part, so the girder assisted by all the beams will be stronger than if assisted by only two of them. The floor, therefore, will carry an increased load in consequence of attaching all the floor beams to the girder.

As to the amount of the increase in the load, that will now be considered.

Experiment has shown that within the limits of elasticity the deflection of a beam is directly in proportion to the weight laid upon it. For example: If 100 pounds deflect a beam one inch, 200 pounds will deflect it two inches, and so in like proportion for all weights and deflections.

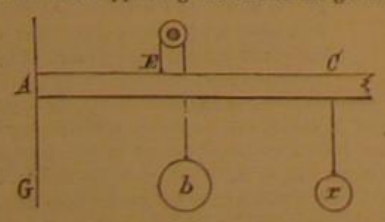
Now, of the several beams attached to the girder, the service that each will render, in resisting the weight, will be in proportion to the distance it is deflected. The beams will all be deflected just as much as the girder is, but the amount of deflection which each will sustain will be according to its position upon the girder, the greatest deflection being at the middle of the girder, and thence each way to the ends, the deflection gradually diminishing to nothing at the ends. In deflecting the girder the upper surface becomes curved, and an ordinate to this curve, drawn at each beam, measures the deflection of that beam. But to avoid the intricacy involved in obtaining these ordinates, it will be sufficient for the present purpose to consider the top of the girder as not curved but declining from each end in straight lines to the point of greatest depression at the middle. Thus in Fig. 1, if ADB be the top line of the girder when deflected by the load at the middle, then CD will be the deflection at the middle, and EF the deflection at E. AEF and ACD are similar triangles, therefore their corresponding lines are in proportion, thus, AC : CD : : AE : EF; or, putting for these several lines respectively the letters $l$, $a$, $m$, and $b$, then $l : a : : m : b$, from which $b = a\frac{m}{l}$. This expression gives the value of the line EF, drawn at any distance from A, and hence may be used to obtain the deflection of each beam located anywhere from A to C.




This gives the deflections, but inasmuch, as before stated, the weights are as the deflections, therefore $a$ and $b$ are in proportion as the weights which deflect the two beams at E and C; or when, by any scale, CD measures the weight which is required to produce the deflection, CD, in a beam crossing the girder at C, then will EF by the same scale, measure the weight required to produce the deflection, EF, in a similar beam crossing the girder at E; or $b = a\frac{m}{l}$, when $b$ equals the weight at E, and $a$, that at C.

By this formula, the resistance which each beam exerts may be ascertained. But this resistance is that which is exerted by each beam at its location; while the weight to be resisted is not at the beam, but at the middle of the girder. The resisting power, therefore, will have to act with leverage, and this leverage will now be considered:

Let AC, Fig. 2, represent one half of the girder, and AG the face of the wall supporting one end of the girder:




Let a weight, $b$, equal to the resistance exerted by a beam located at E, be suspended by a rope over a pulley, the other end of the rope being attached to the girder at E. The weight, $b$, may thus represent the resistance exerted by the beam located at E; and when there is an equilibrium between this weight and the weight, $r$, suspended from the middle of the girder, then $r$ will represent the weight at the middle of the girder which will be sustained by the resistance of the beam at E. To obtain the value of $r$, it may be observed that the weight, $b$, acts with the leverage, AE. Let $m$ represent this distance. The weight, $r$, acts with the leverage, AC, or half the girder, equal to $l$. Now, when there is an equilibrium, the product of one weight into its leverage equals the product of the other weight into its leverage, hence $bm = rl$, from which, $r = b\frac{m}{l}$.

Substituting, in this expression, for $b$, its value $a\frac{m}{l}$, as before found, then $r = a\frac{m}{l}\cdot\frac{m}{l} = a\frac{m^2}{l^2}$.

In this expression, $r$ equals the weight, at the middle of the girder, which will be resisted by any one of the beams crossing the girder at the distance $m$ from A; and $a$ represents the weight which will be resisted by a beam located at the center of the girder. From this expression the resistance of each beam may be had. In order to gather the several resistances in one, let the beams as they cross the girder divide it into equal spaces, and let $c$ equal one of these spaces. Now the distance AE, Fig. 2, from the end of the girder to the location of one of the beams will contain a certain number of these spaces. Let $n$ equal this number; then $cn$ will equal $m$, the distance AE, and may be substituted for it, thus: $r = a\frac{m^2}{l^2} = a\frac{c^2n^2}{l^2} = n^2\frac{ac^2}{l^2}$.

In this expression, $a$, $c^2$ and $l^2$ are constants; that is, for any given case, they will not change, in the application of the formula to each beam. For convenience, let $t = \frac{ac^2}{l^2}$; then $rn^2 = t$.

For the first beam from the end, $n = 1$, for the second beam, $n = 2$, for the third, 3, and so on to the middle of the girder.

Now, in this case, there are 14 beams crossing the girder. 7 on each end, or 6 besides the 2 nearest the middle which carry the load.

The several values of $n$, for these six beams, are 1, 2, 3, 4, 5, 6; and the several values of $n^2$ are 1, 4, 9, 16, 25, 36.

The sum of the resistances, therefore, of the six beams, is

$$R = 1t + 4t + 9t + 16t + 25t + 36t.$$
$$R = t(1 + 4 + 9 + 16 + 25 + 36).$$
$$R = 91t.$$

The sum of the resistances of the other six beams being the same, therefore, for the twelve beams, $W = 182t$, or, substituting for $t$ its value: $W = 182\frac{ac^2}{l^2}$.

The value of $c$ for this case is 16 inches, $= 1\frac{1}{3}$ feet, and $c^2 = 1\frac{7}{9}$. The value of $l$ is 10, and of $l^2$, 100.

The value of $a$ is to be obtained from* $a = \frac{Enbd^3}{l^2}$, in which $b$, $d$, and $l$ respectively stand for the breadth, depth and length of the beam; E is a constant, derived from experiment, and for white pine equals 1750; and $n$ is the rate of deflection per foot of the length of the beam.

If the rate of deflection in the girder, which is 20 feet long, be assumed at 0·04 of an inch per foot, then the rate of deflection of a beam at the middle of the girder will be 0·0286, the beam being 28 feet long; therefore $n = 0{\cdot}0286$. The beam being $2 \times 12$, $b = 2$, and $d = 12$; also $l = 28$. Therefore $a = \frac{Enbd^3}{l^2} = \frac{1750 \times 0{\cdot}0286 \times 2 \times 12^3}{28^2} = 220{\cdot}63$.

Therefore $W = 182\frac{ac^2}{l^2} = 182 \times \frac{220{\cdot}63 \times 1\frac{7}{9}}{100} = 713{\cdot}86$.

This is the additional load at the center due to the assistance afforded by the 12 beams.

The resistance of the girder and that of the two beams may now be ascertained. For one of the two beams, the same formula will serve as for each of the others, thus, $r = a\frac{n^2c^2}{l^2}$. In this case $n = 7$ and $n^2 = 49$, therefore $r = 220{\cdot}63\frac{49 \times 1\frac{7}{9}}{100} = 192{\cdot}19$. And $2 \times 192{\cdot}19 = 384{\cdot}38$ = the resistance afforded by the two beams. The formula $W = \frac{Enbd^3}{l^2}$ will give the resistance of the girder. The girder is of yellow or Georgia pine; for this wood, $E = 2970$. The value of $n$ is, as before assumed, 0·04, and $b = 6$, $d = 8$, and $l = 20$. Therefore $W = \frac{2970 \times 0{\cdot}04 \times 6 \times 8^3}{20^2} = 912{\cdot}38$.

The several results are as follow:

| | |
|---|---|
| The resistance of the girder | 912·38 |
| The resistance of the two beams | 384·38 |
| Girder and two beams | 1296·76 |
| The resistance of the 12 beams | 713·86 |
| Total resistance is | 2010·62 |

Or, in round numbers, the girder and two beams will sustain safely 1,300 pounds; but if aided by the other beams, as proposed, they will sustain 2,000 pounds. The addition is about 65 per cent. Stronger beams would make the percentage of increase higher.

The question discussed in this article is essentially that of the value, in a tier of beams, of what is known as "cross bridging;" for when beams are braced to each other by this device, they each help to sustain any concentrated weight.

SCREWS IN PLASTER WALLS.—W. A. A. of Hartford, Conn., states that screws are best inserted in plaster by making the hole large enough and driving in a wooden plug. It is better to split the plug and cut a groove in each half.

* *American House Carpenter*, page 206. (38.)

### The Patent Law Discussion.

A correspondent, E. A. B., of Georgia, writes as follows, in regard to the first question propounded by the Secretary of State (see page 7 of our current volume): "Is the protection of inventions by patents just and expedient, and, if so, on what grounds?"

"There are two theories on the subject, of which yours is one. I will say a few words about each in turn. 1. One is expediency, held by you. If, as you say, patents are a 'tyranny,' no expediency could make them other than a wrong. If we use the word expediency to signify the advancement of men, moral, then mental, then material, it never could be gained by violation of men's rights. Men have not 'equal rights;' they have merely an equal claim to justice or to defense of their rights. On the ground of expediency, men cannot be made to feel an obligation to sustain patent or other laws. It is sometimes said that, when regulations of expediency become the law of the land, it is thereby made a duty to obey them. But this goes on the supposition that the claim of a government does not depend on the justice of its laws, but the justice of its laws depends on its will. This makes all forcible revolutions, without exception, wrong; and its operation would have for ever prevented free government. Expediency does, however, help to determine all questions of human property.

2. The other theory puts patents, along with other property, on the ground of men's convictions of right. Men do, in a thousand ways, show that they have the conviction that what any person produces by his sole work is rightfully his property. But this principle alone will not serve as a basis for men's property, either in ideas or things material. Ideas are mere abstractions, and property does not consist in abstractions. Property is exclusive, and different men might have the same ideas. As to the material property of men, it cannot rest on the mere conviction that every person rightfully owns what he produces by his sole work. Since men cannot create, in the proper sense, it is clear they cannot by their sole work produce anything. They must have material and instruments, and a right to them. Thus neither theory alone is sufficient foundation for any right of property. But put the two together and they are worth something. The ownership is in the Creator of the world, and of course He could convey it to men. That laws recognizing and protecting ownership in men do advance men's interest, moral, mental, and material, in the order named, is a proof or sign that God designs to convey ownership. For, on any view of God, held by civilized people, He designs the progress, first moral, then mental, then material, of all who aim thus to advance; and this is best furthered by laws recognizing and protecting property. God designs that manufacturers should pay wages to the inventors for the mental labor of the latter, as well as to operatives for their manual labor, as He designs that the public shall pay the manufacturers for their goods. We know that God wills it because the legitimate interests of human beings are advanced by it, or, in other words, it is expedient in every sense.

Whenever we cannot get any work voluntarily done which the permanent interest of the public demands, without recognizing some right of property, it is a sign that right exists. It is very desirable to keep the popular discussion of this matter from getting on metaphysical grounds. If those who see that it is impossible to settle any question of property without using the argument from expediency would guard their language and call expediency merely a sign or token of existing right, not the origin of right, they would keep off metaphysical ground. It would also conduce to the same end if men would not talk of 'right of property in ideas,' but of the right of inventors and authors to wages.

The first subject of inquiry consists really of two vastly differing questions. That patent laws are expedient, I have assumed because I was discussing the right, and it was necessary to show its relation to expediency. But the existence of expediency is one of the points of inquiry."

### New Method for Boot and Shoe Heels.

John Blakey, of Leeds, England, has lately patented in this country a method or process of forming heels or heel lifts for boots and shoes, by first cutting, from waste scraps of leather, small pieces of appropriate size and shape; next, compacting and solidifying such pieces into a solid bar, with or without a wooden core, by means of adhesive material and pressure; next, drying the same, and then cutting or sawing the same into heel lifts of the desired thickness.

### A New Motor.

Louis Charles Errani and Richard Anders, of Liége, Belgium, have patented in this country a new motor, operating as follows: Oil is sprayed into the cylinder behind the piston, and, being mixed with air, is ignited at the proper point by an electric device; the consequent expansion drives the piston forward, the momentum of the fly wheel returning it to its first position. An ejector supplies the oil from the tank to the sprayer, the ejector being connected to a piston blower driven by a crank attached to the main shaft. The general principle is the same as the gas engine.

IT appears from the researches of Dr. D. J. Macgowan, of Shanghai, that the medical virtues of fish oil as a cure for lung complaints was known to the Chinese many centuries ago. But instead of codfish, they take the oil from the shad. Acting on this hint, our apothecaries may perhaps be saved the necessity of sending to Newfoundland for their supplies, as the waters of the Hudson, Connecticut, Chesapeake, and other rivers will afford an abundance of the medicine.

J. M., of Cal., "hopes that the circulation of the SCIENTIFIC AMERICAN will increase till it is read by every mechanic in the land."

