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Air Target Pistol.

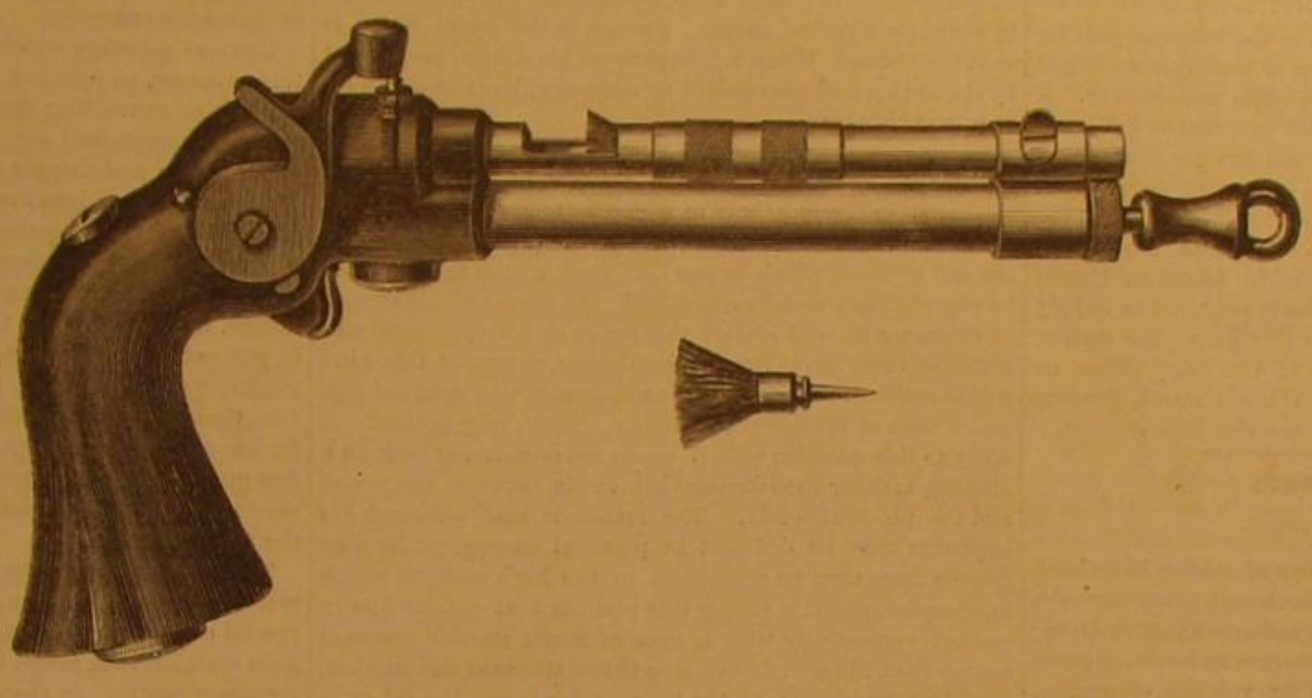
There is a peculiar fascination in all amusements that require skill of hand, eye, and judgment, which entirely distinguishes them from games of chance. The latter soon pall upon the taste without the zest given to them by stakes. The former, the more they are indulged in, the more they delight, because with increasing skill there is an increasing sense of acquired power, which always comes from discipline.

There is all the difference between these two classes of amusements that exists between health and disease, between moral purity and moral depravity. Hence those who have made moral science a study have been unanimous in recommending games of skill, and just as unanimous in deprecating games of chance.

Among all the recreations which demand skill, perhaps none present more attractions to the majority of mankind than shooting; and this amusement is also an educating exercise, training the eye and nerves to steadiness and precision.

At pleasure resorts and watering-places, air-gun practice has become a standard amusement with both sexes.

Air pistols and guns have heretofore been somewhat expensive, costing from twenty dollars to sixty dollars, according to style and finish. The pistol herewith illustrated costs only three and a half dollars, and is, we believe, the cheapest air pistol ever constructed.



HAWLEY'S AIR TARGET PISTOL.

The stock or handle is of japanned iron, the barrels being of brass. The lower barrel is the air-pump, by which the stock is filled with condensed air.

The dart or bullet is put into the breech end of the upper barrel, through an aperture shown in the engraving, and the aperture is then closed by a ring slide.

The hammer of the lock strikes upon a solid nipple which communicates with and opens a valve leading from the air chamber to the upper barrel, and allows just sufficient air to escape for a charge. It will shoot from five to ten shots a distance ranging from thirty to fifty feet at one charging.

Darts are furnished with each pistol, and every piece is tested before leaving the factory. E. H. Hawley, patentee, June 1, 1869. For rights and pistols address P. C. Godfrey, agent, 119 Nassau street, New York.

Improved Peat Machine.

Our readers have seen enough upon the subject of peat in these columns to need little posting in regard to the importance of a machine which can successfully deal with this somewhat difficult material to manipulate.

The fact that there exists in this country an immense aggregate area of peat lands, and that it is calculated that some of these lands will produce one thousand tuns of condensed fuel per acre, is enough to arouse attention to the immense value of these deposits. It may even be questioned whether these deposits do not exceed in value those of coal and petroleum.

Our readers have been well informed also in regard to the industrial value of this fuel in the generation of steam, particularly on locomotives and steam vessels also in metallurgy and for domestic purposes.

This value has been so well understood and appreciated that very numerous attempts have been made to devise a machine to prepare it for market. The advances have been slow but sure, and earnest efforts are still making both in this country and in Europe to surmount difficulties which at first seemed almost insurmountable. These difficulties are finally yielding to inventive skill, and resolute effort.

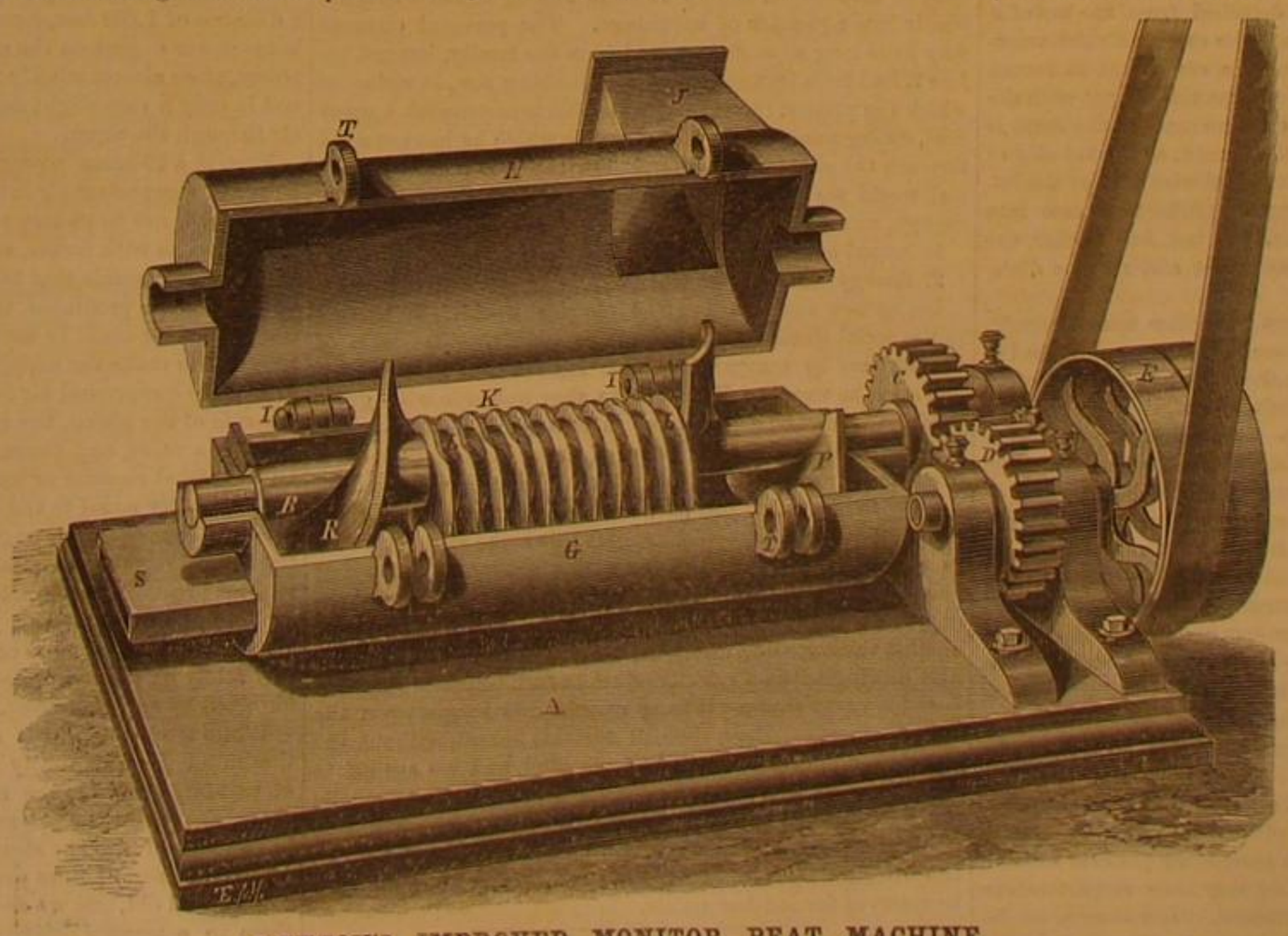
It is claimed that the machine herewith illustrated has combined all the elements necessary to the successful working of peat, and that it gives a firm compressed fuel suitable for metallurgic operations, and of course for other industrial purposes.

The machine bears a strong resemblance to the rotary sausage meat cutting machines quite commonly known throughout this country.

The engraving is a perspective view with the cover turned back. A is the platform or bed-plate upon which the machine is supported. B is the shaft upon which the knives and wings are fastened.

The shaft is revolved by means of gear-wheels, C, D, and belt on the wheel, E, or in any other suitable manner.

The cylindrical casing or shell, is made in two parts, G and H. The former is made fast to the bed-plate, A, and the latter is hinged to the part, G, as seen at I.



LUXTON'S IMPROVED MONITOR PEAT MACHINE.

J is the hopper, attached to or forming part of the cover, H, through which the peat is introduced.

K represents a series of cutters or knives, fastened on the shaft in any suitable manner, so that they cannot turn independently of the shaft.

These cutters are separated by the collars, L, and kept at a proper and uniform distance apart, so that they engage with vertical slots in the bed-piece.

These slots in the bed leave vertical studs or teeth, of rectangular form in their cross section, but tapering edgewise.

The cutters may be revolved in an opposite direction for cleaning or washing the machine, or other purposes, whenever it is desired.

Directly beneath the hopper or orifice, J, and firmly attached to the shaft, is a spiral wing, P, so placed as to convey or force the peat toward the cutters.

After the peat has passed through the cutters, there is another spiral wing, R, which receives the comminuted peat from the cutters and forces it from the machine, through the orifice, S, in a broad sheet, or any other form wished.

By this machine the peat is operated upon as it is taken from the peat-bed and delivered in a finely comminuted state in a form suitable for drying. The sheet is cut up, before drying, into suitable sized pieces for convenient handling after being dried.

The top part of the machine is fastened down to the other part by means of pins or screws through the lugs, T, or in any other suitable manner.

We have not yet had an opportunity of seeing this machine in actual operation, but we are confident it is correct in principle, and entertain no doubt as to its efficiency in practice. This opinion is strengthened by the reports of those who have seen it in operation and upon whose testimony we can rely. We are further informed that, on the 8th September last, a public trial of the Luxton Peat Machine was made at the Engine Works of Messrs. Porter & Allen, in Harlem, New York, in the presence of a number of scientific gentlemen and others engaged in the peat business, and that its perfect success was acknowledged with enthusiasm by all who witnessed it.

We hope to be able during the coming season to see the machine at work, which will enable us to give our readers a statement of practical results.

Mr. Luxton, the inventor, was formerly the superintendent of the New York and Pennsylvania Peat Works. He is now sole owner of those works, and desires to secure a partner with capital to put them in full operation. The works are situated within one mile of the Erie Railway, and therefore a market is at hand for the fuel manufactured.

The machine we have described has been the result of long study on the part of the inventor, than whom few in this country have had a larger experience in the manufacture of peat.

In other machines attempts have been made to compress the peat just as cut from the bog, without any preliminary manipulation. The vegetable fiber, contained more or less in all peat, has rendered it impossible to thus compress the fuel so that it would not become injured by wet. We have specimens of compressed fuel now on our table prepared from coarse surface bog by this machine, as dense to all appearance as Peach Orchard coal; and its specific gravity is about equal to, and it will absorb no more water than, that excellent coal.

The inventor affirms that at 100 revolutions per minute the machine will grind and compact 30 tuns per hour; but at the usual speed, requiring seven horse power, it easily produces 150 tuns per day of ten hours, at a cost for attendance of about eighty dollars.

Many railroads are now using peat, which is found peculiarly adapted to their purpose, as no alteration is necessary in their furnaces, and steam can be got up in a cold boiler much quicker than by the use of wood.

On an English railroad, a special locomotive trial gave the following results: "With peat, a pressure of 25 lbs. of steam

was obtained *in one hour and thirty-two minutes*, while, with coal, it took 2 hours 25 minutes to secure a pressure of 10 lbs. In keeping up steam at 30 lbs. pressure, for 8 hours, the consumption of peat was 1,150 lbs., and of coal 1,750 lbs. On another road, the use of peat for three months was found to be 30 per cent cheaper than that of coal."

In a trial made on the Grand Trunk Railway, reported in a former issue of this journal, it was found that in ascending grades the pressure of the steam gage invariably increased. The damper was nearly closed at all times, the slot in the door open nine by two inches, and with never more than from six to nine inches of fuel in the fire box. Abundance of steam was raised; and, for a distance of many miles, the pressure of steam did not vary.

On the return trip, with a similar weight of fuel, and a train of six passenger cars:

The total distance run was	172 miles.
Fuel used per mile	71 lbs.
Average speed, including stoppages	22 miles.
Greatest pressure of steam	125 lbs.
Least pressure of steam	85 lbs.

Experiment with engine No. 65, in good working order, and with peat fuel containing about twenty per cent of water. Express train, consisting of six passenger cars.

Total distance run	177 miles.
Total consumption of fuel	7,836 lbs.
Consumption per mile	45 "
Maximum consumption between stations	60 "
Minimum consumption between stations	30 "
Average speed, including stoppages	25½ miles.

There is no lack of testimony as to the value of peat for locomotive use and in the reduction of ores, and we might fill columns upon this point, but it is quite unnecessary. If Mr. Luxton has succeeded—as we are prepared to believe—in at last producing a machine that can produce compressed peat at a sufficiently cheap rate, and of proper density, the success of his invention is beyond a peradventure.

The machine is covered by several patents, the last of which was issued, through the Scientific American Patent Agency, April 5, 1870. The patentee is prepared to supply machines, or to negotiate for the sale of rights. For further information address Charles Luxton, at the Land Office, on the corner of Palisade avenue and Warren street, Hudson City, New Jersey. Foreign Patents have also been secured.

WHAT IS ENERGY!

[Balfour Stewart in Nature].

It is only of late years that the laws of motion have been fully comprehended. No doubt it has been known since the time of Newton that there can be no action without reaction; or, in other words, if we define momentum to be the product of the mass of a moving body into its velocity of motion, then whenever this is generated in one direction an equal amount is simultaneously generated in the opposite direction; and whenever it is destroyed in one direction an equal amount is simultaneously destroyed in the opposite direction. Thus the recoil of a gun is the appropriate reaction to the forward motion of the bullet, and the ascent of a rocket to the downrush of heated gas from its orifice; and in other cases where the action of the principle is not so apparent, its truth has notwithstanding been universally admitted.

It has, for instance, been perfectly well understood for the last 200 years that if a rock be detached from the top of a precipice 144 feet high it will reach the earth with the velocity of 96 feet in a second, while the earth will in return move up to meet it, if not with the same velocity yet with the same momentum. But inasmuch as the mass of the earth is very great compared with that of the rock, so the velocity of the former must be very small compared with that of the latter, in order that the momentum or product of mass into velocity may be the same for both. In fact, in this case, the velocity of the earth is quite insensible and may be disregarded.

The old conception of the laws of motion was thus sufficient to represent what takes place when the rock is in the act of traversing the air to meet the earth; but, on the other hand, the true physical concomitants of the crash which takes place when the two bodies have come together were entirely ignored. They met, their momentum was canceled—that was enough for the old hypothesis.

So, when a hammer descends upon an anvil, it was considered enough to believe that the blow was stopped by the anvil; or when a break was applied to a carriage-wheel it was enough to imagine that the momentum of the carriage was stopped by friction. We shall presently allude to the names of those distinguished men who have come prominently forward as the champions of a juster conception of things, but in the meantime let us consider some of those influences which served to prepare men's minds for the reception of a truer hypothesis.

We live in a world of work, of work from which we cannot possibly escape; and those of us who do not require to work in order to eat, must yet in some sense perform work in order to live. Gradually, and by very slow steps, the true nature of work came to be understood. It was seen, for instance, that it involved a much less expenditure of energy for a man to carry a pound weight along a level road than to carry it an equal distance up to the top of a mountain.

It is not improbable that considerations of this kind may have led the way to a numerical estimate of work.

Thus, if we raise a pound weight one foot high against the force of gravity we may call it one unit of work, in which case two pounds raised one foot high or one pound raised two feet high would represent two units, and so on. We have therefore only to multiply the number of pounds by the vertical hight in feet to which they are raised, and the product will represent the work done against gravity. The force of gravity being very nearly constant at the earth's surface, and always in action, is a very convenient force for this purpose; but any other force, such as that of a spring, would do equally well to measure work by. Generalizing, we may say, *the space moved over against a force multiplied into the intensity of that force will represent the quantity of work done.* So much for the definition of work, and it is necessary to know what *work* is before proceeding to define *Energy*.

Now what does the word Energy really mean? In the first place it does not mean force.

Two substances may have an intense mutual attraction, in virtue of which they form a very intimate union with one another; but when once this union has been consummated, although the force still continues to exist, the combination is singularly deficient in Energy. Nor does Energy mean motion, for although we cannot have motion without Energy, yet we may have Energy without motion.

By the word Energy is meant the power of doing work; and the energy which a laboring man possesses means, in the strictly physical sense, the number of units of work which he is capable of accomplishing.

This is a subject which at this stage we may attempt to illustrate by reference to a very different department of knowledge.

The analogy which we shall venture to institute is between the social and the physical world, in the hope that those who are more familiar with the former than with the latter may be led to perceive clearly what is meant by the word Energy in a strictly physical sense. Energy in the social world is well understood. When a man pursues his course, undaunted by opposition and unappalled by obstacles, he is said to be a very energetic man.

By his energy is meant the power which he possesses of overcoming obstacles; and the amount of this energy is measured (in the loose way in which we measure such things) by the amount of obstacles which he can overcome—the amount of work which he can do. Such a man may in truth be regarded as a social cannon-ball. By means of his energy of character he will scatter the ranks of his opponents and demolish their ramparts. Nevertheless, a man of this kind will sometimes be defeated by an opponent who does not possess a tithe of his personal energy. Now, why is this? A reply to this question will, if we do not mistake, exhibit in a striking manner the likeness that exists between the social and the physical world. The reason is that, although his opponent may be deficient in personal energy, yet he may possess more than an equivalent in the high position which he occupies, and it is simply this position that enables him to combat successfully with a man of much greater personal energy than himself. If two men throw stones at one another, one of whom stands at the top of a house and the other at the bottom, the man at the top of the house has evidently the advantage.

So, in like manner, if two men of equal personal energy contend together, the one who has the highest social position has the best chance of succeeding. For this high position means energy under another form. It means that at some remote period a vast amount of personal energy was expended in raising the family into this high position. The founder of the family had, doubtless, greater energy than most of his fellows, and spent it in raising himself and his family into a position of advantage. The personal element may have long since disappeared from the family, but not before it had been transmuted into something else, in virtue of which the present representative is able to accomplish a great deal, owing solely to the high position which he has acquired through the efforts of another. We thus see that in the social world we have what may justly be termed two kinds of energy, namely:

1. Actual or personal energy.
2. Energy derived from position.

Let us now again turn to the physical world. In this, as in the social world, it is difficult to ascend. The force of gravity may be compared to that force which keeps a man down in the world. If a stone be shot upwards with great velocity, it may be said to have in it a great deal of actual energy, because it has the power of doing useful work or of overcoming up to a great hight the obstacle interposed by gravity to its ascent, just as a man of great energy has the power of overcoming obstacles. But this stone as it continues to mount upwards will do so with a gradually decreasing velocity, until at the summit of its flight all the actual energy with which it started will have been spent in raising it against the force of gravity to this elevated position. It is now moving with no velocity—just, in fact, beginning to turn—and we may suppose it to be caught and lodged upon the top of a house. Here, then, it remains at rest, without the slightest tendency to motion of any kind, and we are led to ask what has become of the energy with which it began its flight? Has this energy disappeared from the universe without leaving behind it any equivalent? Is it lost forever, and utterly wasted? But the answer to this question must be reserved for another article.

Air Power in Manufactures.

A recent experiment in the mines of Galena, in the use and transmission of compressed air as a motive power, is, says the *Bureau*, full of suggestion and interest to all who find the increased rates of insurance, and the dangers of destruction by fire, owing to the introduction of steam engines into their premises, a serious deduction from their profits and an embarrassment to success. A small steam engine of 10-horse power will often add one per cent to the rates of insurance on hundreds of thousands of dollars of property in the same building. Where, as in planing mills, saw mills, and manufactories of light wooden wares, the dangers from the introduction of steam are enhanced by the collection of large quantities of light combustible substances, near its fires, flues, and sparks, the chances of fire are so increased that the soundest insurance companies refuse the risks altogether. If, therefore, the expansive power of compressed air can be substituted for that of steam, with economy in the cost of producing the power, some important advantages will be gained. As the power is not, like that of steam, dependent on the existence or retention of heat, it can be transmitted through pipes of any required length, almost as gas is sent from a central reservoir to all parts of a city. At all events, while steam would cool and lose its power in any attempt to transmit it through pipes a few score feet, compressed air could be transmitted for thousands of feet, for several city blocks, at least, without any loss of power, in proportion to the degree of compression. Hence, if the machinery for compressing the air, which it is assumed must be driven by steam power, be erected in one block so protected as to be absolutely fire-proof, the pipes will carry the power to the machinery in any number of surrounding blocks, which being thereby freed from the introduction of heat into their premises, may run any weight of machinery, and be surrounded by any quantity of combustible matters without increasing their liability to fire, so far as their power is concerned. Where block after block is filled with saw and planing mills, wagon and blind factories, and even founderies, machine shops, and grist mills, the reduction of insurance, if it could be effected without loss of power, would amount to a saving of hundreds of thousands annually.

The one question which determines the practicability of this economy, is, whether the loss of motive power, which arises from converting steam power as it comes from the engine into compressed air power, is equal to the present cost of insurance, and danger of destruction by the introduction of fires and steam into manufacturing premises. Some loss, of course, may be expected to arise, for on the common principle of mechanical philosophy, a cause must equal its effect, and no force can give rise to a force which exceeds itself, or indeed, which is not less than itself by the friction involved in generating the new force by the power of the old one. It might be assumed from this principle of mechanics, therefore, that if a steam engine be employed in condensing air for use as a motive power, the compressed air will furnish a less number of "horse-power" than that of the steam engine used in condensing it—less by the amount of the friction and the waste.

The value of the experiment at Galena consists in its demonstration that the loss of power is so slight as to be of no special consequence compared with the important pecuniary gain which would result from the substitution of air power for steam power. In that experiment it was found necessary to transmit compressed air from the surface, where it was obtained by air pumps, worked by a steam engine of 10-horse power, through pipes down a shaft of 1,300 feet in depth, in order there to work a pump for expelling the foul air to the surface.

The introduction of a steam engine into the bottom of the shaft was impossible because of its tendency to still further foul the air, and other objections existing to the simpler modes of ventilation usually used in the coal mines. It was found that the air, compressed by a 10-horse power engine at a distance of 1,300 feet, formed a motive power equal to a 9-horse power engine on the spot; that the loss of one tenth in power, arose almost wholly from the friction of the air pumps, and in only a very slight degree from the transmission of the air through the pipes.

Now, if a 10-horse power steam engine can send 9-horse power of compressed air into a building 1,300 feet distant, why may it not be as easy and profitable to supply manufacturing blocks with power, as to supply a whole city with gas? It is not impossible that two sets of pneumatic tubes might be found more profitable than one. Through one of these compressed air could be sent, from a sufficiently large central reservoir to make the supply uniform and the pressure steady. While the compressed air is introduced into the cylinder on one side of the piston, the cylinder on the other side might open by a valve, and through a similar pneumatic tube into an exhausted receiver or huge vacuum, having an exhaustive power exactly equal to the compressive power of the air reservoir. Thus every air engine might be worked on the principle of a low-pressure steam engine—that is, with a simultaneous pressure on one side of the piston and exhaustion on the other. Whether this joint use of compressed air and a vacuum would be a more economical use of power, than to rely solely on the compressed air, could probably only be determined by an experiment.

While the change, if it should accomplish the economy that might seem naturally to be expected from it, would be of vast importance to the manufacturing world, it is obvious that there is nothing patentable or susceptible of monopoly in any part of it. The steam engine, the air pump, the pneumatic tube, and engines propelled by air, whether heated or cold, are all old, and we do not suppose any combination of them in a manner designed merely to save extra building expenses and insurance, can be considered an invention. It amounts, however, to a suggestion worthy the attention of all manufacturers and users of machine power.

THE coach is a French invention. The first coach seen in England was in (about) 1563. In 1626 the vehicle was first plied for hire.

A SINGLE establishment in this city—the Singer Sewing Machine Company—turns out five hundred sewing machines per diem. The works are run night and day.

MEAT PRESERVING IN MELBOURNE, AUSTRALIA.

Having in regard the enormous and continually advancing progress which meat preserving and its consumption have taken of late years, we are induced to present to our readers a description of the works of the Melbourne Meat Preserving Company, condensed from the London *Grocer*.

The Melbourne Meat Preserving Company was established on December 31, 1867, at a meeting of squatters, and others interested in finding a market for their surplus stock, and the projected process of preservation was that devised by Mr. S. S. Ritchie, who earned his experience in meat-preserving establishments in Great Britain. He was supported in the first instance by the firm of Holmes, White & Co., who encouraged his experiments with Australian meat, and backed his enterprise. The result has been successful. At the present moment the Company's capital consists of £40,000,in 8000 shares of £5 each, all called up, and the premises consist of an extensive series of buildings, erected on a site adjoining the Saltwater River,within three miles of Melbourne. It employs 251 persons, including a large number of boys; pays weekly wages amounting to £493, purchases from 7000 to 8000 sheep, and from 80 to 100 head of cattle, worth together from £3500 to £4000 (the present average price is 8s. per sheep, and £7 per bullock) per week; and produces weekly £6000 worth of produce—item, 17,000 tins of preserved meat, worth £2450, 65 tuns of tallow, worth £2350, and sheepskins, hides, bones, and sundries worth £1200. Its operations in January, 1870, alone, comprised the shipping to London of 48,620 tins of meat (weight of meat 295,012 lbs.), and 780 casks of tallow, weighing 254 tuns, 1 cwt., 2 qrs. But this is not all, for the excellence of the meat, so preserved, has caused an enormous local consumption, and the local demand is daily increasing. In the article of ox and sheep's tongues, for instance, export is not to be thought of, for though the Co. purchase about half the amount of sheep and cattle consumed in Melbourne itself, yet it is unable to supply these tongues (in a preserved form of course) fast enough for its local customers. Its sale for consumption in the colony amounts to 61,455 tins, or 183,806 lbs. of meat.

The above are preserved in vacuo,and guaranteed to remain perfectly sweet any length of time and in any climate.

The Company's buildings being on the side of a hill, are arranged conveniently in stages, and as they spread over a considerable area, tramways, ingeniously designed for easy transit, connect the departments. First come the slaughter houses and sheep and cattle pens. The former are substantially built of stone, with ample means of ventilation. Drainage is obtained by a false floor, composed of joistings laid as a grating, and thus all fluid matter runs through into a bluestone reservoir beneath, which, in its turn, drains into the places prepared for that purpose. The strictest exercise to obtain cleanliness appears to be the pervading rule of the establishment, and necessarily so, for much of the Company's success depends upon the meat being put up in the best form, which could not be the case if it had to remain in an atmosphere charged with noxious gases. The Company is now working day and night, and 1000 head are brought in for the day's work, and 500 head for the night's operations. Water is laid on in every direction. The process of slaughtering is of the simplest, and the sheep are brought into the slaughter-house, polled, disemboweled, and skinned with such amazing speed that it is only the allotted work of two men and a boy. The bullocks are killed by spearing,and the use of very simple tackle enable the easy transit of the carcasses,which are eventually hung on a truck (used for sheep also) constructed for the purpose, and run along a tramway to the scene of the next series of operations. It is not too much to say that the only observable smell in these slaughter houses is that of fresh meat, for the blood and offal have no time to accumulate.

The carcass, as it leaves the slaughter yards, is next taken to the "butcher's shop," where the meat is boned and jointed, ready for the kitchen, and it is fully occupied by the men and boys at work preparing mutton and beef for the tins, and sorting it into the lots required. The greatest cleanliness prevails here. In dealing with mutton, the legs and shoulders are boned, and, sometimes, when the sheep is a particularly fine one, a portion of the sides is put up, too, as mutton with bone; but, in most cases, the fore-quarter, except the actual shoulder, is abandoned altogether to the boiling-down part of the establishment, where the tallow is extracted, and the remainder turned into manure. Indeed, it is a fixed rule to consign to the tallow vats all the inferior portions of every animal preserved. All the bone is taken from the beef, the rounds, flanks, and briskets of which are turned into "corned beef," and the rest is made into "roast or boiled beef" (fresh). As fast as the meat is sorted into the requisite quantities, it is placed in trucks, which run on a tramway to the "kitchen." The first process there is to place the meat on large trays, and immerse it for a few minutes in boiling water, which scalds it, and removes scum and possible impurities. Steam lifts next carry the trays away to tables, on to which their contents are shot. Nimble fingers then place the meat in the tin canisters, which are brought in from the tinmen's room; and it is now that care is taken to give adequate weight, and to insure further the great desideratum of cleanliness. As fast as the canisters are filled, tinmen solder on the tops, and each canister is then intact, save a small pinhole in the center of the convex-shaped cup. The canisters are next put into huge trays, which steam hoists carry aloft into the preserving room. In the "roasting and soup" department of the kitchen are six 260-gallon coppers,of the kind known as "jacketed pans"—*i.e.*, with a chamber left between the outside and inside coating of the copper to be filled with the steam by which the boiling process is effected. In these coppers is boiled the stock for the soups, which, when ready for use, is drawn off by taps, cooled, and passed into the kitchen, where it is placed in the pans with the material that establishes its flavor, and which is prepared in the same apartment. In this place, too, is a special process for the manufacture of "extractum carnis," or the essence of meat prepared according to Liebig's process. An essential feature of the latter is the reduction of the extract in shallow pans at a low temperature.

It will be recollected that the soldered canisters, the pin-hole open at the top, have been conveyed to the "preserving room." The trays—in each of which 100 tins have been placed—have perforated bottoms—and they are carried along the room on travelers, and lowered into the cisterns ranged round the room,and sufficiently full of a chemical composition of which muriate of lime forms a large ingredient. The cisterns are heated by steam, and here the canisters are boiled, according to the nature of their contents and the amount of cooking they are intended to undergo. As we have before indicated, Mr. Ritchie's process involves the expulsion of air to the last particle possible, and to secure this, whatever the amount of cooking required,the concluding point is always when a jet of steam is being expelled through the pin-hole. At this juncture the solderers come and solder up the pin-hole, applying a cold sponge immediately afterward to cool the solder and prevent the steam from forcing its way through. This final process is a very delicate one,and great skill is demanded from the workmen who perform it, for an extra pressure of the finger might cause air to re-enter the tin, the effect of which would be found out in the testing room, and cause the ruin of the meat. So soon as the tin is hermetically sealed in this way, the canister is subjected to a still higher heat, by which means the trifling quantity of air that may be left inside is nullified. The tins are then hoisted away into the cooling room, from which each day's work passes in batches to the testing room. The appliances for cooling are so arranged, that when once the contents of the canisters have received their last heating, the temperature is rapidly reduced by cold water, and in this way the cooking is not allowed to continue a moment beyond the needful point. The temperature of the testing room is kept at 100° Fah., and here the canisters remain a certain time—generally seven days—to develop defects which are ordinarily exhibited by the exudation of the contents or the convexity of the ends of the tins. On leaving the testing room,the tins are carried off into other apartments, where they are painted, labeled, and packed in wooden cases, stenciled with marks showing their contents. Last of all, they are placed in trucks and transported by rail to the Company's wharf on the river side, when they are put into lighters for transit to the exporting ship's side.

Besides all this, there is a melting department for tallow, which the Company export so largely, being impelled thereto by the necessity of utilizing their *débris*. The latter is packed into trucks and carried on rails to a staging in the melting room, from which it is unloaded into six huge vats. There are three large and three small vats, and they hold,collectively, as much as would constitute the carcasses of 1200 sheep. The fat, being boiled out, is carried off by spouting for refining, and from the refinery it runs into coolers, from whence it is turned off by means of taps into the barrels in which it is sent to market. All the above processes are arranged so that there shall be no handling of the fat, and the human labor required is comparatively trifling. Outside this department is a kind of mill, where the bones and other *débris*, after boiling, have their last drop of fat expressed from them.