### PATENT VENTILATING AND HEATING STOVE.

The improved form of stove to which the accompanying engravings refer is claimed by its inventor to both heat and ventilate the apartment in which it is placed, to prevent gases from rising in the room, to insure an even and uniform temperature, and also to be cleanly and easy in management. The construction is such as to cause a down draft of air through the fuel, which, the cover being removed, is placed in the basket grate shown in the sectional view. The rear portion of this receptacle, it will be noticed, consists in a single plate, opposite to the smoke escape pipe. Beneath, the stove is hollow, so that the ashes fall down into a drawer or box placed in the ash pit.

In kindling a fire, small coal is first put in the grate, and then the kindling wood, and paper above. On applying the match, the cover is replaced, and the draft is regulated by the apertures therein. In a few moments, it is stated, the downward current of air causes a bright clear fire, and carries away with it all gas due to combustion. The latter has no means of escape except through the apertures above, where it is driven back by the draft and through the small pipe, where it makes its exit. After the fire is well started, the cover can be removed and the coals exposed, giving all the cheerful appearance of an open grate.

Air being drawn in only from above, the cold floor drafts, drawn from under doors and other openings by ordinary forms of stoves, are prevented. Moderation of the entering current is effected both by the orifices in the cover and those in front of the ash pan, the latter allowing a counter flow of air to enter the chimney without passing through the fuel.

No shaker is needed, so that the grate is easily cleaned, and its contents pushed down into the ash pan by an ordinary poker, thus avoiding the dirt and deposit of dust caused by violently agitating the ashes. When the fire is out, the stove may be emptied without touching its interior with the hands.

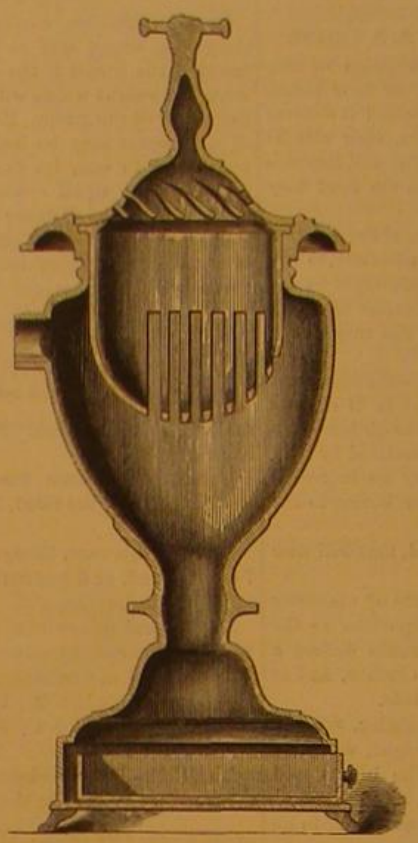
For light housekeeping, it is believed that the device is well adapted, and that broiling or frying can be accomplished with great facility. In sleeping apartments, this stove will doubtless be found an excellent arrangement, as its action is to draw off the foul de-oxygenized air. Its appearance, as represented in our engravings, is both neat and handsome, and much more ornamental than the ordinary cylindrical form; and in principle it is quite a novelty.

Patented through the Scientific American Patent Agency, June 3, 1873. For further particulars address the inventor, Mr. T. H. Salmon, 180 West Baltic street, Brooklyn, N. Y.

*Fig 1*



*Fig 2*



THE SALMON PATENT VENTILATING STOVE.

### AUTOMATIC CAR COUPLER.

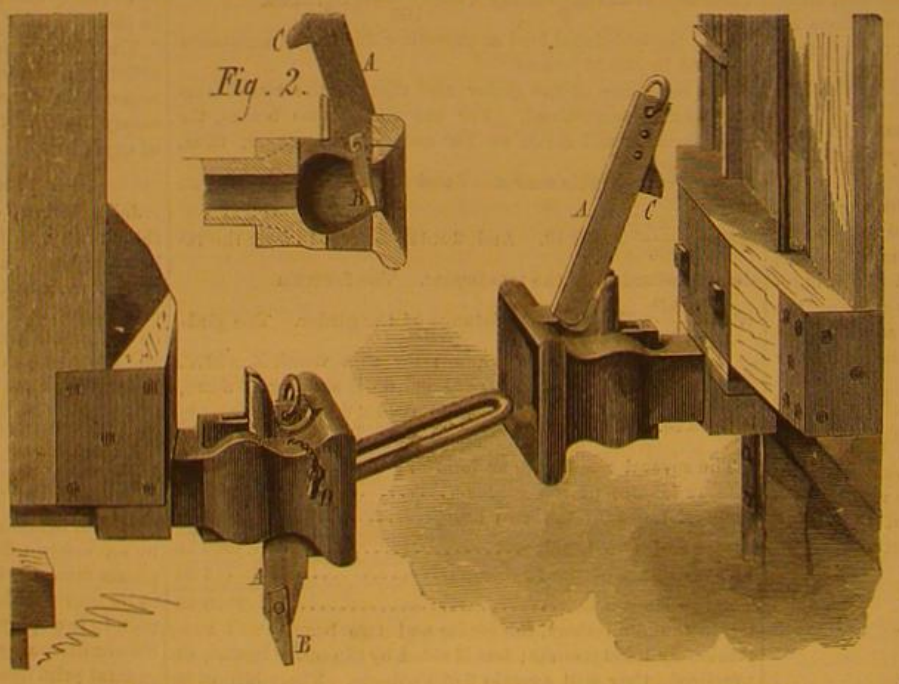
Our engraving illustrates a device for coupling cars which, it is claimed, will instantly attach cars of different hights even if the difference in level of the drawheads be as great as sixteen inches. The drawhead employed is of cast iron and of the same formation as the ordinary hand coupler, and, it is stated, can be put on old trucks without any difficulty or additional expense.

The pin, A, is of steel, flat sided, and is of greater strength than the ordinary round bolt. As it has to be raised ten inches before the link can be withdrawn, possibility of accidental uncoupling is precluded. B is a revolving tripper attached to the lower end of the pin which, when the pin is set as shown in section in Fig. 2, hangs across the opening of the drawhead. On the entrance of the link the lower extremity of the tripper is pushed to the rear, so that, in revolving on its pivot, its upper end meets the iron of the head. The effect of this is to push the bottom of the pin back, dislodging it from its rest, when, by its gravity, it falls through the link.

In uncoupling, the pin is drawn up as high as it will come, when the notch cut in its lower end catches on top of the drawhead. The tripper then hangs across the latter, and the top of the pin, as represented in the engravings, inclines slightly to the rear. In this position, it is claimed that the cars can be backed for any distance without throwing the pin. The link can then be withdrawn, the tripper breaking away to the front, leaving the coupling in position for action whenever a link enters the drawhead.

A flange, C, is made on the pin, which, when the latter is down, rests upon the link, holding it in position to enter the opposite drawhead. The pin is perforated with quadrated holes for the insertion of the small bolt, D, so that the link may be adjusted, as shown on the left of the large engraving, at proper angle to suit a higher bumper. This arrangement of the link does not interfere with its up and down play suiting it to the motion of the cars.

*Fig. 2.*




INGE, WHEELER & CO.'S AUTOMATIC CAR COUPLER.

It is claimed that the disconnection can be effected equally as well from the ground, platform, or from the top of box cars, and that the link, having increased play, is prevented from becoming bent or broken in use by the drawhead riding it. The device will couple or run on any curve. The cars can be coupled to old hand couplers with greater ease, less danger, and more rapidity, and a whole train may be connected by a single stroke of the engine. Straight or crooked links of sufficient lengths may be employed.

This coupling is in use on the New Orleans, Jackson, and Great Northern, the Mobile and Ohio, the Pennsylvania Central, and other railroads, and we are informed that it has proved in every way successful. Other advantages claimed are simplicity, durability, and cheapness, together with complete immunity from the accidents due to the employment of hand couplers.

Patented by Inge, Wheeler & Co., May 7 and August 6, 1872. For further information address James A. Wiggs, Secretary of the Memphis Automatic Car Coupling Company, Memphis, Tenn.

### Vermilion for Dental Purposes.

Having recently seen the statement, that the use of the red sulphide of mercury for artificial gums was highly objectionable, as it might produce salivation, I wish to state, that this fear, in my opinion, is altogether groundless. The sulphide of mercury is very insoluble, even in concentrated acids, and not attacked by alkaline fluids; besides, in the case of gums, each particle is surrounded, so to say, by a film of india rubber, which helps to protect it from being acted upon, if such were necessary at all. I have made very large quantities of vermilion and always taken care to protect the workmen from the effects of the mercury itself, but have never been able yet to prevent them from handling the vermilion rather carelessly, or from inhaling some of the dust; but, in spite of these highly unfavorable circumstances, the first case of mercurial poisoning has yet to make its appearance. I have had the same men in my employ for years, and they all enjoy good health.—*Dr. Alsberg in American Chemist.*

### The Condition of the Earth's Interior.

It seems now to be demonstrated by astronomical and physical arguments—arguments that are independent, it should be noted, of direct geological observation—that the interior of our globe is essentially solid.

The condition of the earth's interior here recognized is, as many readers will have observed, that suggested long ago by Professor W. Hopkins—the author who first offered (1839) a mathematical argument in favor of the earth's either having a very thick crust or being solid throughout. In a paper on "Theories of Elevation and Earthquakes," in 1847, Professor Hopkins argues that the central mass of the earth became solid in consequence of the pressure whenever the temperature within reached a limit that permitted of it; that crusting at surface from cooling commenced afterward; and that between the regions of interior and exterior solidification, there long remained a viscous layer, which, in the progress of time, was gradually contracted by the union of the solid nucleus to the thickening shell.

The possibility of solidification at center from pressure, in the face of a temperature too high for consolidation from cooling, has not been experimentally demonstrated. Yet a number of facts favor the principle. It has been urged that since the solidification of rocks is attended by contraction, that is, by increase of density, and since pressure tends to produce this greater density, therefore pressure may bring about the condition of the solid. The fact that ice, which has less density than water, changes to water under pressure, has been appealed to in support of the conclusion. The pressure to which the material within the earth is subjected is so great that experiment can never imitate it, or directly test its effects. Beneath only one hundred and fifty miles of liquid rock, it would be not less than one million of pounds to the square inch. Less than this may have been sufficient to produce crystalization, and so give rigidity to the viscous rock material, or at least so, after the cooling the earth has undergone. The rigidity of slowly solidified rock is beyond that of glass or steel—of the degree which, according to Sir Wm. Thomson, must exist in order that the earth should be as completely free as it is from tidal movements in its mass.

According to the above, the solid part of the globe consists as regards origin, of three parts.

The central mass, consolidated by pressure; the solidification centrifugal, or from the center outward.

The crust proper, consolidated by cooling; the solidification centripetal, or from the surface inward.

The outer crust, or superficial coatings—the supercrust—made chiefly by the working over and elaborating of the material of the surface through external agencies, aided by the ever-acting lateral force from contraction, and including all terranes from the Archæan upward.—*Professor James D. Dana, American Journal of Science and Arts.*

### Wellesley College.

This is a new institution at Needham, Mass., endowed by Henry F. Durant, and intended for the collegiate training of young women. All the instructors are to be women. The building is in the form of a double cross, five stories high, 600 feet long, 150 feet wide, fitted with all the best modern appliances for lighting, heating, and ventilation. Very many of the studies will be elective, but the classics, chemistry, and probably moral philosophy, will be obligatory. The pupils are to be taught cooking and all the higher kinds of housework, and are themselves to do all such work, in the manner of the Mount Holyoke seminary, where experience shows that one hour a day for each girl is sufficient for household duties. The fees have not yet been fixed, but will probably not exceed $250 a year. The college is to open next year.

THE City of Washington, a large steamer plying between Liverpool and New York, went ashore in the day time, July 5, during a dense fog, on the coast of Nova Scotia, 70 miles from Halifax, and 30 miles from the spot where the Atlantic was wrecked in April, 1873. No lives lost.

THE Cincinnati (Ohio) Industrial Exposition opens September 3, and closes October 4.

THE Louisville (Ky.) Industrial Exposition opens September 2, and closes October 11.

## GREAT BALLOONS.

The construction of the great *Graphic* balloon in this city, in which Professor Wise is soon to attempt the passage of the Atlantic ocean, lends new interest to the general subject of aerial navigation.