The Company's works include other processes and manufactures, the most interesting of which is, perhaps, to be seen in the tinmen's room, which is fitted with a large variety of cutting, rolling, and die sinking machines. Here are forty-four tinsmiths preparing the tins. The engineer's room is provided with lathes, forges, and all the appliances for keeping the tools, etc., of the establishment in order. There is, also, a cooperage, where the tallow casks are made to exactly suit the purpose in view.

Curiosities of Breathing.

The taller men are, other things being equal, the more lungs they have, and the greater number of cubic inches of air they can take in or deliver, at a single breath. It is generally thought that a man's lungs are sound and well developed, in proportion to his girth around the chest; yet observation shows that slim men as a rule will run faster, and farther, with less fatigue, having "more wind," than stout men. If two persons are taken, in all respects alike, except that one measures twelve inches more around the chest than the other, the one having the excess will not deliver more air at one full breath, by mathematical measurement, than the other.

The more air a man receives into his lungs in ordinary breathing, the more healthy he is likely to be; because an important object in breathing is to remove impurities from the blood. Each breath is drawn pure into the lungs; on its outgoing, the next instant, it is so impure, so perfectly destitute of nourishment, that if rebreathed without any admixture of a purer atmosphere, the man would die. Hence, one of the conditions necessary to secure a high state of health is, that the rooms in which we sleep should be constantly receiving new supplies of fresh air through open doors, windows, or fireplaces.

If a person's lungs are not well developed, the health will be imperfect, but the development may be increased several inches in a few months, by daily out-door runnings with the mouth closed, beginning with twenty yards and back, at a time, increasing ten yards every week, until a hundred are gone over, thrice a day. A substitute for ladies and persons in cities, is running up stairs with the mouth closed, which compels very deep inspirations, in a natural way, at the end of the journey.

As consumptive people are declining, each week is witness to their inability to deliver as much air at a single out-breathing as the week before; hence the best way to keep the fell disease at bay is to maintain lung development.

It is known that in large towns, ten thousand feet above the level of the sea, the deaths by consumption are ten times less than in places nearly on a level with the sea. Twenty-five persons die of consumption in the city of New York, where only two die of that disease in the city of Mexico. All know that consumption does not greatly prevail on hilly countries and in high situations. One reason of this is, because there is more ascending exercise, increasing deep breathing; besides, the air being more rarefied, larger quantities are instinctively taken into the lungs to answer the requirements of the system, thus at every breath keeping up a high development. Hence the hill should be sought by consumptives, and not low flat situations.—*Hall's Health Tracts.*

The Birmingham Die-Sinkers.

Die-sinking is a most important branch of Birmingham industry, and has had an existence since the year 1650. It is now almost wholly in the hands of "garret-masters," who work for the larger manufacturers, its wide distribution having chiefly been brought about during the last half-century. It has been well remarked, that as the die-sinker executes almost all, and in some cases quite all, his work for various manufacturing houses, he seldom gets the credit of his performances with the public. Some well-known manufacturer in Birmingham, London, or elsewhere, brings the finished goods into the market, often stamped with his own name, and and absorbs the praise justly due to the garret-master, up an entry, in a back street, who is the real author of the work.

The principal departments of die-sinking, in Birmingham, as indicated by the industries in which dies are most largely used,are,says the *Engineer*, coining, medaling, button-making, steel seals, and ornamental metals.

The demand for dies used in coining has been subject to considerable fluctuations, owing, in many cases, to Government interference. In 1812, dies were made for coining gold forty-shilling pieces, of which 800 were struck, the only gold coins ever struck in Birmingham. They were for a banker in Reading, named Monk. Two millions of penny tokens for circulation among the British forces in Spain were struck, in the same year, from Birmingham. The issue of gold tokens was, according to Mr. Timmins, stopped by the Government at the onset, and that of silver, copper, and other metals was, with some temporary exceptions,declared illegal after January 1, 1819. The only coin now produced in Birmingham, is the current copper coin for English and foreign Governments.

Medaling is an important industry, affording considerable employment to the Birmingham die-sinkers. The varieties of medals produced in commemoration of events or individuals are very considerable. Royal births, coronations, marriages, and deaths, anniversaries of schools, churches, chapels, societies, and institutions of almost every kind; weddings, "silvern" or "golden;" laying of foundation stones, or inauguration of public buildings, of every popular hero, or as decorations or prizes for schools and colleges, or for athletic sports. It is noticeable, that almost every metal known to manufacturing industry has been used,at some period or other for striking medals in. An excellent authority, in Birmingham, informs us that most of the ordinary medals are struck either in bronze or tin, the latter carefully refined by the medallist, being the familiar white metal of the "coronation" medals. In bronze medals, the process of "bronzing," which gives their peculiar color, is generally performed before the medal is struck for the last time.

In button-making, the labor of the die-sinker is chiefly expended in livery buttons. The figured gold buttons of the pigtail period, and the sporting buttons, both in horn and metal, fashionable in the early years of her Majesty's reign, many of them of exquisite workmanship, and by first-class artists, have now almost entirely disappeared.

Steel seals, for public and private use, have enormously increased of late, and, as a manufacturer writes, "the demand has been largely augmented by the limited joint-stock companies recently sprung into existence." The enormous development of the envelope trade, and the equivalent demand for stamped note paper, have opened up for the die-sinker quite a new field of enterprise.

Dies for the stamping of ornamental metals are used, of almost every sort and size,varying from two ounces to two tuns in weight. A practical maker remarks that the heavy dies are for the most part cast, and only finished (if finished at all) with the graver or in the lathe. Among the largest dies principally worked by the graver, are those for brass handles and feet, curtain poles, and cornice ornaments.

The processes employed, says Mr. Timmins, are simple, though frequently demanding the exercise of great artistic skill and delicacy of manipulation. In ordinary cases a piece of steel is cast of the requisite shape, round which a collar of iron is welded, in order to prevent the steel cracking when hardened. The surface being prepared,the die-sinker stretches his design upon it, and engraves it, employing for the purpose, gravers with edges of three different shapes—one straight, with the corners rounded, and one semicircular—some forty or fifty sizes of each of these three kinds of gravers being required to suit the varying character of the work, and the special treatment demanded in the several portions of the die. When the engraving is finished, the die is heated and suddenly hardened by cooling; the surface is polished by "lapping," and it is then ready for use in the stamp or press.

THE COCKCHAFER AND ITS RAVAGES.

[By Edward C. H. Day, of the School of Mines, Columbia College.]

Excepting the migratory locust, the cockchafer is perhaps the greatest enemy that the agriculturist of the Old World has to encounter among the entire class of insects. The perfect cockchafers—beetles of the family of Scarabæids, a family of which we intend to give some details on a future occasion—are represented in the upper part of the accompanying illustration, the female being the one crawling over the ground. These insects appear in Europe, in greater or less numbers, every year, during the months of April and May, feeding upon the young and tender foliage of various trees, until after copulation, when the females descend into the ground, there to lay their eggs. From these are hatched the larvæ, small at first, but growing eventually to large, thick, clumsy, inactive, whitish grubs.

During this period, which varies, according to different observers, from two to four years, the discrepancy being probably explicable by diversity in the circumstances of seasons and of food, the grubs feed upon the roots of plants; passing at length, however, into the harmless chrysalis stage shown in the lower left-hand corner of the engraving), whence they finally transform into the perfect beetle.

Happily for us, this insect, so destructive in two phases of its history, is unknown in America, though allied forms closely resembling it in habit occur, and are only less noxious because, as yet, less abundant. Its history, nevertheless, is full of interest to every one, because an enduring lesson of the ignorance of the simplest facts of natural history that prevails among those to whom a knowledge of them would be of the most essential value.

The cockchafer is not, like the locust (we mean the true locust, not the insect commonly so-called in this country, which is a Cicada), an offspring of the grassy wilderness; its abundance is essentially the result of the spread of husbandry; for it is said that it is only within modern times that it has taken rank as a pest, the firm, unmoved earth of unclaimed regions not being so well adapted to the life of the grub as the soils loosened and lightened by tillage. This fact is of significance to us as it suggests the possibility that, under the increase of similar favoring conditions, our native species, already at times a minor trouble, may become a more serious inconvenience, unless we are on the guard against them. The abundance in which the perfect insect occurs in Europe may be best realized from the following quotations. Harris says: "Mouffet relates that, in the year 1574 such a number of them fell into the river Severn as to stop the wheels of the water mills; and, in the "Philosophical Transactions," it is stated that in the year 1688 they filled the hedges and trees of Galway in such infinite numbers as to cling to each other like bees when swarming; and, when on the wing, darkened the air, annoyed travelers, and produced a sound like distant drums. In a short time the leaves of all the trees for some miles round, were so totally consumed by them, that at midsummer the country wore the aspect of the depth of winter."

Kirby tells us that seventy years ago a poor farmer near Norwich and his servant declared that they had gathered eighty bushels of the beetles, and that he was allowed by the court of that city, out of compassion, £25 for the damage that the grubs had done him. Kirby adds that in "1785 many provinces of France were so ravaged by them that a premium was offered by the Government for the best mode of destroying them."

But the evils wrought by the perfect insect during its brief existence of, at the utmost, a few weeks, are nothing compared with those which the grubs effect during their years of underground life. The roots of grass and cereals are alike palatable to them, and their ravages are probably not confined to these but extend to any they meet with, that are sufficiently succulent and tender. It is in these, however, that their evil is most felt. Kirby says this insect "destroys whole acres of grass. . . . It undermines the richest meadows and so loosens the turf that it will roll up as if cut with a turfing spade;" a statement that we can personally corroborate.

We remember seeing, some years ago, all the grass lands in a rich valley in the West of England converted by these grubs into brown wastes—looking as though they had endured the drought of a tropical dry season. Yet such was the ignorance of the farmers of the cause of this ruin, that one of them asked us to fire at the rooks on his meadow, as "they were tearing up his grass by the roots!" It was in vain that we defended the cause of the birds, protesting that rooks did not feed on grass, and that it was the grubs for which they were in search, that were the real authors of the mischief. "No! No!" was the persistent reply; "Haven't they pulled up every blade of grass all through the valley, and made every meadow look like a plowed field? The ——'d birds!"

Thinking that the farmer's pig-headedness did not deserve the friendly offices of the rooks, we fired a harmless though scaring shot. Scarcely were the birds out of sight before the farmer summoned us to the lower part of the field where his laborers were digging potatoes, to see some "queer-looking grubs" they were turning up. At our suggestion he now dug round a bare patch of what once was grass, and there were the same grubs, busy at their secret destruction! The farmer found, too late, that he had, well—"condemned" the wrong individual; but the birds were gone, and to the best of our belief they had the good sense, notwithstanding the farmer's substitution of prayers for curses, not to return for the benefit of such an incredulous and unthankful ignoramus. As a knowing old rook (undoubtedly) cawed out, "They wouldn't go there to be ——;" the final word being lost amidst the indignant cawings of the entire community!

The worst of the story was ("and is") that all the farmers of that ilk ("and of many others, too,") were ("and are") just as grossly ignorant of the commonest facts of that nature amidst which, and upon which, and by which they lived ("and live") as my whilom acquaintance.

N. B. The words above, in brackets, are suggested by a deputation of one from the crows, rooks, jays, cow-birds, robins, sap-suckers, sparrows, skunks, shrewmice, carnivorous beetles, and other "vermin," too numerous to enumerate, that seem to know and care about the farmer, a great deal more than the farmer knows and cares about them. The deputation says that it is not in Europe alone that ignorance prevails on these subjects, but that here in America, where the schoolmaster is abroad, there is still much to be found. But then, as he justly adds, how should the schoolmaster teach when he himself has not been taught on this subject?

But let us return to our cockchafers.

(To be continued.)



METAMORPHOSES OF THE COMMON COCKCHAFER.

Poisoning by Carbolic Acid.

The subject of tar poisoning which is now attracting a good deal of attention in connection with the extensive employment of carbolic acid, is not by any means a novel one. It has been long well known that various preparations of tar if applied freely to the skin were capable of absorption, and might bring about certain special symptoms. The reader will find an account of these in Hebra's work on Skin Diseases. Numerous observers have recently met with cases in connection with the use of carbolic acid. It would appear that caution is requisite as to the too free external use of this agent; as it is quite possible to encounter, inadvertently, considerable risk. Although we are not aware of any cases of actual death from its legitimate surgical use, we know of several in which alarming symptoms occurred. Dogs are very easily killed by carbolic acid baths. The remedy is the free use of diluents taken by the mouth; and it is equally useful if employed as a precaution.

Indian Moccasins.

"We recently examined," says the *Shoe and Leather Reporter*, "a pair of mocc sins, the workmanship of old 'Mother Friend' a squaw of Shakopee's band of the Sioux Indians, whose village, only fifteen years ago, occupied the site of the now thriving town of Shakopee, Minnesota.

"They are made of buckskin, fine and white, and soft as velvet, the squaws surpassing in the excellence of their tanning and dressing of skins. The instep is an ornamental piece, of porcupine strips of variegated colors, set in and braided together as in basket work; the seams are all on the upper part, the sewing being done with fine selected sinews of the deer; at the ankle is attached a high, encircling flap, to which are buckskin thongs to wind about the leg and tie in front.

"Moccasins are much worn by the women of the far West as house slippers, and, in the dry season, are preferred by pedestrians on long journeys. In the very still, cold weather of the inland high latitudes, they often prove the warmest covering for the feet that the hunters and pioneers can procure, though having at command the most approved devices of the sons of St. Crispin.

"To the uninitiated, the moccasins of the different tribes seem so much alike as hardly to be distinguishable, yet they each present to those wise in those trifles that make the sum of human wisdom, traces by which they may be as easily detected in their origin as our own trade oracles determine an Eastern from a New York shoe, or it may be fix its exact locality. Indeed, the imprint of the moccasined foot in the dust on the well worn trails of the prairie, or the muddy margin of the stream or lake, will indicate unerringly to the experienced eye the trace of friend or foe. The white man's foot is wide or large, turned outward. The Indian's foot is usually narrow, medium sized or small, the track straight, or turned slightly inward; two little tabs wide apart at the heels betray the Dakota or Sioux. One tab marks the Winnebago, three the Chippewa. These distinguishing marks are no doubt meant to indicate nationality, as also, the mode of dressing the hair, or any other feature of the costume which, though it varies among tribes, may be described generally and briefly, as breech cloth and nakedness, blanket and paint.

"The manufacture of moccasins is one of the few branches of legitimate industry, that, systematically pursued, provides a welcome addition to the scanty living that hardly suffices to save the skulking bands on the frontiers from starvation. The moccasin of the Sioux, cheap and durable, is considered the best for service, and ranges in value from 50 cents (cosh poppi zopta), to $1·50 (Murzez skar tonka, cosh poppi zopta), in specie, for your copperhead of the plains, proudly ignorant of finance, scorns the greenback.

"The moccasins of a chief, or a brave, are not less important auxiliaries of dress than are this portion of the dress of a fashionable lady in civilized life; and in full dress, trailing in the dust from the heels of the 'Bucks,' may often be seen otter skins that would bring fabulous prices on Broadway; or other costly fur skins, ornamented with so much of skill and expenditure of labor as to make them valuable indeed.

"The superlatively beaded wash leather imitation moccasins exposed for sale at Niagara, or peddled in the streets of Eastern cities by degenerate mongrels of historic races, are not those of which we are writing. As a curiosity, the latter may answer every purpose, and as a souvenir they may satisfy the tourist; but if one would know what a genuine Indian moccasin really is, he must go to other sources of supply than these, for they are seldom found in aboriginal purity except among the Indians of the Plains."

SALT IN THE AIR.—From a series of observations, conducted with great care at Monaco, on the shores of the Mediterranean, a French scientist reports to the Academy the presence of a stratum of air two hundred feet high, extending for miles inland, which is constantly impregnated with saline particles. This saline stratum, the writer asserts, is found on all sea coasts, is independent of barometric pressure or the hydrometric state of the atmosphere, is due to the "pulverization" of the sea water by the breaking of the surf up on the rocks. He contends that the phenomenon he points out must not be confounded with what is commonly known as spray, which is of a coarse nature and entirely local in character.

The Rider Cut-off Engine.

In introducing this engine to the notice of our readers, we do not deem it necessary to preface our remarks by a dissussion of the value of the method of using steam expansively. This subject is worn threadbare, and anything we could now say would be only a repetition of what we have already said. The system is now generally adopted by the steam-using public.

The valve gear of the engine of which we give engravings, is remarkable for its extreme simplicity, its delicacy and certainty of action, and the very slight space it occupies. Durability, the offspring of simplicity, it possesses in a very high degree; and it is entirely devoid of certain delicate niceties of construction, which in some other kinds of valve gear necessitate constant attention and frequent repairs.

The delicacy and precision of its action is amply attested by indicator diagrams, taken by a well-known expert of this city, which diagrams we have personally examined with much interest. These cards indicate that with proper adjustment this gear can compete in economical results with many others, which have acquired a very high reputation, but which are far more expensive and complicated.

The cut-off valve is shown, seated upon the back of the principal valve, in Fig. 2. Its face is a true segment of a cylinder, working in a corresponding recess on the back of the main valve. The ends of the cut-off valve are not square, but are inclined toward each other, forming a contour resembling the line of screw-threads cut in opposite directions, but having the same pitch. The parts in the back of the main valve are cut at a corresponding angle. It is evident that if the cut-off valve be placed so as to cover the ports in the principal valve, a reciprocating motion of the cut-off valve spindle will open and close the ports alternately. It is also evident that if the spindle be rotated in the direction of the widest part of the face of the cut-off valve, while it has no other motion, both ports will be simultaneously uncovered, and covered again by reversing the direction of the rotation. This rotation is imparted to the spindle from the governor, as the velocity of the engine increases or diminishes, while the reciprocating motion is received from a special eccentric on the crank-shaft. The combined action of these motions produces a variable cut-off, capable of cutting off at any part of the stroke. For when the spindle is rotated toward the wider part of the face of the cut-off valve—which is the case whenever the speed of the engine slackens, the cut-off is retarded, and the reverse takes place whenever the engine runs faster than the correct speed.

The excentric is connected with the cut-off valve spindle by means of a swivel joint, so that the rotary motion described is not interfered with. The latter motion is imparted through a simple system of toothed sectors, not distinctly shown in Fig. 1, and which does not need special description. The speed of the engine is established or changed by weights like those used on common platform scales, placed upon a stem attached to a rack, which transmits motion from the governor to the toothed sectors, alluded to above.

Besides the valve gear the general design of this engine is worthy of special notice. The fly-wheel is placed near the bottom of the engine, and the cylinder at the top, an arrangement which secures great steadiness. The general form of the upright portion of the engine is such as to economize space to the utmost.

An engine with cylinder 18" by 24", making 110 revolutions per minute, and developing 152-horse power when cutting off at full stroke, or 129-horse power when cutting off at half stroke, occupies only 6 feet 8 inches over all on the floor, and stands only 13 feet in hight.

The workmanship is also first class. The crank shafts are of solid wrought iron, with two bearings of ample size to secure durability. On an engine of the size specified in the preceding paragraph, the crank shaft is 6·5 inches in diameter, and its principal bearing is 18 inches in length, and these dimensions are of proportionate extent on other sizes of engines.

Patent oil cups are placed on every bearing, so that the engine needs oiling, on the average, not oftener than once in three days. The cylinders are handsomely lagged, and a new style of crosshead to which the piston-rod is keyed is employed. All the gibs and keys are provided with keepers.

The clearance is reduced as nearly to a minimum as possible, there being an aggregate of only 42·51 cubic inches in a cylinder 8" by 10" inclusive of all valve ports and passages.

It is officially attested by Mr. F. W. Bacon, of this city, who tested one of these engines with the indicator that it gave an economical result of one-horse power for every 5·19 pounds of coal consumed per hour, steam being supplied from a boiler so defective that it evaporated only 4·89 pounds of water for every pound of coal consumed.

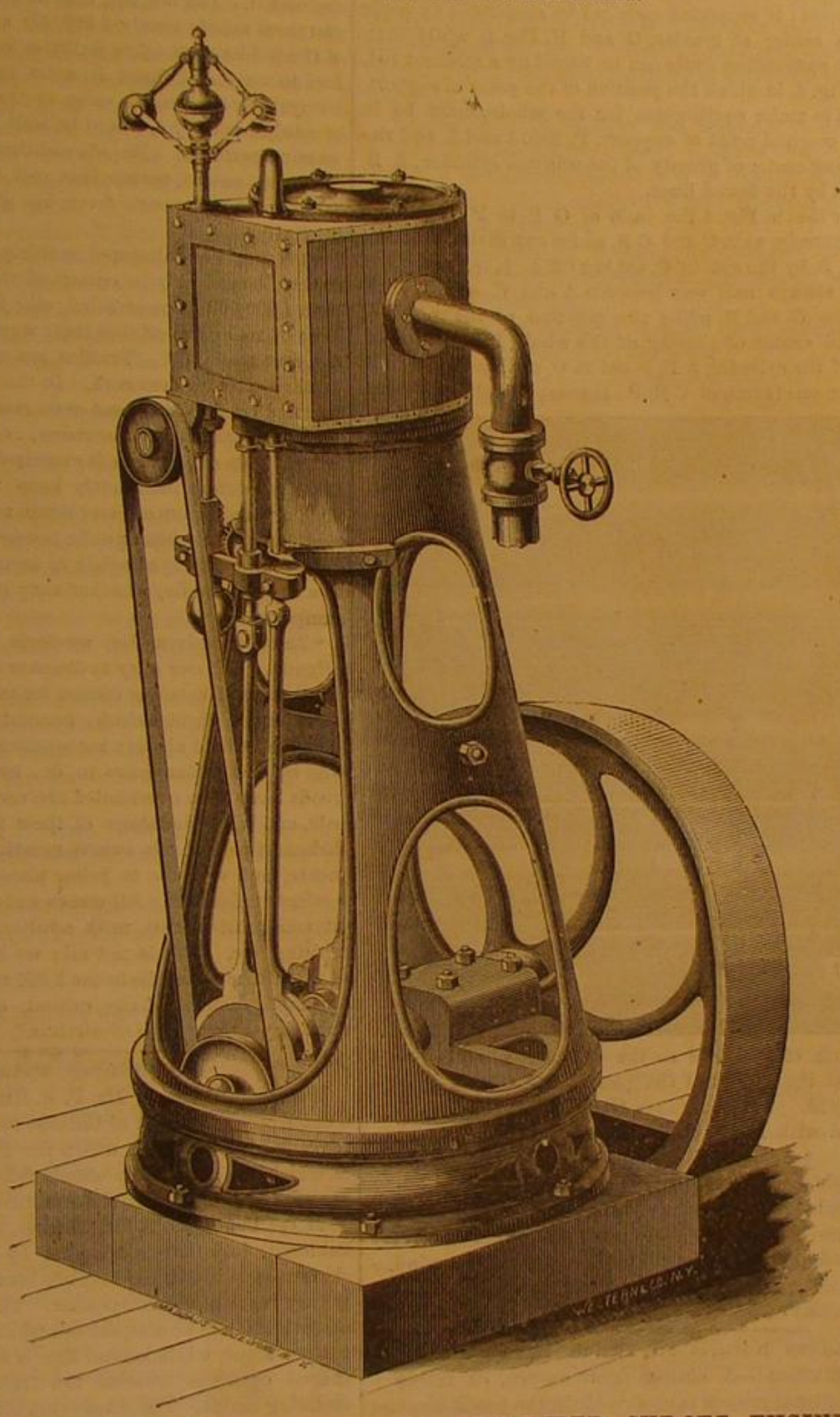


Fig. 1.

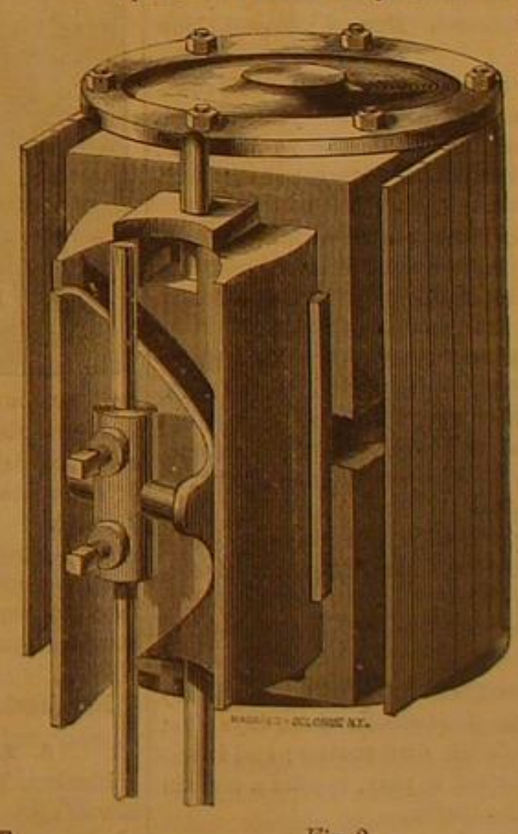


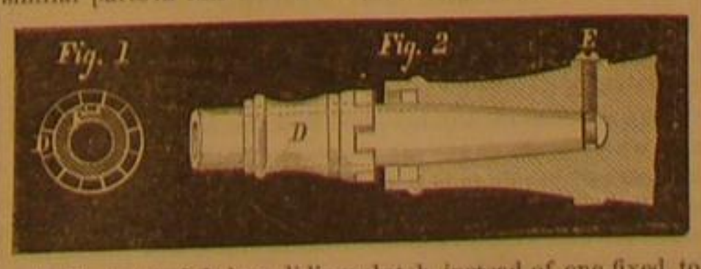
Fig. 2.

THE RIDER CUT-OFF ENGINE.

For further particulars address Handren and Ripley, Albany Street Iron Works, corner of Washington and Albany streets, New York.

Drummond's Improved Screw-Driver.

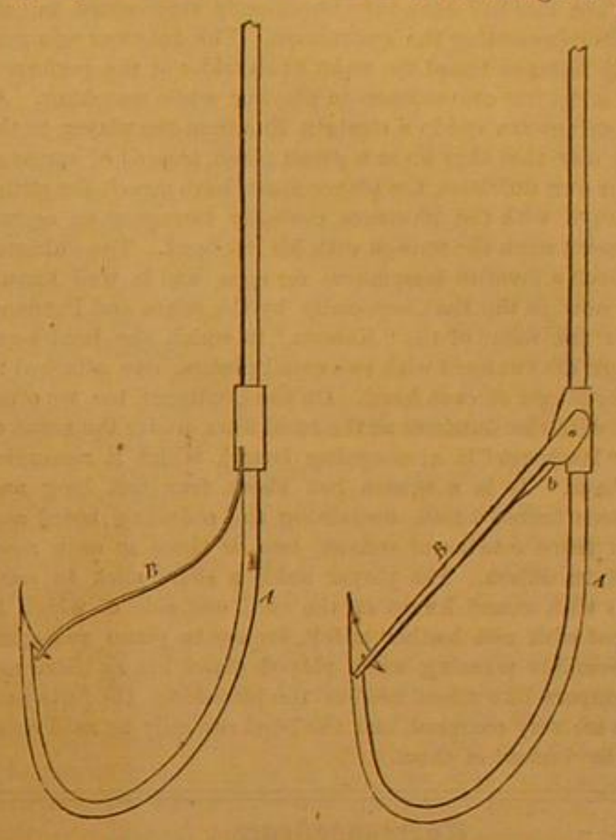
The description of this implement, the invention of David Drummond, of McGregor, Iowa, published and illustrated on page 318 current volume, to which the reader is again referred, contains an error into which we were led by the imperfect description furnished us by the inventor. We give herewith a detail engraving of that part of the instrument incorrectly shown and described. Similar letters are used to refer to similar parts in this and the original engraving.



D, Figs. 1 and 2, is a sliding clutch instead of one fixed to the shank as originally described. It has a feather or key, F, formed in its interior, which slides in a groove cut lengthwise in the shank. A friction spring holds this clutch in place when locked by sliding it up with the finger. The screw, E, Fig. 2, is not employed for the purpose described in the original article, but simply to hold the shank in the handle. A pin may be substituted if desired, as it is not used except in putting the tool together or taking it apart. The whole forms a light, durable, and convenient tool, which will take the place of the bit stock for light work, while with it rusty or large screws may be put into wood with much greater ease than with the ordinary screw-driver.

KEMLO'S SPRING-LOCK FISHHOOKS.

The fishhook is one of the oldest implements by which man has been able to draw from the treasures of the watery world a portion of his necessary sustenance. But it is a long way from the rude bone hook of the savage to the



delicate steel fishhook of modern times, exquisitely finished, and possessing such a "taking way" that the fish once induced to swallow the dainty morsel which conceals its subtile point, escapes, if he escapes at all, only by dint of a severe and protracted struggle.

The ordinary modern hook, however, is not as reliable as is desirable. A strong fish, by his struggles, so enlarges the punctured hole in his jaw, that if he can secure a moment's relaxation of the line, he can shake the hook out and free himself, and from this cause many an angler has had to content himself with a "capital bite," instead of the splendid fish he had set his heart upon taking.

The fishhooks illustrated herewith admit of no such mortifying contingency; the fish must either tear his jaw entirely through, or yield himself a captive to the art of his ensnarer, for besides the ordinary barb it comprises a spring lock, which prevents the fish from releasing himself in the manner alluded to.

When the point of the hook has penetrated the fish's jaw, the lock will be pushed downward and backward by it. If now, by the struggle of the fish to get away, or by the pull of the fisherman, a slit be torn in its jaw, the outer loose end of the lock will pass out of the mouth of the fish, and at once be thrown up by the spring and close the hook, thus making it impossible for the fish to escape, unless its jaw be torn in two.

The inventor of this improved fishhook is also the patentee of a fine grapple hook, calculated for fishing through the ice, or to be used on set lines left to be taken up at regular periods. The construction and action is such, that a fish may get caught by the grapple-hooks by only pulling at the bait; it sets itself after all pulls at the bait, except when drawn entirely down.

The patents on these hooks cover the proportionate lengths of the barbed ends of the hooks, as well as the spring locks.

For further information address F. Kemlo, 146 Washington street, Boston, Mass., who will furnish circulars describing and illustrating all the various numbers and styles.

Trial Trip of the "City of Merida."

This vessel, of F. Alexander and Son's Line, underwent her trial trip May 24th. She is intended to run as companion vessel of the *City of Mexico*, between New York and Vera Cruz, touching at Havana and Sisal. She was launched Feb 23, of the present year, from the yard of the builders, John Englis and Son. She is 236 feet in length, with 37 feet breadth of beam, and a clear depth of 26·5 feet. Her engine was built by the Delamater Iron Works. The cylinders are 56" bore, by 54" stroke, and, at sixty revolutions per minute, develop 1,000-horse power. On the trial trip with an average of 53 revolutions per minute, she made the run from the Battery to the light-ship, a distance of 26 miles, in 2 hours and 11 minutes Great satisfaction was expressed at her behavior in all respects.

The Parent of the Pianoforte.

Brinsmead, in his "History of the Pianoforte," expresses the view that the dulcimer was the instrument from which the pianoforte had its origin. In the ancient Assyrian dulcimer the strings passed completely over the sounding board, and were of varying lengths. From the manner in which the strings run in this dulcimer, it is evident that they must have passed over a bridge before they took a vertical direction, but this has been very imperfectly represented in bass reliefs representing the instrument. The dulcimer was generally fastened round the waist or shoulder of the performer by a strap, for convenience in playing while marching. As the strings ran out in a straight line from the player, in the same way that they do in a grand piano, instead of across as in our own dulcimer, the player must have struck the string sideways with the plectrum, probably twanging an accompaniment upon the strings with his left hand. The dulcimer has been a favorite instrument for ages, and is well known even now in the East, especially by the Arabs and Persians, under the name of the "Kanoon," in which the lamb's-gut strings are twanged with two small plectra, one attached to the forefinger of each hand. On the Continent, too, we often meet with the dulcimer at the rural fêtes, under the name of the "Hackbret" (*i. e.*, chopping board), which it resembles in shape. It is a square box about four feet long and eighteen inches broad, containing the sounding board and about three octaves of strings, two or three to each note, tuned in unison. The player holds a short stick in each hand, with round knobs at the end, one side of which is covered with soft leather or felt, for use in piano passages. The sound is pleasing when played piano, but as there are no dampers like those used in the pianoforte, the forte passages are very confused, and the hand can only be used occasionally instead of them.

Correspondence.

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

An Old Piano.

MESSRS. EDITORS:—I notice an article in your paper of March 26th, 1870, giving some account of a piano made by an Italian firm in the city of London, in the year 1786, and recently presented to the New Haven Historical Society by Mr. C. M. Loomis, publisher of *Loomis' Musical Journal*, New Haven, Conn.

It is claimed for this piano that it is the oldest in this country. I have had in my possession about two years a piano which bears the following inscription upon the name-board: "Johannes Zumpe, Londini, Fecit, 1768, Princess street, Hanover Square."

Mr. Karl Merz, in an article in *Brainard's Musical World* for August, 1869, states that pianos were first introduced into London about the year 1760, by one Zumpe. This one doubtless is of his manufacture.

It is of solid mahogany, four feet three inches long, eighteen and a half inches wide, and twenty-seven inches high. The legs are about two inches square. It has no pedals, but the dampers, which run the whole length of the instrument, are operated by two levers in the left hand corner. It is two keys short of five-octaves compass.

The keys are made of ebony, and the short ones are covered with strips of ivory, so that the colors, as compared with recent pianos, are reversed—the short keys white and the long ones black. Upon the whole the keyboard is rather dismal in its appearance.

The original tuning hammer, entirely of iron, and very neatly made, is still preserved. It seems in those days that every player was expected to do his own tuning; and it was not unusual, when one was invited to play, to send a servant to another room to carry in the piano.

You will see by the date that this piano is eighteen years older than the one presented to the above Society by Mr. Loomis.

E. VOSSELLER.

Flemington, N. J.

Street Paving and Sewerage in Russia.

MESSRS. EDITORS:—As we are considered by the postal authorities in Moscow, the oldest subscribers here to your very valuable paper, we request your kind assistance in the following matter, and trust that some of your correspondents may favor us with their advice.

In the cities and towns of Russia the street paving is entirely composed of pebbles, varying in size from 3" to 9" diameter, it naturally follows that at the breaking up of the winter season the streets are entirely out of repair, so that for a few weeks it is utterly impossible to carry more than half loads, or to travel with any degree of safety. Russian law requires that every householder shall patch his own frontage, therefore, the cheaper that is done the better it is!! Should the town authorities undertake the repairs, the bad system of wood drains would not allow for heavy street rollers, otherwise the wooden bore sewers would be crushed; and in fact the generality of the town councils have not the cash in hand to undertake any improvements either in system or repair—at present a stone in one hand for the hammer, the other stones laid being tapped affectionately on the head by the child, boy or man; the traffic has then to consolidate the road, and that is the system. Are there any cheap inventions, patented or otherwise, that would, with one or two men power, give the householder a chance of hammering the roads properly? if so, we should be most happy to entertain any proposal if the invention be of a real and practical service.

Moscow, Russia.

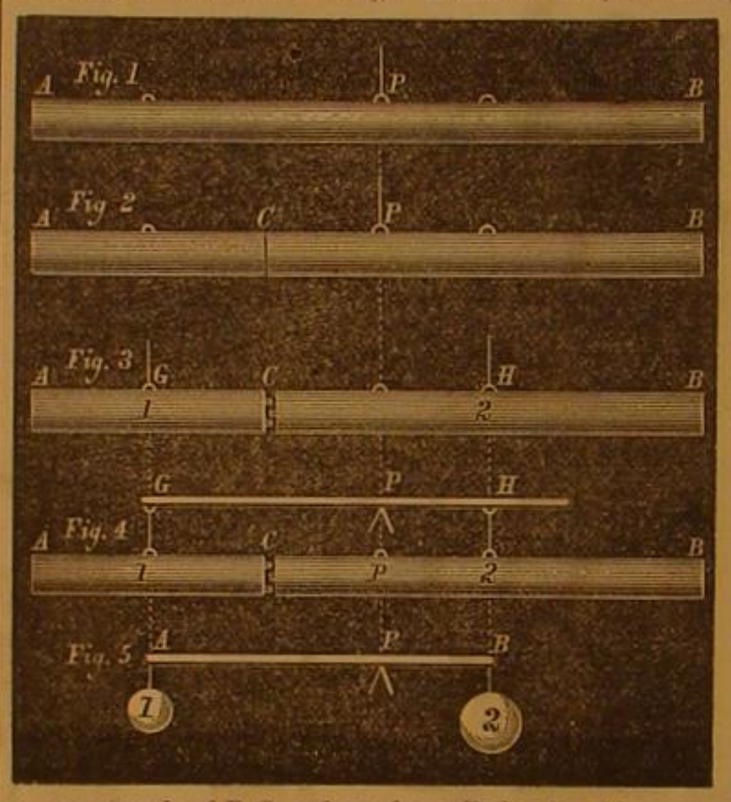
SWANN & Co.,
Engineers and Architects.

Equilibrium of the Lever.

MESSRS. EDITORS:—In answer to the question as to the equilibrium of the lever (page 315), it must be observed that the laws of forces and motion, or dynamics, cannot give as simple an explanation of it as the laws of statics, by which we may reduce the principles of the question, to those of the support of the center of gravity of a system of bodies. In order to make this practically evident, I had, many years ago, a little arrangement constructed which I used in my lectures, and of which the following will give an idea:

A cylinder of homogeneous wood of about two inches in diameter and 24 inches long, A B, Fig. 1, is suspended from the center of gravity, P, and of course makes equilibrium; then it is shown to consist of two pieces, A C and C B, Fig. 2, of which the first is 8 and the second 16 inches long, and which are joined together at C by a few well-fitting pegs and corresponding holes; if separated each can be suspended by cords at its own center of gravity, G and H, Fig. 3, while then again these suspending cords can be joined by a straight rod, G and H, Fig. 4, in which the position of the point of support, P, required to make equilibrium for the whole, must be in line of the original point of support, P, Fig. 1 and 2, and the corresponding center of gravity of the original cylinder, A B, as indicated by the dotted lines.

It is clear that in Fig. 4 the ratio of G P to P H will always be inversely, as A C and C B, as for any division of the cylinder, A B, by the cut in C, taking off ½, ⅓, ¼, etc., G is necessarily always half way between A and C, and H half way between C and B, while the position of the point of support and center of gravity of the whole P is constant. Therefore if the cylinder, A B, is cut in C, so that A C is half, one third, or one fourth of C B, P H must be half, one third,



or one fourth of P G, and as the cylinder is of homogeneous material, the weight of the pieces, A C, C B, is directly as their lengths. It is clear that the case illustrated in Fig. 5 is identical with Fig. 4, except in the form of the weights, 1 and 2.

This simple contrivance served me (of course with the necessary explanation), for many years, to meet questions like that on page 315, on this subject, which I found to be very common among students of a philosophizing turn of mind.

P. H. VANDER WEYDE, M.D.

New York city.

A Lusus Naturæ in Peach Blossoms.

MESSRS. EDITORS:—A curious *lusus naturæ*, or rather a law of agricultural science is observable in the peach blossom of this year, producing twins or triplets. That this is the result of a general law is evident from the concurrent testimony of widely distant regions, and on both shores of the Chesapeake.

The Agricultural Report for 1866 (p 203) states that peaches are grown with complete success only after the ground has rested for a period of twenty years, during which time the peach district moves from North to South about fifty miles, and then returns at a single leap to the place of beginning.

By calling attention to these facts the cause of agricultural science might be advanced. Is there a periodicity in the former case as in the latter? Has this twin development been observed above the 39th parallel?

Baltimore, Md.

GEO. A. LEAKIN.

Eel-Skin Belt Lacings.

MESSRS. EDITORS:—I noticed an inquiry, some time since about eel skins. I would say that from them are made the most valuable strings for lacing belts in the world; one lace or string will outlast any belt, and will stand wear and hard usage where hooks or any other fastening fails. The way we get them and use them is as follows: Our mill being on the bank of the river we keep our net set for eels, which when wanted are taken out in the morning, skinned, and placed or stuck on a smooth board. When dry we cut them in two strings, making the eel skin in three hours from the time it was taken from the water travel in a belt 5,000 or more feet per minute.

Williamsport, Pa.

JAMES W. BENGLER.

THE first book stereotyped in America was *The Larger Westminster Catechism*, revised by A. M'Leod, D.D., New York, stereotyped and printed by J Watts & Co., for Whitting & Watson, June, 1813. 12mo. Two copies of this work are in the New York State Library

Food in Paris.

The French do not enjoy their food without suspicion any more than we do, but they seem to take tolerably energetic measures toward securing the purity of the articles they consume. A French journalist, wondering about what he calls the "ham fair," says he suddenly became aware of a great tumult not far from him, and turning to ascertain the cause, perceived a cart which appeared to belong to some employés of the Prefect of Police, and which was fast filling with hams, sausages, and other savory articles, amid much laughter and plenty of "chaff." The operation came to an end, and the agents of the Perfect were about to retire, when curiosity prompted the amused spectator to enter into conversation with one of them respecting this strange scene. "Sir," said this individual with honest pride, "Paris has no idea of the services we render it. But for us the population would be decimated. You see, Sir, that in a town like this, in which you must satisfy nearly 2,000,000 appetites daily, the supply of the public need offers facilities for imposition which would lead to universal fraud if some measures were not taken. Everything that can be eaten or drunken tempts the cupidity of adulterators. It would be well if innocuous frauds alone were perpetrated. He who adulterates coffee with chicory, chestnuts, acorns, potato, beet root, carrot, turnip, and maize, can give no one gastric fever, but some will employ ground bricks!

"Oil may be adulterated in thirty-eight different ways. As to this, it need only be remarked that Paris consumes more than 1,000,000 liters of salad oil; but only 100,000 liters at most of real olive oil find their way to the capital. What is the rest made of? Truffles are made at will with yams, mushrooms, and even cork. In the lowest class of restaurants you find cats', horses', and even rats' flesh cooked. Yes, Sir, without continual supervision, continual mishaps would occur. This supervision is exercised in the most varied forms. Sixty inspectors incessantly keep watch over the butchers' meat; wine testers are employed to judge of the beverages sold in 3,000 Parisian public houses. At the Halle, seventy persons are employed solely to ascertain, by holding eggs up to a lighted candle, whether they are fresh enough for consumption.

"As to ourselves, Sir, we form part of the scenting-out brigade. It is our duty to discover by the smell the condition of all sorts of eatables offered for sale. We begin our work every day at eight o'clock, generally arranging not to pass over the ground already reconnoitered by our colleagues; but this we sometimes have to do, as those tradesmen whose goods have been overhauled are very apt to think themselves safe, and take advantage of their fancied security to make dishonest profits. In twelve months we visit 2,500 establishments, and we have to bring about twenty actions a week against tradesmen. All comes under our jurisdiction—tainted meat, rotten fruit, milk adulterated with horses' brains, whiting, etc. This is not all; we have to examine the state of the kitchen utensils in the 5,800 restaurants, eating houses, and table d'hôtes of the capital, otherwise verdigris would claim a yearly tribute of victims."

Chinese Printing.

We are indebted to Mr. P. R. Hunt, of Peking, China, for a description of a font of Chinese movable types, with a photograph of the cases in which the types are distributed and at which the compositor stands when at work. The cases are used in the office of the American Mission Press (A. B. C. T. M.) at Peking. A Mr. Gamble, connected with the establishment, has invented a plan by which the multitude of characters in a Chinese font are brought within comparatively easy reach of the compositor. There are three frames, one on each side of the compositor, and another in front, all having but one slope, while behind him is a galley-top table; the V-shaped openings between the frames are filled with corresponding covers. The whole occupies 8 feet by 10, and looks like a huge hopper. The characters are grouped in small cases and arranged, face outward, over this slanted surface. The first sight of this "sea of faces" must produce only bewilderment on the part of the unfortunate typo; however as each box has its character written on it, and all systematically arranged, he soon learns his task, and selects his characters with ease and rapidity.

Cement for Glass Prisms.

The best cement for putting together glass prisms, to be filled with carbon disulphide (bisulphide of carbon), is a mixture of common glue and West India molasses. Make a tolerably liquid glue, and add about one eighth the quantity of common molasses. Lay the metal or glass form, ground to a suitable angle, with its face up; then place the glass plate upon it, and apply the cement on the under side with a brush, and allow it to flow by capillary attraction between the glass and the form; repeat this operation several times if necessary. This is better than to wet the edge of the glass at the outset before attaching it to the prism. The stopper to the prism can be cemented in the same way, and in filling with the carbon disulphide, always leave a small space for the expansion of the liquid. The prisms want to be kept in a cool, dark place, and ought not to be agitated previous to using, as the light is in that case unequally refracted

IT is said that collodion is a good varnish, by means of which the cause of the decay of eggs—viz., the porosity of the shell, and, hence, access of air to the interior, may be prevented. The author of this method, Mr. S. Martin, also mentions that the soundness of eggs may be tested by immersing them in water containing 30 per cent of common salt in solution; in this brine, good and sound eggs sink while bad eggs float.

NEW YORK LYCEUM OF NATURAL HISTORY.

HISTORY OF LOST ELEMENTS.

At a meeting of the Lyceum of Natural History, on Monday, May 16, Dr. H. Carrington Bolton read an interesting paper on the history of chemical elements that had been proposed by chemists, but had not been proved to be new substances, and had hence been dropped from the rolls. The list is longer than is generally supposed, and may serve as a warning to ambitious chemists not to be too hasty in naming their bantlings before they are fairly hatched.

At the time of Aristotle there were only four elements—earth, air, fire, and water. Somewhat later, the alchemists were content with three, mercury, salt, and sulphur. Previous to the year 1700 not more than thirteen bodies had been discovered to which the name element could properly be applied; but during the eighteenth century sixteen new substances were added to the list, all of which have stood the test of the more accurate methods and knowledge of the present day. While the number of genuine elements was thus largely increasing, a longer list of supposed new bodies was swelling by its side. There was a rage for finding something new in every rock and every ore, and the prospect appeared fair of our having as many elements as there were species of minerals on the face of the earth.

Fortunately for the convenience of study a majority of the attempts to coin new names were frustrated by the more acute learning and profounder skill of the chemists of modern times. A complete catalogue of the hypothetical elements is nowhere to be found, and Dr. Bolton has rendered an important service by compiling it. The following is an abstract from his paper:

Terra Nobilis, discovered by Bergmann in 1777, turned out to be the diamond.

Hydrosiderum, of Meyer, 1780, proved to be a compound of phosphorus and iron.

Australium, Josiah Wedgewood, thought that he had found something new in 1790 in some sand from Sydney, New South Wales, but Hatchett showed that it was only a mixture of alumnia, silica, and iron.

Agustum, discovered in 1800 by Trommsdorff, in what was known as Saxon beryl, proved to be phosphate of lime, or apatite.

Silenium, by Proust, in 1803, proved to be uranium.

Niccolanum, 1805, by Richter, closely resembled nickel, but differed from that metal in ductility—Berzelius showed that it was nickel containing six per cent of cobalt, with some iron and a little arsenic.

Andronia, of Professor Winterl, was ignominiously dismissed as being chiefly lime and alumina derived from the crucible of the operator.

Thelike, by the same discoverer, met with a similar fate.

Nitricum is the element which, united with oxygen, gives us nitrogen.

Araeon was ponderable caloric.

Murium combined with Araeon, water, and oxygen gives us muriatic acid.

Junonium, discovered by Professor Thomson in 1811, proved to be identical with cerium.

Thorium.—Berzelius thought that he had detected new earth in 1815, and called it thoria—he soon found that it was phosphate of yttria and abandoned the name, but in 1828, having the good fortune to discern something really new, he revived the name thorium, and it hence remains on our list of true elements.

Vestium, discovered in 1818 by von Vest of Gratz, called after the planet Vesta, but also very suggestive of the name of its discoverer, was shown by Faraday to be a mixture of nickel, iron, sulphur, and arsenic.

Wodanium, 1818, from the Scandinavian deity *Woden*, from whom we derive Wednesday, also proved to be nickel, iron, and sulphur, with cobalt.

Crodonium, 1820, by Trommsdorff, named from *Crodo*, an idol, held in much veneration in Thuringia, proved to be lime, magnesia, iron, and copper.

Pluranium and *Polinium*, by Osan in 1828, in platinum ores, never survived their baptism, and have utterly disappeared from our nomenclature.

Donium.—In 1836 Davidson submitted a mineral found near Aberdeen, Scotland, to Professor Thomson for analysis. The mineral was named davidsonite, and was thought to contain a new earth, the identity of which with glucina was shortly afterwards proved. Davidsonite is in fact a greenish yellow beryl.

Treenium, in 1836, by Boase, from Treene, Lands End, has not been mentioned since the first announcement of its discovery.

Terbium.—In 1843 Mosander discovered in the mineral gadolinite two new elements, which he called terbium and erbium, from contractions of the name of the town of Ytterby, where the stone was found—terbium by dropping the initial Y, and erbium by dropping the initial T. In 1860, Berlin pronounced terbium to have no existence, and showed that Mosander had been misled by traces of uranium and glucinum in the mineral under examination.

Pelopium, Niobium.—In 1801 Hatchett discovered Columbium in an American mineral; the following year Eckeberg found tantalum in a Swedish mineral. Wollaston pronounced the two elements to be identical, and his opinion was accepted as conclusive until 1846, when Henry Rose thought that he could prove the existence of two new oxides in the American mineral, the metals of which he proposed to call niobium and pelopium, from the children of Tantalus. Subsequent researches have shown that he was mistaken, and that Wollaston was also in error, and that the columbium of Hatchett and the tantalum of Eckeberg are elementary substances, and hence niobium and pelopium are wiped out of existence.

Ilmenium, of Hermann, 1846, was the occasion of much controversy at one time, but by common consent is now considered to be a compound of columbium.

Norium, announced by Svanberg as occurring in zircons, may prove to be the metal jargonium, recently found and lost by Dr. Sorby, at Augrete. We have heard nothing further from it since its first discovery.

Aridium was so named from two Greek words, meaning resembling iron; it has since been shown to be iron itself, and thus disappears from our list.

Donarium, of Bergman, 1851, proved to be thorium.

Thalium.—In 1852 Owen discovered in a mineral from Lake Superior what he supposed to be a new earth, it was shown by Dr. Genth to be a mixture of magnesia and lime.

Dianium was announced by von Kobell to exist in tantalite from Finland, but its claims to recognition have been strenuously opposed by Rose, Deville, Hermann, and others; it must be consigned to the same category as ilmenium, niobium, and pelopium.

Wasium, in 1862, by Bahr, was supposed to occur in a variety of allanite; as the mineral contains thirteen different oxides, it is perhaps excusable if a chemist becomes somewhat confused in his analysis of it. Wasium is a mixture of thorium and yttrium.

Jargonium, 1868, by Dr. Sorby, has recently been given up by its discoverer and announced to be zirconium, with minute quantities of uranium.

The above is a tolerably complete list of defunct elements, and will be convenient for reference.

ITALIAN MARITIME EXPOSITION.

The Italian Government has set on foot a grand International Maritime Exposition, which is to take place at Naples, commencing Sept. 1st, and ending Nov. 30th of the present year. Everything relating to the construction and equipment of vessels is to be admitted, and there are to be ten divisions, as follows:

1st Division.—Naval construction.
2d Division.—Steam engines.
3d Division.—Ports and maritime establishments.
4th Division.—Wood, metals, and combustibles.
5th Division.—Articles and materials for rigging and arrangement of ships, and for navigation in general.
6th Division.—Implements connected with navigation, preparation for salvage, and arms for the commercial marine.
7th Division.—Victualing of ships, and sailors' movables.
8th Division.—Fishery.
9th Division.—Scientific section.
10th Division.—Principal merchandise and articles for export of Italy.

Each division is subdivided into classes. Gold, silver, and copper medals are to be distributed. This will be an excellent opportunity for our citizens to exhibit their improvements abroad. Further information can be had on application to the Italian Consul, No. 7 Broadway, New York city.

A NEW SPRING AT SARATOGA.

A new spring called the "Geyser," has been discovered about two miles from Congress Hall, Saratoga, after boring 160 feet. It spouts up after the manner of oil wells every two or three minutes, throwing water and gas fifty feet high.

The following is an analysis of this interesting mineral water, made in the laboratory of the School of Mines, of Columbia College, under the direction of Dr. Chandler: One U. S. gallon of pure water holds 231 cubic inches and weighs 58,318 grains. One gallon of the Geyser spring water weighs 58,959·498 grains, and contains

	Grains.
Chloride of sodium	562·080
Chloride of potassium	24·634
Bromide of sodium	2·213
Iodide of sodium	0·248
Fluoride of calcium	Trace
Bicarbonate of lithia	7·004
Bicarbonate of soda	71·232
Bicarbonate of magnesia	149·343
Bicarbonate of lime	170·393
Bicarbonate of strontia	0·425
Bicarbonate of baryta	2·014
Bicarbonate of iron	0·979
Sulphate of potassa	0·318
Phosphate of soda	Trace.
Biborate of soda	"
Alumina	"
Silica	0·665
Organic matter	Trace
Total solid contents	991·546
Water	57,967·952
Weight of one gallon	58,959·498
Carbonic acid gas in one U. S. gallon (cubic inches)	454·082
Density of the water	1·011
Temperature	46° F.

Dipping Fluids.

BROWN BRONZE DIP.—Iron scales, 1 lb.; arsenic, 1 oz.; muriatic acid, 1 lb.; zinc (solid), 1 oz. Let the zinc be kept in only while it is in use.

GREEN BRONZE DIP.—Wine vinegar, 2 qts.; verditer green, 2 oz.; sal-ammoniac, 1 oz.; salt, 2 oz.; alum, ½ oz.; French berries, 8 oz.; boil the ingredients together.

OLIVE BRONZE DIP FOR BRASS.—Nitric acid, 1 oz.; muriatic acid, 2 oz.; add titanium or palladium, as much as can be dissolved by the acids; when the metal is dissolved, add 2 gals. of pure soft water to each pint of the solution.

Effects of Cyanogen on Health.

Speaking of this subject Napier's *Manual of Electro-Metallurgy* says:

"The effects produced upon the health of those who work constantly over cyanide solutions are not yet fully tested, by which we could form a comparison with the old process; for every new trade, or operation, gives rise to a new disease, or some new forms of an old disease. Having ourselves inhaled much of the fumes of that '*ominous*' gas given off from the cyanide of potassium solution, we are not prepared to stand its advocate, but would rather warn all employed at the business, or who may in any degree have to do with these solutions, to be very careful not to use too much freedom. The hands of those engaged in gilding or plating are subjected to ulceration, particularly if they have been immersed in the solution. We have repeatedly seen, by the aid of a magnifying glass, gold and silver reduced in these ulcerations. We have also known of eruptions breaking out over the bodies of workmen after inhaling those deleterious fumes when they were very bad, as when solutions were precipitated by acids or being evaporated to dryness in a close apartment for the recovery of the metal. Repeatedly have we seen the legs of workmen thus afflicted, and always after they have been exposed to extra fumes.

"The following statement of the general effect of electro-plating and gilding on the health of those engaged in them, as experienced by ourselves and others, may not be uninteresting to our readers; but it is necessary to premise that the apartments in which we were employed were improperly ventilated.

"The gas has a heavy sickening smell, and gives to the mouth a saline taste, and scarcity of saliva; the saliva secreted is frothy. The nose becomes dry and itchy, and small pimples are found within the nostrils, which are very painful (we have felt these effects in the nose from the hydrogen of the batteries, where there were no cyanide solutions). Then follows a general languor of body; disinclination to take food, and a want of relish. After being in this state for some time, there follows a benumbing sensation in the head, with pains, *not* acute, shooting along the brow; the head feels as a heavy mass, without any individuality in its operations. Then there is bleeding at the nose in the mornings when newly out of bed; after that comes giddiness; objects are seen flitting before the eyes, and momentary feelings as of the earth lifting up, and then leaving the feet, so as to cause a stagger. This is accompanied with feelings of terror, gloomy apprehension, and irritability of temper. Then follows a rushing of blood to the head; the rush is felt behind the ears with a kind of hissing noise, causing severe pain and blindness: this passes off in a few seconds, leaving a giddiness which lasts for several minutes. In our own case the rushing of blood was without pain, but attended with instant blindness, and then followed with giddiness. For months afterwards a dimness remained as if a mist intervened between us and the objects looked at; it was always worse towards evening, when we grew very languid and inclined to sleep. We rose comparatively well in the morning; yet were restless, our stomach was acid, visage pale, features sharp, eyes sunk in the head, and round them dark in color; these effects were slowly developed. Our experience was nearly three years.

"We have been thus particular in detailing these effects, as a warning to all employed in the process; but we have no doubt that in lofty rooms, airy and well ventilated, these effects would not be felt. Employers would do well to look to this matter; and amateurs, who only use a small solution in a tumbler, should not, as the custom sometimes is, keep it in their bed-rooms; the practice is decidedly dangerous."

CHINESE THERAPEUTICS.—The Chinese divide medicinal substances into heating, cooling, refreshing, and temperate. Their Materia Medica is contained in the work called the *Pen-taoscang-mou*, in 52 large volumes, with an atlas of plates. Most of our medicines are known to them and prescribed, also mineral waters, with which the country abounds. They also have animal magnetizers, called *Cong-fou*.

They divide their prescriptions into seven categories, viz.:—1st, the Great Prescription; 2d, the Little Prescription; 3d, the Slow Prescription; 4th, Prompt, or Through-by-daylight Prescription; 5th, the Odd Prescription, for fools, madmen, hypochondriacs, and the hysterical; 6th, the Even Prescription, for the wise and good; 7th, the Double Prescription, for those in the family way.

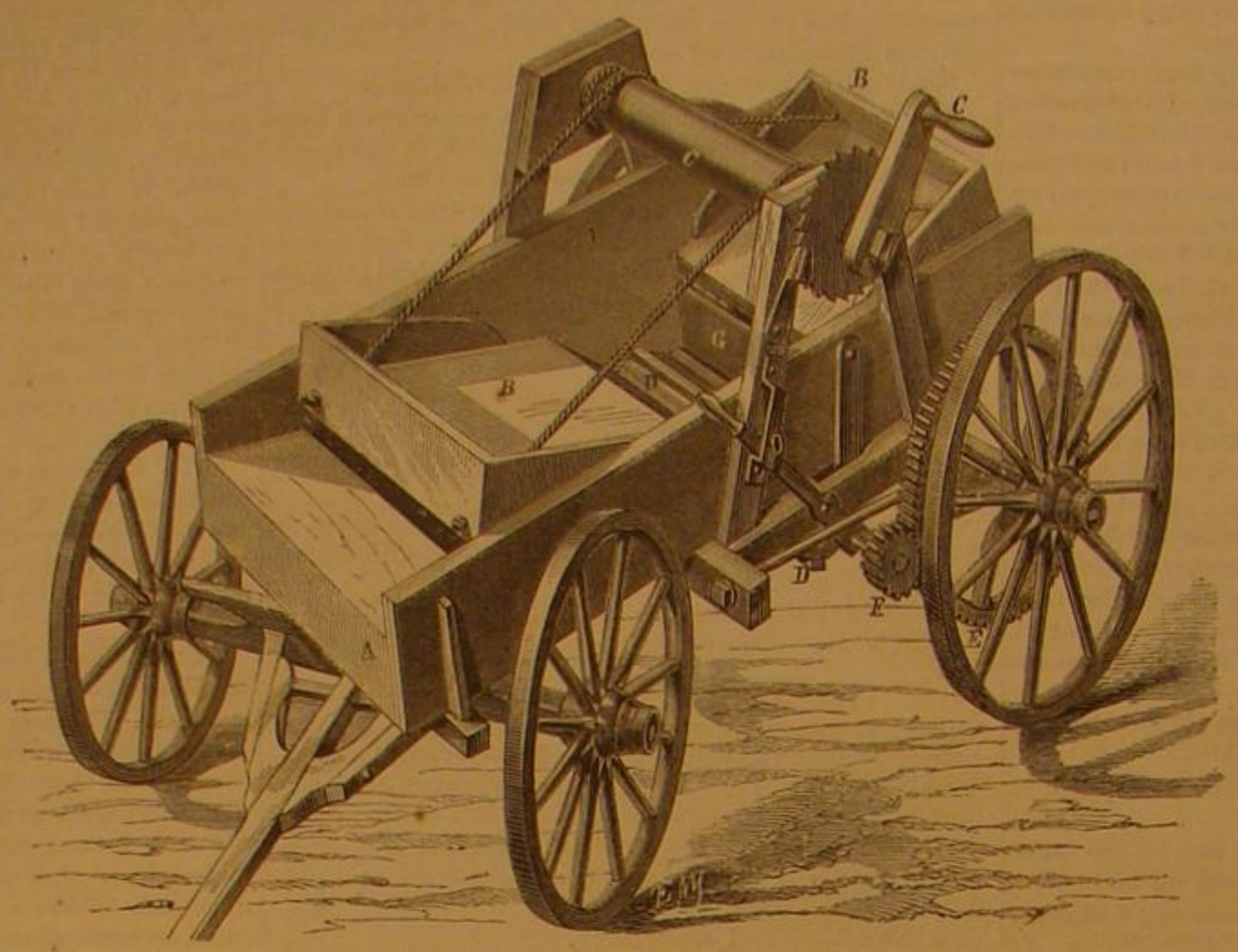
Each of these recipes is applied to particular cases, and the ingredients that compose them are weighed out with the most scrupulous accuracy.

The physician never pays a second visit unless sent for, and sometimes his services are no longer needed.

A REMEDY FOR INSECTS IN PLANTS.—According to the *Gardener's Magazine*, hot water may be employed for the destruction of the insects that most commonly infest plants. Aphides quickly perish if immersed in water heated to 120 degrees Fah. We obtained from various sources plants infested with green fly, and cleansed them all by the simple process of dipping. It became desirable to ascertain the degree of heat the plants could endure in the dipping process. A number of herbaceous and soft-wooded plants were therefore subjected to the process of immersion. We found that fuchsias were unharmed at 140 degrees, but at 150 degrees the young leaves were slightly injured. Calceolarias suffered at 140 degrees, but the plants were not killed, though their soft tops perished. Pelargoniums were unhurt up to 150 degrees, but the slightest rise beyond that figure killed the soft wood and the young leaves completely.

Hill's Manure Spreader.

The manufacture and proper application of manure, and other fertilizers to soil, are matters of great moment to the agricultural interests of the country. Every farmer knows the great difficulty in applying well rotted manure of any kind evenly to the soil, as well as the heavy labor it entails when the work has to be done by hand, and the difficulty of spreading with any degree of regularity. The object of this invention is to do this work better, more rapidly, and without hand labor. It is simple in construction, easily managed, cheap and durable, and can be used on any ordinary farm wagon. In the engraving, A represents the frame or body of the machine, which may be placed upon any farm wagon or truck; or it may be placed on one axle if desired. If four wheels are used, the rear axle is rigidly attached to the frame, A, while the front axle is pivoted in the usual manner to admit turning.



HILL'S MANURE SPREADER.

The frame or box, A, has an open bottom; but for the usual bottom to a wagon box is substituted an adjustable hopper, B, made in two parts, as shown. This hopper consists of four leaves or plates, two for each portion working between the sides of the box or frame, A. The lower plates—of which one is shown at G—form the discharge end of the hopper, while the upper ones, B, receive the matter to be distributed. The leaf, G, is made adjustable toward or from a distributing cylinder, D, so as to regulate the rate of discharge.

The distributing cylinder, D, has longitudinal ribs; or if preferred may have rows of spikes or teeth to engage with the manure and haul it through the narrow opening at the bottom of the hopper next to the adjustable apron, G. This cylinder receives rotary motion from a gear and pinion, E and F, which are run out or into gear at pleasure by a lever. The upper parts of the hopper, lettered B, are thrown down to nearly a level position when the load is placed upon the truck, they being so pivoted that their own weight pulls them down when they are not inclined by the action of the windlass, C. This windlass is used to draw up the parts, B, so as to render them inclined planes down which the manure slides to meet the distributor, D, and as the load is gradually distributed the inclination is gradually increased, a ratchet wheel and pawl fixing the inclination until it is desired to change it. The connections between the windlass and the parts of the hopper, B, are pieces of rope, as shown.

We see nothing about this machine that is not eminently practical, and although we have not seen it in operation, we judge it will work in all respects as claimed for it, and that it is a valuable addition to the machinery of the plantation and the farm.

Patented through the Scientific American Patent Agency, by Daniel Hill, of New Vienna, Ohio, March 15, 1870. The entire right, or State rights, will be sold on reasonable terms. For further particulars address Daniel Hill, as above.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of April, 1870:

During the month, 473 visits of inspection have been made, and 930 boilers examined, 726 externally and 335 internally; while 92 were tested by hydraulic pressure. The number of defects in all discovered, 474; of which 49 were regarded as as dangerous. The defects in detail are as follows:

Furnaces out of shape, 16; fractures in all, 25—9 dangerous; burned plates, 29—2 dangerous; blistered plates, 48—5 dangerous; cases of incrustation and scale, 110—4 dangerous; cases of external corrosion, 21—6 dangerous; cases of internal corrosion, 14—2 dangerous; internal grooving, 7; water gages out of order, 31—2 dangerous; blow-out apparatus out of order, 12—2 dangerous; safety valves overloaded 26—3 dangerous; pressure gages out of order, 92—6 dangerous; variations from —45 to + 23. Boilers without gages, 2—1 dangerous; cases of deficiency of water, 1; broken braces in 15 boilers—4 dangerous; loose braces in 12 boilers; new tubes ordered in 3 boilers; 1 boiler condemned as beyond repair.