One of the most successful efforts in this direction was that of M. de Lôme, made last year in France. We present herewith an engraving of his aerial ship, from the London *Graphic*. We also give some explanatory diagrams and references, with a full account of the voyage, taken from *Science Record* for 1873:

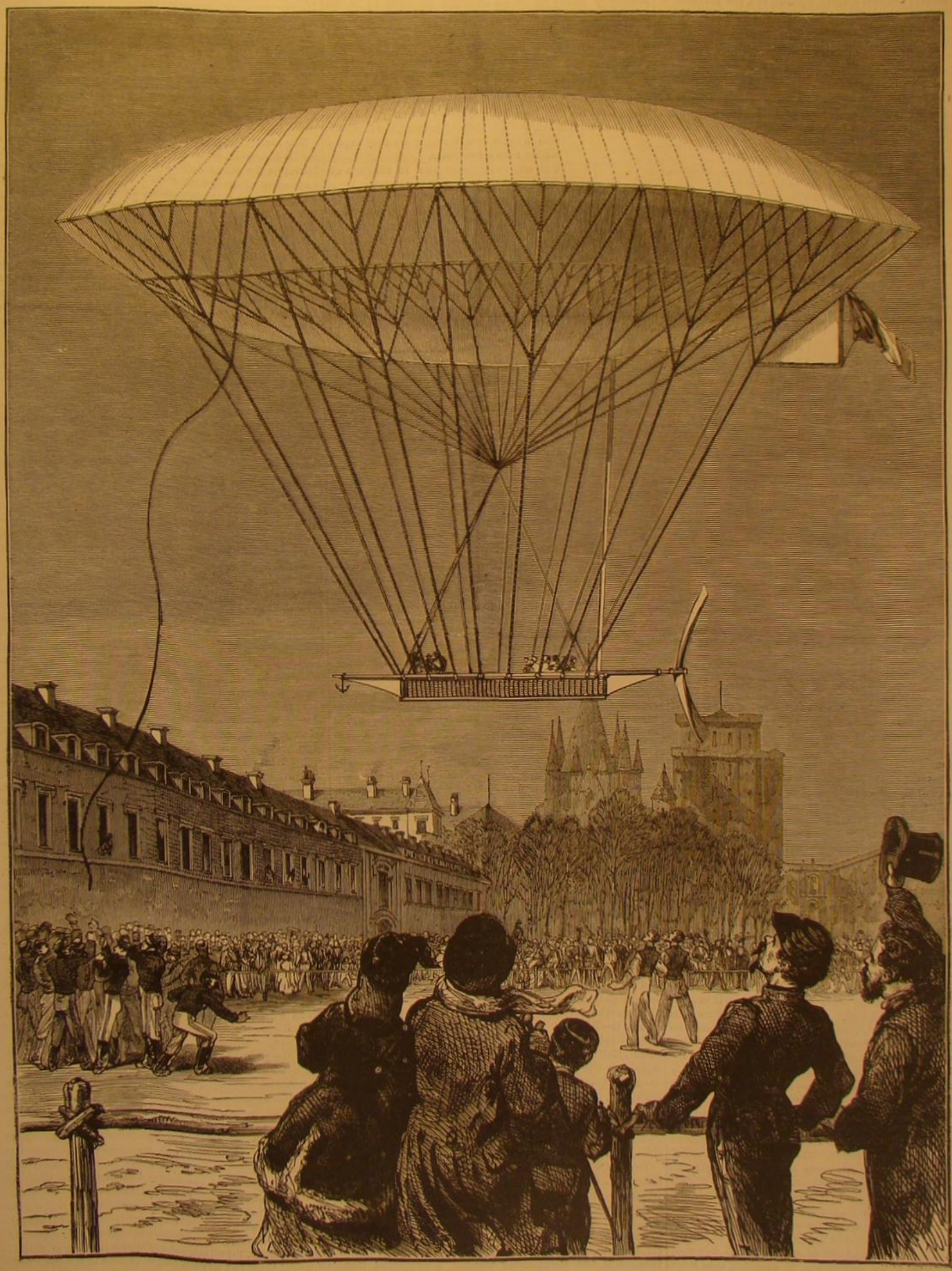
### SUCCESSFUL VOYAGE OF AN AERIAL SHIP.

In continuing the record of what has been done, at home and abroad, to subjugate to man the dominions of the air, we must give attention to the most perfect of aerial machines yet constructed—the aerostat of M. Dupuy de Lôme.

Hydrogen gas was employed, and was obtained by the action of sulphuric acid and water on iron turnings, the gas being afterward washed and dried. The balloon consists of white silk taffeta, lined with india rubber, and again with nanzouk; and to the nanzouk lining, a varnish composition is applied.

That the plane of movement shall be directly under the control of the aeronaut requires that much less resistance should be presented to the air than is the case with the ordinary balloon, and careful calculation led to the following dimensions: Length, 118 feet 6 inches; diameter at center, 48 feet 8 inches; the area of section through the center being 1,862 square feet, and the volume 121,983 cubic feet. M. de Lôme, in his original paper, shows that to obtain a speed of about 5 miles per hour it is necessary to maintain a motive power equivalent to 217 foot pounds per second (about $\frac{2}{5}$ of one horse power), this motive power being preferably obtained from manual labor utilized in rotating a shaft to which is attached a two-bladed screw. By calculation, values were obtained, giving as a result that, for a speed of 5 miles per hour, the labor of four men in turning the winch is necessary, and 8 men for a speed of 6½ miles an hour.

M. Dupuy de Lôme has found that a balloon to be successfully navigated must always be maintained at an equal degree of inflation, in order that the resistance to which the



M. DUPUY DE LOME'S GREAT AERIAL SHIP

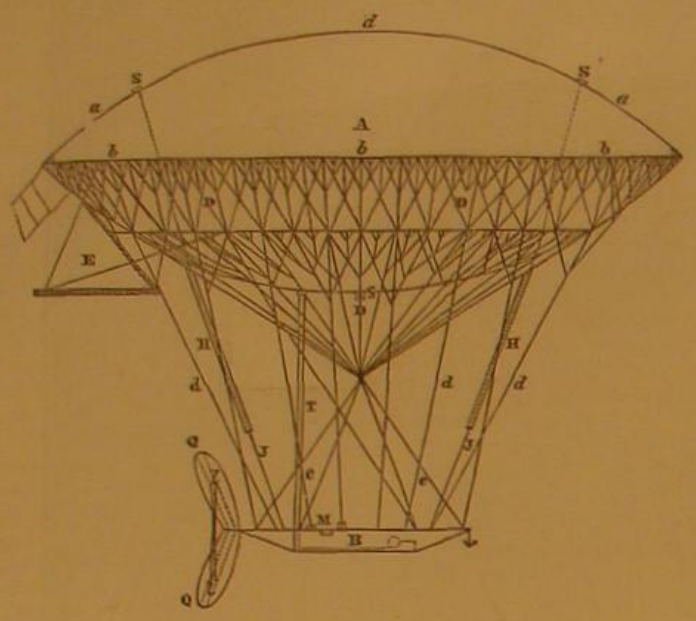
balloon is exposed in its passage through the air should remain constant, and capable at any moment of being defined. The balloon, at starting, being inflated fully with hydrogen, the constant degree of inflation is preserved by means of the hanging tubes, H H. These tubes have the ends open, and are pendant about 25 feet below the balloon. As the gas expands it forces itself down these tubes, while its own pressure in the tube reacts upon the body of gas in the balloon, preserving such an excess of interior pressure as prevents the shape of the outer covering being altered by the wind. Still further to maintain a constant surface there is provided a small internal balloon (termed a *ballonnet*), which, as the gas escapes, through diminution of pressure from the primary balloon, can be filled with air. As the gas expands in the larger balloon it would be forced out of the pendant tubes, were it not that a valve, opening at a low pressure, is attached to the ballonnet. The ultimate proportions of the aerostat, as given by M. Dupuy de Lôme, are:

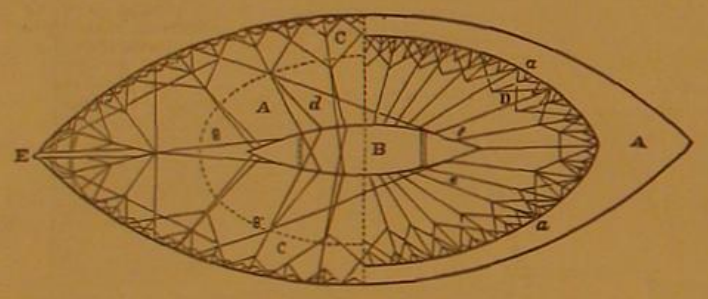
Hight from top of balloon to keel of car, 95½ feet.

Distance between screw shaft and major axis of balloon, 67·1 feet.

Distance of major axis from the center of gravity of complete machine (without ballast), 51 feet.

The rudder is a triangular sail of 161¼ square feet area, manipulated by cords from the car.




A, the balloon; B, the car, with D, the net work; *a a*, taffetas covering; *b b*, collar attaching the upper netting to the covering of balloon; *d d*, silken ropes suspending the car; *c c*, balance ropes for the car; S, small internal balloon, with line of intersection with the balloon; E, gaff sail, or rudder; H, pendant tubes, the length of which regulates hight of the column of hydrogen; J, the cords regulating the valves, S; T, tube for filling small balloon with air; M, crank for working the screw, Q; *l*, stays, strengthening the screw.

We come now to the description of the journey actually undertaken in this machine, premising that instances of so complete a fulfilment of calculation are very rarely occurrent.

The ascent took place from the Fort Neuf of Vincennes. The crew consisted of 14 men, with baggage and provisions weighing 1·13 tuns. There were on board MM. Dupuy de Lôme, Zédé (*Ingénieur de la Marine*), Yon, and Dartois, aeronauts. The instruments weighed 1·75 tuns, and there were 0·27 tun of packages to be carried to the destination of the balloon. The total weight, with 0·59 tun of available ballast, amounted to 3·74 tuns, and the balloon, when thus ballasted, had an ascensional force sufficient to keep it in equillibrium close to the ground. In the first ascent 3 cwts. of ballast were thrown out, the balloon rising from the earth on February 2, 1872, at 1 o'clock. From 1 o'clock to about a quarter past but little more was done than to admire the graceful evolutions of the machine, and the readiness with which it answered to both helm and screw. At 1 hour 15 minutes observations were commenced, and showed the car to be 1,837 feet above the departure station, and moving in a northeasterly direction with a speed of 39 feet per second. The course was then altered to the southeast, at an angle of 83° with the former direction. The number of men working the screw, at 25 revolutions per minute, was eight, the aerostat moving with regard to the earth at a speed of 52·5 feet per second. Afterward this speed increased, with 27·5 revolutions of the screw per minute, to 55·8 feet per second. The speeds given by the form of anemometer employed, as due to the balloon, or rather to the screw, were 7·7 feet to 9·3 feet. The descent was commenced at 2 hours 35 minutes, and was effected at the destination, Mondecourt, near Noyon, without any shock or the slightest accident. We should now consider the results that have been attained in the experiments with the aerostat. They are: The maintenance of a constant exterior surface by means of the ballonnet; freedom from rocking motion, even while two or three persons are walking in the car; and a perfect control, the head of the aerostat being shifted to or kept in any direction, with a maximum force of 60 kilos from the manual labor of the eight men.

These are the mechanical improvements that have been achieved; but the most important result is that an impetus will be given to the study of aerial navigation, now that the science has found a theory seldom paralleled in its application. The remark of one of our greatest men: "Impossible; I don't know the word:" has indeed been practically shown to be an admitted principle by M. de Lôme.

M. de Lôme further proposes to remove seven of the eight men employed to work the screw, and substitute an engine of eight horse power, with one man as engineer. The ballast would then consist of the fuel and water, while the aerostat could be impelled at the rate of 14 miles per hour, at a much larger angle with the plane of direction of the wind. There has thus now been opened to us a new path in the science of aerostation, and it is difficult to limit the imagination to those new wonders we may expect within even a few years.

### THE GREAT BALLOON NOW IN PROCESS OF CONSTRUCTION IN THIS CITY.

The following interesting particulars concerning the new balloon of Professor Wise are given in the *Daily Graphic:*

The main balloon is to be made of unbleached cotton, of which 4,316 yards have been purchased. The greatest strength is required at the crown, and this part of the air ship will have three thicknesses of cloth. The exterior will be coated with a varnish made of linseed oil, beeswax, and benzine. The balloon is to be 110 feet high, and 100 feet in diameter. Gas capacity, 600,000 cubic feet. It will, however, start with only 400,000 cubic feet, as the gas will expand and fill the balloon as the latter rises in the air. When inflated the extreme hight of the apparatus, from the crown to the heel of the boat which will hang below, will be 160 feet.

There will be 14,000 yards (eight miles) of stitching. This is now being done by twelve seamstresses at the establishment of the Domestic Sewing Machine Company, corner of Broadway and Fourteenth street.

The thread used is silk and cotton, the top spool being silk. The valve of the balloon will be three feet in diameter and made of Spanish cedar, with a rubber-coated clapper closing on a brass plate. The valve fixtures and top of the balloon are the essential parts of the apparatus, and are being constructed with special care to guard against any accident of derangement.