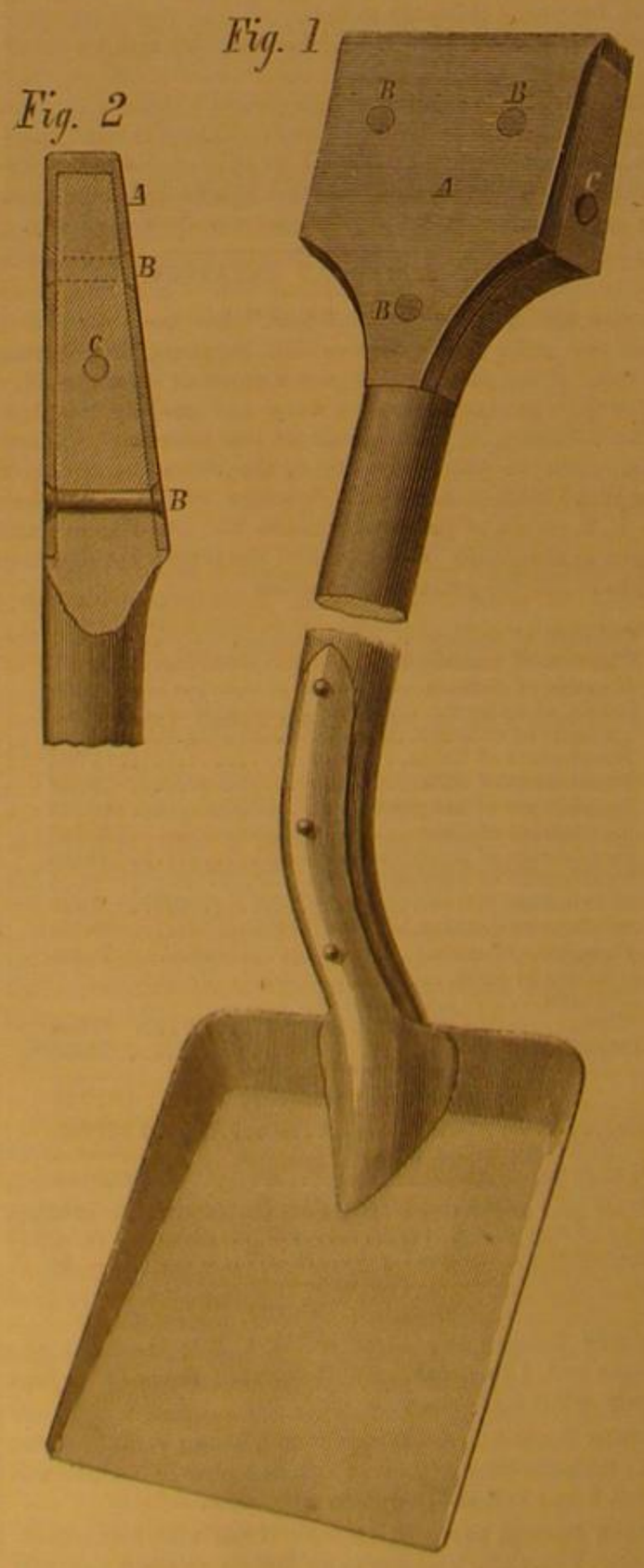
Neglect to keep fire sheets clean, and urging fires too fiercely have shown their effects in distorting and fracturing furnace sheets. The tendency to overwork boilers cannot otherwise than produce such results. If boilers were supplied with accessible *hand holes*, and care taken to remove all deposit frequently, as well as working the fires moderately, our reports would be nearly free from cases of burned plates, fractures, and furnaces out of shape.

Much of the iron put into boilers is entirely unfit for use. We have recently examined a piece cut from a plate which was composed of no less than five distinct leaves or laminations. Such iron cannot otherwise than blister, and the whole structure will be weak and unsafe. Every sheet before being used should be most carefully examined with a view to detect flaws and weak places.

External corrosion arises from leakage at blow-out or steam gages varying from —45 to + 23. It is all-important that these gages be often examined and tested, and engineers should see that they are. It is part of their duty to attend to such matters, and neglect to keep all important appliances in good condition should be evidence of inability.

IMPROVED SHOVEL HANDLE.

The object of this improvement is to so construct the handles of shovels, that they may be used as rammers or tamping irons in leveling and raising railroad ties, in set ting fence posts and telegraph poles, and for all other purposes where a rammer is needed in connection with a shovel.



The rammer, A, is formed on the end of a handle of a long-handled or dirt shovel. The side edges of the broad part of the rammer are covered with an iron plate made thicker upon, and near the end of, the rammer than in other portions, as shown in the sectional detail, and having its edges turned down over the beveled edges of the wooden part of the rammer as shown in the principal engraving.

This iron plate is secured to the wooden part of the rammer by the rivets, B, and the wood is prevented from splitting by transverse rivets, C.

This supplies a neat and convenient rammer without cumbering the workman with a separate tool.

Patented, April 12, 1870, through the Scientific American Patent Agency, by Geo. C. Choate, of Wyoming Station, Wyoming Territory, who may be addressed for the entire right or State rights, or rights to manufacture on royalty.

"What A Change was there, My Countrymen!"

William Cullen Bryant recently delivered an interesting discourse before the New York Historical Society on the life and character of the late Gulian C. Verplanck. Perhaps nothing serves to impress us so vividly with the change that has come over the face of this island in less than a century, as to read that Mr. Verplanck was born in Wall street, on the site of the present Assay Office, when all to the north of it was country, and then to reflect that he lived to see the population cover nearly all the available space between the two rivers, and spread across both; and to become the President of a Board of Emigration which passed at last over 250,000 immigrants in one year into the country.

Petroleum Gas as Fuel.

The largest boilers at the Erie water works are now heated solely by the flow of natural gas from the well recently sunk there. This well is down five hundred and ten feet, and has cost $1,500. The gas is conducted by an inch-and-a half pipe, without gasometer, through smaller pipes underneath the boilers. The flow has been steady, and less than one half the amount has been necessary to keep up a pressure of forty-seven pounds of steam to the inch, the usual pressure required. No coal whatever has been used since its introduction, the cost it saves being from eight to ten dollars per day. Thus far it has only been conducted into the fire space under the boilers, but pipes will be put in to conduct it directly into the flues. Besides the saving of coal, the item of cleanliness is one worth taking into consideration. There is no smoke, no dust, no ashes, and nothing to do except turn a faucet to either shut off all heat or put on full force, in a twinkling. Added to the intrinsic value of this well, the success in finding gas has opened a new channel of prosperity, and several prospects and enterprises, wherein the cost of fuel is the great item of expense and whereby it may be made almost nominal, are already afoot, and doubtless some of them will be pushed through to a fair trial. There is a plan talked of, says the *Dispatch*—and by men who generally mean business—to bore for gas in the edge of the bay, and use it in the manufacture of iron, thus doing away with the enormous cost of coal. The scheme looks like a wild one, but may be more practicable than the majority would consider it. A couple of gas wells like that at the water works would certainly be a great assistant in saving coal.

Gases Evolved by Ripe Fruits.

According to Lechartier and Bellamy, picked fruits—such as apples, cherries, and gooseberries—at first absorb oxygen; afterwards they give off carbonic acid, and in larger volume than the previously absorbed oxygen. At first the evolution of gas takes place uniformly, afterwards it moderates, and then ceases for a time, and commences again and gives off more gas than during the first period. An increase of temperature promotes the transformation. Whether light has any influence upon the reaction is not stated. From these observations it will appear that it is unsafe to sleep in apartments where much fruit is stored.

Useful Household Receipes.

TO IMPROVE STARCH.—To each bowl of starch, add one teaspoonful of Epsom salts, and dissolve in the usual way by boiling. Articles starched with this will be stiffer, and will be rendered to a certain degree fire-proof.

TO REMOVE STAINS FROM LINEN.—To remove wine, fruit, or iron stains, wet the spot with a solution of hyposulphite of soda, and sprinkle some pulverized tartaric acid upon it; then wash out as usual. Strong vinegar can be used instead of the tartaric acid.

MOTH POWDER.—Lupulin (flour of hops), 1 dram; Scotch snuff, 2 oz.; gum camphor, 1 oz.; black pepper, 1 oz.; cedar sawdust, 4 oz. Mix thoroughly, and strew (or put in papers) among the furs or woolen to be protected.

LIQUID FOR CLEANING SILVER.—Add gradually 8 oz. of prepared chalk to a mixture of 2 oz. of spirits of turpentine, 1 oz. of alcohol, ½ oz. of spirits of camphor, and 2 drams of aqua ammonia. Apply with a soft sponge and allow it to dry before polishing.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

DETERIORATION OF COAL BY EXPOSURE TO THE AIR.

Very few articles on this important subject have appeared in our scientific journals, and it is only within a few years that the attention of engineers has been called to the great loss suffered by coal from exposure in the open air. Recently a German chemist, Dr. E. Richters, has been studying the question, and has given the world the benefit of his observations. It appears that coal at ordinary temperatures, absorbs oxygen; and if it be heated to 390° F., it at first increases in weight, carbonic acid and water are expelled, and oxygen absorbed until the oxygen and hydrogen are in the proper proportions to form water.

The carbon in the coal appears to be present in two modifications, one of which is not well understood, and is comprised under the general name of bitumen. The bitumen carbon is first oxidized, and the other modification is the last to be affected. The amount of hygroscopic water that the coal can absorb varies considerably, and does not appear to be dependent upon the structure of the coal. Solid coal absorbs, not unfrequently, three times as much water as a softer, more lamellar article.

The changes that take place in the coal are naturally more rapid in the early stages of its exposure than at a later period, but the absorption of oxygen does not cease at any time. If a current of air is passing over a coal heap, large quantities of carbonic acid will be given off; but where the air is quiet, the coal absorbs the carbonic acid and less change is manifest. According to this, on windy days the loss in the weight of coal must be greater than when the weather is calm.

The temperature of the air has much to do with the deterioration of coal, as warm weather greatly promotes the absorption of oxygen and the formation of carbonic acid. All engineers agree that the influence of moisture is very great. Water operates in various ways; it acts upon the iron pyrites, that in greater or less quantity accompanies all coal, oxidizes the iron, slakes the coal, and thus exposes greater surface to the action of the air, and heats up the mass, so as to promote oxidation. The sulphate of iron in turn oxidizes, and is again reduced by the coal; and it is thought that the green vitriol thus serves as a conveyancer of oxygen to the coal, and occasions its combustion. This fact has been overlooked in accounting for the large loss in the value of coal.

Whether sunlight has any influence upon the decomposition and oxidation of coal is uncertain. All of the observations were contradictory, but perhaps a majority of them authorize the conclusion that sunlight prevents the destruction of coal.

The spontaneous combustion of coal is a matter of great importance, and has been the special object of study, but it is difficult to give a satisfactory explanation of it. By some observers it is attributed to a species of molding, such as moist hay undergoes, thus giving rise to sufficient heat to ignite the mass; others assign great influence to the decomposition of iron pyrites, but a closer study of the subject has shown that 160° Fah. is the utmost that can be anticipated from this cause.

The most rational explanation appears to be the absorption of oxygen and the rapid oxidation of the carbon—the more rapid the oxidation the greater the increase of heat, until a temperature is reached that sets fire to the heap of coal. The conditions that favor the spontaneous ignition of the coal are, great exposure of surface, fine structure of the coal, piling in large heaps, and moisture.

There appears to be no doubt that the loss in the weight and heat-producing value of coal is very great, whenever it is exposed to the action of the atmosphere in large heaps, and it is better not to keep such a stock on hand as is done by many establishments. Aside from the loss in weight, there is a manifest deterioration in its heating power, occasioned by the liberation of much of the hydrogen, and the consumption of the bitumen modification of carbon. Coal freshly mined is more valuable as a fuel, and it is worth more per tun than the heaps that have been deteriorated by long exposure to the air.

THE USE OF WIRE ROPE IN CIVIL AND MECHANICAL ENGINEERING.

A marked feature of present mechanical progress is the increasing use of wire rope in civil and mechanical engineering. The world probably owes a greater debt to the late John A. Roebling than to any other man connected with the introduction of wire cables as a constructive material. It was he who by his scientific employment of this material educated the public, at least the American public, up to the full appreciation of its value. From his labors and experiments the principal data upon which other engineers now depend in the use of wire for constructive purposes have been chiefly obtained.

Now we find wire rope employed in almost every engineering work. It constitutes an important part of modern ship rigging. It is used for hoisting, for towing boats, for bridges, for suspended tramways, for propulsion of cars up heavy grades, and even upon level surfaces. It is found to be the cheapest and most efficient medium for the transmission of power to long distances. Every year increases the number and extent of its applications.

Two of the most recent applications to which this material has been put are in our opinion destined to prove equal in importance to any which have preceded them. We allude to the transmission of motive power, and the tramway system invented by Mr. Hodgson of which several notices have recently appeared in these columns.

The telo-dynamic cable system, is, if we mistake not, destined to a most brilliant future. This country affords a notable field for its advantageous employment. Our mining districts are, many of them, so situated that power can only be obtained in this manner, or by the use of steam.

We do not entertain a doubt either that the wire rope tramway system will be found of vast benefit to our mineral districts. It is simple, practical, and cheap, and has demonstrated its value as a means of transporting ores and freights.

To what other uses wire rope may be destined it is impossible at present to say, but the success which has attended its applications thus far, encourages the belief that inventors and engineers may still find it a valuable resource for purposes not yet thought of and in ways hitherto undiscovered.

THE IMPACT OF BODIES.

The easy discussion of the laws of impact, and, we may add, their easy and complete comprehension, require the use of mathematics. The subject is, however, so important in mechanics, that we shall attempt, in the present article, to place its salient points before our readers, avoiding mathematical discussion, so that those not familiar with such discussions may understand, as well as the nature of the subject will allow, the phenomena of impact and its results.

In the first place, what is meant by impact? A common idea among those who have not paid special attention to this and cognate subjects, is, that bodies of matter may approach until their surfaces touch. But science teaches us, that however much they appear to touch, they are never in absolute contact. When a nail is struck by a hammer, the hammer approaches within a very minute distance from the head of the nail, at which distance the nail instantly recedes, penetrating even the densest wood in its obedience to this law, that no atom of matter shall ever actually touch any other atom.

A body is, in this view, a series of atoms, each keeping its proper distance from all others, and only changing its distance at the near approach of other matter, or by motion derived from some external cause.

Science further teaches us, that neither these atoms, nor the molecules (little masses) which they assemble to form, are ever at rest, but that they are constantly moving within the spaces maintained about them, the various modes of motion which they possess giving rise to the phenomena of heat and its correlative forces.

It is now well established, also, that no motion is lost throughout the universe; that whatever is subtracted from one body is either added to that of some other body, as mass motion, or is added to the molecules, making up the masses themselves, or other masses, appearing as heat, etc., and that when heat, or other mode of molecular motion, or mass motion disappears, either some other form of molecular motion or mass motion commences, or, it may be, both mass motion and molecular motion in equivalent quantity, take the place of the seemingly lost motion.

Impact, we shall, therefore, define to be the arrival of one body to that point of approach toward another body, when the latter commences to move as a mass relatively to the striking body, or to undergo a change in the normal relations of distance between its molecules.

The books define impact to be the sudden blow caused by one body striking against another, either in motion or at rest; but this definition does not appear to express the true nature of impact, in accordance with the present state of the science of molecular physics.

Previous to impact, two bodies may both be moving in the same, or in opposite directions, or one may be (relatively to the other) at rest; or both may be approaching the point where the impact will take place, in lines forming some angle less than 180°, and they may have the same or different velocities. These are the conditions of motion under which all impact must take place.

The other conditions upon which the results of impact will depend, are the respective elasticities or inelasticities of the bodies, and their relative masses.

In examining these results, we find that the modern doctrine of the conversion of mass motion into molecular motion, and molecular motion into mass motion, renders clear much that was formerly mysterious. We must bear in mind, that all the results of impact may be classed, either as mass motion or molecular motion. When mass motion ceases, we shall always be able to detect a change of form or temperature, or other indication of increased molecular motion.

When elastic bodies suffer impact, we have a conversion of mass motion into molecular motion, and a reconversion of the latter into mass motion in directions dependent upon the angle of their approach. When inelastic bodies meet, a portion or the whole of the mass motion may be converted into molecular motion, and as, in this case, there can be no reconversion, as in the case of elastic bodies, the results of such impact will be a permanent change of form. But, as no body is without some elasticity, and as the results of impact increase with increased velocity, and *vice versa*, there may be a velocity from which the result of impact would be less than the limit of elasticity, and no permanent change would be produced.

The destructive effects of impact belong to the class of permanent results. It is now a well-established fact, that the destructive effect and the work a body will perform increase with the square of its velocity, all other things remaining equal.

If a spiral steel spring be placed upon a board and struck with a hammer, it does not penetrate the board to any great extent, whereas, a nail, struck with the same force, penetrates to a considerable depth. Here we have a destructive effect, —*i. e.*, the rupturing of the fibers of the wood,—varying greatly for the same amount of force applied, the difference being entirely in the character of the effect, not in the quantity, and depending upon the difference in the elasticities of the body struck.

The explanation of this is based upon the fact, that it takes time for motion to be communicated from molecule to molecule throughout a mass, and that, if the minimum limit of time, in which this can take place, be not allowed, the molecules are separated beyond their normal molecular distances, and rupture is the result. The intervention of an elastic body between two inelastic bodies, at the moment of impact, lengthens the time during which the motion of one is imparted to the other, so that this motion is transferred gradually, and the minimum limit of time required, for the motion to pass from molecule to molecule, is allowed.

Thus—suppose two cars, upon a railway track, were to approach each other at a velocity sufficient to destroy them without such a spring intervening, and suppose that they can only yield one fourth of an inch without breaking up, their motion would be converted into destructive effect (molecular change or motion), during the time consumed by their movement through the quarter of an inch. But if a spring were interposed, of sufficient strength, capable of yielding three inches, at which point it should still retain sufficient power to completely stop the approach of the cars, it is plain, that the time during which the motion will be transferred, has been greatly increased; and, instead of being converted into destructive effect, it will be converted into tension, or increased molecular motion, in the elastic spring, which will, in turn, be reconverted into mass motion, and the cars will be thrown apart again.

Motion, as a mass, can never be produced in a body by the impact of another body upon any portion of it, until the motion received is diffused throughout the entire mass; this requires time, and, if the velocity of the striking body is so great that this time is not allowed, destructive effect is always produced.

THE PROBLEM OF CITY TRANSIT.

We last week gave the views of Mr. A. T. Stewart, and of Mr. William A. Whitbeck, relative to the great question of transit in this city. These gentlemen expressed their views as to the financial and legal aspects of the question, as well as to the practical details of some of the plans proposed. We herewith give the views of a well-known practical engineer:

VIEWS OF MR. HAMILTON E. TOWLE—HIS GRAND VIADUCT PLAN FOR THE CITY OF NEW YORK.

Mr. Towle thinks it is proper to consider in the first place what general classification is possible—they resolve themselves into three general divisions: the first comprising those to be operated below the general surface or level of the streets; the second, those upon the level of the streets; and the third, those that are elevated and operated above the line of the streets.

Without entering into any detailed recital of the considerations of the objections to the first division, involving a study of the geological structure of the island, the construction of existing sewers, positions of gas and water pipes, and of the relative relations of the streets above—he thinks it will be

sufficient to state that the objections are so serious in the several comparisons, that plans in this division are considered by him to such an extent impracticable, as not to be recommended.

Respecting the second division, which at once brings ordinary local traffic into conflict with any quick and powerful means which must be operated upon its own time tables and rules, the very idea of continued conflict, independent of many other serious objections, also condemns this method.

In considering the third division, including all elevated ways, which are entirely independent of the foregoing objections to both of the other systems, which to certain serious extents hold good in every special plan included under either the first or second division, he thinks we should leave out of view for the moment all other things, and examine what are the requirements of such a means of transit as we wish to find.

Primarily they are, ample capacity, great rapidity, and convenience, with complete safety; and, secondarily, they are, permanence of construction with reasonable cost of permanent way, and economical maintenance and operation of the line when completed, to yield a fair interest on the capital invested.

He believes all these requirements can be better reached through the medium of a magnificent Viaduct stretching from one end of the city to the other, above the general street line, than by any other system.

Such a Viaduct would occupy a strip fifty to sixty feet in width through the middle part of the blocks, and carry eight lines of rails, forming four complete railroad tracks of ordinary (4 feet 8½ inches) gage, all upon the same level.

In general there would be three continuous iron girders forming the center and side longitudinal supports of the cross beams, which will, in turn, receive the stringers carrying the tracks.

A popular and brief description of the structure would be conveyed by saying that it would be a long, well-designed bridge, resting upon short, inexpensive piers, built upon a perfectly reliable foundation, and wide enough to carry four tracks between the side girders of the bridge, with two sidewalks for passengers outside of the outer girders.

The tracks would be operated in pairs. One pair of them devoted to trains for local passenger traffic—stations, say, about four blocks apart—running all day and all night; the other pair of tracks for very rapid passenger traffic during the busy hours of the twenty-four; while during the remainder of the day and night one pair of tracks would be employed for distributing and collecting incoming and outgoing freight for the various railroad lines running out of the city with which the Viaduct should be connected.

Valuable stores would principally occupy the various fronts below the level of the Viaduct, and the present rears of lots or back-yard spaces, directly under the Viaduct, would be more useful and valuable as continuations of such stores or as warehouses for the storage of freight let down from above, than for present uses. Accessible drive-ways would be provided at the side of the fronts for teams to pass in; they would uniformly pass out on the other street. The rental of these spaces or stores would contribute materially to the interest fund on capital invested.

The Viaduct itself would be supported entirely upon its own sub-foundation, and the occupants of buildings on either side would consequently, with other proper precautions in construction, be so slightly inconvenienced as to disregard the practical working of the lines.

The provisions for receiving and sending off freight, from stations located at convenient points, and the handling of the same, are among the many important details of practical engineering, which cannot well be explained here.

This is but a brief general explanation of this Viaduct project, which will, he thinks, be found to be sufficiently comprehensive in its scope to answer all the requirements of a main, central, Grand Viaduct through the central part of the island, and is one perfectly simple and comprehensible. Moreover, he thinks it would prove an ornament to the city and shed lasting fame on the public benefactors who will sooner or later erect, and reap a handsome reward for creating and realizing the Grand Viaduct of the City of New York.

VIEWS OF WM. R. MARTIN.

This gentleman, who is largely interested in real estate, and in the growth and prosperity of the city, favored us with his views at length. His name will be recognized by many as that of one who has given long and patient attention to this question, and whose opinions are of great value in its general consideration.

He thinks the solution of the problem of city transit is to be reached by considering the geographical form and situation of the island, the points of access to and departure from it, its natural thoroughfares, and the daily migrations of its inhabitants; and that it is quite possible to find a solution that will include all that is valuable in the various plans and diverse routes that have been presented to the public attention.

The island is long and narrow: its lower section is occupied by business, and its central and upper sections by residences. Beyond the built-up portions of the island, to the north, are vacant areas, which furnish the best natural advantages for the future sites of fine residence sections, and broad business sections of the metropolis. These sections, the most valuable in the vicinity of the city, are unoccupied, because they remain inaccessible. Means of rapid transit to every part of the suburbs of New York in every direction, for thirty miles, are multiplying as fast as the population demands them. The upper portion of the island alone remains inaccessible, and it is now practically more than thirty miles from the business sections of the city.

The owners of this property are nevertheless taxed as a part of the city, and the property, thus unjustly neglected, pays in taxes (without any reciprocal benefit), every year, enough to build a steam railroad. It is the first consideration of a system of steam transit. That the road should run the whole length of the island. This property then would be filled with population, and trade and value in every portion greatly benefited.

The lower miles' length of the island is its great location for heavy business, and the principal point of access and departure for foreign travel, for travel from Long and Staten Islands, and for travel south and southwest. This travel approaches now by ferries, striking the shore from Chambers street on the North river, round by the Battery, to Catharine street on the East river. It will, before long, have the additional avenues of approach furnished by the East River Bridge from Brooklyn, the tunnel from Jersey City, and the railroad across the Bay from Staten Island.

The city is also approached on the north by railroads, from the east, north, and west, coming in by the Fourth avenue to Forty-second street, and by the Twelfth and Eleventh avenues to Thirtieth street. Steamers from the East, and foreign steamers, will, in the future, land passengers along the East and Harlem river shore; and more frequent ferries and steamboat lines on the North river will bring passengers to the North river shore.

Travelers thus approaching and departing from the city need to be accommodated by inter-mural transit, so as to reach the centers of business and the residence sections; and also, so as to reach opposite and different points of departure. This is the second consideration of a system of steam transit.

The island now is occupied by business at its lower section; the Park may now be regarded as its center, and in the future, the business center may advance upwards along the line of Broadway.

The residence section lies now principally between Fourth and Sixth avenues, from Fourteenth street to the Central Park, for the residences which cost the most; with well defined sections, east of the Fourth avenue and west of the Sixth avenue, for the residences which cost less, and which accommodate more than one family in a single house. Further northward, abreast of the Central Park, the division of the residence sections into the East side and the West side is more distinctly marked. From these several residence sections to the down-town business sections is the daily migration of the inhabitants, and these are the natural lines of travel. If the main thoroughfares were opened on these natural lines there would be, in addition to Broadway for the central thoroughfare, one for East side travel, by continuing Third avenue southerly from Fourth street to the head of Center street, at Broome street; and the other, for the West side travel, by continuing Sixth avenue from Carmine street to the head of West Broadway, at Canal street. This is the third consideration for a system of steam transit.

Now in a comprehensive system there are three central points to be regarded as fixed—1st, The Park; 2d, the Battery; and 3d, the Railroad Depot at Fourth avenue and Forty-second street.

The Park is now the down-town terminus of all the city surface railroads. It will be the landing place of the Brooklyn bridge, and will be the best place for the debouchment of the tunnel to Jersey City when one shall be made. The space in front of the Astor House is too crowded. That between the City Hall and the Post Office is to be the future down-town center for city transit, surface and underground. A sufficient area underground would be excavated and vaulted over, to which passengers could arrive by tunnel from Jersey City, and perhaps from Brooklyn, and thence communicate with all the underground roads that might be constructed. Over this, under a sufficient colonnaded canopy, might be the station for all the surface roads, and for the road over the Brooklyn bridge; and by ample staircases, all these modes of communication from every direction would be in close contact. Mr. Mould, the Architect in Chief of the Department of Public Parks, has a well elaborated plan for combining this utilitarian use with the ornamentation of the Park. From this point, an underground road should pass down Broadway to the Battery, and up Broadway and the Bloomingdale Boulevard to Manhattanville, with a branch, diverging at Union Square, and passing up Madison avenue to Harlem river, passing the Union Depot at Forty-second street.

Around the river border of the city, there should be an elevated road, in connection with such new system of wharves and docks as may be adopted, extending the whole length and circuit of the island. These roads should be elevated above the street level, and should be reached by staircases from every ferry house, pier, and steamboat landing.

There should also be a means of rapid transit along the line of Greenwich street to the Ninth avenue, as a line midway between the North river and Broadway; and another along the line of Third avenue and Center street, Nassau and Broad street, each extending southerly to the Battery. These should be either underground or elevated roads. The most economical and serviceable plans would be elevated roads, running upon tracks supported by columns and girders, over and across the carriage way, and propelled by endless ropes.

A cross road from river to river should be made at Forty-second street, connecting with the new Union Depot at Fourth avenue, at Twenty-third street, and perhaps at other points. But as these distances are short, surface roads might, at present, answer the needs of travel.

Upon this comprehensive system of routes, thus generally indicated, accommodation would be afforded for suburban and city travel. A person who arrived at the city by ferry or steamboat, and wished to depart by any other ferry or steamboat, would find a river border road going directly there. If he wished to go to the Hudson River or Harlem Railroad depot, or to seek an hotel or a private residence, he could go to the Battery, where he would find the starting point of a road leading up Greenwich street and the Ninth avenue, of another leading up Broadway, and of a third leading up Center street and the Third avenue. This would take him within one-fourth of a mile of any point on the island, except the section east of the Bowery, that he wished to reach. Passengers arriving in the city at the Fourth avenue and Forty-second street could go at once to the Central depot at the Park, or to the Battery, and thence to their destinations, if down town; or, by taking the cross roads at Forty-second street, intersect any of the five main longitudinal lines of which mention has been made. At the various intersections proper connections should be made between the underground, elevated, and surface roads, and a great advantage would result from a direct elevated or underground communication, from the Park to the Fulton ferry on the East river side, and to the Jersey City ferry on the North river side.

This system of routes would comprehend the needs of city travel from the residence sections to the business portion of the city.

As to the various plans, the underground is the best for Broadway; for the other avenues on either side, the elevated is preferable, on the ground that it is less expensive and more comfortable. If a viaduct is used anywhere, it might be used on a line near Broadway, in place of an underground under Broadway. It would be needlessly expensive for a side route. But as between a viaduct near Broadway and an underground in it, the controversy has a strange attitude. The very men who would be most benefited by the underground, are opposing it, and advocating the plan that would be the greatest injury to them, the viaduct.

These men do not yet understand that the reason why Broadway has made them millionaires, and thus of consequence, is that travel, the best travel, is concentrated on it; and that their true policy is to concentrate it there, and not to allow it to be diverted; to hold on to it and give it every possible facility and increase of accommodation. Their conduct is just as sensible as if, on a proposition to lay additional tracks, the owners of the land along the New York Central, from Albany to Buffalo, should insist that the additional tracks should be laid twenty miles off, on one side, from the present track.

These property owners on Broadway are able to see that they might be incommoded temporarily in the occupation of their property; but they cannot see a step beyond, and discern the incalculable benefits that would accrue to them if Broadway should become the channel of the travel of a continent, and the greatest thoroughfare of money-spending people in the whole world. They can see that, so far, this is the present measure of the value of their property; and now that the street is crowded to its capacity, they set themselves to work to prevent any increase of its capacity and of its travel.

The best plan for the construction of a road on Broadway would be to excavate under the carriage way, between the curb stones, and to lay four tracks. If this were done to-day, there is not a merchant who would not, at his own expense, excavate his own vault and connect it with the road, merely for the sake of saving the expense of cartage, and of sending his goods to the railroad and steamboat.

If the viaduct plan near Broadway were adopted, as the Central route, it would take travel away from Broadway, and build up a parallel rival to it, and thus destroy the supremacy on this island which Broadway holds, and which it cannot lose unless it blindly sells itself out. This is the great argument in favor of the viaduct plan.

The Government at Albany has treated the city very harshly on this subject, and has rejected applications for authority to construct these roads, on insufficient grounds and for very crude reasons. But two plans have met their approval: One, the central underground, which has made no progress, and will not, unless they can build under Broadway; for they know that so expensive a road will not pay unless they have the best route. The second is the Greenwich street elevated road. This has been restricted by narrow public prejudice to a single row of columns to support the track. Leave should at once be given them to erect columns on each side the street, and to throw girders across for the support of their tracks. But Mr. Harvey is indefatigable, and has nineteen chances out of twenty in favor of his success: and if he succeeds, that plan, with such a modification as above suggested, will be very popular. Five miles of it can be built for the cost of a single mile of underground, and it will be very profitable.

The true test of city transit is not found in the wisdom of the Legislature. It is found in Capital. Any plan must call for money to build it, and it is here that it is scrutinized, and its engineering problems practically determined. The true way to do would be frame a comprehensive plan, and then authorize such companies as could show the capital to build the different lines. There would be need of all the capital that could come forward. Every one would have a chance to invest, practical questions would be solved, and the roads would be built.

But as yet all is disappointment and delay. This island is being depleted of its population. New Jersey and Long and Staten Islands are being built up. Capital and population are transported there. Strong property interests are accumulating in opposition to any movement for rapid steam transit northward to the Central Park. These men will oppose the plan which is uppermost in public support, and favor a rival plan, only to denounce that if it turns up. The bulk of transactions in the New York real estate market are of property off the island. There is more New York active capital employed in improving land and building houses in the

suburbs than on the island. The stage lines and the surface railroads are adverse to steam transit: many citizens live down-town, or midway up-town, and take no interest in more rapid transit. Property owners on any of the proposed lines take narrow views, oppose everything that may injure them to-day to benefit them a hundred-fold to-morrow, and have no regard for the general advance and prosperity of the city. Capital turns to the suburbs off the island to escape city taxation, and launches out into wild and speculative projects. Many of them contain the essential elements of failure, and when these appear, these capitalists will, for their own safety, gather together all the elements of opposition to rapid city transit, and fight desperately to prevent the growth of the city, and its population, on the splendid regions about the Central Park. Consider the advantages that Staten Island will present, when its beautiful shores and splendid hights are, by their railroad bridge, brought nearer in time to the City Hall than Murray Hill.

No man cares for New York; no man who has power. The city authorities, who have great power, do not see how the citizens are investing their property off the island to escape their taxation; and that this taxation falls with double weight on those who keep their property here, and who thus pay for themselves, and for their neighbors who take their property away. And still they go on, year by year, increasing the taxation. They do not consider the relation of this question of city transit to the natural growth of the city, in wealth and population, and how it is being depleted. This is too abstruse, as if it were some question about the obliquity of the ecliptic. In this respect, they have not been equal to Madison avenue. More time was taken to grade two miles of this avenue, free from rock, from Forty-second to Eighty-sixth streets, than was taken to grade the Pacific Railroad from the Missouri to the Sacramento; and after it is graded, they allow the Railroad Company two years to lay two miles of track, while thousands of people along that line have no means of transit, and must walk.

PATENT OFFICE AFFAIRS.

The business of the Patent Office is now in a flourishing condition, and the present is a favorable time to enter applications. Inventors will find the SCIENTIFIC AMERICAN PATENT AGENCY ready to attend to the prosecution of claims with the greatest dispatch. By reference to our register, we find that we have made upwards of twenty-four thousand preliminary examinations into the novelty of alleged new inventions. This great experience, together with the fact that a large proportion of all the business with the Patent Office, for the past twenty years, has been conducted through this Agency, suggests to inventors the surest and best means to secure their rights.

We give opinions free, and all we require is a rough sketch and description of the invention.

Inventions patented through this Agency receive notice in the SCIENTIFIC AMERICAN.

MODELS.—In order to apply for a patent the law requires that a model shall be furnished, not over a foot in any of its dimensions, neatly and substantially made. Send the model by express, prepaid, addressed to Munn & Co., 37 Park Row, New York, together with a description of the operation and merits of the invention.

CAVEATS.—Whenever an inventor is engaged in working out a new improvement, and is fearful that some other party may anticipate him in applying for a patent, it is desirable, under such circumstances, to file a caveat, which is good for one year, and, during that time, will operate to prevent the issue of a patent to other parties for the same invention. The nature of a caveat is fully explained in our pamphlet, which we mail free of charge.

EUROPEAN PATENTS.—Probably three-fourths of all the patents taken by American citizens in Europe have been secured through the SCIENTIFIC AMERICAN PATENT AGENCY. Inventors should be careful to put their cases in the hands of responsible agents, as in England, for example, the first introducer can take the patent, and the rightful inventor has no remedy. We have recently issued a new edition of our Synopsis of European Patent Laws.

All communications and inquiries addressed to Munn & Co., respecting patent business, are considered as strictly confidential.

Telegraphic Improvement.

The *Telegrapher* describes a valuable improvement in relay magnets, by W. W. Smith, of Cincinnati, Ohio. The improvement consists in arranging the connections of a relay so that the main circuit is divided, one half passing through each helix, and uniting again on the opposite side, instead of having the conducting wire of the two spools continuous, as in the usual manner. It will be seen upon a moment's reflection, that, by changing the connections of a magnet of the usual form, and arranging them upon Mr. Smith's plan, that the total resistance will be reduced one-fourth of the original amount, while the two helices will exert their magnetic influence in conjunction upon the soft iron cores, as usual.

BEET ROOT SUGAR IN THE UNITED STATES.

As our readers are well aware, we have always had faith in the ultimate success of the beet sugar industry in this country, and although our views have been characterized as sanguine, the press at large will credit us with having done more to foster this manufacture than almost any other journal.

We have not merely contented ourselves with statistics which go to demonstrate the possible profits of well-conducted beet sugar manufacturing, and the general good which would arise from its extensive introduction, but have also been at the expense of publishing a copiously illustrated series of articles upon the subject, so accurate and comprehensive that they were solicited for republication, and the engravings were purchased by Dr. Crookes, the editor of the *Chemical News*, London—than which no periodical published in the English language, ranks higher as a scientific exponent of its peculiar department.

We are happy to say, that although the progress of beet root sugar manufacturing in the United States is slow, still some advance has been secured by our efforts, and the articles we have published have been the means of stimulating inquiry and diffusing a great deal of useful and practical information—as well as interesting those, who, from want of correct information, had been accustomed to regard the subject with indifference.

Could the large area of territory adapted to this industry be aroused to active engagement in it, it would enormously increase the wealth of the country. At present seven eighths of the sugar consumed here is of foreign production. In France, Germany, and Belgium, native production supplies the entire demand.

How American stands in the scale of sugar-producing countries will be seen from the report of M. B. Dureau, the editor of the *Journal des Fabricants de Sucre*, upon the state of the sugar industry, made as one of the jury reports of the late Paris Exposition, and which we find in the American Supplement of the *Chemical News*:

TOTAL PRODUCTION OF SUGAR IN 1867.

COUNTRIES.	Kilogrammes.	Pounds.	Per cent.
Cuba (exportation)		1,168,448,600	22·72
Porto Rico (exportation)		132,277,200	2·57
Antilles, English, Dutch Guiana		551,155,000	10·72
French Colonies		330,69[illegible],000	6·43
Louisiana		66,138,600	1·28
Mexico		70,547,840	1·37
Peru (exportation)		2,204,620	0·04
Brazil		286,600,600	5·57
Sandwich Islands		22,046,200	0·42
Spain		12,345,872	0·24
Port Natal		13,227,720	0·25
Queensland		1,102,310	0·02
China		31,505,604	0·61
Penang (exportation)		6,613,860	0·12
Siam		11,464,024	0·22
Java		286,600,600	5·57
East Indies (exportation)		57,209,880	1·03
Mauritius		220,462,000	4·29
Manilla (exportation)		132,277,200	2·57
Egypt (exportation)		22,046,200	0·43
Cane sugar		3,420,467,980	66·47
Beet sugar, Europe		1,433,003,000	27·87
Palm or date sugar		220,462,000	4·29
Maple sugar, North America		66,138,600	1·28
Total sugar		5,140,071,580	100·00
Sorghum sirup (gallons	18,000,000		

Although these figures are for 1867, the proportion cannot have altered much since, except that the cane sugar produced in Louisiana has increased somewhat.

The value of the annual consumption of sugar of all kinds in this country does not fall short of $75,000,000, about seven eighths of which, or nearly $66,000,000, flow out of the country, and we think might, and if so ought to be retained in it.

The proportion which beet sugar bears to the total production of all kinds will be seen from the following:

TOTAL PRODUCTION OF BEET SUGAR IN 1866.

COUNTRIES.	Kilogrammes.	Pounds.	Per cent.
France	216,850,000	478,071,847	32·14
Zollverein	192,500,000	424,389,350	28·53
Russia	100,000,000	220,462,000	14·83
Austria	100,000,000	220,462,000	14·83
Belgium	40,000,000	88,184,800	5·92
Poland	19,000,000	41,887,780	2·81
Holland	6,000,000	13,227,720	0·89
	674,350,000	1,486,685,497	100·00

The lesson which these figures teach cannot be strengthened by any comments of ours.

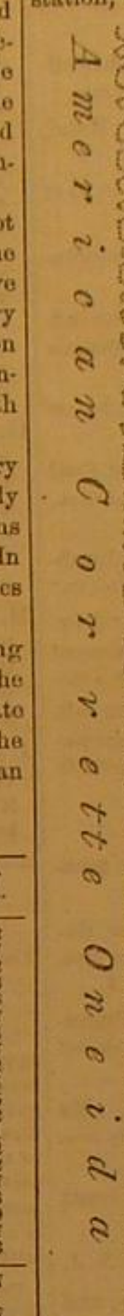
In Illinois, Wisconsin, and California, the production of beet sugar has commenced, with results highly encouraging, when we take into account the difficulties in establishing any new industry.

One of the difficulties hitherto experienced has been the necessity of importing the necessary machinery and outfit from Europe. We are glad to learn from the *Bureau*, a Chicago monthly, that this need no longer be the case, as a Philadelphia firm is now prepared to fill orders for this class of machinery. This begins to look like work. A little more experience of the fact that the beet sugar business pays will set the tide of capital in the direction of this industry, and it will become a permanent occupation on this continent.

Novel Telegraphy--Electrification of an Island.

Fleeming Jenkins communicates to *Nature* a curious discovery made by Mr. Gott, the superintendent of the French company's telegraph station at the little island of St. Pierre Miquelon. There are two telegraph stations on the island. One, worked in connection with the Anglo-American company's lines by an American company, receives messages from Newfoundland and sends them on to Sydney, using for the latter purpose a powerful battery and the ordinary Morse signals.

The second station is worked by the French Transatlantic Company, and is furnished with exceedingly delicate receiving instruments, the invention of Sir William Thomson, and used to receive messages from Brest and Duxbury. These very sensitive instruments were found to be seriously affected by earth-currents; *i. e.*, currents depending on some rapid changes in the electrical condition of the island; these numerous changes caused currents to flow in and out of the French company's cables, interfering very much with the currents indicating true signals. This phenomenon is not an uncommon one, and the inconvenience was removed by laying an insulated wire about three miles long back from the station to the sea, in which a large metal plate was immersed; this plate is used in practice as the earth of the St. Pierre station, the changes in the electrical condition or potential of the sea being small and slow, in comparison with those of the dry rocky soil of St. Pierre. After this had been done, it was found that part of the so-called earth-currents had been due to the signals sent by the American company into their own lines, for when the delicate receiving instrument was placed between the earth at the French station and the earth at the sea, so as to be in circuit with the three miles of insulated wire, the messages sent by the rival company were clearly indicated, so clearly indeed, that they have been automatically recorded by Sir William Thomson's siphon recorder. Annexed is a *fac simile* of a small part of the message concerning the loss of the steamship *Oneida*, stolen in this manner.



It must be clearly understood that the American lines come nowhere into contact, or even into the neighborhood of the French line. The two stations are several hundred yards apart, and yet messages sent at one station are distinctly read at the other station; the only connection between the two being through the earth; and it is quite clear that they would be so received and read at fifty stations in the neighborhood all at once. The explanation is obvious enough: the potential of the ground in the neighborhood of the stations is alternately raised and lowered by the powerful battery used to send the American signals. The potential of the sea at the other end of the short insulated line remains almost, if not wholly unaffected by these, and thus the island acts like a sort of great Leyden jar, continually charged by the American battery, and discharged in part through the short insulated French line. Each time the American operator depresses his sending key, he not only sends a current through his lines, but electrifies the whole island, and this electrification is detected and recorded by the rival company's instruments.

No similar experiments could be made in the neighborhood of a station from which many simultaneous signals were being sent; but it is perfectly clear that unless special precautions are taken at isolated stations, an inquisitive neighbor owning a short insulated wire might steal all messages without making any connection between his instrument and the cable or land line. Stealing messages by attaching an instrument to the line was a familiar incident in the American war; but now messages may be stolen with perfect secrecy by persons who nowhere come within a quarter of a mile of the line. Luckily, the remedy is simple enough.

All owners of important isolated stations should use earth-plates at sea, and at sea only. This plan was devised by Mr. C. Varley many years ago to eliminate what we may term natural earth-currents, and now it should be used to avoid the production of artificial earth-currents which may be improperly made use of.

BRICKS FROM GAS COAL ASHES.—According to the *Gaslight Journal*, walls of remarkable lightness, porosity, and dryness may be built cheaply of bricks made from the ashes of the coke derived from gas-works. Mr. Wagner, the first inventor of the process for effecting this, instructs us as follows as to his *modus operandi*: "The ashes, after being taken from the retorts, are spread on the surface of a clean floor; they are then finely pulverized, and 10 per cent of slacked lime, together with a small proportion of water, is intimately stirred and incorporated with them. After a rest of twenty-four hours, the mixture is made into bricks by the ordinary process. These bricks are immediately transferred to the drying sheds, where a few days' exposure renders them fit for use."

IT is a well-known fact in surgery that when air gets into the tissues in consequence of a perforation of the lung by a punctured rib, it does not excite putrefaction or suppuration as it is apt to do, when it acts on an external wound. Professor Tyndall, in a letter to the *Times*, connects with this fact his observation, by means of a beam of light, that air expelled from the lungs by a forced expiration contains no floating particles, and considers that together these facts afford a complete demonstration that germs in the air removable by filtration are the cause of putrefaction and its associated phenomena of animalcular life.

APPLICATIONS FOR EXTENSION OF PATENTS.

MACHINE FOR SWEEPING GUTTERS.—William H. King, Philadelphia, Pa., has applied for an extension of the above patent. Day of hearing Aug. 3, 1870.

PROCESS OF PREPARING LINSEED, ETC., FOR PRESSING, IN EXTRACTING OIL.—Charles Moore, Trenton, N. J., has petitioned for an extension of the above patent. Day of hearing Aug. 3, 1870.

REDUCING WOOD FIBER TO PAPER PULP.—Henry Voelter, Heidenheim Kingdom of Wurtemburg, Germany, has petitioned for an extension of the above patent. Day of hearing August 10, 1870.

The Universal Wringer has been in use in our family for years, giving entire satisfaction. We speak whereof we know when we say it is one of the best labor-saving machines ever invented, having several points of superiority over any Wringer we have examined.—[New York Liberal Christian, April 2, 1870.

Business and Personal.

7 1c Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

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

Pictures for the Sitting Room.—Prang's latest Chromos, "Flowers of Hope," and "Flowers of Memory." Sold in all Art and Book Stores throughout the world.

Keane's Silver-plating Compound plates metals with pure silver instantaneously. Keane, Silver Plater, 75 Bleecker st., New York.

Proprietors of Soapstone Quarries send address to E. D. Rand, Burlington, Iowa.

Cheese-box and Salt-box Manufacturers send address to Box 81, Stroudsburg, Monroe Co., Pa.

Tempered Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

Adjuster Wanted.—We want first-class sewing-machine adjusters. For further particulars apply or address Wilson Sewing Machine Co., Cleveland, Ohio.

Watchmaking and Photographing, at Three Oaks, Mich., on M. C. R. R. Price of business and building, $2000.

Shop, Town, County, or State Rights for sale, for Patent Coal Scuttle. For circular, etc., address T. T. Markland, Jr., 1515 South st., Philadelphia, Pa.

Rawhide Sash Cord has no equal for heavy windows or dumb-waiters. Makes the very best round belting. Darrow M'f'g Co., Bristol, Ct."

Galvanized iron ventilating skylights, straight and curved extension lights, conservatories, etc., under patents dated 1869-70, are approved by every architect. For Rights address Geo. Hayes, 75 8th ave., New York.

Crampton's Imperial Laundry Soap, washes in hard or salt-water, removes paint, tar, and grease spots, and, containing a large per centage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Komp Eyeletting Machine. See advertisement.

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

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

L. L. Smith, 6 Howard st., N. Y., Nickel Plater. First Premium awarded at the late Fair of the American Institute. Licenses granted by the United Co., 17 Warren st., New York.

One 60-Horse Locomotive Boiler, used 5 mos. $1,200. Machinery from two 500-ton propellers, and two Martin boilers, very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

Stiff, heavy, powerful lathes, planers, shapers, slotters, and radial drills, in stock. E. & A. Betts, Wilmington, Del.

Second-hand donkey pumps, 12, 25, and 35-H. engines, leather hose, old style blowers, cocks, valves, etc., etc. Wm. D. Andrews & Bro., 414 Water st., New York.

Steel Makers' Materials—Wolfram ore, oxide manganese, Speigel iron, borax, titanium, chrome, lubricating black lead, for sale be L. & J. W. Feuchtwanger, 55 Cedar st., New York.

Revolving Head-screw Machines, Gang Drills, Lathes, Tapping, milling, profiling, and other machines for sewing machine works, with latest improvements and excellent workmanship, constantly on hand or finishing, by the Pratt & Whitney Co., Hartford, Conn.

An experienced mechanical and railway engineer wishes a position as Master of Machinery, or Manager. Address "Engineer," Station "G," Philadelphia, Pa., Postoffice.

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

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

For tinmans' tools, presses, etc., apply to Mays & Bliss, Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Answers to Correspondents.

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

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

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

W. S. W., of Mass.—The information you desire would occupy too much space for this column. We advise you to consult the Painter, Gilder, and Varnisher's Companion, published by Henry Carey Baird 406 Walnut street, Philadelphia.

J. C., of Ind.—To make paper hangings stick well to a wall that has been whitewashed, scrape the whitewash off thoroughly, and give the wall a coat of glue size before putting on the paper.

C. E. M.—We know of no water-proofing that we think would be practicable for fish-lines. We think a twisted linen line better than a braided one.

W. H. C., of Ill.—The number of strokes and diameters of cylinders upon two steam engines being equal, and the pressure of steam and other circumstances of working precisely similar, the greater power will be developed in the longer cylinder.

W. K. B., of Ind.—The attraction of U-shaped electro-magnets, with an equal number of windings, is proportional to the squares of the magnetizing current force, or intensity. With equal currents it is proportional to the square of the number of windings of the magnetizing spirals. It is proportional to the square of the current force multiplied by the square of the number of windings. [This is true alike for attraction and sustaining force, both in straight and in U-magnets.] The magnetism of massive cylinders of iron of equal length, magnetized by Voltaic currents of equal force, and by spirals of an equal number of windings, closely surrounding the core, is accurately proportional to the square roots of the diameters of these cylinders. For the particular case in which the surface of contact does not disturb the result, the attraction and sustaining force are, with equal magnetizing forces, proportional to the diameters of the bar or U-magnets. The attraction of bar and U-shaped electro-magnets with equal magnetizing forces, increases the nearer the whole of the windings are to the poles. The attraction, like the sustaining force of U electro-magnets—other things being equal—remains the same, whatever be the distance of the branches of the magnet. The length of the branches of a U-shaped electro-magnet has no influence on its attractive or sustaining force, if the windings of the spiral surround its whole length. The attraction which a helix or spiral exerts upon a soft iron bar placed in its axis, follows the same law as an electro-magnet; hence it follows, that: The attraction of a spiral is proportional to the square of the magnetizing current, multiplied by the square of the number of windings. The sustaining power of the electro-magnet increases with the mass of the armature up to a certain point, not exceeding the mass of the electro-magnet itself; and, moreover, Lials has shown that an armature whose face of contact is not over one third the breadth of the poles to which it is applied, gives a maximum effect. The intensity of the current increases with the number of cells. A reliable description of Leclanche's battery appeared in No. 7, current volume.

G. H. W., of N. Y.—The collapse of your kitchen boiler was undoubtedly owing to the sudden escape of steam and sudden condensation from influx of cold water, when the faucet was opened; the water being probably nearly all driven out of the boiler by the pressure of the steam. We had a boiler collapsed in the same way a few days since, by the carelessness of a servant. A valve opening inwards, at the top of the boiler, will prevent any such accident.

M. T., of Pa.—The side-thrust and dragging of wheels on locomotives and railway cars in passing curves, are mostly obviated by the conical form of the tread of the wheels, so that the wheels on the outer part of the curved track bear on a larger circumference than the inner ones.

J. F., of Pa.—Were there no resistance of the air, a ball fired vertically from a gun would return to the muzzle with exactly the force it left it in its ascent. As it is, however, it loses a considerable velocity by the atmospheric resistance, both in ascent and descent.

Recent American and Foreign Patents.

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

LOOM SHUTTLES.—Horace Wells, Hopkington, R.I.—This invention relates to improvements in shuttles, and consists in arranging the spool or bobbin-retaining spring, or other device which holds the bobbin on the spindle, so that when the shuttle is struck by the picker and set in motion in one direction, the spring or holding device will yield to the force of the inertia of the bobbin and set it more gradually in motion, thereby preventing the picking of the thread off the spool or bobbin, now so common, when set in motion in the direction having that tendency. The invention also consists in an arrangement for adjusting the spindle to cause it to stand in line with the long axis of the shuttle when holding the bobbin therein.

CHERRY STONER.—C. A. Fisher, Philadelphia, Pa.—This invention relates to improvements in apparatus for stoning cherries, and consists in the combination of a pair of plates hinged together, and provided with recesses in the two faces which come together, which recesses form molds for holding the cherries, of a follower, provided with a plunger for each mold, and a case for the whole; the said mold plates being provided with small passages through the molds for the passage of the plungers by which the stones are thrust out.

APPLE PARING, CORING, AND QUARTERING MACHINE.—George W. Bennett, Harrodsburg, Ind.—This invention relates to improvements in machines for paring, quartering, and coring apples, and consists in an arrangement on a sliding carriage of the apple-holding and revolving spindle, the knife and the driving mechanism gearing with a toothed rack on the ways upon which the carriage moves for imparting motion to the spindle and the knife for paring, while the apple is carried to coring and quartering cylinders, into which it is forced after it has been pared and the rotary motion of the spindle has stopped. From the quartering and coring cylinders the quarters are delivered laterally into a receptacle, and the cores are forced through the small cylinder and out at the end.

LAMP LIGHTER AND BURGLAR AND FIRE ALARM.—J. B. Irwin, Newark, O.—This invention relates to improvements in apparatus for lighting and extinguishing lamps, and giving alarm for awakening persons at required times, or in case of burglars making attempts to enter buildings, or of fire, and consists in a revolving match-holding and scraping mechanism worked by a spring, let free, either by pulling a cord by a person in bed, or by a weight let fall at the required time by the action of attachments to a clock, or by the moving of doors or windows by the attempts of burglars to enter, or by strings burned off by fire in case of fire. It also consists in the connection therewith of an alarm mechanism to be set in motion by the clock, burglars, or fire.

STEAM GENERATOR.—George O. Sampson, Jamestown, N. Y.—This invention relates to improvements in the sectional boilers made of hollow cast-iron plates, set up on end and clamped together at the sides, by long clamping bolts running through the whole. The invention consists in forming the bonnet or connection between the lower and upper flues at the rear, which conveys the product of combustion from the lower flues to the upper return flues, within the rear plates; also in forming the return flues through the plates in zig-zag lines, so that the heat will impinge upon the surfaces of the flues, and act more intensely thereon.

DOUGH WORKER.—Wm. R. Pool, Havana, Ala.—This invention relates to improvements in machines for rolling or working dough, and consists in the employment in slotted bearings on each side, of a table suited for the ready application and removal of the same, and for working higher or lower, as required in the bearings of a roller, to be turned back and forth by hand or otherwise, and having weighted levers for pressing it down to the work, under which roller the dough is worked back and forth by turning the rollers first one way and then the other.

BRAD PUNCH.—Roswell F. Cook, Potsdam, N. Y.—This invention relates to improvements in automatic feeding brad punches, and consists in an application to the plunger, and to the feeding rack of a feeding and holding pawl arranged to feed and lock the rack by the return movement, in an adjustable arrangement of the gage, and in an improved construction of the plunger case for application of the operating pawl.

COMBINED STAND AND CLOTHES DRYER.—Michael E. Charles, Hope, Ind.—This invention consists in arms, so combined with an ordinary table or stand, that they may either hang pendant from the under side of the table or be made to stand out radially from the table so as to form a clothes dryer.

CLOTHES DRYER.—David Morris, Cutler, Ohio.—This invention consists in a vertical standard, provided with a recessed circular head, and combined with arms pivoted in the recesses of the head, and provided with folding bars, which may be turned down, so that their lower ends rest on the ground when the arms are extended, so as to form supports at the outer extremities of the same.

HAND-SAWING MACHINE.—G. P. Hill and Edward C. Dow, East Deering, N. H.—This invention relates to an improved arrangement of driving mechanism for the arbors of hand-sawing machines, and consists in journaling one end of the arbor between the peripheries of three friction wheels, one of which, preferably the upper one, is arranged in movable bearings, and provided with springs to press it upon the journal of the arbor, and all have a belt working over them. The power is applied by hand crank preferably to one of the wheels in fixed bearings.

STOVE LEG FASTENER.—Frank Moon, Newberry C. H., S. C.—This invention relates to improvements in securing the legs to stoves, and consists in the application to the leg of a spring bolt, and in providing a socket in the under side of the bottom plate of the stove, so arranged that when the leg is shoved "home" in the dovetailed groove, the bolt will be thrown up into the socket and prevent the leg from working out of the groove. A stem of the bolt projects down through the leg to be taken by the fingers to pull it out of the socket when the leg is to be removed.

AUTOMATIC MAGNETIC INDICATOR.—James P. Snyder, Brooklyn, N. Y.—This invention relates to improvements in the magnetic burglar alarm apparatus used in houses, hotels, and the like, to sound alarms when efforts are made to enter by raising windows, or opening doors, and it consists in an arrangement for setting in action automatically a secondary circuit, which will continue the alarm, although the circuit first set in action may be suddenly stopped again by the closing of the window or door, by the burglar overhearing the alarm. The invention also consists in an arrangement for causing the armature to effect the uncovering of the name or number of the room, from which the alarm proceeds.

STOVE GRATE.—Price Dempsey, Erie, Pa.—This invention relates to improvements in stove grates, and has for its object to provide an arrangement of that class of grates which revolve horizontally, whereby the ashes and cinders may be more readily discharged. It is also designed to provide a simple and cheap construction. The invention comprises the combination with a circular rim having radial projections towards the center, but stopping short of it, leaving a large central space, of a vertically oscillating center, mounted on a shaft supported at the circular part, and having a socket in one end for the insertion of a handle for imparting oscillatory motion to the other part of the grate.

MACHINERY FOR CLEANING PIPE.—Henry Davies, Newport, Ky.—This invention relates to improvements in machinery for cleaning the core sand out of the pipe after casting, and it consists in a combination on an inclined frame, of a set of pipe-holding and rotating rollers, and a sliding, boring, or scraping tool, and suitable operating gears and apparatus for revolving the pipe and drawing the boring or scraping tool with it, for scraping off the sand, which is discharged by the revolving of the pipe.

NUT FASTENING.—E. T. Ligon, Demopolis, Ala.—This invention relates to improvements in fastening nuts to bolts to prevent them from unscrewing, and consists in combining a ring, a pin, or a coating of soft solder, with the nut and bolt in any suitable way, when screwed together, for afterwards melting the solder with a hot wrench, or other means, which, being removed, allows the solder to cool again, and permanently unite the parts.

TABLES.—Charles T. Sutton, Brooklyn, N. Y.—This invention relates to improvements in tables for schools, restaurants, reading rooms, and the like, and consists in an arrangement calculated to economize in space, facilitate adjustment to different positions required for different uses, and to provide a simple and cheap construction.

COMBINED HORSE POWER AND SAWING MACHINE.—Asa Trone, Nebraska, Ohio.—This invention relates to new and useful improvements in machines for sawing logs (cross-cut) by horse power, the arrangement being such that the machine may be used for moving other machinery.

CARPET STRETCHER AND TACKER.—James R. Bancroft and R. C. Bache Philadelphia, Pa.—This invention relates to a new instrument for stretching carpets, matting, etc., and for applying the fastening tacks to the same. The invention consists in the combination of a stretching frame with vertical tack holder and hammer.

LOUNGE.—William H. Colley, Leavenworth, Kansas.—The object of this invention is to so improve lounges, that the head rest of the lounge proper will also serve as a head support for the bed. The invention consists in hinging the upper part of the head rest to the folding seat, so that it will swing in or out with the same, and in thereby making the said head rest part of the extension bed.

FURNACE FOR BOILING OR PUDDLING IRON.—James Westerman, Sharon, Pa.—This invention relates to a new and useful improvement in furnaces for boiling or puddling in the manufacture of wrought iron, whereby the bosh is more perfectly protected from injury, and whereby the waste heat is more perfectly utilized than in ordinary boiling furnaces.

SADDLE OR SWEAT CLOTHS.—Richard Allison, New York city.—This invention has for its object to furnish an improved saddle or sweat cloth, simple and economical in construction, and effective in use.

DETACHER.—Thomas J. Harte, New York city.—The object of this invention is to furnish a detaching apparatus for ships' boats, and for other purposes, which shall be cheap, simple, safe, and effective under all circumstances.

BED BOTTOM.—Cyrus S. Stevens, Portland, Me.—The object of this invention is to provide a cheap, durable, and highly elastic bottom for beds.

DROPPER-ATTACHMENT FOR REAPERS.—Martin T. Reynolds, Centerville Ind.—This invention has for its object to furnish an improved dropper-attachment for reapers, which shall be so constructed as to drop the gavel with the butts of the grain even, and which shall evenly separate the gavel from the grain being cut, while the gavel is being dropped.

PAD-PLATE FOR HARNESS.—Conrad Gahr, Newark, N. J.—This invention relates to certain improvements in the construction of metal plates, which are inserted as stiffenings in harness saddles, and as supports for the turret hooks and rings, and for the other appendages of said saddles, and it consists in several details of construction, whereby the necessity of using the ordinary excessive amount of padding is dispensed with.

DIES FOR FORGING CARRIAGE STEPS.—Leander Burns, Port Chester, N. Y.—This invention has for its object to furnish improved dies for forging carriage steps, by means of which the steps may be quickly and thoroughly formed of two pieces, instead of being forged of a single piece in the ordinary manner.

BOB SLED.—John Wampach, Shakopee, Minn.—This invention has for it object to furnish an improved bob sled, which shall be strong, durable, and convenient, each runner being allowed to move independent of the others to adjust itself to the surface of the ground.

SPARK ARRESTER.—Benjamin P. Freeman and Pat Peyton, Macon, Ga.—This invention has for its object to arrest the sparks, cinders, or other ignited matter, which is discharged into the smoke-stack of a locomotive engine, and, at the same time, to allow the exhaust steam and smoke, which accompany the sparks, to pass freely out of the stack.

SAW BUCK.—Leonard D. Howard, St. Johnsbury, Vt.—This invention has for its object to furnish an improved saw buck, which shall be so constructed and arranged that it may be folded together compactly, for convenience of storage and carriage, and so that the saw will not be liable to cut the upper round of the saw buck.

PRINTING MACHINE.—C. C. Maurice, New York city.—This invention relates to a new machine, which can be employed for all kinds of lithographic and autographic printing, and, also, for printing with types. The invention consists, chiefly in the employment of a stationary segmental platen, in conjunction with a cylindrical printing roller, whereby more rapid and satisfactory operation can be produced. The invention consists, also, in the arrangement of a novel mechanism for operating the said roller.

CLAMP FOR SECURING AUGERS TO CRANKS.—Isaac Holliday, South Brooklyn, N. Y.—This invention has for its object to furnish an improved clamp for securing augers to cranks, which shall be so constructed as to hold the auger securely, and, at the same time, shall be so arranged as to allow the augers to be easily and quickly changed when required.

CANS.—John R. Compton and Crowell M. Toms, Rahway, N. J.—This invention has for its object to furnish an improved can for containing kerosene oil, and other liquids, which shall be so constructed as to open the discharge and ventilating orifices automatically, when the can is inclined to pour out the liquid, and to close them, also, automatically, when the can is raised to a vertical position.

DUMPING PLATFORM.—Geo. Burkett, Bluffton, and Samuel Lantz, Ada, Ohio.—This invention relates to improvements in platforms for dumping coal or wood on engines or tenders, or sand, gravel, and the like, on flat cars for loading, and consists in a platform, arranged on an elevated frame by the side of the railroad, and provided with one set of wheels, near the center, arranged to roll forward and back, and another set arranged to roll up and down inclined ways, as the platform is moved forward and back, to cause it to tilt and return to its normal position. It is also provided with a locking bolt and actuating apparatus, and all arranged so that persons on the tram may unlock it, move it forward, dump, and return it again.

WATER WHEEL.—Henry W. Shipley, Portland, Oregon.—This invention relates to constructing a wheel, with internal buckets, in such a manner that the water is directed to the outside of the rim and held as far possible from the axis during the revolution, so as to obtain its greatest power, the buckets being made exceedingly shallow, and their capacity preserved by widening them and increasing the depth of the wheel, there being three rows of buckets, and, in connection with them, a system of internal casing; the object of thus constructing a water wheel being to utilize to the fullest extent the power of water during dry seasons, and to take advantage of small streams, inasmuch as, by the use of the outside casing, every drop of the water can be saved; and a great amount of leakage prevented.

CARPET SWEEPERS.—A. J. Knight, New York city.—This invention relates to improvements in cushions for carpet sweepers, such as are applied to the extension of the sides thereof, to prevent them from bruising the furniture, when sweeping, by striking against the legs and other parts of the said furniture. The invention consists in making cushions of long, broad belts or strips of thick felt, with straps at the ends, and a buckle arranged for attaching them to large or small sweepers.

ORE FURNACES.—C. M. Atkins and Alexander Govan, Pottsville, Penn.—This invention has for its object to furnish an improved air kiln or furnace for roasting sulphury ores, which shall be so constructed as to roast the ores without any blast for forcing the air through the ores, and which will require but a small amount of fuel.

MALTING FLOORS.—Charles Hollmann, Union Hill, N. J.—This invention has for its object to improve the construction of malting floors of artificial stone, so as to prevent the said artificial stone from being cracked and broken by the contraction and expansion of the wooden floor upon which it is laid.

ADJUSTABLE COUPLING FOR JOURNALS, AXLES, ETC.—Frederick Burghardt, Curtisville, Mass.—This invention has for its object to furnish an improved coupling for connecting the parts of car axles, or other revolving axles, journals, or shafts, which shall be simple in construction and effective in operation, effectually holding the adjacent ends of the coupled axle, journal, or shaft, against longitudinal movement, and at the same time allowing the said parts to each revolve freely and independently of the other.

CORN PLANTER.—J. G. Fetzer, Brunswick, Mo.—This invention has for its object to furnish an improved corn planter, which shall be simple in construction and effective in operation, and which shall at the same time be so constructed and arranged as to enable the corn to be planted accurately, without its being necessary to mark out the ground.

MANUFACTURE OF ARTIFICIAL LEATHER.—S. Sorensen, Ebeltoft, Denmark.—The object of this invention is to so treat the scraps and pieces of leather, which are generally thrown away as useless by shoemakers and others, that a fabric resembling leather in strength, flexibility, and appearance, will from such process be produced.

DUMB WAITER.—W. H. Elliott, Boston, Mass.—This invention has for its object to improve the construction of dumb waiters, so that they may be easily and conveniently raised and lowered to or from any story of the building, and fastened and unfastened by any one upon any story, whether above, or below the waiter, and which shall at the same time be simple in construction, and easily operated.

FLATIRON HEATER.—Josiah Burgess, Zanesville, Ohio.—The object of this invention is to provide suitable and efficient means for heating flatirons and consists in a portable apparatus for that purpose, which may be used in any locality, either indoors or out.

OX BOWS.—A. L. D. Moore, Lagrange, Texas.—The object of this invention is to provide an ox bow, which shall not require bending, and which may be made in sections of the country where timber suitable for bending is scarce.

STEAM AND HOT WATER BOILER.—A. L. Pennock, Philadelphia, Pa.—This invention relates to a new steam and hot water boiler of novel construction, arranged with a view of producing a large heating surface, and a proper circulation of water and heated gases.

COMBINATION BATH TUB.—A. C. Brownell, Brooklyn, N. Y.—This invention relates to a new and useful improvement in bathing apparatus, and consists in combining with the ordinary bath tub a vessel or tub arranged for a "sitz bath," either permanently attached or so constructed that it may be removed therefrom.

SEWING MACHINE SETTER.—J. W. Field, Marysville, Ohio.—This invention has for its object to enable the operator of a sewing machine to set a fresh needle in that position in the holder, which will give the desired length of loop without the trouble and delay of adjustment on his part.

MANUFACTURE OF CITRIC ACID.—W. R. Johnston, Memphis, Tenn.—This invention has for its object to facilitate the manufacture of citric acid from the hitherto worthless sour or bitter oranges which abound in the Southern States of the Union. The acid is produced by precipitating it either by means of lime or lead.