The network will be composed of three-strand tarred rope, known as "marlin." The width of the net will be 212 meshes, and its breaking strength will be 58,300 pounds. Five hundred pounds of "marlin" will be used. From the netting 53 ropes, ¾ inch in diameter, of Manilla, will connect with the concentrating rings. These ropes will each be 90 feet in length, or 4,770 feet in the aggregate. The concentrating rings will be three in number, to guard against breakage, and will be each fourteen inches in diameter, each ring being of wood, iron bound. These rings will sustain the car, life boat, and trailing rope, and will bear the strain when the anchor is thrown out in landing. From the concentrating rings, twenty-four Manilla 1 inch ropes, each 22 feet long, or requiring 528 feet in all, will depend and form the frames for an octagonal shaped car. They will be kept in place by light hoops made of ash. The lower ropes will be connected with network, and over the network at the bottom of the car a light pine floor will be laid loosely, so that it can be thrown out if required. The car will be covered with duck, of which fifty yards will be needed. Attached to the side of the car will be a light iron windlass, from which the boat and trail rope can be raised and lowered as may be desired. From a pulley attached to the concentrating rings a heavy Manilla rope will fall down through the car, and thence to a sling, attached to which will be the life boat. This boat will be of the most approved and careful construction. It will have watertight compartments, sliding keel, and will be so made that it will be self-righting. The boat will be provided with a complete outfit of oars and sails, and to it will be lashed instruments, guns, lines, etc., and provisions for thirty days, all in watertight cases.

The trial rope, by which the aeronaut can maintain any desired altitude without resorting to ballast, will be of Manilla rope, 1¼ inches thick, and 1,000 feet long.

The car will be fully provided with instruments, provisions, etc., independently of the boat. It will be so constructed that it can be taken apart piecemeal and disposed of as ballast. It will carry about 5,000 pounds of ballast, which will consist of bags of sand, each carefully weighed and marked. Among the instruments to be carried in the car, there will be a galvanic battery, with an alarm, two barometers, two chronometer watches, a compound thermometer, a wet and dry bulb thermometer, a hygrometer, componer, quadrant, chart, parachutes with fire balls attached, and so arranged as to explode when striking the water, so as to indicate the direction traversed; marine glasses, two vacuum tubes, a lime stove, etc. A number of carrier pigeons will be taken along, and dispatched, at intervals on the route, with intelligence of the progress of the expedition.

The lifting power of illuminating gas is about 36 pounds to the 1,000 feet, so that the balloon will have a lifting capacity of 11,600 pounds. The pressure will be 1½ pounds to the square inch.

The weight may be summed up as follows:

| | Pounds. |
|---|---|
| Balloon | 4,000 |
| Net and ropes | 800 |
| Car | 100 |
| Boat | 1,000 |
| Dray rope | 600 |
| Anchor and grapnels | 300 |
| Sundries | 300 |
| | 7,100 |

Then 4,500 pounds will be allowed for passengers and ballast.

### Frightful Death of La Mountain, the Celebrated Aeronaut.

The particulars of the frightful fall and death of Professor La Mountain, while making a balloon ascension at Ionia, Mich., on the 4th of July last, are thus described by a correspondent of the Detroit *Post:*

"Among the many advertised attractions of the celebration of the Fourth by our citizens was that of the ascension of Professor La Mountain, of Brooklyn, Mich., in his mammoth air ship. Several thousand spectators thronged the public square for hours before the appointed time. A heavy squall of wind necessarily delayed the ascension for two or three hours, but at the end of that time the air became calm. Under direction of the Professor the balloon was got into position, and its inflation with hot air was commenced. The canvas soon filled, and loomed up nearly 75 feet high. The basket was a willow one of a size sufficient to hold one person comfortably. It was attached to the balloon by six or eight long ropes, which were fastened at the top to a round piece of wood some two or three feet in diameter. The ropes were in no manner fastened together between the top and the basket. As each piece was 100 feet long it seemed, even to inexperienced eyes, that there should have been some webbing or net work, at least over the bag or bulge of the canvas. The fear was generally expressed that some accident might occur by the canvas slipping through between the ropes. It was also noticed that the ropes were unevenly distributed—three or four being in a comparative cluster, leaving the other strands far apart. Nothing was said of the matter, as the Professor, who gave the whole structure a thorough look before taking his seat in the car, made no comment on the fact, and it was thought that his experience was sufficient for the occasion. Everything being in readiness, the words "let her go" were given, and the air ship darted up with great rapidity, while the aeronaut waved his hat to the uneasy multitude, who almost breathlessly watched his flight. Immediately upon leaving the ground the mouth of the canvas began to flap around with great violence. When fully a half mile from the earth and when the whole structure looked no larger than a hogshead, the balloon slipped between the ropes and was instantly inverted. The car and its occupant dropped like a shot; and when the ropes were pulled taut, the round piece of wood was torn from the canvas. With the most terrific velocity the unfortunate man descended, clinging to the basket. That he was conscious was evident from his struggles. With all the intensity of a life with but one chance, he strove to raise the basket above him, evidently hoping to use it as a parachute. He succeeded in his object; but when 100 feet high, he loosed his hold, folded his hands and arms before his face, and, feet first, struck the ground with a dull heavy thud. Then ensued a panic and uproar in the crowd, which is indescribable. Women fainted, men wept, and to add to the confusion the canvas came flying over the crowd like a huge bird. Some one cried out to get out of its way, as it would fall with crushing force. The cry was taken up and a general rush was made for safety, in which many were more or less injured.

La Mountain was crushed into a literal pulp. Not a sign of motion or life was visible when he was reached. Medical examination disclosed the fact that hardly a whole bone was left. Many were ground and splintered to powder. His jaws fell upon his arms, and were pulverized. The blood spurted from his mouth and ears. Where he struck there was an indenture, made in hard gravel ground, five or six inches deep. The corpse was laid out and placed on the public square, where it was viewed by thousands.

The Grand Rapids, Mich., *Eagle* says: "There was but little wind at the time, and the balloon arose directly upward, remaining right over the Court House square, whence it started, appearing of course, to diminish in size, till it was judged, by that appearance and the rate of its upward movement, to be 3,000 feet high. The shouts had ceased, and 10,000 upturned faces watched the diminishing object intently, when the basket was seen to separate from the sack, which hung and wavered about in one spot for half a moment or so, while the basket and man were shooting downward with the velocity of a cannon shot!

As the vast throng of witnesses comprehended the frightfully tragic spectacle, a thrill of intense horror spread through them, as from among them issued one wide spread suppressed groan of agony, for all seemed too horror stricken to shriek. Of course there was no such length of time in the downward

flying of the devoted man as the reader has occupied in reading these last few lines describing it. From the instant of the disaster to the balloon till he struck the ground, the time was not probably more than fifteen seconds, as measured off on the watch dial by the second hand. At a hight of five or six hundred feet from the earth, the unfortunate man got separated from the basket—in fact it appeared as if he leaped from it intentionally. This certainly made no difference as to the fatality of the fall. The concussion must have killed him just as quickly had he struck the earth with the basket beneath him. Wonderful as it may seem, from the time he sprang from the basket his position in the air remained erect, feet down, till he struck, notwithstanding the greater weight of the head and body, which causes most human bodies to turn and fall head first. It is possible he had acquired a faculty of controlling his position in the air by athletic force. Perhaps, in the hurried thoughts of despair, he fancied he might, by striking feet down, be spared from death. But the indescribable swiftness of his descent must have knocked the breath out of him, even had he struck on a newly made hay stack. Many people declare that they saw such movements of his limbs and even expressions in his face as showed him to be alive and conscious until he struck. But this is considered by the greater number to have been entirely improbable. His shooting downward through space with lightning-like swiftness deprived him of all breath and sense of life, undoubtedly, while part way down. Indeed, it is hardly possible that he intentionally jumped from the basket. It is more likely that he fell from it when he had no longer any power to hold on to it. With terrific violence he crashed upon the earth, feet down, his legs being driven up into his body, and all but his head instantly mashed into a sickening, quivering mass of spouting blood, protruding bones, and dropping flesh. His feet struck into the earth several inches. He struck a few feet from the jail wall, only about eight rods from the very spot where he went up. Down came the basket right after him, and his hat came wavering down. What became of the sack of the balloon is not known."

La Mountain's name is familiar to the readers of the SCIENTIFIC AMERICAN. He was the hero of many a remarkable balloon ascension, and had great confidence in his abilities to navigate the air. But it is evident that he was careless, in the present instance, in respect to the mechanical details of his air ship, and the loss of his life is the sad result. La Mountain was one of the party who accompanied Professor Wise in his famous aerial flight from Missouri to New York in 1859. On that occasion, La Mountain narrowly escaped drowning in Lake Erie.

### Action of Water on Lead.

The most general results of Sir Robert Christison's inquiries are: 1. That the purest waters act the most powerfully on lead, corroding it, and forming a carbonate of peculiar and uniform composition. 2. That all salts impede this action, and many prevent it altogether, some of them when in extremely minute proportions. 3. That the proportion of each salt required to prevent action is nearly in the inverse ratio of the solubility of the compound which its acid forms with the oxide of lead.

The corrosive action of water upon lead has often been confounded with other causes of corrosion, and the water has borne the blame. Thus the true action has been confounded with the corrosive action of potent agents accidentally coming in contact with the metal in the presence of water, as, for example, when a lead pipe has been led through fresh mortar, which is frequently or permanently kept moist, or when lumps of fresh mortar have been allowed to fall upon the bottom of a lead cistern.

The true or simple action of water has not unfrequently been confounded also with the effects of galvanic action. Thus, if a lead pipe or cistern be soldered with pewter solder and not with lead, erosion takes place near the line of junction of the solder with the lead. The presence of bars of other metals crossing lead, or bits of them lying on it, will also develop the same action; and some facts seem to point to the same property being possessed in a minor degree by some stony and earthy substances. This observation may explain the local erosion sometimes observed in cisterns containing hard water; since, if galvanic action be excited, it will be increased by the fact of saline water existing more largely in these waters than in soft or comparatively pure water.

Lastly, some observers have contradicted former statements, because under certain circumstances, which led them to anticipate no action, they nevertheless found lead in water, but only in extremely minute and unimportant proportion. The test for lead, hydrosulphuric acid, when employed in the way now usually practiced, is so delicate as to detect that metal when dissolved in ten million parts of water, or even more. Facts, however, warrant the conclusion that the impregnation must amount to at least ten times this quantity before water can act injuriously on man, however long it may be used.

### Tin as a Filling for the Teeth.

Dr. E. W. Foster, in *Dental Cosmos*, says: Tin possesses many considerations of fitness for stopping carious teeth not held by gold. Its freedom from being suddenly affected by thermal changes, its plasticity and ease of adaptability to all the irregularities of the cavity, its permanency or stickiness in the cavity, its comparatively low specific gravity, and other favorable features, are some of the prominent facts connected with this really fine metal, that make it no mean competitor with gold in the daily and important question of filling and preserving the teeth. The prejudice of most operators is generally, we well know, against this foil, and from grounds we think not entirely reasonable.

We have occasion to use it much in our practice, sometimes for permanent fillings, and sometimes to precede gold in the soft vascular teeth of children and youth. As to the extreme permanency of tin when removed from the attrition of mastication, it will be difficult to determine. Yet we have seen tin fillings between thirty and forty years of age, still serviceable and in good condition.

The low specific gravity of tin, and its non-irritating nature, resembling in the latter trait, though in a less degree, the same remarkable quality possessed by lead, enable it to rest with comparative non-disturbance even in the midst of vital presences.

For this reason lead had long ago been used for filling teeth in many countries of Europe. In France especially it was the material *par excellence* for such purposes; and it may not be uninteresting to remark, that the very word in the French language used to signify the term "filling teeth," is "*plomber*," a word of historical significance in this connection, being derived from the name and the fact of lead being used as a stopping for teeth, even so far back as the formation of that language.

Though tin is easier of manipulation than gold, the same care, to the same end, should govern its introduction into the cavity, its condensation and finish afterwards. If the cavity is large, and nerve nearly exposed, the use of polish-powder (oxide of tin) moistened with water or glycerin, and applied to the walls of the cavity before the introduction of the tin, will produce agreeable and substantial results.

### Cornell University.

The attention of our readers is called to the commencement of the above well known institution published in our "Business and Personal" column. The next scholastic year begins on September 8, so that ample time is afforded between that date and the present, for those desirous of availing themselves of the advantage of the various courses, to make all necessary preparations. Young mechanics, engineers and students in the various professions and trades will find no institution in the country better adapted to give them a sound, practical as well as theoretical, basis for their future callings than Cornell. Five hundred free scholarships are in existence, and the college is liberally endowed with every requisite for thorough and systematic instruction.

### Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From June 20 to June 26, 1873, inclusive.

BRAIDER.—E. H. Alexander, New York city.
EXTINGUISHING FIRES.—J. W. Stanton, Brooklyn, N. Y.
GAS.—J. H. B. M. Randolph *et al.*, Detroit, Mich.
PICKER MOTION.—T. C. Morton, Waterbury, Conn.
PRESERVING MEAT, ETC.—A. T. Jones, Clinton, Wis., *et al.*
PRESERVING WOOD.—C. Brown (of Albemarle, Va.), London, Eng.
PRINTING OIL CLOTH, ETC.—W. H. Townsend, New York city.
SEWING MACHINE.—Lev Griswold, New York city.
STEAM BOILER.—J. Griffith (of New York city), London, Eng.
TREADLE.—S. K. Herrick, Boston, Mass.
TUNNELLING.—D. C. Haskins, Vallejo, Cal.

## Recent American and Foreign Patents.

### Improved Relisher and Wedge Cutter.

Wesley J. Hoskins and Amos D. Rowe, Essex, N. Y.—This invention consists of a combination of instrumentalities whereby the relish of a door rail may be cut, and the part to be removed may first be cut into wedges and then removed by a succession of operations, all of which are performed with one machine. A gang of three saws cuts three parallel slits on the swinging frame which is connected to a tilting table. Over the saws are mounted the two saws for cutting the diagonal slots on an arbor. In front of these the stationary cutters are arranged for cutting out the relish. In the first place, the rail is put on the table and moved along one of the guides, properly adjusted therefor against the saws, till the shoulder of the rabbet comes against a stop by which the saws cut a slit; then the table is tilted upward by a handle, without moving the rail from its position on the table, to other saws which make the diagonal cuts; from the saws the work is moved up to the cutters above; then the treadle is forced up and the wedges are cut off, leaving the relish, and making the wedges complete.

### Improved Corn Harvester.

James H. Spears, Kennedy Wells, and Robert Wells, Piper City, Ill.—This invention has for its object to furnish an improved machine for detaching the ears from the stalks, removing the husks from the ears, and depositing the husked ears in a wagon. To a cross bar are attached the ends of the shanks of the three guides or gatherers. Rollers are arranged parallel with each other, in pairs, and upon the opposite sides of the shank of the central guide. These rollers have corrugations upon their lower or forward ends, the corrugations of the rollers of each pair running in opposite directions, and extending longitudinally along the upper or rear part of the said rollers. To the rear journals of the rollers of each pair are attached small gear wheels, meshing into each other, so that the rollers of each pair may be revolved together with equal velocity and in opposite directions. The journals of the inner rollers are extended to the rearward, and connect by gearing with a shaft on which is a roller. An endless carrier passes around a roller pivoted in a slot in the lower part of the shank of the central guide and around the roller attached to the shaft, and by which the said carrier is driven. The carrier receives the ears of corn from the rollers, carries them up and discharges them into the inclined spout, down which they slide to other rollers which are provided with short teeth arranged spirally, which tear off the husks from the ears, and at the same time carry said ears along and discharge them upon the elevator, which passes around rollers pivoted to the upper and lower ends of the elevator frame and discharges the husked ears into a hinged spout, down which they slide into a wagon.

### Improved Medical Compound and Medicated Food.

Jean M. O. Tamin, of New York city.—This invention consists in extracting from vegetable substances those most nourishing ingredients which are combined with phosphorus, and in subsequently adding them to the substances to be eaten or imbibed as articles of food or medicines. Thus, for example, it is proposed to withdraw from vegetables, such as peas or beans, the ingredients above referred to, discarding the indigestible, or at least with difficulty digestible, residue of such vegetables, and to add the matter extracted to chocolate or other suitable article of food. A certain quantity of peas, for instance, is powdered and then treated with water. The mixture is filtered, and so much of the moisture is evaporated as to leave the remainder of a more or less viscid consistency. Gastric juice or finely cut pieces of a calf's stomach are next added. Finally, the mixture is dried at a moderate heat. The substances with which the phosphorus is thus mixed it is proposed to call "phosphorine."

### Improved Washing Machine.

James W. Hannah, Sticklerville, Mo.—This invention has for its object to furnish an improved washing machine. The body of the machine is made semicylindrical in form, having vertical wooden ends and curved zinc bottom and sides. In the middle part of the ends of the box, leading downward from their upper edges, are formed vertical slots to receive the journals of the rubber, the ends of which enter grooves in the vertical bars or standards attached to the outer sides of said ends. To the inner surface of the bottom and sides of the box are attached round cleats. The end plates of the rubber are made semicircular in form and are connected and held in their proper positions by the cross rounds. To the rounds, at equal and short distances apart, are secured the concave edges of segments of ring plates. To the end plates and shaft are attached levers, the upper ends of which are connected by a round which serves as a handle in operating the rubber. By this construction the plates, being vertical, pass easily through the water and without carrying the water with them, which makes the labor of operating the machine very slight, and, at the same time, the scalloped edges of said plates, operating upon the clothes, clean them in a very short time.

### Improved Animal Trap.

John Gould, Clinton, Pa.—This invention has for its object to furnish an improved animal trap, which shall be so constructed that the entrance of the animal will reset the trap for the next animal. By suitable construction, when the trap is set, as the animal enters the box and steps upon a platform, he tilts said platform, which draws back a catch lever and allows a wheel to be revolved by a spring until a pin, upon the other side of the wheel, strikes a stop spring. This movement closes the doors and leaves the animal shut up in the box. The animal then sees light entering through another box, and, trying to reach it, he raises a gate, steps upon and operates the trip platform, and passes into a third box whence he cannot escape. This movement withdraws the catch lever and allows the wheel to revolve until the next pin upon its other side strikes against the other stop spring, opening the doors and again setting the trap.

### Improved Knapsack.

George H. Palmer, first Lieutenant 16th U. S. Infantry, Beloit, Wis.—In this invention the frame is made of small, tough, flexible pieces of wood, butted together at the end and secured at the corners by strong duck, canvas, or other heavy cloth, in which the sticks are bound at the edges. Between the sticks are strong thick pieces of leather fastened to the cloth and turned around the corners. They are to hold the sticks apart the width of the cloth pieces, and to afford sufficient strength for holding the covering and the straps, which are attached to them. About half an inch from the end the wood pieces are tied together by strong leather strings. The cloth pieces of each corner are connected together by straps which prevent them from sliding up on the rods, and bind the frame strongly together at the corners. The cover, of flexible material, is shaped so as to envelope all sides except one, and, having flaps, is fastened on by metal loops with a toggle piece, the said loop being inserted through the canvas and leather corner pieces; and the flaps are provided with means of buckling together when folded down. The lower loop straps also unite with the straps, the said straps passing through the metal loops and meeting and buckling together at the middle of the bottom of the knapsack. The loops are connected to the knapsack by the metal loops, that they can be readily shifted as may be required for changing the knapsack sides about. The shoulder straps are connected to the back plate by rivets, which are suitably arranged to allow the straps to turn freely as required in separating and adjusting them on the wearer, also for shifting them about to different positions for ease in sustaining the load. The knapsack frame is covered with linen or cotton duck, having on one side a waterproof flap of vulcanized rubber cloth. It may be reversed on the back by simply hooking it from the back pad, turning it, and changing the supporting straps to the opposite side. By this means the canvas back may be turned outward in hot weather, and the waterproof flap outward in rainy weather. The knapsack may be worn at almost any place desired on the back.

### Improved Friction Attachment for Securing Pulleys to Shafts.

Henry Cox, Peterborough, Canada.—The invention consists in the improvement of friction attachments for pulley shafts. A shaft carries a loose pulley in the hub of which is formed a mortise, at the sides of which are formed one or more lugs to receive a pin by which an eccentric disk is pivoted to said hub. By this construction, when the pulley is turned in one direction it will run freely, but when turned in the other direction the eccentric will take hold of the shaft and carry it with the said pulley in its revolution. This secures the pulley on the shaft or prevents its retrograde motion.

### Improvement in the Manufacture of Zinc White.

Nathan Bartlett, of Bayonne City, assignor to himself and Samuel C. West, Elizabeth, N. J.—The furnace has three chambers, an upper, middle, and lower one. The fire is built at one end and delivers the lighter vapor into the upper chamber and the heavier into the middle chamber, the latter vapor passing out at the chimney, while the former, after traversing the length of the furnace, descends in two passages to the lower chamber, where, after having twice traversed the whole length, it enters the discharge chimney. This improvement in the arrangement of the furnace consists in making the middle chamber funnel-shaped, or approximately so, by which to concentrate the heat, as before stated, and thus work out the oxide from the ore much cleaner than it has ever been done before, and thus increase the percentage of gain. In carrying out this improved mode of working the furnace the chamber is in four imaginary sections. When fully heated and charged a batch of the residuum at the opening and the three other batches are shifted along one stage, and a fresh batch applied, thus working the ore along intermittingly as the reduction proceeds, and at the same time supplying the fresh ore and removing the refuse without cooling the furnace down or losing the time now lost by discharging at the mouth of the furnace and recharging again, the doors remaining open the while so that much heat is lost. For introducing the oxygen to combine with the gases evolved from the coal in the furnace, also the vapors of the ore, and thus to insure more perfect combustion, two blast pipes discharge into the chamber, so that the air, which is forced in by any suitable blower, unites with the gases as they emerge from the passages and burns intensely.

### Improved Horse Power.

Joseph Milbourn, Millport, Ohio.—The object of this invention is to improve and render more useful the horse powers which are used for thrashing grain, and other purposes; and it consists in adjustable extension levers, in combination with the old or ordinary levers, and in stay rods which connect the ends of the extension levers, and in draft rods attached to the stay rods. There are but two draft rods, but there may be a draft rod for each lever, if desired. By this arrangement the draft is applied to the ends of the extension levers, which results in a great saving of power.

### Improved Washing Machine.

Nathan F. Reed, North Wolcott, Vt.—This invention has for its object to furnish an improved washing machine. A set of rollers, the journals of which revolve in bars of such a size that the rollers work clear of the bottom of the box, form a roller bottom to said box. A second set of rollers, the journals of which revolve in bars which are made shorter than the bars above mentioned, are connected by boards, thus forming a roller platform or rubbing board. To the sides of the middle part of the platform are secured staples upon which hook notches are formed in the lower ends of bars which are pivoted to levers. By this construction, by moving the upper ends of the levers back and forth, the roller platform will be moved back and forth, rubbing the clothes between it and the roller bottom, washing them quickly and thoroughly. By suitable means the roller platform may be held down upon the clothes with any desired pressure.

### Improved Implement.

Henry B. Whitehead, Holly Springs, Miss.—This invention relates to an improved tool for use as pliers or as a hand vice; and consists in an arrangement of jaws having perpendicular toothed shanks, and transversely slotted handles provided with teeth on their pivot ends for engaging with the jaw shanks, whereby a parallel motion of the jaws is produced. By tightening a thumb screw the jaws may be set and used as a hand vise. The handles when used as calipers and dividers, and opened to the desired angle, are thereby held in position. When the handles are thrown out as far as the frame will allow, the jaws may be moved one or two teeth, and can then be used to gripe larger bodies than in the former state.

### Improved Medical Compound for Liver Diseases.

Joseph M. Cunningham, Mount Morris, Ill.—The object of this invention is to supply an efficient compound for diseases arising from a deranged condition of the liver and complaints having their origin therein. It consists mainly in extracting with alcohol the bitter part of different roots and herbs, to be mixed, after percolation, with water, sugar, and the oil of sassafras.

### Improved Railroad Crossing.

Robert J. Hughes, Rynear, Ind.—This invention is an improvement in the class of switches or railroad crossings in which the rails of the side track are elevated to allow the wheels of the cars to pass above the rails of the main track. The cross ties are placed nearer together at the switch. They of the crossing rails, and are placed nearer together at the switch. They are suitably notched for the reception of the main rails, to keep them on the level of the main track. The crossing rails are placed on the elevation of the ties, and are thereby raised above the level of the main rails. Between the rails of the main track is laid the pivoted or spring rail, the end of which is curved from the main rail, and, by suitable means, is prevented from being lifted off the track. The flanges of the wheels pass between the main rail and spring rail by pressing the latter sidewise. A flange plate is placed on a level with the top of the main rail adjacent to end of the spring rail and serves the purpose of conveying the flanges of the car wheels from the spring rail to the raised side rails. The guide rail placed opposite the flange plate, on a level with the crossing rails, assists the wheels to pass over the flange plate to the side track.

### Improved Presser Foot for Sewing Machines.

George W. Allerton and Zenas M. Powers, Robinson, Ill.—This invention consists of a glass disk pivoted to the supporting arm in the axis of the needle by a hollow pivot through which the needle works, the object of which is to have the presser turn with the work when curved seams are to be made, so that the work can be turned more accurately and easily than it can be with the ordinary non-turning foot. A rotating presser of this kind is very useful in equalizing the length of the stitches, by the facility it affords for turning the work accurately.