PROJECTILE.—Joseph Link, Raleigh, N. C.—This invention has for its object to cause the explosion of a shell by means of a needle communicating with a button at the front end of the shell, and extending thence inward to a cap that lies in contact with the explosive material, so that the striking of the forward end of the shell against any object, after its discharge, may result in its explosion.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

999.—WASHING AND IRONING TABLES.—O. H. Weed, Boston, Mass. March 28, 1870.

1,003.—SASH FASTENER.—Edward Blythe, Rochester, N. Y. April 6, 1870.

1,021.—SPRING FILE OR BINDER.—A. M. Crowhurst, Boston, Mass. April 7, 1870.

1,075.—METHOD OF APPLYING POWER TO THE RUNNING OF MACHINERY.—AND TOOLS.—W. S. Coon, Rochester, N. Y. April 12, 1870.

1,082.—FILTER.—F. C. Krause, New York city. April 13, 1870.

1,084.—MEANS FOR WORKING RAILROAD SWITCHES.—James Davis, New Orleans, La. April 13, 1870.

1,089.—UTILIZING COTTON WASTE.—Anthony Peple, East Billerica, Mass. April 13, 1870.

1,100.—METALLIC ALLOYS OF MANGANESE.—Elliott Savage, West Meriden, Conn., and Jos. Mayer and Julius Waterman, New York city. April 14, 1870.

1,101.—KNITTING MACHINE.—E. K. Harding, Bath, Maine. April 14, 1870.

1,114.—APPARATUS TO BE EMPLOYED IN THE PERFORMANCE OF GYMNASTIC EXERCISES.—Wm. Hanlon, New York city. April 16, 1870.

1,145.—DEVICE FOR OPERATING THE THROTTLE VALVES OR REGULATOR IN LOCOMOTIVE ENGINES, ETC.—H. L. Brevort, Brooklyn, N. Y. April 19 1870.

1,146.—COMBINATION CULINARY ARTICLES.—S. Cooke, New York city April 19, 1870.

1,153.—APPARATUS TO PROMOTE CIRCULATION IN LOCOMOTIVE STEAM BOILERS.—W. B. Mack, Detroit, Mich. April 20, 1870.

1,155.—HARDENING COMPOSITION FOR GUMS AND OILS.—J. B. Newbrough, New York city. April 20, 1870.

1,158.—SHIRT FRONTS AND CUFFS.—E. H. N. Warner, New York city. April 20, 1870.

1,164.—ADJUSTABLE BEDSTEAD.—W. O. Reid, Vienna, N. C. April 21, 1870.

1,167.—CONDENSERS FOR MARINE STEAM ENGINES.—John Houpt, Springtown, Pa. April 20, 1870.

1,154.—BUTT HINGES.—G. A. Lloyd and J. W. Stow, San Francisco, Cal. April 20, 1870.

1,171.—KNITTING MACHINERY.—J. R. Clark and G. M. Patten, both of the State of Maine. April 22, 1870.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING May 24, 1870.

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103,275.—PREPARING THE FIBER OF RAMIE AND OTHER PLANTS.—S. M. Allen, Boston, Mass.

103,276.—SWEAT CLOTH FOR SADDLE.—Richard Allison, New York city.

103,277.—STOPPING MECHANISM FOR DOUBLING, SPOOLING, AND LIKE MACHINES.—James Arnold, Pawtucket, R. I.

103,278.—HANDLE FOR KNIVES.—Jacob B. Bailey, New York city.

103,279.—ROTARY STEAM ENGINE.—John W. Bailey, Aurora, Ind.

103,280.—FILTER.—Thomas Barrows, Brooklyn, N. Y.

103,281.—BIT STOCK.—Harry S. Bartholomew, Bristol, Conn.

103,282.—CLOTHES WRINGER.—E. G. W. Bartlett, Providence, R. I.

103,283.—DEVICE FOR HITCHING HORSES.—W. H. Bell, Spring Lake, Mich.

103,284.—APPLE PARER, CUTTER, AND CORER.—George W. Bennett, Harrodsburg, Ind.

103,285.—STREET CAR TRUCK.—John Berry, San Francisco, Cal.

103,286.—MARINERS' COMPASS.—John Bliss and G. H. Bliss, Brooklyn, N. Y

103,287.—MARINERS' COMPASS.—John Bliss and G. H. Bliss, Brooklyn, N. Y.

103,288.—KEY HOLE GUARD.—James F. Bodtker, Chicago, Ill.

103,289.—GRAIN PLANTER.—Isaac Bogart, Newport, Ind.

103,290.—PAINT FOR SHIPS' BOTTOMS, ETC.—James Bowker, Baltimore, Md.

103,291.—VARNISH FOR TIN WARE.—Jas. Bowker, Baltimore, Md.

103,292.—HOISTING APPARATUS.—G. W. Brown, New York city.

103,293.—COMBINATION BATH TUB.—Asa C. Brownell, Brooklyn, N. Y.

103,294.—SADIRON HEATER.—Josiah Burgess, Zanesville, Ohio.

103,295.—ADJUSTABLE COUPLING FOR JOURNALS, AXLES, ETC.—Frederick Burghardt, Curtisville, Mass.

103,296.—DIE FOR FORMING CARRIAGE STEPS.—Leander Burns, Port Chester, N. Y.

103,297.—GAS HEATER.—C. C. Burt, Jackson, assignor to G. Herrick, Albion, Mich.

103,298.—BARREL.—E. H. Cady, Grand Rapids, Mich.

103,299.—DRINKING TUBE FOR INVALIDS.—Eugene Chapin, St. Louis, Mo.

103,300.—DRINKING TUBE FOR INVALIDS.—Eugene Chapin, St. Louis, Mo.

103,301.—LOUNGE.—William H. Colley, Leavenworth, Kansas.

103,302.—WEATHER STRIP FOR DOORS.—E. G. Covey and Addison Birch, Marshall, Mich.

103,303.—MACHINE FOR BEVELING AND CROZING BARRELS.—H. A. Crossley, Cleveland, Ohio.

103,304.—ROTARY INJECTOR FOR STEAM BOILERS.—H. C. Crowell, Morgan, Ohio. Antedated May 10, 1870.

103,305.—MACHINE FOR CLEANING CAST PIPES.—Henry Davies, Newport, Ky.

103,306.—COOKING STOVE.—W. C. Davis and John W. Garrison, Cincinnati, Ohio.

103,307.—STOVE GRATE.—Price Dempsey, Erie, Pa.

103,308.—NUT LOCK.—Casper Dittman, Leacock, Pa.

103,309.—MACHINE FOR BURRING WOOL, ETC., ON THE SKIN.—G. F. Dockham, Lynn, Mass.

103,310.—TOWING HOOK FOR CANAL BOATS.—James Doty and Asa H. Doty, West Falls, N. Y.

103,311.—LOOP FOR HARNESS.—G. L. Du Laney and James S. Huston, Mechanicsburg, Pa.

103,312.—TOOL AND WHEEL FOR CUTTING AND POLISHING IRON, STEEL, AND OTHER MATERIALS.—A. K. Eaton, Piermont, N. Y. Antedated May 9, 1870.

103,313.—DUMB WAITER.—William H. Elliott, Boston, Mass.

103,314.—LATCH.—M. Proctor Favor, East Northwood, N. H.

103,315.—CORN PLANTER.—J. G. Fetzer (assignor to himself and A. H. Fetzer), Brunswick, Mo.

103,316.—SHUTTER FASTENER.—John Bentley Field, Detroit, Mich.

103,317.—CHERRY STONER.—Charles A. Fisher, Philadelphia, Pa.

103,318.—GATHERING ATTACHMENT FOR SEWING MACHINES.—H. A. Fisher, Elyria, Ohio.

103,319.—MACHINE FOR ATTACHING THIN PAPER TO STRAW BOARDS.—Maurice Fitzgibbons, Brooklyn, N. Y.

103,320.—APPARATUS FOR RECTIFYING ALCOHOLIC LIQUORS.—C. L. Fleischmann, Cincinnati, Ohio.

103,321.—PAD PLATE FOR HARNESS.—Conrad Gahr, Newark, N. J.

103,322.—Suspended.

103,323.—MANUFACTURE OF SHEET IRON.—John D. Grey (assignor to himself and John Lippincott) Pittsburgh, Pa. Antedated May 7, 1870.

103,324.—STEAM BOILER FURNACE.—C. J. Hagstreem, Chicago, Ill.

103,325.—ANTI-FREEZING DEVICE FOR PUMPS.—John G. Hanning (assignor to himself and Roswell R. Rouse), Indianapolis, Ind.

103,326.—CONDENSER FOR STILLS.—John Harrison and Caleb Low, Fawn Grove, Pa. Antedated May 10, 1870.

103,327.—PRUNING SHEARS.—Aaron L. Hatfield, Clyde, Ohio.

103,328.—WOOD PAVEMENT.—Herman Haupt, Philadelphia, Pa.

103,329.—CONFLUENT COCK.—John H. G. Hawes, Newark, N. J.

103,330.—BOX OPENER.—Albert Heusser, Ellington, Conn.

103,331.—GALVANIC BATTERY.—Joseph Hill (assignor to himself, M. S. Frost, and E. P. Hayler), New York city.

103,332.—KNITTING MACHINE.—Warren S. Hill, Manchester, N. Y.

103,333.—LAYING MALTING FLOOR.—Chas. Hollmann, Union Hill, N. J.

103,334.—FEED TRAP FOR LAMPS.—M. W. House, Cleveland, Ohio.

103,335.—SAW BUCK.—Leonard D. Howard, St. Johnsbury Vt.

103,336.—REFRIGERATOR.—Francis W. Hunt, Brooklyn, N. Y.

103,337.—FLY NET FOR HORSES.—Jas. S. Huston, Mechanicsburg, Pa.

103,338.—LAMP LIGHTER, AND BURGLAR AND FIRE ALARM.—James B. Irwin, Newark, Ohio.

103,339.—WASHING MACHINE.—Joseph Johnson, Boston (Highlands), Mass.

103,340.—MANUFACTURE OF CITRIC ACID.—Wm. R. Johnson, Memphis, Tenn.

103,341.—MITER MACHINE.—F. C. Jones, Ouachita parish, La.

103,342.—TUCK MARKER FOR SEWING MACHINE.—James F. Kellogg, North Bridgewater, Mass.

103,343.—PISTON PACKING.—Orlando Kelsey, Worcester Mass.

103,344.—GUARD FOR CARPET SWEEPER.—A. J. Knight, New York city.

103,345.—PIANO.—Christian Kurtzmann, Buffalo, N. Y.

103,346.—PARLOR SKATE.—John Lemman, Cincinnati, Ohio.

103,347.—SAW TABLE.—Mitchel Lepp, Albany, N. Y. Antedated May 17, 1870.

103,348.—LOCK NUT.—E. T. Ligon, Demopolis, Ala.

103,349.—SEWING MACHINE.—Benjamin Little and John B. Lundberg, Coffee Creek, Ind.

103,350.—TUBULAR SUBMARINE VIADUCTS.—W. G. Mann, Savannah, Ga.

103,351.—PRINTING PRESS.—Charles Camille Maurice, New York city.

103,352.—POCKET CUTLERY.—Wm. H. Miller and George W. Miller, Meriden, Conn.

103,353.—CURTAIN FIXTURE.—Jas. Montgomery, Marseilles, Ill.

103,354.—STOVE LEG FASTENER.—Frank Moon, Newberry Court House, S. C.

103,355.—OX BOW.—Alfred L. D. Moore, Lagrange, Texas.

103,356.—COTTON, HAY, AND HEMP PRESS.—Wm. H. Morris, Troy, Tenn.

103,357.—WASHING MACHINE.—Russell S. Morse, Wilton, Me.

103,358.—FOLDING CHAIR.—William Morstatt, New York city.

103,359.—SAW SET.—James Morton, Philadelphia, Pa.

103,360.—MEAT CUTTER.—August Nittinger, Philadelphia, Pa.

103,361.—CUTTER BAR FOR HARVESTER.—Wm. Jas. Oxer, Williamsport, Ind.

103,362.—COMBINED CORN HARVESTER AND HUSKER.—Samuel Patton, Chatsworth, Ill., assignor to himself, John M. Long, and Robert Allstatter, Hamilton, Ohio.

103,363.—STEAM GENERATOR.—Abraham L. Pennock, Philadelphia, Pa.

103,364.—CHURN.—W. H. Pennock, Mermaid, assignor to himself and W. H. Greenwalt, Mill Creek Hundred, Del. Antedated April 28, 1870.

103,365.—BOOT-BLACKING ATTACHMENT TO BUREAUS.—Wm. E. Phelps, Elmwood, Ill.

103,366.—DOUGH WORKER.—William R. Pool, Havana, Ala.

103,367.—ELEVATOR AND CONVEYER.—T. J. Powell, Naples, N. Y.

103,368.—SAFETY SOCKET FOR WHIP.—Winthrop D. Putnam, Chicago, Ill.

103,369.—FLEXIBLE TUBING OR HOSE.—Thomas L. Reed, Providence, R. I.

103,370.—DROPPING PLATFORM FOR HARVESTERS.—Martin T. Reynolds, Centerville, Ind.

103,371.—MACHINE FOR WASHING BARRELS.—Thomas Reynolds, Yonkers, N. Y.

103,372.—HAULING UP LOGS.—S. H. Richardson (assignor to himself and T. N. Egery), Bangor, Me.

103,373.—DREDGING MACHINE.—Wm. D. Robertson, San Francisco, Cal.

103,374.—DEVICE FOR NEBULIZING PERFUMES AND VOLATILE LIQUIDS.—Edward P. Rouche, Bath, Me. Antedated May 17, 1870.

103,375.—BALANCE ELEVATOR.—C. B. Sawyer, Fitchburg, assignor for one half his right, to J. W. Labaree, Springfield, Mass.

103,376.—NAIL MACHINE.—Henry Scheuerle, New York city Antedated May 13, 1870.

103,377.—AMALGAMATOR AND ORE CONCENTRATOR.—Joseph Scott, San Francisco, Cal.

103,378.—GRATING, SIFTING, AND SLICING MACHINE.—John F. Shepard, Hampton Falls, N. H.

103,379.—WATER METER.—Gerard Sickels, Boston, Mass.

103,380.—ROLLED IRON OR STEEL COLUMNS.—F. H. Smith, Baltimore, Md.

103,381.—BRICK PRESS.—J. N. Smith, Jersey City, N. J.

103,382.—SEED PLANTER.—Thomas H. Smith, Clyde, N. Y.

103,383.—ELECTRO-MAGNETIC INDICATOR FOR BURGLAR ALARM AND FOR OTHER PURPOSES.—James P. Snyder, Brooklyn, N. Y.

103,384.—SIZING COTTON AND OTHER FABRICS.—Jacob W. Speyer, Hamburg, Germany.

103,385.—APPARATUS FOR DISTILLING HYDROCARBON.—H. A. Stearns, Smithfield, R. I.

103,386.—TINSMITHS' SHEARS.—Orson W. Stow, Plantsville, Conn.

103,387.—TABLE.—Charles T. Sutton, Brooklyn, N. Y.

103,388.—MANUFACTURE OF TUBULAR CANDLES.—F. A. Taber, Boston, Mass.

103,389.—COOKING STOVE.—Christian Temme, St. Louis, Mo.

103,390.—HOT AIR FURNACE.—Moses A. Thayer, Chicago, Ill.

103,391.—APPARATUS FOR OPENING AND CLOSING THE TOP OF BLAST FURNACES.—James Thomas, Parryville, Pa.

103,392.—GAS CONDENSER.—Edward Thompson, Madison, Wis. Antedated May 14, 1870.

103,393.—PAPER HANGERS' APPARATUS.—Wm. F. Trautman, Llewellyn, Pa.

103,394.—HORSE POWER SAWING MACHINE.—Asa Trone, Nebraska, Ohio.

103,395.—ATTACHMENT FOR BUCKLES.—H. Trott, Boston, Mass.

103,396.—BOB SLED.—John Wampach, Shakopee, Minn.

103,397.—MACHINE FOR ROLLING METALS.—Wm. H. Ward, Auburn, N. Y. Antedated May 14, 1870.

103,398.—GEAR WHEEL.—William H. Ward, Auburn, N. Y.

103,399.—HOUSING FOR METAL-ROLLING MILLS.—Wm. H. Ward, Auburn, N. Y.

103,400.—SHUTTLE FOR LOOMS.—Horace Wells, Hopkington, R. I.

103,401.—FURNACE FOR BOILING AND PUDDLING IRON.—Jas. Westerman, Sharon, Pa.

103,402.—COMPOUND FOR OILING, POLISHING, AND BLACKING LEATHER.—Geo. F. Whitney (assignor to himself and Herbert S. Merrill), Boston, Mass.

103,403.—ROOFING COMPOUND.—Luke A. Wilder, Chicago, Ill.

103,404.—APPARATUS FOR MEASURING LIQUIDS.—Moses H. Wiley and Thos. Miller (assignors to themselves and John H. B. Lang) Boston, Mass.

103,405.—WASHING MACHINE.—C. P. Winslow (assignor to himself and L. P. Day), Westborough, Mass.

103,406.—SPEAKING TUBE WHISTLE.—Thos. J. Woolcocks, New York city.

103,407.—DEVICE FOR ADJUSTING CROSS HEADS OF LOCOMOTIVES.—James D. Akley and Richard English, Oil City, Pa.

103,408.—STEAM GENERATOR AND FURNACE.—Jonathan Amory, West Roxbury, Mass.

103,409.—FURNACE FOR ROASTING ORES.—Charles M. Atkins and Alexander Govan, Pottsville, Pa.

103,410.—CARPET STRETCHER AND TACKER.—James R. Bancroft and Robert C. Bache, Philadelphia, Pa.

103,411.—LINIMENT.—Wm. H. Barr, Monterey, Ky.

103,412.—PARASOL.—Lucretia Battles, Gloucester, Mass.

103,413.—MOP HEAD.—Wm. H. Beatty, Columbus, Ohio.

103,414.—ELEVATOR FOR BUILDING MATERIAL.—John C. Bennett and David N. Green, Coldwater, Mich.

103,415.—LET-OFF MECHANISM FOR LOOM.—E. B. Bigelow, Boston, Mass.

103,416.—VULCANIZED INDIA-RUBBER ROLL FOR WRINGERS, GRAIN DRILLS, ETC.—James R. Bird, Brooklyn, and George C. Smith, Matteawan, N. Y.

103,417.—STAND FOR TRANSIT INSTRUMENTS.—John Bliss and George H. Bliss, Brooklyn, N. Y.

103,418.—WELDING POWDER FOR IRON AND STEEL.—Samuel Bothwell (assignor to himself and Ralph Ormrod), Philadelphia, Pa.

103,419.—ROLLER SKATE.—R. T. Bradley and H. W. Wansbrough (assignors to R. T. Bradley and C. A. Scott), Cincinnati, Ohio.

103,420.—NOZZLE AND STOPPER FOR CANS, ETC.—Mellen Bray, Boston, Mass.

103,421.—HAMMER STRAP FOR WAGONS.—Charles Brown (assignor to himself and A. G. Salom), Adrian, Mich. Antedated May 13, 1870.

103,422.—PRINTING PRESS.—Jesse Bailey Brown, Nashville, Tenn.

103,423.—PIPE COUPLING.—Joseph R. Brown, New Haven, Conn.

103,424.—CLOTHES DRYER.—William L. Browne, Shortsville, N. Y.

103,425.—SPRING BED BOTTOM.—D. C. Bronson, Great Bend, Pa.

103,426.—DUMPING WAGON.—George Burket, Bluffton, and Samuel Lantz, Ada, Ohio.

103,427.—BROOM-CORN-SEED PLANTER.—Jacob Bush, Darien, Wis.

103,428.—OIL CAN.—J. R. Compton and Crowell M. Toms (assignors to themselves and Albert Asmann), Rahway, N. J.

102,429.—BRAD PUNCH.—R. F. Cook (assignor to Sparrow & Swan), Potsdam, N. Y.

103,430.—WHEELBARROW.—Nelson Cronkite, Milford, N. Y.

103,431.—STEAM ENGINE.—J. M. Curry, South Framingham, Mass., assignor to himself, John McLaughlin, Brooklyn, N. Y., and Dennis Phalen, Watertown, Mass.

103,432.—WALL-PAPER PROTECTOR.—Mary Disston, Philadelphia, Pa.

103,433.—PROCESS OF EXTRACTING SILVER AND GOLD FROM ARSENIO-SULPHURETS.—Cyprien Marie Tessié Du Motay, Paris, France.

104,434.—PROCESS FOR THE TREATMENT OF ORES.—Cyprien Marie Tessié Du Motay, Paris, France.

103,435.—PUMP.—B. W. Felthousen, Milwaukee, Wis.

103,436.—TATTING SHUTTLE.—B. L. Fetherolf, Tamaqua, Pa.

103,437.—FURNACE FOR TREATING CAST IRON TO CONVERT THE SAME INTO IRON AND STEEL.—William Fields, Wilmington, Del.

103,438.—WASHING MACHINE.—William L. Frazee, St. Louis, Mo.

103,439.—WATER POWER MECHANISM.—Abel French, Central City, Iowa.

103,440.—ELECTRO-MAGNET.—Mahlon S. Frost, New York city.

103,411.—HAY SPREADER.—W. H. H. Frye, North Fryeburg, Me.

103,442.—LAMP.—Jim B. Fuller, Norwich, Conn.

103,443.—BUTTON FASTENING.—J. C. Gaston, Cincinnati, Ohio.

103,444.—SEWING MACHINE.—M. F. Geraghty, Jersey city, N. J., assignor to T. J. McArthur, New York city, and I. W. Parmenter, Newark, N. J.

103,445.—PICTURE POISE.—John Jefferson Glover, Quincy, Mass.

103,446.—DOOR-BELL.—E. G. Goldman and D. W. Hisey, Kansas, Ill.

103,447.—ADJUSTABLE CONNECTION OF SUCKER-ROD TO WALKING BEAMS.—Adam Good, Jr., Titusville, Pa.

103,448.—ORGAN.—Horatio N. Goodman, Syracuse, N. Y.

103,449.—COOKING STOVE.—James Greer and Rufus J. King, Dayton, Ohio.

103,450.—PERMUTATION LOCK.—Henry Gross, Tiffin, Ohio.

103,451.—BUTTON.—R. H. Guilford, West Cheshire, Conn., assignor to Cheshire Manufacturing Company.

103,452.—COMBINED SEEDER AND HARROW.—J. E. Halsted and C. C. Halsted, Blossvale, N. Y.

103,453.—SODA FOUNTAIN.—N. T. Hamilton, Cedar Falls, Iowa.

103,454.—SEED DROPPER.—J. F. Hanson and J. E. Callaway, Barnesville, Ga.

103,455.—DETACHING BLOCK.—T. J. Harte (assignor to himself and James Brandon), New York city.

103,456.—PIANO.—Charles Hattersley, Trenton, N. J.

103,457.—HAT.—J. M. Heard, Aberdeen, Miss.

103,458.—STEAM STEERING APPARATUS.—Horatio F. Hicks, Grandview, Ind.

103,459.—SAWING MACHINE.—G. P. Hill and E. C. Dow, East Deering, N. H.

103,460.—LAMP.—J. H. Hobbs, Wheeling, West Va.

103,461.—COUNTERSINK.—S. E. Holbrook, Jr., Charlestown, Mass.

103,462.—BIT STOCK.—Isaac Holliday (assignor to himself and Gervert Papo), South Brooklyn, N. Y.

103,463.—MACHINERY FOR SCOURING OR DRESSING HIDES.—Charles Holmes and F. E. Holmes, Boston, Mass.

103,464.—SEED SOWER.—Thomas Howell, Morgantown, West Va.

103,465.—MACHINE FOR GENERATING AND CARBURETING HYDROGEN GAS.—H. J. Hoyt, Norwalk, Conn.

103,466.—STRIP PRESS.—Philip Hufeland, New York city.

103,467.—WHIP.—Liverus Hull, Charlestown, assignor to the American Whip Company, Westfield, Mass.

103,468.—COOKING VESSEL.—Martin Van B. Johnson, Holden, Mo.

103,469.—POTATO DIGGER.—Moses Johnson, Three Rivers, Mich.

103,470.—GRAIN METER.—J. T. Keeling, Hibernia, Mo.

104,471.—TRANSFERRING AND LOOP-RETAINING COMB FOR KNITTING MACHINES.—J. N. Kendall, Nashua, N. H.

103,472.—SEWING MACHINE TABLE.—M. J. Kerigan (assignor to himself, Wm. P. Emerson, and Edward Faxon), Boston, Mass.

103,473.—REFRIGERATING VESSEL.—Leopold Klee and Andrew Patterson, Pittsburgh, Pa.

103,474.—PULLEY SHEAVE.—Victor Knecht, Cincinnati, Ohio.

103,475.—WATER WHEEL.—Jesse Krall, Hall, Pa.

103,476.—CULTIVATOR.—Hugh Laird, Mechanicsburg, Pa.

103,477.—PROJECTILE.—Joseph Link, of the United States Army.

103,478.—PLATFORM SCALE.—C. C. Lyman, Edinborough, Pa.

103,479.—SELF-RECORDING SURVEYING MACHINE.—Henry Manger, Philadelphia, Pa.

103,480.—RAILWAY RAIL JOINT FASTENING.—T. B. McConaughey and James Adams, Newark, Del.

103,481.—PUMP.—A. Y. McDonald, Dubuque, Iowa.

103,482.—ROTARY BLOWER.—H. C. McIlwain and Alonzo Bramfiel, Connersville, Ind.

103,483.—FENCE.—James McKee, Hunt's Station, Ohio.

103,484.—SECURING CAR WHEELS TO AXLES.—Alexander McLeod and G. G. Lobdell, Wilmington, Del.

103,485.—HORSE HAY FORK.—Samuel P. Mecay, Kilbourne, Ohio.

103,486.—CLOTHES DRYER.—David Morris (assignor to Knowles & Brooker), Cutler, Ohio.

103,487.—TAILORS' MEASURE.—Isaac Moses, New York city. Antedated May 17, 1870.

103,488.—BREECH-LOADING FIRE-ARM.—Aloyse Muller, Paris, France.

103,489.—FURNACE FOR PRODUCING "SPONGE" FROM IRON ORE.—George Nock, New Monmouth, N. J.

103,490.—HARVESTER.—C. N. Owen, Salem, Ohio.

103,491.—WASHING MACHINE.—J. B. Padon, Troy, N. Y.

102,492.—BOILER FOR STEAM HEATER.—J. W. Paige, Rochester, and Dexter Reynolds, Albany, N. Y.

103,493.—TOOLS FOR FITTING BOTTOMS TO FRUIT BASKETS.—A. S. Parks, Winchendon, Mass.

103,494.—FEED-WATER CONNECTING PIPE FOR LOCOMOTIVES.—C. A. Peavey, Joliet, Ill.

103,495.—HARNESS SADDLE TREE.—George Pennoyer, New York city.

103,496.—PRINTING-TELEGRAPH INSTRUMENT.—W. P. Phelps, Brooklyn, N. Y., and W. J. Philips, Philadelphia, Pa., assignors to W. J. Philips.

103,497.—HAND CORN SHELLER.—C. H. Pickering, Memphis, Tenn.

103,498.—APPARATUS FOR PRESERVING BEER.—Chas. Pohlmann, Louisville, Ky.

103,499.—CORN PLANTER.—Benjamin Porter, Ossian, N. Y.

103,500.—KILN FOR DRYING AND BURNING BRICK.—N. F. Potter, Providence, R. I.

103,501.—SADIRON.—Mary F. Potts, Ottumwa, Iowa.

103,502.—COAL BARGE.—Julius A. Preston, New Haven, Conn.

103,503.—WASH-BOILER ATTACHMENT.—A. H. Proctor (assignor to himself and B. J. Canfield), Galesburg, Mich.

103,504.—BREECH-LOADING FIRE-ARM.—O. M. Robinson, Upper Jay, N. Y.

103,505.—STOP WATCH.—Frederick Rotig, Havre, France.

103,506.—MACHINERY FOR WASHING AND DYEING FIBROUS MATERIAL.—C. G. Sargent, Graniteville, Mass.

103,507.—COKE OVEN.—Lewis Schantl, St. Louis, Mo.

103,508.—JACK FOR CONNECTING POLES AND SHAFTS TO WAGONS.—Mathias Schou, Englishtown, N. J.

103,509.—FLUID METER.—H. C. Sergeant, Newark, N. J., assignor to J. F. De Navarro, New York city.

103,510.—BASE-BURNING FIREPLACE STOVE.—S. B. Sexton, Baltimore, Md.

103,511.—BEDSTEAD FASTENER.—Alfred B. Sheaffer, Ephrata, Pa.

103,512.—MEDICAL COMPOUND FOR THE CURE OF DIPHTHERIA.—H. L. Sheffer, Marston, Wis.

103,513.—WATER WHEEL.—Henry W. Shipley, Portland, Oregon.

103,514.—PROJECTILE.—William H. Shock, Washington, D. C.

103,515.—DRILLING MACHINE.—James Smith, New Haven, Conn.

103,516.—TRUSS.—W. J. Smith (assignor to himself and G. W. May), Trevillians, Va.

103,517.—PREPARATION OF ARTIFICIAL LEATHER FROM SCRAP LEATHER, ETC.—Soren Sorenson, Ebeltoft, Denmark, assignor to himself, Sophus Orting, same place, and P. J. McKenzie Orting, Pensacola, Florida.

103,518.—WATER ELEVATOR.—Hatherly Spear, Cape Elizabeth, Me.

103,519.—APPARATUS FOR EXTRACTING OIL FROM ANIMAL AND VEGETABLE SUBSTANCES.—H. A. Stearns, Smithfield, R. I.

103,520.—MANUFACTURE OF ARTIFICIAL STONE.—C. Stephens assignor to himself, R. H. Steptoe, and W. J. Steptoe, New Orleans, La.

103,521.—SPRING BED BOTTOM.—C. S. Stevens (assignor to himself and Daniel F. Knight), Portland, Me.

103,522.—OVERSHOE.—W. W. Swann, Richmond, Va.

103,523.—FAUCET.—Geo. Taylor, New York city.

103,524.—COMBINED HAY RAKE AND TEDDER.—S. J. Taylor, Rome, N. Y.

103,525.—PIANO LOCK.—John Thielemann and Philipp Meyer, Newark, N. J., assignors to William Sellers.

103,526.—COAL-OIL STOVE.—James H. Thorp, New York city.

103,527.—SURFACING CAST IRON.—Hiram Tucker, Newton, Mass.

103,528.—WASHING AND DRYING MACHINE.—Wm. P. Uhlinger, Philadelphia, Pa.

103,529.—SAW-FILING MACHINE.—G. Z. Vanderslice and B. L. Churchill, Philipsburg, Pa.

103,530.—MANUFACTURE OF WINKERS FOR HARNESS BRIDLES.—Eugene Ward, Newark, N. J., assignor to himself, F. C. Butler, and E. S. Ward.

103,531.—MACHINE FOR PUTTING TOGETHER AND TIRING WHEELS.—W. F. Waters, Dunkirk, N. Y.

103,532.—MACHINE FOR BOTTOMING FRUIT BASKETS.—B. D. Whitney, Winchendon, Mass.

103,533.—CUTTER FOR CUTTING THE BODIES OF FRUIT BASKETS.—B. D. Whitney, Winchendon, Mass.

103,534.—TREATING CANDLE AND LAMP WICK.—T. S. Williams and F. A. Tabor, Boston, Mass.

103,535.—APPARATUS FOR DISTILLING AND PURIFYING LIQUIDS.—F. M. Young, Nashville, Tenn.

REISSUES.

3,987.—MACHINE FOR CUTTING LEATHER.—Charles F. Davis, Thomas Corey, Samuel Boyd, and Roger Boyd, Marlborough, Mass., assignees of C. S. Stearns.—Patent No. 58,315, dated Sept. 25, 1867.

3,988.—TREE FOR SIDESADDLES.—J. B. Gathright, Louisville, Ky.—Patent No. 74,909, dated Feb. 25, 1868.

3,989.—COATING IRON AND STEEL.—S. B. Hewitt, Jr., Eagle Grove, and L. P. Jones, Iowa Falls, Iowa, assignees of Charles Usher.—Patent No. 62,706, dated March 5, 1867.

3,990.—REVERSIBLE KNOB LATCH.—Russell & Erwin Manufacturing Co., New Britain, Conn., assignees of C. R. Fisher.—Patent No. 80,539, dated August 4, 1868.

3,991.—CARRIAGE AXLE.—Alfred E. Smith, Bronxville, N. Y.—Patent No. 93,436, dated Dec. 28, 1869.

3,992.—MACHINE FOR SEPARATING GRAIN AND OTHER MATERIALS.—William W. Stoll, Brooklyn, N. Y., assignee, by mesne assignments, of Charles G. Stoll and William Stoll.—Patent No. 54,263, dated April 24, 1866.

3,993.—CAN FOR PAINT, FRUIT, ETC.—The Devoe Manufacturing Co., New York city, assignees of Herman Miller.—Patent No. 43,226, dated June 28, 1864.

3,994.—SEWING MACHINE.—The Globe Sewing Machine Co., Buffalo, N. Y., assignees of Nicholas Meyers.—Patent No. 99,783, dated Feb. 15, 1870.

3,995.—Division A.—MACHINE FOR MAKING KETTLES.—The Waterbury Brass Co., Waterbury, Conn., assignees of H. W. Hayden.—Patent No. 8,589, dated Dec. 16, 1851; extended seven years; reissue No. 2,171, dated Feb. 13, 1866.