### Improved Peach Cutter.

William J. Hill, Fayetteville, Tenn.—The invention consists in the improvement of peach cutters. In using the machine the peaches are laid blossom end downward upon cutters, with one hand, in such a position that the seam of the peach may be in line with the wing or straight cutters, and a lever is operated with the other hand to bring a block down upon the peach. As the block presses upon the peach with sufficient force to hold it in place, the first hand is removed from the peach and the block is pressed down upon the edges of the cutters, the parts of the peach dropping into the spout, and the pit sticking in the cavity of the cutters until it is pushed out by the next pit.

### Improved Scaffold.

Daniel Y. Miller, Huntsville, Ill.—The object of this invention is to construct a scaffold for the use of painters, carpenters, and others, which may be easily set up and taken to pieces and readily transported. The invention consists of two main supports resting on standards and composed of several pieces, connected by strong staples, the uppermost pieces suspending, by block and tackle arrangement, an adjustable platform, which may be elevated to the full hight of the supports.

### Improved Cotton Planter.

George Paterson, Waynesborough, Ga.—This invention consists in the improvement of cotton planters. Behind the plows are the guano hoppers, supported on iron rods or bars, or other supports, adjustable toward or from the frame. Vertical slides are arranged in the hoppers with pockets to fill with the guano as they rise up in the hopper, and carry it down to discharge below. Said slides are pushed down by tappets on the seed-dropping wheels, and they are forced up by a spring, when the tappets escape from projections. The pockets are varied as to capacity by adjustable blocks, held by binding screws so they can be readily loosened, shifted, and fastened again. The relative arrangement of the guano droppers and the seed droppers is such that the seed and the guano will be dropped together. It will be seen that a great economy of labor will be effected by the use of this machine, which combines eight separate and special machines in one, requires only one horse or mule and one attendant, and neither the horse nor the attendant has to walk along the ridges and tramp the earth down, as when separate machines are used. The principal improvement in the device consists in the vertical pocket slide, arranged to reciprocate up and down in the guano dropper.

### Improved Cut-off and Regulating Cock for Gas.

Charles E. Seal, Winchester, Va.—This invention consists in a cock or valve, attached on or near the gas meter or on gas-conveying pipes, and having a flexible connection attaching it to valve-lifting mechanism that has been arranged in the room or apartment where the gas is used.

### Improved Horse Hay Rake.

Lyman Litchfield and Jay Spencer Corbin, Gouverneur, N. Y.—This invention consists in a novel means whereby the driver can conveniently use both the foot and hand simultaneously in elevating the rake, in novel means whereby the rake may be adjusted by the driver without leaving his seat, to run on the ground or at a slight distance thereabove, and finally in a peculiar construction of rake tooth head which allows each tooth to be rigidly held and independently moved, or to be raised with the others.

### Improved Mode of Splitting Rock.

Patrick Croghan, Cockeysville, Md.—This invention consists in the method of splitting off blocks of stone by boring subjacently beyond the longitudinal middle line of the block, placing the side pieces across said line and causing the up and down pressure of the wedge to be exerted inside and not on the edge of the rock.

### Improved Saponifying Apparatus.

George W. Hatfield, Nashville, Tenn.—This invention relates to means for applying heat, pressure and mobility to the alkali and fatty matter used in the process of saponification, so that the product will be uniform in its character and thus adapted to make a soap of the best and most reliable quality. It consists in arranging spirally upon a common shaft a series of paddles or agitators, which are continually lifting and transferring the fluid matter from one end to the other of a close boiler or mixing chamber.

### Improved Plow.

Lewis B. White, Norfolk, Va.—This invention consists in making the landside of a turn plow reversible by a peculiar construction of ends and bottom flanges, so that two landsides are virtually made of but little more metal than one as now constructed. The invention also consists in applying a slotted adjustable wedge between the beam and handles of turn plows, that they may both be held solid and without a chance to move out of their respective positions under strain.

### Improved Process of Preparing Corn for Grinding.

William Standing, DuQuoin, Ill.—The object is to produce a superior article of corn flour and corn meal, by subjecting the corn, before it is manufactured, to a steam drying process with steam of high pressure, and with a thorough ventilation of the grain for the rapid escape of all the moisture that may accumulate in the corn while passing through the drying process. The corn is passed over and through several cleaning machines, similar to those used in the cleaning of wheat, then it is elevated into the dryer, having a capacity of about fifty bushels, more or less. But before the corn is admitted into the dryer, the slide, which is placed at the bottom, is closed until the dryer is filled, then the valve is opened sufficiently to permit it (the grain) to escape only as fast as it becomes thoroughly dried. The valve is adjustable to suit any circumstances which may conduce to a slower or more rapid rate of drying. The passing of the grain through the dryer containing a high pressure of steam, say, from seventy-five to one hundred pounds to the square inch, more or less, with the corresponding temperature, is for the purpose of having the latent heat of the steam penetrate thoroughly the germ, phosphate, dextrin, and starch portion of the corn, as also its oil gluten, and neutralize the strong rank smell and taste peculiar and common to all corn, but more especially in the large starch-bearing kinds. As the corn leaves the dryer it is conveyed to and passed over or through machines for the purpose of cooling thoroughly before grinding. The corn is then ground on the best French burrs, somewhat finer than the ordinary style of grinding.

### Improved Lawn Mower.

Theodore Soetbeer, Irvington, N. Y.—This invention has for its object to furnish an improved instrument for shearing the edges of grass plots along the edges of walks, beds, etc., where the grass cannot be cut by the lawn mower. To the lower end of the standard or frame, in an inclined position, is secured the lower or stationary blade of the shears. To the blade, near its rear end, is pivoted the rear end of the upper blade. To the latter, near its rear end, is pivoted the lower end of the connecting rod, the upper end of which is pivoted to the crank. Several holes are formed in the connecting rod to receive the crank to enable the instrument to be adjusted. The crank is attached to the end of a shaft, to which, within the frame, is attached a small grooved pulley around which passes a band which also passes around a larger pulley attached to a wheel, which revolves in the lower part of the frame. The wheel is designed to roll along the ground at the side of the edge to be sheared and carry the machine forward, and at the same time by its revolution to work the movable blade. The standard and frame may be adjusted upon each other to adjust the lower blade to the proper hight above the ground.

### Improved Match Plane.

James Edwards, New York city.—This invention consists in the improvement of match planes. The face of the tool for cutting the tongue is formed in two parts. An adjustable piece is fitted into a rabbet of the stock, and is made adjustable laterally thereon. By moving this piece out or in, the length of the mouth of the tool is varied so as to correspond with the width of the adjustable iron. A guide is made adjustable on the face of the tool by means of screws and slots, and a gage is provided for regulating the depth of the cut. The iron is made in two parts. By means of this adjustment the space is made broad or narrow to receive the tongue, which is cut of corresponding size. Any ordinary plow iron may be used in the grooving tool, and the tonguing tool may be adjusted to suit the groove. With the adjustable tool and an adjustable grooving tool, the machine is prepared to tongue and groove boards or lumber of all ordinary thicknesses.

### Improved Cotton and Rice Chopper.

Joseph B. Underwood, Fayetteville, N. C.—This invention consists in supporting the axle of a cotton cultivator in a U shaped bar hinged at one end and adjustable at the other, so as to regulate the depth at which the plows shall run in the ground. It also consists in horizontal chopping knives arranged to operate in the rear of the cultivator plows. It also consists in a novel arrangement of the plow standard and the chopper bar, so that the choppers will be shielded from the moving soil, or other obstacle. It also consists in means for throwing the choppers out of gear with their operative mechanism.

### Improved Soldering Apparatus.

Wm. D. Brooks, Baltimore, Md.—This invention consists in bringing the cans upon a carriage truck or car so as to be centered by the cap holder, and so that the seam which is to be soldered shall come directly under the burners of the soldering apparatus and the pipe. The can is then revolved and quickly heated while the bit of solder that is cut off in the holding tube falls through the lower end thereof and rests with one end on the can, being melted gradually as the can revolves.

### Improved Method of Soldering Cans.

George D. Brooks, Baltimore, Md.—This invention has mainly in view to form a tight joint at the junction of a can body with its top and bottom before the solder is applied; otherwise the solder finds its way through, is wasted, and does not form so strong, full, and reliable a joint. The invention consists in the method and in the particular means by which this object is accomplished.

### Improved Plow Truck.

John Flanagin, Pawnee City, Neb.—This invention relates generally to gang plows, and particularly to the mode of arranging plows of unequal size in the same gang so that rows may be plowed out deeply, except in close proximity to the plants, where the brace roots would be too much fractured and injured; also, to adapt a single turn plow to be worked without necessitating either horse to tread in the furrow or upon the plowed ground. The invention consists in a triangular wheeled plow truck, in whose front is the clevis, to which the whiffletree is attached, and at whose rear are placed one or more adjustable clevises, to which are attached the plow or plows.


# Value of Patents,

## AND HOW TO OBTAIN THEM.

## Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Larger inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business: and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

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

### How Can I Best Secure My Invention?

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

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

### Preliminary Examination.

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

### Rejected Cases.

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

### To Make an Application for a Patent.

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

### Caveats.

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

### Reissues.

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

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

### Design Patents.

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

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

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

### Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 35,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

### Value of Extended Patents.

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## Notes & Queries

A. asks how to make a touchstone for testing gold.

T. F. asks: What other ingredients mixed with hydraulic cement and plaster of Paris will make a hard and fixed lining for the hollow iron shafts of mantels?

J. N. F. asks: Is there a soft white metal, that will not rust, as cheap as common gray iron? Something similar to white clothes line metal is wanted.

W. H. M. says: I have a mirror, and the heat of a stove has affected the glass so that it is worthless; there seems to be a blur over it, and it looks as though it were covered with dust. Is there any way to restore it?

J. H. F. wants an instantaneous black walnut stain for soft woods. "I want to dip the pieces into the stain tank and let the stain strike in as they drain on a rack."

J. S. C. asks for information respecting a plant or fungus known in the South as California moss or beer moss, used for making molasses beer. Would the beer be deleterious to health?

A. K. asks: Is there a book published on phosphorescent compounds?

E. J. B. asks (1) how to put a polish on steel or iron, such as there is on a chisel or butcher's knife. 2. What is a good preventive for rust, for use on bright articles exposed to open air? 3. How are locks japanned giving them such a hard glossy color?

## Answers to Correspondents

A. will find recipes for Worcestershire sauce on pp. 249 and 281, vol. 26, and one for waterproof blacking on p. 90, vol. 26.—R. C. will find the description of Hugo Tamm's manganese process on p. 21, vol. 28.—L. S. C. can temper mill picks by following the directions on p. 106, vol. 25.—A. B. can harden set screws and similar articles by using the process described on p. 90, vol. 26.—J. G. D. can find processes for tempering steel in many of our recent numbers. We cannot repeat them so frequently as many of our correspondents seem to desire.—J. W. T. is correct; W. A. J. made an error.—C. S. P. will find directions for kalsomining on p. 351, vol. 24.—H. S. can make Pharoah's serpents by following the instructions given on p. 410, vol. 28.—A. N. will find a cement for china described on p. 346, vol. 24. Try your perpetual motion, and get the water up your siphon, if you can.—B. W. Jr. will find an account of the method of raising pearls on p. 305, vol. 26.—A. J. A. and C. T. B. should read H. C. Baird's advertisements in our journal.—P. T. R. will find an answer to his queries about magic lanterns, etc., on p. 27, vol. 29.

E. M. G. and others ask us for a rule for proportioning screw cutting gears. Answer: Multiply the screw on your lathe and the thread you wish to cut by a given number. If you want 10 threads to the inch and your lathe screw is 4 threads to the inch, multiply by 8, 10, or 12. The result will be 80 and 32, 100 and 40, 120 and 48, and so on.

J. A. G. & Bro. ask: What is the decision of the Supreme Court referred to on p. 396, vol. 28, in regard to rights of assignees under extensions of patents? We do not find it given in present volume. Answer: The article on p. 396 says: "We published last week." Look on p. 328.

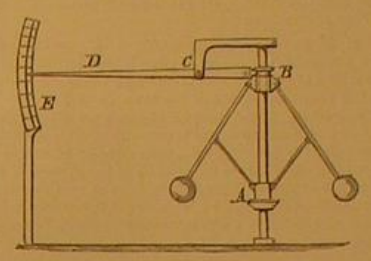
J. E. E., of Pa., asks: Will some one give the scientific cause of the light produced from lightning bugs and light wood. In a dark night I have held a lightning bug to ascertain the time by my watch, and often wondered what produced it. Is it electricity like the electricity produced by stroking a cat, more distinctly seen from a black cat? Electricity would not seem to be the cause of light in light wood. In either case, it would seem that the sun is not the only source of light unless it is held that as it is the source of all life (both animal and vegetable) these light sources could not have existed without the sun. Answer: The light produced from lightning bugs and other insects is due to the secretion of phosphorus in the form of a substance termed noctilucine. It is secreted by a special organ, just as bile is produced by the liver. Noctilucine can be obtained from the bugs mentioned, from glow worms, from phosphorescent marine animalculæ, from decaying fish, flesh, light wood, etc. Thus obtained, it yields light by contact with air, the phosphorus being thereby oxydized. In Science Record for 1873, at page 467, an interesting chapter on this subject is given.

P. S. A. says, in answer to a great many queries on cutting old files: Acid is a good means of cleaning old files, and there it ends. It will destroy any cutting edge that may have been left on the files. The only way to renew old files is to send them to a file manufactory, have them annealed, ground out, and then cut as if the blank were new. If the steel in the files is good and the blanks heavy, this will give satisfaction. Acid has done more to condemn the recutting of files than all the poor work that has ever been put on file blanks.

T. S. S. says that E. S. can remove iron rust from tools by using carbon oil. Apply it, and in a few hours rub it with fine sand paper; it will lift it off or remove it immediately.

J. S. C. asks: What is the oil of rhodium? Answer: No such substance is mentioned in the pharmacopeia. A correspondent once informed us that a quack recommended its use, and then offered to sell the stuff at a very high price.

A. A. N. (1) encloses a sketch of a machine for measuring the velocity of the wind, and asks: Will it work? In it a governor, similar to that in an engine, is attached to a common windmill. A and B are sleeves that revolve around a spindle. B slides up and down,

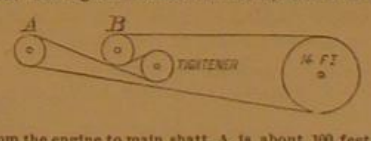



while A does not. At A is a bevel wheel through which the motion is communicated from the windmill. D is an arm or pointer pivoted at C, and also to the sleeve at B; while the other end moves over the graduated part of a dial, E. As the balls rise or fall, by the force of gravity overcome by centrifugal force, the sleeve B rises and falls also, and with it the end of the pointer, D. If it will work, how can I graduate it? How can I find the position of the pointer when the wind blows at the rate of 10 miles an hour? 2. How can I whiten blocks for engraving, so that pencil marks will show? I have used the white off cards until my cards are all gone. Answers: 1. The contrivance described by our correspondent is not novel. It will work, if the scale can be graduated; and this can only be done by experiment. There are many anemometers, or instruments for measuring the velocity of the wind; but we do not know of any that record it with perfect accuracy. 2. Use Chinese white, in the form of fine powder, and apply it to the block with the finger.

A. C. S. asks: Which is the most economical style of boiler to use, say to the amount of 100 horse power? Answer: Your choice would probably lie between the locomotive or tubular, and some form of the sectional boiler. We could not give you any definite advice, without knowing more of the circumstances of the case. We would also say, in this connection, that these columns are for matter of general interest to all our readers. Special suggestions as to what particular machines to use in individual cases cannot be given here. Information of this kind should be obtained from some reliable consulting engineer. Your other query, as to bevel gears, was answered on page 1 of our current volume.

J. H. K. says: A friend says that the crosshead connected with the piston rod of a locomotive moves forward in the guides and remains stationary until the guides slip the length of the stroke, then forward again. My idea is that the crosshead moves backward and forward in the guides. He also says that the piston rod moves forward twice as quick as the guides slip up the length of the stroke. It is understood that the wheels do not slip. Answer: Probably you and your opponent are looking at the matter from different standpoints. If the driving wheels do not slip, the whole locomotive, and consequently all the moving parts, go forward at a greater speed than the piston travels in its reciprocating motion in the cylinder. Consequently the cross head and piston rod are constantly moving forward with reference to a fixed station, such as a telegraph post, on the line.

W. A. P. says: We have a 40 horse engine fed by two 50 horse tubular boilers, and we burn about eight tuns of coal per week, besides all the fuel made by our wood working establishment (which is enough to run most engines with the same amount of power that we use). The following will illustrate the situation. The engine makes 60 revolutions, and the distance




from the engine to main shaft, A, is about 100 feet. 1. Do we lose power by the long distance the power is transmitted? 2. Does it take more power to drive the intermediate counter, B, by the same belt than it would by belting back with another belt? 3. Could we get more power by moving the engine nearer the work, and carrying the steam through pipes? 4. How much would be lost by condensation if the pipe were well protected? 5. Do you think wire rope could be applied to advantage? Answers: 1. Yes. 2. Yes, if you could drive the countershaft with a smaller belt. 3. Yes, if the pipes were properly protected. 4. Probably not more than 3 per cent, if the connection were straight. 5. We would advise you to correspond with the manufacturers.

M. A. G. asks: What is bay rum? How is it prepared, and what are its uses? Answer: It is an alcoholic spirit distilled from the leaves of a species of laurel termed "bay tree"; extensively used on account of its peculiar and pleasant flavor by apothecaries.

S. A. asks: What is the best metal to use on the bottom of a small steamer in a southern or tropical climate? She is to carry about 3 tuns, and to draw about 4 feet when loaded, and to be used to tow vessels at times. We have a boat of iron; but the bottom has to be painted every 7 or 14 days, as the paint is rubbed off in crossing a sand bar from 2 to 6 times every day. We have thought of using heavy zinc plates below water line and sheet iron above; would they be durable? 2. What would be the best kind of tubes for an upright boiler, iron, brass, or copper, when salt water is used as feed for boiler and wood as fuel? Answers: 1. A light sheathing of wood, covered with copper, would answer very well. The wooden sheathing should be double. 2. Composition tubes would probably be the most durable for your boiler

G. G. asks why lithographic pictures can not be transferred by the Willis' process, described on p. 369, vol. 28. Answer: The Willis process refers to photographic pictures only.

A. M. asks for an explanation of the word "penny," as used to describe the sizes of nails, fourpenny, tenpenny, etc. Answer: It is a corrupt on. "Four pound," "tenpound," etc., is correct, and signifies the weight per 1,000 of the nails.

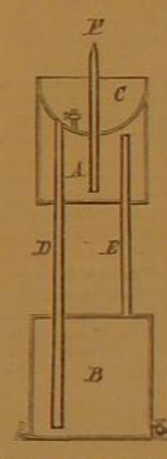
A. R. asks what are the number and dimensions of the tunnels and bridges on the Erie canal. Answer: The bridges are all 11 feet or more from the water The published statements do not give their number.

C. E. H. says: I am building a small locomotive, and I fear my boiler will be too small. The dimensions of the cylinder are 2x1¾ inches; the boiler's length, not including smoke arch, is 20 inches and diameter 8 inches. Inside of fire box is 6x7x7 inches. There is one flue 2½ inches in diameter. The boiler is of 16 ounces copper. If my boiler is too small, can you suggest any way to remedy the evil of insufficient steam? Answer: You can reduce the diameter of cylinder by bushing it, or shorten the stroke by making the heads fit into the cylinder for some distance. By either method, you can get engines proportioned to the size of the boiler, without changing many of the parts.

G. P. S. says: I am a fireman on one of the dreaded brass engines, and all that I can do will not keep the hot brass from turning blue. I have used acid in almost every form, but with little success. Answer: Fine emery and oil, well rubbed in, will polish most brass work, but we are not sure that they act as specifics in every case.

A correspondent encloses a specimen of a grass growing largely in Mississippi, and asks: 1. Has it any commercial value? 2. The yellow pine tree of this country was never known to bud or sprout out from the stump after the tree was cut down, the stump dying and decaying very nearly as fast as the log; but there is a spot of land, in this place, of about five acres, that is thickly covered with pine, cedar, oak, and sweet gum trees, where about ten years since there were about a dozen of the pines cut down. The stumps have remained perfectly green, and the sap has continued to rise and fall yearly ever since; yet there are no sprouts or buds springing from them. Answers: 1. The grass might possibly be used in the manufacture of paper. Its commercial value would depend upon the cost of its preparation for the market. 2. If it is really sap that rises and falls in the pine stumps, we cannot account for it. But if the stumps are in a locality where they are kept continually wet, that would account for their preservation.

J. W. asks: Is there any simple and inexpensive method of forcing water through a small tube say three sixteenths inch bore, after the manner of a fountain? For instance, suppose I have a tank 3 inches deep that will hold a quart how can I force the water through the tube 6 inches above the level of the water in the tank? By placing the tank a foot above the top of the tube, I can get pressure enough, but that will not answer; I want to force it through the tube from below and have pressure enough to cause it to flow through a pin hole in the nozzle to the hight of an inch. Answer You can do it by employing compressed air in your reservoir; or you can easily make a "Hero's fountain," as represented in the sketch. The operation of this fountain is as follows: The vessel, A, is first filled with water up to the top of the pipe, E. Then, by pouring water into the basin, C, the air in the vessel, B, is compressed, and the water in the vessel A, will be forced out through the jet, F, to a hight corresponding to the length of the tube, D, less the friction of the water in the discharge pipe.




G. K. asks: 1. Can steel be cast, as cheaply as forged, and of as good quality? 2. Is there a liquid, oil or spirit, that will not freeze, congeal, expand, or contract between 0° and 112° Fahr.? Answers: 1. Yes. 2. There is no liquid known to us that will not expand or contract by heat and cold.

T. C. W. says: Covington, Ky., has as fine water works as can be found in the United States. They are on the Holly system, and all the water is pumped out of a well on the bank of the Ohio river. The water is perfectly clear and has a good taste, but it is too hard. People cannot wash with it, even after it has been boiled. What shall we put in the water in order to make it fit for washing? A recipe to soften a barrel full of water at a time will oblige. Answer: Put in just enough milk of lime to take up the excess of carbonic acid, when the insoluble carbonate will be precipitated

B. S. asks: What is the best method of bringing water from a spring about a mile distant? The fountain head is about 15 or 20 feet higher than the reservoir. I would like to know whether wood, iron, cement, or pottery tubing would be the best. Answer: Wooden pipes would be the cheapest. They are well suited for conducting water.

S. H. N. asks if aluminum can be soldered or brazed to itself or any other metal, in such a manner that it will stand a twisting or bending pressure as well as any other metal. What flux must be used? "I can solder it, but not so as to stand the required strain." Answer: A good solder for aluminum has not yet been invented. Gold can be employed, we suppose, but cannot tell what strain it will bear. One great disadvantage attending the use of aluminum in alloys is its tendency to make them brittle.

W. P. asks: Is there any difference in the draft of a tug boat drawing a vessel or not, the tow line to be horizontal? Answer: We have an idea that the draft will be increased, up to a certain speed, when the tug is towing a vessel. Perhaps some of our readers who have made observations on this matter, will favor us with communications.

S. A. asks: Has vacuum any immediate action on the piston of an engine? Answer: Vacuum produced on one side of the piston of an engine, has precisely the same effect as an equal amount of pressure applied to the other side of the piston.

J. G. R. asks: How long does a current of electricity take to cross the ocean on the cable? Answer: One quarter of a minute is the time required to make an intelligible signal on the cable.

F. D. H. asks: 1. How many Grove's cups are required to heat a fine platinum wire to redness? 2. Does it require quantity, or intensity of electricity to accomplish this result? Answers: 1. The electricity from a No. 1 cell of Grove's battery, if passed directly through a piece of platinum wire one quarter of an inch long and one four-thousandth of an inch in diameter, will heat it to redness. 2. Quantity.

J. M. W. asks: If gunpowder be enclosed in a very strong glass tube, leaving no waste space, and then exploded, would (provided the tube did not burst) all the powder explode? If it did, would the resulting gases remain as such, or would they be changed into a solid? In short, what would be the result of the explosion? Answer: We think this experiment has never been tried. If there were no waste space and no air in the tube, no explosion would take place, for although gunpowder contains in itself a quantity of oxygen sufficient for its combustion, the gases thereby produced must have room for expansion in order to produce an explosion. A patent was once taken in England for transporting gunpowder safely by placing it in airtight vessels filled with some neutral gas like carbonic acid, which does not support combustion. But this was a useless device. To ascertain the resultants from the explosion of a given quantity of gunpowder, the latter is commonly suspended within an iron globe several times larger than the charge, and the air is then exhausted. The powder is now fired by electricity, and the chemist ascertains the nature and quantity of the gaseous and solid products. The solids are mainly carbonate and sulphate of potash; the gases, nitrogen and carbonic acid. The sudden heating and expansion of the latter gives the mechanical effect.

J. K. asks (1) how to straighten a circular saw when it gets sprung. 2. Is there a chemical preparation to sharpen worn out files? Answers: 1. No instructions for straightening saws that will assist any one can be given. It is an art only attainable by practice. 2. There are various processes of using acids for sharpening files. I have tested three of them, but my experience is that they are more trouble than benefit. The cheapest way, all things considered, is to sell the worn out files and buy new ones. It will not pay even to get them recut, for filing tempered steel.—J. E. E., of Pa.