3,996.—Division B.—BRASS KETTLE.—The Waterbury Brass Company, Waterbury, Conn., assignees of Hiram W. Hayden.—Patent No. 8,589, dated Dec. 16, 1851; extended seven years; reissue No. 2,171, dated Feb. 13, 1866.

3,997.—FIRE EXTINGUISHER FOR USE ON RAILROADS, ETC.—W. P. Van Deursen and W. C. Davis, Cincinnati, Ohio, assignees of H. C. Stewart and R. T. Bradley.—Patent No. 101,404, dated March 29, 1870; antedated March 5, 1870.

DESIGNS.

4,055.—DOG MUZZLE.—John Braentigam and Henry Braentigam, Chicago, Ill.

4,056.—OXYGEN GENERATOR.—A. H. Carpenter, Newark, N. J.

4,057.—STEP AND HITCHING POST.—Morgan Dyer, Elmira, N. Y.

4,058.—TOY BLOCK.—J. A. H. Ellis, Springfield, Vt.

4,059.—EMERY WHEEL.—T. J. Frazier, Clinton, Iowa.

4,060.—AX.—Edward Hurd, Champaign county, Ohio.

4,061.—TYPE.—Hermann Ilenburg (assignor to Mackellar, Smiths & Jordan), Philadelphia Pa.

4,062.—STOVE DOOR.—D. G. Littlefield, Albany, N. Y.

4,063.—SCREEN FOR FIREPLACE.—J. R. Rose and Edward Caley, Philadelphia, Pa., assignors to Samuel Budd Sexton, Baltimore, Md.

4,064 and 4,065.—NEEDLE CASE.—Jules Semele (assignor to himself and Joseph Garrus), New York city. Two patents.

4,066.—SPOON HANDLE.—Geo. Sharp, Philadelphia, Pa.

4,067.—GATE LATCH.—J. W. Still, San Francisco, Cal.

4,068.—SCHOOL DESK.—William P. Uhlinger, Philadelphia, Pa.

4,069 to 4,074.—SUGAR TONGS.—Robert Wallace, Wallingford, assignor to the Meriden Britannia Company, Meriden, Conn. Six Patents.

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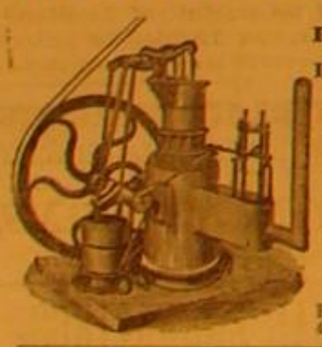
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Vol. XXII.—No. 24. [NEW SERIES.] NEW YORK JUNE 11, 1870. $3 per Annum [IN ADVANCE.]

Beck's New Improved Self-Adjusting Vise.

Mechanics are generally aware that vises with parallel jaws, are a source of great perplexity and loss of time when they are used in finishing anything but plain, parallel work. If the faces of the piece to be clamped incline towards each other at all, the piece—if wood—becomes badly defaced; and—if metal—while it is more or less defaced, according to its quality, it is also submitted to unequal side strain, which renders the danger of breakage much more imminent.

To obviate these difficulties it has been customary in times past to employ clumsy make-shifts extemporized for emergencies as they arise, such as angular blocks of wood or metal, lead plates, etc., familiar to all machinists.

These facts are justly held by the inventor of the device which forms the subject of the present article, as demonstrating the faulty character of the principle of uniform parallelism in the jaws of vises, and sufficient to entitle it to be called unphilosophical and unmechanical.

This fact has long been admitted by others, as the numerous attempts which have been made to produce a good vise with jaws adjustable to any ordinary kind of work, amply prove.

Our engravings show distinctly an improved construction of this essential implement, which, it is claimed, is free from the numerous defects which have hitherto prevented the general adoption of vises with adjustable jaws. These defects have been, for the most part, loss of leverage, unequal strain, and undue complication, which rendered them expensive to manufacture or repair.

We may mention as tending to establish the claims of this inventor, that on pages 175 and 221, Vol. XXI., of this journal, were published advertisements challenging a competitive trial of these vises with any other whatsoever at the National Fair of the Maryland Institute held at Baltimore last fall, and that the judges awarded the highest premium to the exhibitor of these vises. The inventor is satisfied that these vises, if left on trial (as he is willing to do where any doubt exists as to their merits), will secure preference from practical mechanics over any others in market.

Fig. 1 is a perspective view of the Machinists' Vise adapted not only to their use, but to the needs of metal-workers in general. Fig. 2 is a sectional view of the outer jaw of the same vise, and its attachments.

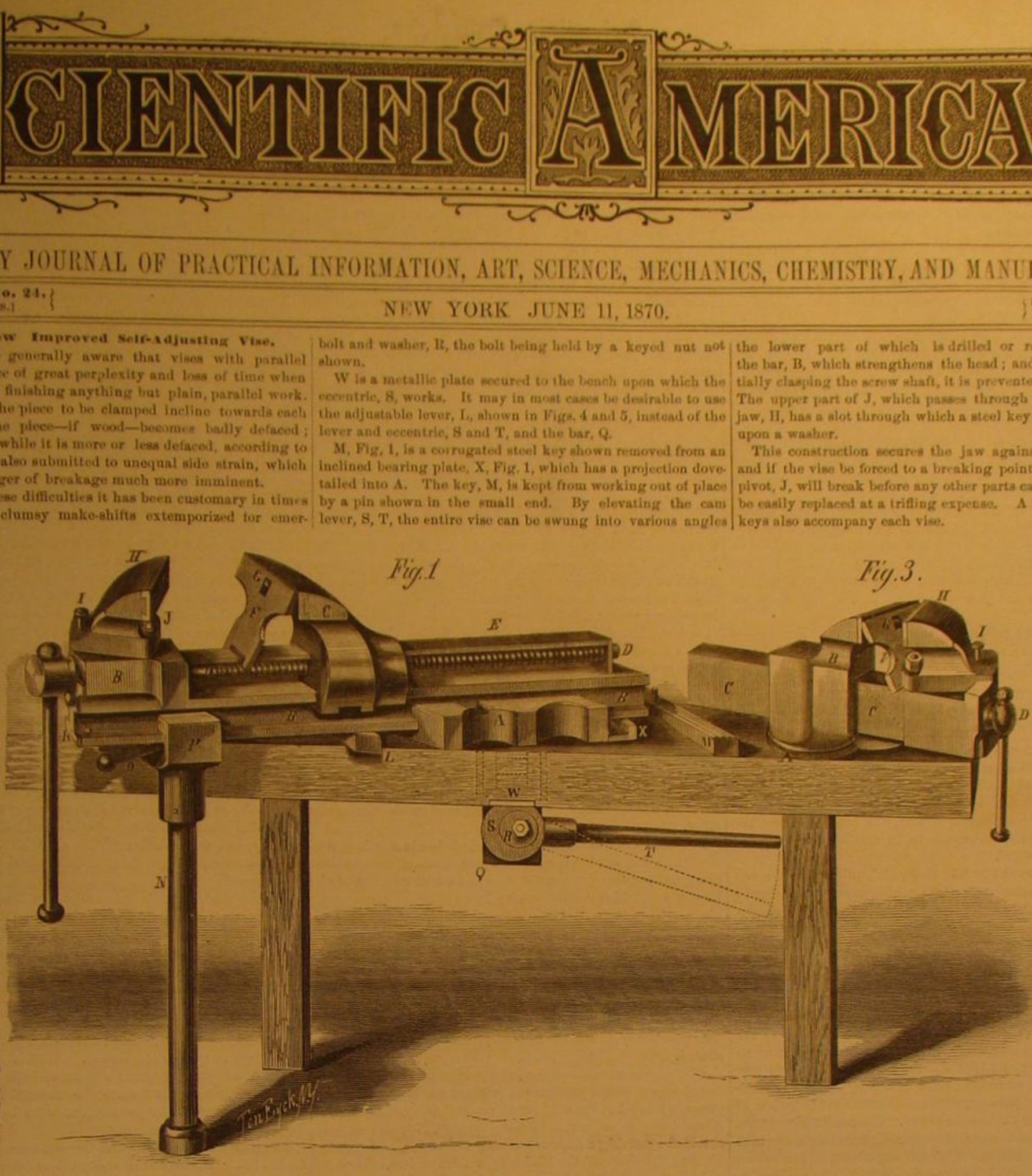
A, Fig. 1, is the bed-plate of the vise, in which the extension bar, B, Figs. 1 and 2, slides. C, Fig. 1, is a movable jaw, operated by the screw, D. The screw, D, is swiveled to the ends of the shield, E, Figs. 1 and 2, which ends are turned down at right angles, serving to keep the screw clean. The parts, A, C, B, are held together by corresponding flanges. The bed-plate, A, Fig. 1, has a socket shown in dotted outline, cast solid with it, which enters the bench, and is connected with the clamping bar, Q, by a pivot bolt. This bolt has a side partly flattened, as a bearing for a key which enters the clamping bar, Q; this prevents the nut from working loose.

S is an eccentric of chilled iron, having a socket for the lever, T. S is connected with the clamping bar, Q, by a bolt and washer, R, the bolt being held by a keyed nut not shown.

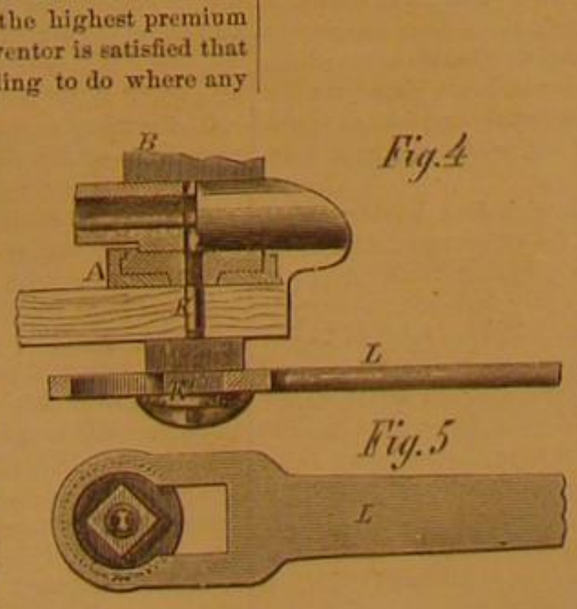
W is a metallic plate secured to the bench upon which the eccentric, S, works. It may in most cases be desirable to use the adjustable lever, L, shown in Figs. 4 and 5, instead of the lever and eccentric, S and T, and the bar, Q.

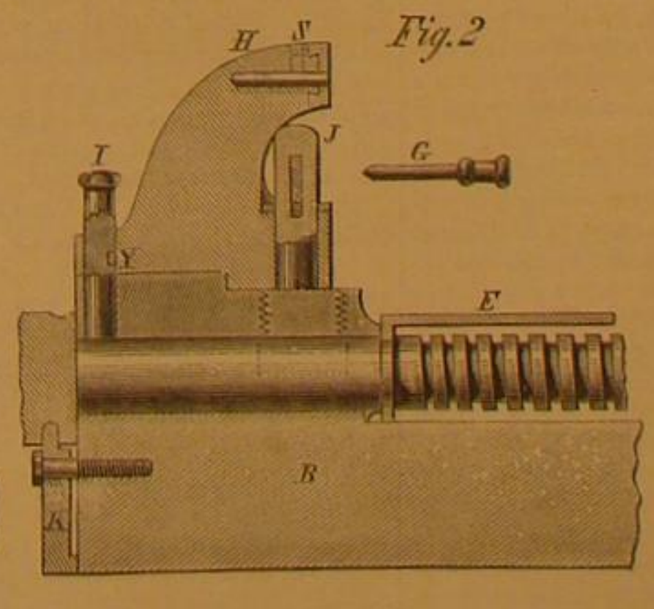
M, Fig. 1, is a corrugated steel key shown removed from an inclined bearing plate, X, Fig. 1, which has a projection dovetailed into A. The key, M, is kept from working out of place by a pin shown in the small end. By elevating the cam lever, S, T, the entire vise can be swung into various angles and positions, and clamped therein by pressing the key, M, with the thumb, and depressing the lever, T, to the position shown by the dotted line; the parts, A and B, being simultaneously clamped, and the whole held with great firmness.

In heavy chipping, the post N, is employed to strengthen and support the other parts of the vise, it being attached to the extension bar, B, by a socket and clutch, P, and adjusted to rest upon the floor by a tapered key, O. This key is also secured by a small pin placed near its point. The post, N, may be metal, but is preferably made of wood, which answers all purposes and is much cheaper.



BECK'S NATIONAL SELF-ADJUSTING VISE.





K, Fig. 1, is an adjustable semi-collar, fitted to a circular groove in the screw-head, and secured to B by a bolt, by which it is instantly adjusted to take up the wear of the screw.

H, Figs. 1 and 2, is a horizontally or laterally adjustable jaw, having a semi-circular shoulder fitted into a corresponding recess of the extension bar, B, shown in section in Fig. 2. It is held down by a pivot stud, J, Figs. 1 and 2, which is screwed into the bar B, as shown in Fig. 2 by the dotted lines, the lower part of which is drilled or reamed out with the bar, B, which strengthens the head; and also by its partially clasping the screw shaft, it is prevented from turning. The upper part of J, which passes through the front of the jaw, H, has a slot through which a steel key passes and rests upon a washer.

This construction secures the jaw against lateral strain, and if the vise be forced to a breaking point, the key in the pivot, J, will break before any other parts can yield, and can be easily replaced at a trifling expense. A number of these keys also accompany each vise.

This mode of attachment also allows of compensation for such wear as may occur through long use, and allows the jaw, H, to be lowered or tightened at pleasure, and turned at will about the pivot, J, to any required angle.

I, Figs. 1 and 2, is a steel pin, which holds the jaw, H, in a parallel position, when parallel work is clamped. It has a small rubber block placed in a hole at its lower end which keeps it from slipping down while the workman is adjusting the jaw H. This rubber is shown at Y, Fig. 2. F is a vertically adjustable jaw, having a slot in which a connecting pin, G, Figs. 1 and 2, is secured. The latter is pointed, and it is flattened near its head, and forced tightly through the slot, so that it has no play. This jaw, F, is quickly attached to the jaw, C, by means of the connecting pin, G, similar to the one shown in the jaw H, Fig. 2. It is held from working loose by a block of leather placed tightly in a vertical hole in the jaw, and compressed by a screw, as at Z, Fig. 2. The lower part of the jaw F, is notched as shown in Fig. 1, to slide on the shield, E, and its rear side which rests against the jaw C, has the form of a segment of a cylinder which causes it to automatically adjust itself to the face of a beveled piece, and the jaw, H, being also automatically adjustable the whole forms a universally adjustable vise, by which any plain tapering or beveled piece of work may be securely held in any position for facility and convenience in working without defacing it or subjecting the vise to injurious side strains, resulting from clamping angular work in parallel vises.

The movement of the jaws may be reversed by loosening the key, M, and placing the key, L, Fig. 1, in the notch of the plate, A, and the jaw, C; which then becomes fixed, and the jaw, H, movable.

The post, N, can be readily attached to A, by means of a hook not shown, and instantly adjusted to any point desired. Fig. 3 represents a vise designed for wood workers and light metal working; and Fig. 4 is a longitudinal section of the same through the jaw, B, and clamping plate, A. The latter, which is securely bolted to the bench, has a circular conical flange, in which the base of the jaw, B, revolves. It has also a projecting flange, which forms a solid support for the nut, and also for the extension bar, C, which slides on a shoulder of the same, as shown in Fig. 4, and in dotted outline in Fig. 3. As the screw, D, passes through this flange,

it may be made into a nut with a screw tap, and when worn out, a new nut may be substituted.

C is the extension bar, cast hollow to receive the nut, flange, and screw. It slides through the jaw, B. H is the adjustable and movable jaw. Its front part is secured to the bar, C, by a pivot bolt to which a nut is securely locked, which can be loosened or tightened at pleasure to compensate for wear. This bolt, when properly made, breaks before any other part, and it may be easily replaced, thus insuring more expensive parts against breakage.

The rear part of the jaw H, rests against a segmental shoulder, cast solid with the bar, C, by which leverage is gained and the durability of the jaw, H, is increased. This jaw may also be held in a parallel position by the pin, I, as in the Machinists' Vise.

K, Fig. 4, is a stud secured to the base of the jaw, B, and it passes through the center of the clamping plate, A, and bench, into the nut K', Figs. 4 and 5. This nut is cast with a flange, on which the adjustable wrench or lever is supported. This lever is easily adjusted to any side of the nut by pulling it so that the nut will be in the circular part of the aperture, as shown in Fig. 5. When turned for a new grip, it is pushed so that the nut will be in the angular part of the aperture. This wrench can only be removed from the bolt by first taking off the nut.

The vise may be firmly and easily clamped at any desired angle with the edge of the bench. The rear part of the vise is held down by three segmental shoulders or projections cast solid with the flange of the clamping plate, A; and can only be placed in, or taken out, when turned to a position where places in the jaw correspond to the projections described.

This vise is the subject of several patents. For further particulars, rights, etc., address J. D. Beck, patentee, Liberty, Tioga county, Pa.

ON THE CONDITIONS AND LIMITS WHICH GOVERN THE PROPORTIONS OF ROTARY FANS.

Mr. Robert Briggs, in a paper recently read before the Institution of Civil Engineers, stated that, by the theoretical investigations of Redtenbacher and Rittinger, of MM. Combes and Péclet, and of Mr. Appold, as well as by the recent practice of constructors of fans, the conditions and the limits that would be attempted to be established were more or less acknowledged.

A rotary fan might be said to consist, primarily, of a certain number of tubular passages, which were rotated about a lineal axis at right angles to the direction of the passages, whereby a given volume of air, impelled either by centrifugal force, or by the shape given to the tubular passages radially, was moved at a determined pressure. In other words, it might be conceived that a shaft revolved, upon which was placed a disk or set of arms, to which disk or arms some blades or vanes were attached, the zone of blades or vanes having sides or a casing, either in close proximity to the edges of the blades or vanes, or attached to and made to revolve with them: and then the area inclosed between any two blades or vanes and the sides or casing might be considered as a tubular passage, with an entrance at the center of the fan and an exit at the periphery. The conclusions drawn by M. Péclet, from a course of reasoning based upon the tube example, were at variance with the experience of the author of the paper, and might be extended, first, to a tube closed at the axial end and open at the periphery, when the partial vacuum would correspond to that due from the velocity of a body of the density of the atmosphere at the time, falling with the velocity at which the extremity moved; and, secondly, to a tube closed at both ends, when, whatever might be the density of the inclosed atmosphere, the pressure on the axial end would be less than that on the outer end by that due from the velocity of a body of the density of the inclosed air, falling with the velocity at which the extremity moved. Hence, whatever the shape of the vanes of a fan, its maximum pressure or suction involved no delivery whatever; and if the fan were so proportioned that no regurgitations took place as the blades passed any point in the case, such a fan would consume no power when it was closed, either at the inlet or the outlet, or both, for it was performing no work. The condition was that of a fly-wheel at a uniform velocity, or a ball governor with the balls spread to a running position. Now the pressure attainable by any rotary fan was an exceedingly low one, when considered in pounds per square inch; thus a column of water of 14 inches or 16 inches gave velocities dangerously near the strength of materials of which fans were constructed, in resisting centrifugal force, and a column of water of 7 inches or 8 inches was attainable only by very high speeds. In fact, a pressure or suction of 3 inches or 4 inches was nearly as large as could be economically attained, in delivering a quantity of air, when the friction of machinery at high velocities, the want of adhesion of belts, and certain other considerations of the friction of air on the vanes, were accounted for. Thus, the largest differences of pressure were less than the ordinary atmospheric disturbances, as indicated by the barometer.

It was possible to construct a series of fans, following from one to the other, and to increase the pressure by repeated efforts; and this method was applicable to many purposes where the volumes to be moved were beyond the scope of a pump, and the pressure was relatively low to that obtained from pumps. So far as volume was concerned, a very small fan represented the largest blowing engines at blast furnaces. This limit of efficiency, as regarded pressure, was the first limit of a rotary fan.

Since the terms, pressure on the one hand and suction on the other, were interchangeable, and did not vary so much as the atmosphere, it happened that the suction fan of the most economic proportions was identical with the blast fan best adapted for the performance of duty. This condition was regarded as of the highest importance in simplifying the study of the fan question.

But the propositions, that the fan of suction was that of blast, and that suction and pressure were interchangeable, implied and carried with them the conclusion, that the action derived from the shape of the blade should be the same on the entering air as on that leaving the fan. This condition, however, was only incident to one particular shape of blade, that was one where the angle of the blade at any point was constant with any radial line at that point—in other words, was a logarithmic spiral. This angle might be from 0° to 90°, that was, from a straight line to the impossible case of a series of concentric circles, but the shape would insure each part of the blade giving an impulse to the air in contact with it proportionate to the velocity of that point round the axis. Taking this form of blade, and supposing the air to be impelled with velocities proportionate to the radial distances from the axis, then the area of each concentric ring should diminish as the length of the radii increased. The calculations and the formula for determining the section of the cone of the fan from the mouth to the periphery were then given.

At the entrance of a fan, the direction of the currents of air was at right angles with the plane of rotation; and, in the case of the ordinary fan, taking in air at both sides, the two entering currents were directly opposed to each other. In the center between the currents there might be inserted a conoid, so shaped that each particle of air should preserve its uniform velocity, and be gradually diverted into the direction desired. The conoidal mouth of the fan should be of such a shape as to give a constant area to the passage formed between a newel, or corner round the mouth, and the surface of the conoid. The calculations and the formula demonstrating the outline of the conoid then were given. With this section of mouth, and that previously described for the zone of the blades (supposing them to be a logarithmic spiral), and with the supply of air which the velocity of the tips of the blades demanded, the air would enter with the least resistance until it reached the blades, would fill the fan whilst it was accelerated, and be discharged with maximum effect.

In a fan 10 feet in diameter, and only 2 feet in width at the circumference, and having 62·83 square feet of area of discharge, the openings on both sides should be 7·42 feet in diameter and 3·63 feet wide at the inner edge of the zone of blade. This left only 1·22 feet for the width of the zone of blades from the opening to the periphery. But the zone of blades was made as wide as two feet at the disk, so that the average width of the zone was 1·65 feet. Attention was directed to this departure from the usual proportions, to indicate the advantage of more than the ordinary number of blades, and the discussion would fail to be understood unless the opportunity, if not the necessity, of so doing were demonstrated.

After it was ascertained that any particular form and number of blades would produce the highest useful effect, at the pressure related to the velocity of the periphery of the fan, if it was desirable to have a higher pressure, it would be best obtained by giving a greater velocity to the fan, and not by altering the shape of the blades to a form of less efficiency; unless when the desired pressure approached the strength of the parts of the fan to resist centrifugal force, and it was advisable not to employ a fan of repeated effort, when the blades became beyond question radial, and the useful effect was secondary.

In the year 1856 and 1857, the author, who was then employed as one of the principal assistants upon the works of the United States Capitol Extension and the Washington Aqueduct, under the engineering charge of Captain (now Major-General) M. C. Meigs, had delegated to him the investigation of what form of fans should be employed in ventilating the buildings of the Capitol. A series of experiments with models, based on the reasoning adduced in the paper, gave as the best shape or curvature to the blades, that which had been indicated, a logarithmic spiral of 45°, and showed a loss of mechanical effect when, within the zone of blades, the number of blades employed exceeded that which allowed the heel or inner edge of one blade to much more than pass the point or outer edge of the next in a radial direction, or in the direction in which the current of air, when the maximum discharge was occurring, passed.

The same rule would hold good with fans having radial blades; for as then the direction of the current was at an angle of 45° to the radius vector, the overlapping of the opposite ends of the two contiguous blades in relation to the current would take place in the same way. Taking a fan of 10 feet in diameter of the proportions assumed, where the zone of blades had been stated to be 1·65 feet average width, about sixteen blades would be required for a fan with blades at angle of 45°, and about twenty-four for the same fan with radial blades. The fan here described was narrow, with a large opening on both sides, and numerous blades, as compared with the usual practice; but it possessed the merit of being the smallest in external diameter, of having the largest capacity, and the least surface friction compatible with the contact of the air with the blades.

It was not pretended that a fan of the usual proportions, with the diameter three or four times the opening at the side or mouth, and the relative width much greater than had been assumed, was radially inefficient; nor that even in such a case, if the number of blades were limited to four, six, or eight, or where the case was composed of flat plates, there was a total loss of efficiency. So far as the extremity of the blades merely rotated a mass of air which was not passed forward, no power was consumed, upon the principle of the tube closed at the inner end. The air could only be delivered so fast as, by the action of some part of the blade of a fan thus constructed, it could be induced to enter at the restricted openings at the side. But the rolling of compressed air, intercepted by the outer ends of the blades and the friction upon the enlarged surfaces, must consume more or less power.

A table was next given of the proportions of fans with less blades than had been assumed, showing that eight blades of 45°, or twelve radial ones, were the least number desirable, as a fan 10 feet in diameter then became only 0·62 foot in width at the tips of the blades.

The reasoning was adduced on which the calculations of quantities and pressures were based. It was urged that when all the resistances of the fans were considered, the unrestricted discharge with unrestricted supply would occur at one-half the velocity of the tips of the blades and the pressure to correspond, while the quantity would equal a discharge at that velocity through eighteenths the area of the fans at the tips.

Up to this point it had been possible to demonstrate by reasoning, or with the modification of some co-efficients, the proportions enumerated. But there were no accurately determined figures to show the relationship between the quantities of air discharged and the increased resistances. The instances in use, although numerous, about a hundred in fact, had been restricted to cases where ducts were employed, some or all of which had been closed off at one time, no regularity of working having been adopted; nor were there any experiments to show the variations of pressure, when the quantities were increased or diminished. The author had assumed, in giving the performance of fans, that double the unrestricted pressure could be got with half the quantity of air. This relationship seemed to be warranted by many results, where the quantity of air had been measured by an anemometer, and the pressure registered by a gage simultaneously; but the law of the relation of variation of quantity with pressure to this limit, or further limits, had not been determined. The ultimate pressure attainable for the discharge was four times, less 10 per cent, or 3·6 times the pressure of unrestricted discharge. The assumption that half the quantity would be delivered under double the pressure involved the passage of the current of air in a radial direction through the blade at half its unrestricted velocity, and the rotation of the air with the fan at such a rate that its centrifugal force should equal the double pressure assumed.

It should be borne in mind that this double pressure followed when the air was impelled tangentially at 0·707 the velocity of the tips of the blades, and that this was the speed which would be given to the current outwards, when there was an infinite number of frictionless blades, with the logarithmic curve of 45°. That there would be discharged quantities of air up to the limit of pressure was certain, but the economic effect of the fan fell off rapidly, as the blades were only moved at high velocities through a bath of air without producing proportionate results. With these estimates of unrestricted discharge and pressure, and the modification of a certain pressure up to double the unrestricted pressure, the limits of fans of proper proportions were brought to definite conclusions.

The general dimensions and description next followed of a 10-feet fan. It was stated that this construction of fan was also adapted to the ventilation of public buildings and to the supply of air for puddling and heating furnaces, for all of which purposes they were in common use in the United States.

In conclusion, tables were given of the presumed duty of fans for different uses, admitting of practical application to many purposes; including the capacities of a 10-feet fan, with an unrestricted discharge, and a discharge restricted to half the quantity, of fans to be used for the ventilation of public buildings or mines, for the supply of air under grates of puddling or heating furnaces, and to tweers, or cupolas, smiths' forges, hollow furnaces, etc. In each case the tables embraced the following particulars: The number of revolutions and the quantity of air delivered per minute, the pressure, the proper dimensions of the pulleys, and the horse-power required for the several conditions.

The Effect of Temperature on Coal Gas.

Of the many experiments which have from time to time been made on the illuminating power of coal gas under different conditions, very few, we believe, have been conducted with a view of ascertaining the extent to which that power is affected by the temperature to which the gas is exposed, and for this reason some experiments of this kind, which were not long ago carried out in the laboratory of the University of Munich, possess a special interest. In these experiments the illuminating power of the gas at the normal temperature of 64½° Fah. was taken as the standard, and the object was to compare, by means of a Bunsen's photometer, this illuminating power with that obtainable when the gas was burnt in the same burner at a higher or lower temperature. In order that this might be done, the burner was attached to a U-tube, which could be immersed either in a cooling mixture or in a liquid at an elevated temperature. The illuminating power at the normal temperature being represented by 100, it was found that when the U-tube was immersed in snow, so as to bring the temperature of the gas down to 32°, the illuminating power was reduced to from 76 to 85; while when a mixture of salt and snow was used to give a temperature of—4°, the illuminating power of the gas was reduced to from 33 to 40, or, in other words, it was only equal to about ⅓ of that which it possessed at the normal temperature. Of course such a temperature as—4° is

one to which gas is never practically exposed, at all events, in this country; but the fact that even at a temperature of 32° there was found to be an average diminution of the illuminating power to the extent of about 20 per cent is an important one, well deserving of attention.

Heating the gas above its normal temperature was found to have far less influence upon its illuminating power than cooling it below that temperature, and this was a result which might have been expected, for reasons which we shall point out presently. By immersing the U-tube in boiling water, and thus raising the temperature of the gas to 212°, it was found that the illuminating power was increased to 104 (the illuminating power at the normal temperature being, as before, represented by 100), while when melted paraffine was substituted for the water, and the temperature thus increased to 288°, the illuminating power became 118. Thus while a reduction of temperature of about 32° lessened the illuminating power by about 20 per cent, an increase of temperature of 224° raised that power by about 18 per cent only. This state of affairs is readily explicable if we suppose the reduction of temperature in the former case to have been sufficient to cause the liquefaction of a portion of the hydrocarbons associated with the gas, as in that case the total amount of sensible and latent heat abstracted from the gas by the reduction of temperarure of 32° might even be greater than that imparted to it when its temperature was raised to 288°. In all the experiments the air for supporting combustion was, we believe, supplied at the normal temperature; but it would have been interesting if, in the case where the gas was cooled to 32° Fah., the light had been supplied with air at that temperature also, and notice taken of the effect.

In the course of the experiments it was found that, after the gas had for some time traversed the tube immersed in the cooling mixture, a thick coating of ice was deposited on the interior of the tube. The water resulting from the melting of this ice had a strong smell, was neutral to test papers, but when exposed to suitable tests gave a feeble reaction, showing the presence of cyanogen. With indigo carmine (sulphindigotate of potass) and sulphuric acid, it developed the blue color of indigo, and evolved the odor of nitro-benzine. To determine the amount of water carried by the gas a large quantity of the latter was caused to pass very slowly through a drying tube charged with pieces of pumice-stone soaked in sulphuric acid. A large number of experiments made in this way on the ordinary gas supplied to Munich showed the quantity to average about 1·6 grains per cubic foot.—*Engineering.*

The New Anæsthetic Chloral.

Professor John Darby, writing for the *American Grocer*, anticipates that not long hence, the vial of chloral will take its place beside the camphor bottle and other household remedies, displacing to a great degree, the paregoric and laudanum. Opium and its derivatives have held a high place in the esteem of mankind; and, after centuries of use, is to-day more highly prized than ever before. We have felt consoled that in our extremest agonies, we had within our reach an agent that could arrest or mitigate our sufferings, and give us ease and quiet. But, connected with the use of opium, there are sequelæ that are disagreeable. Headache, sickness of the stomach, loss of appetite, and other unpleasant results are sure to follow its administration. How much more highly should we esteem opium if these unpleasant consequences could be avoided. If we could command sleep and not suffer, on waking, as the price for our rest. If our pains could be relieved, and our deliverer would leave no sting behind.

Chloral seems to fulfill these conditions. It produces refreshing sleep from the most excruciating pains, and the sleeper awakes as from a natural sleep, with no unpleasant symptoms from the action of the chloral.

Chloral was discovered by Liebig, in 1832, and stood more than thirty years in the list of recorded discoveries, exciting no interest outside the field of chemistry. On the 2d of June, 1869, it was brought before the Medical Society of Berlin, Prussia, as a new hypnotic (producer of sleep) and anæsthetic, by Dr. Otto Liebreich. Pure chloral is a colorless fluid, with a sharp, pungent taste and odor, not disagreeable. When united with one atom of water it becomes a white solid, retaining its odor and taste. It is in this form that it occurs for use. It dissolves rapidly in water. It is not an anæsthetic as chloroform, protoxide of nitrogen, and ether are, as it does not usually produce insensibility when it produces sleep, unless given in large quantities. Its true influence is to produce sleep. When given to animals they go to sleep as naturally as though they had taken nothing. The cat is said to lie down, adjust her paws, and with her accustomed low purr, pass into the state of sleep, and after five or six hours, wake up naturally, as from her accustomed slumber. So in the human subject, it produces a peaceful sleep of any length of time, depending on the dose given.

The following points have been well established in regard to efficient doses of the hydrate of chloral:

1. It produces deep sleep quickly after administration.
2. The action produces no excitement.
3. No bad effects result from its action.
4. The brain is first affected, then the lungs, and lastly the heart. The heart is said to beat, when fatal doses have been taken, after all the other functions have ceased.

Extensive experiments have been made on the lower animals to develop the properties of chloral, and they have all been in conformity with the above principles. We select the following cases reported in European journals: An insane person, in a state of high excitement, was put to sleep in a few minutes by twenty grains of chloral and slept five hours. A woman with a very painful inflammation of the wrist-joint, was put to quiet sleep by forty grains of chloral. A lady, suffering internally from an intractable attack of sciatica, could not be relieved by morphine and atropa, took thirty grains of chloral, which produced a night of perfectly tranquil sleep, from which she awoke fresh and as well as from a natural slumber. A lady suffering from prolonged neuralgia, and all ordinary sedatives proved unavailing, when forty grains of chloral produced immediate relief.