J. B. asks: What factory turns out the greatest number of locomotives? Answer: The Baldwin works, Philadelphia, Pa.

C. G. D. asks: 1. Does the law offering the reward for the improved canal boat for use on the Erie canal require the wheels and apparatus to be so constructed that the banks shall not be washed? 2. What does a boat cost, exclusive of engine and necessary machinery? 3. Is it probable that this season will decide the question? Answers: 1. A device that would injure the banks of the canal would not be likely to take the State reward of $100,000. 2. A common canal boat costs, we believe, about $1,000. 3. This season will probably decide the reward question.

E. McD. asks: Is there such a blessing as a clockwork fanning machine, for keeping a body cool? Answer: Yes, any quantity of them. Makers will do well to advertise them in the SCIENTIFIC AMERICAN.

G. H. asks: If I make the cores of a common sized electro-magnet extend ¼ inch beyond the end of the spools in front, will the magnetism be as strong at the poles, when a current excites the cores, as though the cores were not extended? Answer: No, the magnetic force will be a trifle less.

C. H. H. asks for a method of covering pulleys with leather. What sort of leather and what sort of glue should be used? Answer: Ordinary belt leather will answer quite well. Secure it to the face of the pulley with small belt rivets. For information as to the process lately described in the SCIENTIFIC AMERICAN, address the patentee.

J. O. E. says: 1. An engine pump is 6 inches in diameter and 1½ feet stroke. The sucker is a flat one. When all the air is shut off, it makes a loud crack in the pipes, as if it was going to break everything to pieces. 2. What is the best solution to make solder adhere to old copper pipes and to tin? Answers: 1. We cannot answer this, as we do not know what our correspondent means by the air being shut off. 2. For soldering copper pipes, use sal ammoniac or chloride of zinc. For tin, resin or chloride of zinc.

W. E. F. says: We use 8 cords of pine (Jersey) wood daily. Price $3. Nut hard Schuylkill coal can be delivered at $7.25 a ton. Which is cheaper? Answer: The wood is probably the cheaper fuel of the two. If your furnace is so constructed that you can burn wood or coal without change, you might try the experiment. General results sometimes fail to be realized in special cases; and whenever the test of experiment can be readily applied, it should be done.

J. E. W. says: In your reply to V. M. K. regarding the relative power of the same machine with either a 20 inch or 10 inch driving pulley at the same surface speed, did you not lose sight of the extra friction produced in the journals by the necessarily closer hug of the belt to the smaller pulley in order to transmit the same power? Answer: In each case the belt is transmitting the same amount of power, and consequently has the same strain, as its speed is unchanged.

B. says: A cubic foot of anthracite weighs about 95 pounds. Will some one state the number of cubic feet per ton of the various sizes in common use, "nut," "stove," "egg," etc.? By measuring the coal bin, we can then decide whether we have full weight or not. Answer: From the average weights of a great variety of coals, we obtain as a mean result, for broken coal of almost any size: Anthracite, 38 5, and bituminous, 40, cubic feet per ton of 2,000 pounds. Probably many of our readers may have made observations on weight and bulk of different kinds of coal, and if they will send us their figures, specifying kind of coal, size, and weight in pounds per cubic foot, we will tabulate them, and publish them in our columns. If a sufficient number of replies are received, we shall be enabled to form a very interesting and valuable table.

E. O. W. asks what is the best substitute for nitro-glycerin for blasting purposes? Answer: Dynamite is a good substitute for, or rather a safer means of using, nitro-glycerin. If you want a powerful and dangerous explosive, use picrate of potash, either alone or combined with an equal quantity of saltpeter.

M. M. W. asks: How many pounds pressure does the water, (coming from the reservoir in your city) exert at the outlet of a half inch faucet? Answer: This depends upon the amount of water in the reservoir, the part of the city, and the hight of faucet from ground. It varies every hour in the day. The fact that Croton water is often able to rise, in pipes, to the fifth floor of a house will enable you to get some idea of the pressure, remembering that a column of water 35 feet 9 inches high exerts a pressure of 15 lbs. to the square inch.

J. C. asks how many revolutions per minute an engine 6x18 inches must run to get the most power? Answer: The speed at which you can run the engine, provided you have sufficient boiler power, depends upon how well the running parts are balanced. If the engine is well designed in this respect, 100 revolutions will not be too fast.

J. P. L. asks how to tin small brass articles. Answer: The process employed in tinning small brass articles, such as pins and hooks, is to boil them in a solution of one part cream of tartar, 2 parts alum, and 2 parts common salt, in 12 parts of water. In this bath is placed a sufficient quantity of granulated tin. They can afterwards be polished with sawdust or bran and tow.

A. P. asks: 1. Is there any cheap substance known which, mixed with water, will make the same evaporate more rapidly, at the ordinary temperature, than the water would of itself? 2. Has any one metal the property of making water evaporate from its surface more rapidly than another? Answer: We should advise you to employ vacuum pans or some other method of diminishing the pressure of the atmosphere, if heat can be used. If not, keep the air in rapid circulation. If the quantity is small, place it under a receiver, and near it place fused chloride of calcium or oil of vitriol. If the quantity is large, try the German method with brine, called graduation.

R. F. says, in reply to R. A. C., who asked for a remedy for bleeding at the nose: I will give one obtained from Dr. Gleason during a course of lectures: It is a vigorous motion of the jaws, as if in the act of mastication. He advised us, in the case of a child, to make a wad of paper, put it into the child's mouth, and instruct it to chew it hard. Of course an adult does not need the paper. It is the motion of the jaws that stops the flow of blood. This remedy is so simple that people sometimes laugh when I recommend it, but I have never known it to fail in a single instance, even in very severe cases.

MINERALS.—Specimens have been received from the following correspondents, and examined with the results stated:

J. W. S.—The specimen is chiefly mica, with a little felspar. It has no value.

J. R.—We think it is corundum.

G. S. K.—Iron pyrites. Their only use is in making oil of vitriol.

C. D. M.—Copper pyrites.

D. Van B.—Tourmaline.

J. McM.—Quartz; of no especial value. Perhaps agates, suitable for mounting as ornaments, may be found in that locality.

J. J. F.—The rock you send contains some pyrites, iron, alumina, silica, etc. An assay will cost $10 or $15.

J. D. A.—Limestone.

DELTA sends us a specimen of chrome red (American vermilion) and asks how it can be prepared. Answer: Liebig and Wöhler state that it is best prepared by fusing together, at a very low red heat, equal parts of potassium and sodium nitrates, gradually pouring into the fused salt small quantities of chemically pure yellow chromate of lead. After cooling, the insoluble chrome red is washed and dried. It is then a magnificently colored, cinnabar-like crystaline powder. Professor Duflos prepares chrome red by precipitating a solution of acetate of lead with a solution of chromate of potassa to which caustic potassa has been added. Various shades from deepest to palest vermilion red are caused by the difference in size of the constituent crystalline particles. According to Dr. Duflos, its formula is $2PbO, CrO_3$.

## COMMUNICATIONS RECEIVED.

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

On an Auroral Phenomenon. By J. D. B.

On Pressure Gages and Safety Valves. By E. D. S.

On the Natural Rights of Inventors. By T. W.

On Iron Steam Yachts. By J. H.

On Retardation of the Earth's Rotation. By J. H.

On Fresh Water Crayfish. By J. S.

On the Patent Discussion. By E. A. B., by M. J. and by M. J. D.

On Embryology. By J. L.

On Mechanical Elements. By F. M. McM.

On the Roper Engine. By H. S. W.

Also enquiries from the following:

T. R. J.—A. O.—J. S. T.—C. R.—B. L.—R. L. S.—A. M.—J. P. D.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

# Index of Inventions

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## APPLICATIONS FOR EXTENSIONS.

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

25,565.—ROLLING MILLS.—J. & G. Fritz. September 10.
25,569.—BEDSTEAD SLATS.—T. Howe. September 10.
25,572.—MOLDING WATER TRAP.—J. A. Lowe. Sep. 10.
25,586.—BURGLAR ALARM.—A. Q. Ross. September 10.
25,588.—STEAM PUNCHING MACHINE.—J. Sparrow. Sep. 10.
25,640.—STEAM BOILER.—J. Harrison, Jr. September 10.
25,683.—HYDRANT.—C. L. Stacy. September 17.
25,796.—JACQUARD MACHINE.—A. Babbett. October 1.
27,589.—GUN BARREL.—J. H. Burton. September 10.

## EXTENSIONS GRANTED.

24,531.—GAS RETORT.—W. Beaumont.
24,563.—COUCH FOR RAILROAD CAR.—C. Knight.
24,588.—HAY SPREADER.—J. C. Stoddard.

## DESIGNS PATENTED.

6,711 & 6,712.—CENTER PIECES.—B. Dreyer, Phila., Pa.
6,713 to 6,720.—CARPETS.—A. Heald, Philadelphia, Pa.
6,721.—JEWELRY BOX.—E. C. Moore, Yonkers, N. Y.
6,722.—FURNITURE.—T. W. Moore *et al*, New York city.
6,723.—LOCK FRONT.—E. J. Steele, New Haven, Conn.
6,724.—DRAWER PULL.—L. Widmayer, New Britain, Conn.
6,725.—BARBER'S FOOTSTOOL.—F. J. Coates, Cincinnati, O.
6,726 to 6,733.—STOVE PLATES.—S. H. Ransom, Albany, N. Y.
6,734.—HANDLE SOCKET.—J. S. Ray, East Haddam, Conn.

## TRADE MARKS REGISTERED.

1,329.—MEDICINE.—F. W. Barnum & Co., Danbury, Conn.
1,330.—VARNISH BRUSH.—E. Clinton & Co., Phila., Pa.
1,331 & 1,332.—PLUG TOBACCOS.—Liggett *et al*, St. Louis, Mo.
1,333.—WINES AND LIQUORS.—Morrow & Co., N. Y. city.
1,334.—COSMETIC.—W. T. Wenzell, San Francisco, Cal.
1,335.—STOCKING SUSPENDER.—C. A. Shaw, Boston, Mass.
1,336.—PAINT.—H. P. Webb, New York city.
1,337 & 1,338.—OILS.—Devoe Manufacturing Co., N. Y. city.
1,339.—FOUNTAIN PUMP.—J. A. Whitman, Cranston, R. I.

## SCHEDULE OF PATENT FEES:

On each Caveat ..... $10
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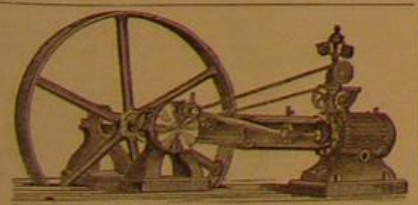
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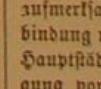
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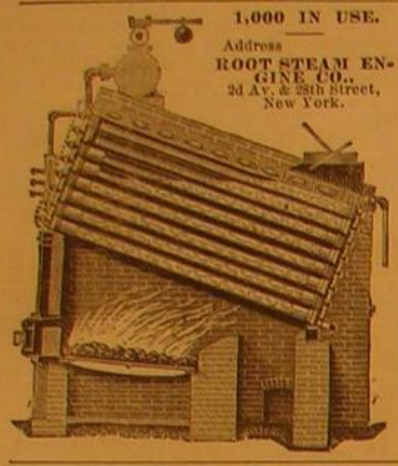
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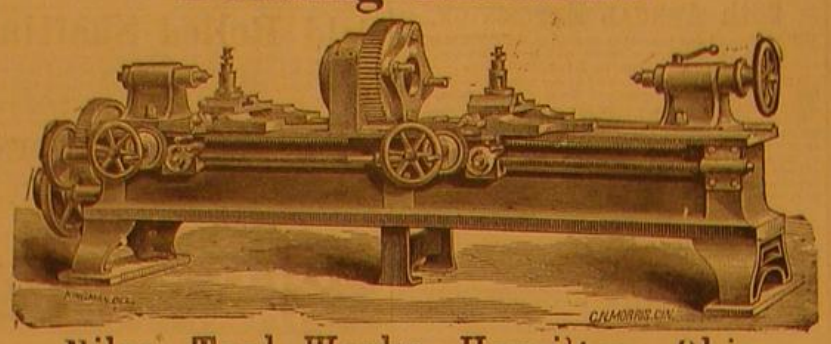
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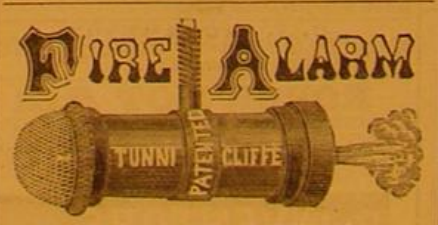
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THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard sts., Philadelphia and 59 Gold st. New York.