In a case of comminuted fracture of the humerus, the patient became furiously maniacal, and every attempt to fix the limb proved abortive, although excessive doses of opium were given. Sixty grains of chloral were given, and in a quarter of an hour the patient was fast asleep and continued to sleep quietly until the next morning.

A woman who had been ill and without more than five minutes' sleep at a time for five weeks, who had been treated with opium and morphine without benefit, and who, after taking twenty-five grains of hydrate of chloral in two ounces of water at bedtime for three consecutive nights, completely recovered. Sound sleep was produced and her pulse, which at the beginning was 130, fell to 90. She did not complain of nausea or headache, or any other unpleasant feeling during the time she was taking the chloral.

In nervous excitement, preventing sleep, chloral acts with promptness and with no evil results. It is evidently indicated in a severe pain resulting from rheumatism, neuralgia, sprains, or dislocation. It reduces the animal temperature and affords relief in cases of fever attended with restlessness and excitement. It produces muscular relaxation, and must afford relief in the horrid torture produced by the passage of gall-stones or the gravel from the kidneys.

The action of chloral on the system is supposed to depend on the chemical fact that alkalies decompose it and produce chloroform and formic acid. The blood is alkaline, and as the chloral comes in contact with it chloroform is produced, and its appropriate effects follow. This takes place throughout the system, thus producing a universal effect, and not a local one, as when chloroform itself is taken.

Solar Motive Power.

We hear nothing further from Captain Ericsson's experiments in converting the sun's rays directly into motive power, and whatever results he has been able to obtain are, as yet, unpublished by that investigator. But public attention once aroused to the importance of the subject, does not seem likely to let it drop. A writer in the *British Quarterly Review* has taken it up, and states some very interesting facts relating to the general consideration of the subject in connection with the experiments of Mouchot.

The sun's issue of caloric has been variously represented. According to Sir J. Herschel, it would melt a pillar of ice 1,590 square miles at its base and 194,626 miles in hight in one second of time. According to Pouillet, it would liquefy a shell of ice ten and a half miles thick in a single day, though it encompassed the entire orb. According to Professor Tyndall, it is equal to the heat which would be yielded by a seam of coal sixteen and a half miles in depth were it fired and reduced to ashes. Large figures are generally very bewildering, and when M. Guillemin expresses the sun's deliveries of caloric by a row of twenty-five ciphers, preceded by 4,847, the effect upon the imagination is benumbing rather than exciting.

But the matter may be put in a more simple and accessible form. Calculating the caloric yielded by each square foot of the sun's surface every hour, as equivalent to that which would be given out by the combustion of 1,500 lbs. of coal, this would accomplish the work of upwards of 7,000 horses There is something overpowering in this conception, when we consider that it applies to the entire superficies of an enormous globe of more than 880,000 miles in diameter, and not to a few selected spots. We may have here and there on our own planet, steam engines doing the work of innumerable quadrupeds, but the idea of several thousands clustered—concentrated, we may say—on each square foot of the sun's area, and exerting their energies incessantly, is one which we cannot compass with much sense of success.

Let us, however, transfer the question of solar power to the surface of the earth. Our globe, of course, intercepts but a fractional part of these burning emanations—only about $\frac{1}{2150000001}$th of the whole, according to Herschel. But, relatively small, they are intrinsically enormous, for M. Guillemin observes that the quantity poured upon a single hectare of ground (2·47 acres) develops, under a thousand various forms, as much force as is equivalent to the continued labor of 4,163 horses. The vast amount of work our luminary could, therefore, execute as a mechanical agent, by means of his rays, even in the diffuse condition in which they reach this planet, has not failed to attract the attention of curious inquirers. Indeed, we might say, that the waste of valuable sunshine, which might do the duty of all the steam engines in the world, has excited the displeasure (wrath might be a better word) of more than one scientific economist. There are people who will always be indignant to think that Niagara cannot be employed to turn mills for grinding our corn, and Vesuvius converted into a forge to melt metal on the most stupendous scale. We plead guilty to a touch of the same stupendous temper. But, without indulging in philosophical covetousness, is it not distressing to know that the beams which play so unprofitably, in some respects, on many parts of our earth, might, if properly impounded and harnessed to cunningly-constructed machines, be compelled to serve mankind in a very useful and lucrative capacity?

So, at least, thinks Monsieur Mouchot.

On a fine day, at Paris, it was found that the sun's rays, playing upon a surface of one square meter (1·196 yards) communicated as much heat every minute as would suffice to raise at least one liter (1·76 pints) of ice-cold water to the boiling point. In other words, says our Frenchman, its effect was nearly equal to the theoretical duty of a single horse-power steam engine. There are places, however, on our globe where the sky is clearer, and the soil more arid, and where, consequently, the Lord of Day is known to stalk in burning splendor. Could not some of this radiance be captured by means of what M. Mouchot calls solar receivers? He announces that he has taken some practical steps toward the solution of this question. So far back as 1861 he showed the possibility of working a hot-air engine by the instrumentality of the sun's rays. Subsequently, having ascertained that he could generate seventeen liters of vapor in a minute by the use of a silver reflector, he attempted to drive a small steam engine by the agency of arrested sunshine. In 1866 he succeeded. Since, however, his experiments were made upon a restricted scale, this ingenious Frenchman recommends that they should be repeated in tropical countries, and with receivers of more magnificent dimensions. In his enthusiasm, he even indulges the hope that, some day, the invention will be transferred to the deserts, where industry will settle down, and establish important works, for the sake of the superior sunshine which those glowing tracts afford. Who will not sympathize with M. Mouchot, on learning that, according to his experiments, it would be practicable to collect, in an inexpensive way, fully three-fifths of the solar heat which falls upon our earth? Is it not a matter for many groans that, while the sum of the sun's influence upon our planet has been computed as equivalent to the labor of 217,316,000,000,000 horses, toiling day and night, not a single patent, so far as we know, has been taken out for an engine to be directly worked by sunbeams. Ours is certainly a wasteful world. A large portion of the warmth we might extract from our coal, goes idly up our chimneys; and it seems that the cheaper caloric which is sent us from our luminary is allowed to flow back into space without driving (by its immediate action) so much as a coffeemill, or performing any artificial mechanical duty for mankind.

Ivory Carving.

Those who are familiar with the working of this exquisite material, says the *London Builder*, are aware that no other substance lends itself with such facility to the highest skill of the artist. Capable, on the one hand, of a breadth and largeness of treatment equal to that to be attained by such a wood carver as Grinling Gibbons himself, it is susceptible, on the other hand, of a microscopic delicacy of finish equal to that of the Greek gem-cutters, which may be combined with a boldness of relief, and shadow of undercutting, equal to those of the modeling of Ghiberti.

The chief defect of ivory as a material is its loss of color by exposure to dirt or damp. This may be entirely prevented by proper care, and by exposure to light under glass. Under these conditions, ivory is inferior to gems alone in durability, as metals are subject to oxidation, and wood to cracking by change of hygrometric condition. The most delicate *cameï* of Wedgwood are coarse, when viewed under the magnifying glass, in comparison with *cameï* in ivory. Nor is shell capable of equal finish.

Ivory carving is not to be judged of by such productions as the rude little figures, the execution of which forms an industry at Dieppe. These are essentially wood toys, executed in a better material. Neither are the brooches, ear-rings, and other ornaments, now executed in London, to be considered as specimens of artistic work in ivory. The price at which they are sold is too low to allow of the exertion of artistic skill and taste worthy of the beauty of the material. A case of modern English carvings, exhibited at South Kensington, may be referred to as another example of inferior modern work in ivory.

On the other hand, the well-known set of six plaques, representing *amorini*, goats, satyrs, and vintage scenes, attributed to Il Fiamingo, may be cited as an example of the bold, broad style of carving for which ivory is eminently suitable. Of the *cameo*, or gem-like style of work, it difficult to name any publicly accessible example. Exquisite statuettes were produced, some thirty years ago, by machinery invented by Mr. Cheverton. But, in this case, the reduction, which made no allowance for the diminution of scale, revealed its merely mechanical mode of execution to the critical and educated eye. Very recently, a few modern French carvings of great beauty have been added to the collections at South Kensington.

The importance of offering some encouragement for the revival of one of the most charming branches of the sculptor's art, will become apparent to any one who should wish to sell, or in any to bring before public notice, a modern ivory carving, even if of a thoroughly artistic character. The first question with which he will be met is "Is it antique?" The second, "Is it foreign?" If neither of these questions is answered in the affirmative, neither dealer nor connoisseur will glace further at the object. Grace of design, purity of rendering, boldness or delicacy of touch, attract no admiration, if the work confess a modern English origin. "There is no sale for objects of that kind," says the dealer. "I take no interest in any but antique," says the connoisseur. A hideous triptych, boasting a consular date, or a clumsy Lot, embracing a one-legged damsel, but attributed to a Flemish chisel, may command a hundred guineas, while an English work of art—deserving the title—attracts no attention whatever.

A RAIN OF SAND.—A curious shower of sand took place in some parts of Italy on February 13th and 14th last, and has been described in the *Comptes Rendus*, by M. P. Denza. This memoir, says the *Chemical News*, contains the account of a very curious phenomenon—viz., rain in the southern parts of Italy, accompanied by a fall of a fine reddish sand, while, in the northern parts of that kingdom, snow fell, accompanied by the same substance.

[For the Scientific American.]

THE COCKCHAFER AND ITS RAVAGES.

By Edward C. H. Day, of the School of Mines, Columbia College.]

(Concluded from page 362).

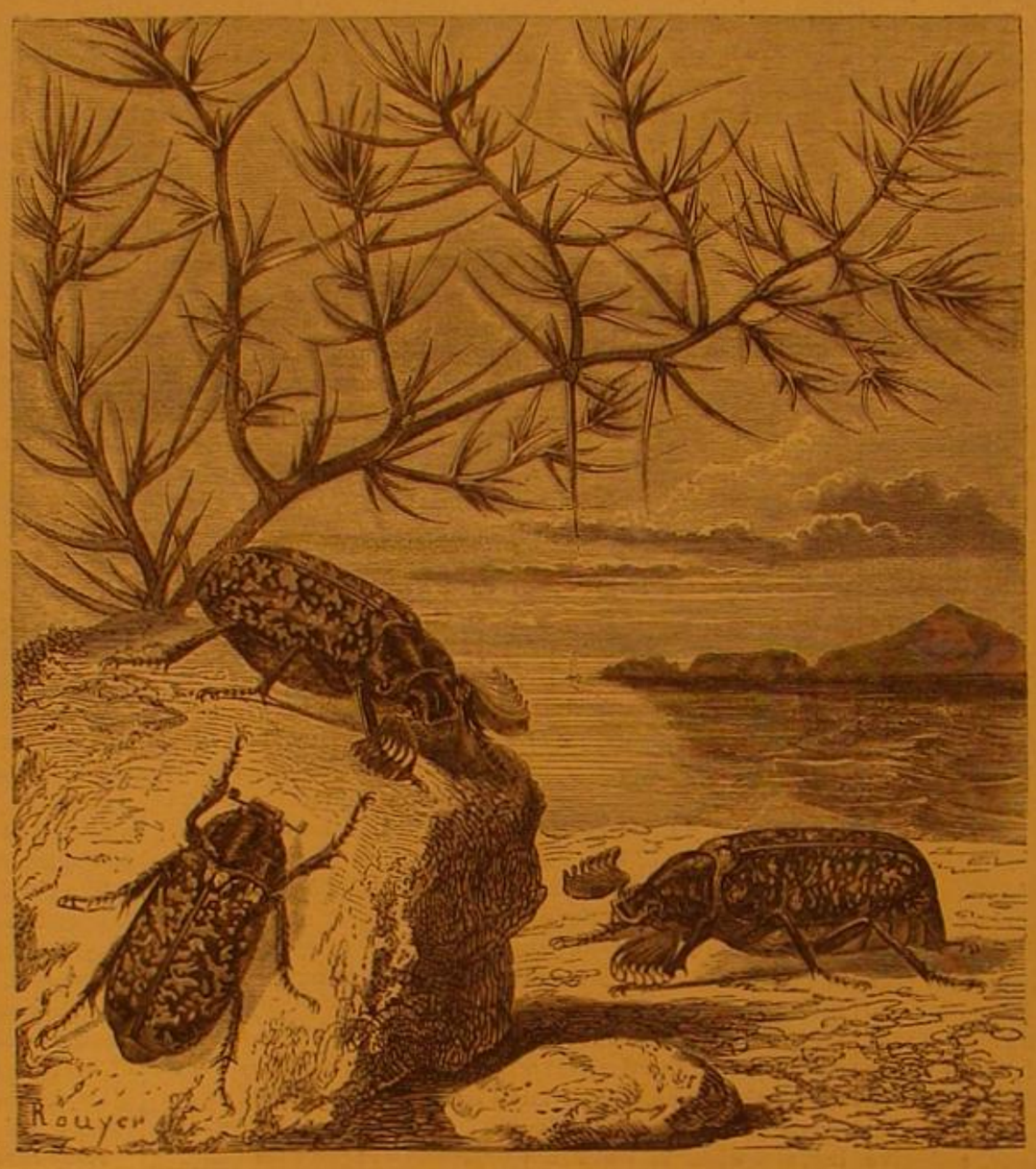
France and Germany suffer equally with Great Britain from the injuries of the cockchafer, and numerous have been the attempts made of late years to check an evil which had been allowed for centuries previously to grow upon the community. One plan followed is to select the perfect insects and destroy them; but even in this it seems that ignorance must have prevailed in some cases, as we find it suggested, that the beetles should not be buried as had been done—a course of proceeding that, as the slightest knowledge of their habits would show, would only have the result of considerately saving the pregnant females from the trouble of burying themselves! Of course the only way to be rid of them with certainty is to burn them as soon as caught. This hint applies equally to several American pests. In other cases the grubs have been collected, and it shows that the evil is still in the ascendant, and at the same time to what a really fearful extent it reaches, that, according to Prof. E. Blanchard, as late as 1866, a M. Jules Reiset caused to be collected, in only two Arrondissements of the Department of the "Seine-Inférieure," 160,000 kilogrammes of these *vers blancs*, as they are called in France. Nearly eighteen tuns, representing eighty millions of grubs! But do not rest here. As each worm before it was captured had consumed many times its own weight of food, this total weight represents many times eighteen tuns of roots consumed and injured; and each of these tuns of roots represents who shall say how many tuns of grass, of straw, and of grain destroyed? And how many hours of anxious labor wasted by the patient husbandman? And all this havoc, mark you! only in one year, in two small districts, in one region.

"Bugs" are not such trifles after all! It will at once occur to the thoughtful mind—Was there any one else, while M. Reiset was so patriotically engaged in his two Arrondissements, similarly occupied in the adjoining districts? Because, if not, it is but too certain that in the course of time some one will most assuredly have to do all his work over again. Just so! this is exactly what we wish you to realize. Thank heaven! we have not, as we said before, the *Melolontha vulgaris* in America; but we have hosts of insects almost as destructive in the same or in a multitude of other ways, and it is no use for Ezra Wideawake to keep his trees free from insects, if Micky Doolan, on the next lot, "just lets the nasty craythures alone," because he doesn't know any better; it is no use for Mr. Brown to encourage the birds to breed in his boxes in the spring, if the sons of Max Müller come over his land to "hunt" them with powder and shot in the fall. If insect pests are to be kept under, all hands must pull together; but the trouble is, that ninety-nine hands out of one hundred know nothing about the ropes; and this, though there are numbers of books and periodicals written on the subject. People do not care to read such books—despise them—because, in fact, they do not know *how* to read them, simply because they have not received that trifling amount of elementary instruction in natural history that would enable them to understand them without the trouble of some little extra thought, and that would give them a zest for, and a due appreciation of, the value of such natural knowledge.

The remedy is obvious, and it is the sole remedy sufficiently general to meet the case as it should be met. Let practical, well-digested instruction in the elements of natural science form part of the course of every school—public or private—so that every school boy and school girl may be led to take a pleasure in learning something besides empty words concerning the wisdom and beauty of Nature. They will then realize the nature and the importance of the part that insects play here beneficially, there injuriously, in the economy of mankind, and be energetic in taking measures to protect or destroy them, as the case may require. Do not, good reader, say you have read all this of insect ravages before; it is quite probable that you have done so, as Reaumur, Huber, Kirby, Harris, Packard, Walsh, Blanchard, and a host of others, have been drumming away on this tune to the community for years and years, and so far from endeavoring to give any novelties about insects, we are only stealing a little of their thunder wherewith to re-stimulate the readers of the SCIENTIFIC AMERICAN. Neither cry out "Pshaw! I have no garden and no fields; let the farmer and the entomologist settle this between them." If the farmer's crops are destroyed you will have to pay more for your bread; if the curculio gets to the plums first, you will not be able to buy them at all. You have, therefore, an interest in this great case of "the community *versus* cockchafers and others." As was done in the most recent *cause célèbre*, engage the best of private counsel for the prosecution, retain your own services, and plead energetically for the spread of knowledge in natural science among all classes.

The American species of Melolonthians, more or less closely allied to the common cockchafer, are very numerous; the several kinds of pine bugs, the vine-chafer, and the rose-chafer or rose bug, being perhaps the most familiar of these allies, though not the most closely related. In their habits, however, the June bugs closely resemble the cockchafers, and they have at times proved very destructive to vegetation, and probably much of their underground destruction is attributed to other causes. There is, however, a species of *Melolontha*, the *M. variolosa* or "scarred chafer" (so called from its coloration), which is a nearer relative of the European insect. It resembles the insect figured in our present engraving, which is the large and handsome *M. fullo*, in the very large leaf-like expansions at the ends of the antennæ, or feelers, of the males. In each of these expansions there are seven leaves, while in our common June bugs the observers will only find three.

The "scarred chafer," according to Harris, is confined to the coast and the islands in the vicinity. It is singular that the *M. fullo* is similarly restricted in Europe, not being distributed, like the common form, over the interior, but occurring only near the coasts of the English Channel, the Baltic Sea,

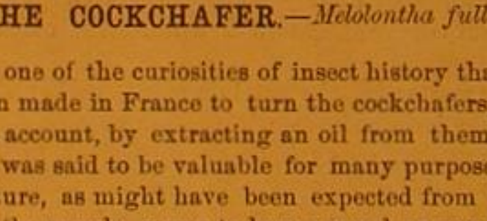


THE COCKCHAFER.—*Melolontha fullo.*

etc. It is one of the curiosities of insect history that attempts have been made in France to turn the cockchafers, when collected, to account, by extracting an oil from them. The oil obtained was said to be valuable for many purposes, but the manufacture, as might have been expected from the uncertainty of the supply, seems to have proved unsuccessful. Perhaps, according to the Rev. Henry Ward Beecher's seemingly paradoxical suggestion, that the Canada thistle would be easiest extirpated by cultivation, it may be advisable to attempt to raise June bugs for oil! Doubtless a host of their natural enemies would at once multiply indefinitely, and, combining with diseases as fatal as that of the silkworm,, soon put a stop to our oil works and effectually abolish the Melolonthians!

THE ROLLER BARROW.

The peculiarity of this ingenious English invention is, that it causes no unsightly scores or marks upon lawns or walks in wet weather, when the use of the ordinary wheelbarrow is a source of constant disfigurement. The *Ironmonger*, from which we copy the engraving, states that as a roller it is



easily worked by a boy, though it can be rendered of any weight desired by filling it up with ballast, the load being discharged at once by tipping the handle. It is very serviceable for bedding out plants, carrying away cut grass or turf, gathering up leaves, or when manuring the ground. The roller barrow is equally adapted for grass lands where horses and carts cannot be employed, and for croquet lawns, being always sufficiently light to be managed in case of need by a lady. It is in use at the Crystal Palace, Kensington, and other gardens, where its handy qualities have rendered it a permanent favorite.

DUBUQUE, Iowa, is very proud over the new cave recently discovered in its suburbs. This hole in the earth has stalactites and stalagmites, and all the modern improvements in the cave line.

The Electric Fulgurator.

The Plymouth Institution and Devon and Cornwall Natural History Society, England, was interested, at its recent *Conversazione*, by a display of the marvelous effects of a new electrical apparatus of enormous power, devised by Mr. J. N. Hearder, F.C.S., and constructed by him expressly for a scientific amateur, who had kindly permitted him to exhibit it to the society that evening. This extraordinary apparatus, to which Mr. Hearder has given the name of Electric Fulgurator, has for its objects the production of electric sparks or discharges of statical or frictional electricity of immense length, precisely resembling lightning flashes. The effect is produced by a peculiar arrangement of large Leyden jars, which are all insulated on separate glass pillars, 3 feet high, fixed in a frame, and connected by levers, which permit them to be joined together, either as an ordinary battery or turned into a position which connects the inner coating of each with the outer coating of the next. The jars are first charged as an electric battery from a powerful glass electrical machine, and when sufficiently charged, are suddenly dissevered from battery connection with each other, and are thrown into the intensity, or, as it is sometimes called, cascade position. The discharge takes place between the balls of a suitable discharger connected with each terminal. By this arrangement prodigious sparks of great length are obtained, resembling zig-zag flashes of lightning, accompanied by a loud report. The apparatus, consisting of thirteen Leyden jars, gave sparks in free air, of 3 feet 6 inches in length, very thick and crooked, and of a brilliant bluish white color. The deflagrating power of the apparatus, as exhibited in the combustion of metal leaves and wires, appears to be greater in the intensity than in the quantity arrangement. When this discharge is made to pass through heated air, its length is amazingly increased. Sixty-three small spirit lamps, each having two wicks, were arranged in a long ebonite trough, so as to form a line of 126 spirit flames, extending to the length of nine feet. Over these flames, a brilliant spark passed with such ease, from a moderate charge, that Mr. Hearder calculated that a full charge would be able to pass more than double the distance. When the charge was a little reduced the sparks still passed through the flames in a less brilliant form, but producing a bright spot immediately over the top of each wick, giving to the whole the appearance of a long string of brilliant beads. Mr. Hearder stated that, although this apparatus originated with him, it was not new, as regards date, for he had shown the society a similar arrangement, though on a very much smaller scale, more than forty years ago. Its present more imposing form was entirely due to the zeal and liberality of the gentleman before mentioned, who, being desirous of ascertaining to what extent the principle admitted of development, had given him an order to construct the apparatus now before the society.

The conclusions arrived at were, that with suitable apparatus and accommodation, and electrical machines of adequate power, the arrangement might be almost indefinitely extended, and that sparks of fifteen or twenty feet in length, in free air, would be by no means difficult of attainment. The present apparatus originally consisted of fifteen jars, which gave sparks five feet in free air. In conclusion, Mr. Hearder remarked that this apparatus opened a new field for electrical investigation in connection with the effects of quantity and intensity in relation to statical electricity, a subject never yet attempted for want of suitable apparatus, and he was bound to say that the results of the few experiments he had been able to make are such as could hardly have been predicated with our present notions of the action of the Leyden jar.

Protection of Lead Water Pipes.

A paragraph is going the rounds of the scientific journals and the newspapers generally, to the effect that Dr. Schwarz, of Breslau, has found a simple way of protecting lead pipes from the action of water, by forming on their inner surface an insoluble sulphide of lead. This is done by filling the pipes with a warm and concentrated solution of sulphide of potassium or of sodium, which is left in contact with the lead for about fifteen minutes.

This, says the Boston *Journal of Chemistry*, may be a new thing in Breslau, but more than two years ago we suggested a similar process as, on the whole, the best that we knew for the purpose. The directions we gave were as follows: Dissolve 1 pound of sulphide of potassium in two gallons of water, and let it remain in the pipe twelve hours, or until the inside is thoroughly blackened. The same recipe was given in Rolfe and Gillet's "Hand-book of Chemistry," published in 1868. The use of a warm saturated solution, as Dr. Schwarz directs, would do the work in shorter time, which might be more convenient in some cases.

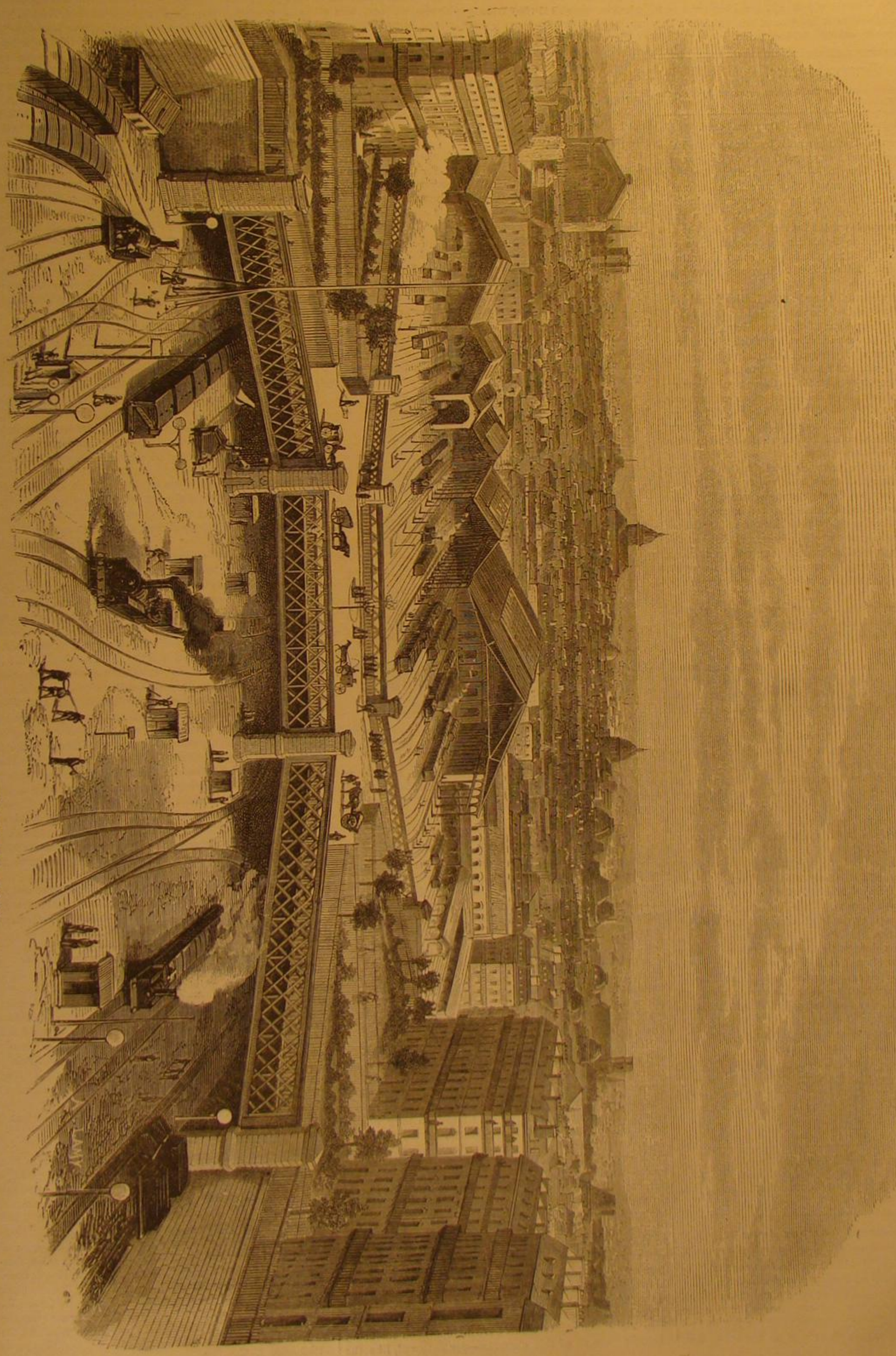
BOILER TEST WANTED.—A correspondent suggests that all patent or non-patent boilers be tested publicly to ascertain their evaporative power, and thinks the Brooklyn Navy Yard would be a good place to do it. This suggestion supposes a state of willingness upon the part of everybody who has ever invented a boiler, and also on the part of the United States authorities, rather difficult we think to be realized.

Bridge of the Western Line of Railroad in Paris.

We give our readers, in the present number, an engraving of an important work which considerably interested us when we were in Paris. As the subject of the intersection of streets by railways is one of great, and, in view of the rapid development of railway travel in and through cities, increasing importance, a brief description of this work, which the engraving will enable the reader easily to comprehend it, may be both useful and interesting.

We refer to the iron bridge upon the site of the old *Place de l'Europe*, in Paris, upon which several streets cross between thirty and forty rails of the Western line (*la ligne de l'Ouest*). Under the *Place de l'Europe* formerly passed two arched tunnels of stone; but to make room for passenger depots or platforms capable of receiving full trains, that is to say, trains of twenty-four cars, these tunnels have been removed and stone abutments erected, upon which are placed an iron trestle-work supporting the floorway of the bridge, which consists of three grand passages, and serves for the crossing of *les rues* de Madrid, de Berlin, de Constantinople, de Londres, de Vienne et de Saint Petersbourg. The bridge spreads out at each end in a fan-like form, but is wide enough at the center or between the two central abutments not only to give abundant room for the passage of the numerous vehicles which have occasion to cross it from the several converging streets, but to allow of the establishment of two circular open spaces for foot passengers similar to those found in several of the most frequented localities of Paris.

Instead of a trestle bridge, one of great arches of stone would have been preferred on the ground of more economical



BRIDGE CONSTRUCTED AT THE PLACE DE L'EUROPE IN PARIS.

construction and more imposing, or, as the French term it, more *monumental* appearance; but this preference could not be gratified, for the reason that the lowering of the *Place de l'Europe* had not left the hight at which the bridge must be constructed, sufficient with such a structure for the passage underneath of the engines and cars.

The depot forms a junction for seven railroad lines, and receives on the average over two hundred trains per day. On Sundays and *fête* days the number of trains frequently rises to over four hundred.

A feature of the bridge is its adornment at the ends with miniature gardens, a thing which will seem superfluous to the utilitarian minds of most Americans, but which to a Parisian is an appropriate and tasteful decoration.

Correspondence.

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

First Attempt to Make Oxygen Gas.

MESSRS. EDITORS:—Having seen it frequently stated that it is an easy thing to make oxygen. Three of us boys who are at school in the town of ——, Connecticut, decided to try the experiment. We saved of our weekly allowance of spending money until we had enough to set up in business under the firm name of Acid, Base & Salt. Acid is a sharp fellow, and to him was intrusted the duty of making the necessary purchases for the firm. He went down town and bought some bottles, some manganese, some chlorate of potash, and a piece of india-rubber tubing, and came home quite triumphant.

We soon rigged a stand for heating the bottles, bored holes through some corks that had been smuggled into the school, with bottles attached, by some of the larger boys, put on the tubing, and hung it into a pail of water which we had converted into a pneumatic trough, and everything being properly adjusted, the signal was given by Salt to fire up.

Breathless excitement, wonder if the thing would blow up; fiz, smoke, bottle cracks, bad smell—end of experiment one.

Observations in note book—"Mistake of text-book, oxygen gas has a decided odor." The failure of the first experiment was attributed to Acid's ignorant purchase of a common glass bottle instead of the Florence flask mentioned in the books, and Base agreed to try his luck. He brought a green bottle, and we thought this a good omen, as it was a capital likeness of ourselves—verdant people always want sympathy. The green bottle was soon filled with the black mixture, and we again fired up. This time the stopper flew out and scattered powder up to the ceiling and into our faces, and Salt lost the use of his eyes for several days. We resolved to abandon what the teacher called inorganic chemistry for the present, and try our hand at the manufacture of organic compounds, such as nicotine.

In this department we are happy to say that we met with eminent success, and had no difficulty in inducing neighboring boys to assist at the experiments. Our success in organic work gave us considerable courage, and we resolved to make another trial of oxygen. This time we made use of a small covered tin pail. It is hardly necessary to remark that the pail soon leaked, and an ugly semi-fluid mass ran out on to the stove, and confirmed our previous notions about the bad smell of oxygen.

The firm then went in a body to wait on a traveling photographer who lived in a big van on the village green, and he generously sold us a broken retort for two dollars. Armed with this, we made another attack upon the manganese and chlorate, and this time had the satisfaction of seeing a few bubbles of air collect in a jar over the water. This we carefully treasured for future experiment, and then wound up that day's work with a little additional manufacture of nicotine.

The first holiday afternoon the small boys of the school were invited to witness experiments with oxygen. A piece of phosphorus was procured and lighted with a match, and plunged into the jar—result, a brilliant light, a puff of smoke, strong smell of phosphorus, a loud explosion, and a heavy invoice of broken glass.

This was as far as we got with the experimental illustration of the properties of oxygen, and as soon as the smoke was cleared up, and the small boys had disappeared through the windows, it was resolved to settle up accounts and see how we stood previous to a dissociation of the association and a consequent liquidation of the firm.

The following is a copy of the balance sheet:

Acid, Base, & Salt in account with Chemistry:

	Dr.		Cr.
To 1 retort	$1 00	By 4 quarts oxygen	$0 04
" 2 bottles	0 50	" tickets sold to small boys	0 10
" 1 green bottle	0 25		$0 14
" 1 tin pail	0 50		
" Repairs of ceiling	1 00		
" Manganese, etc	0 60		
" Rubber tubing	0 50		
" Cleaning stove	0 20		
	$5 55		

Balance to A. B. & S. debit $5 41

Respectfully yours,
ACID, BASE & SALT.

P.S.—We are willing to part with our retort at half price.
A., B. & S.

Curious Associations Among Animals.

MESSRS EDITORS:—You willing, under the head of "Curious Associations of Animals," I will offer an instance or two. The first was of a young gray squirrel, captured to make a pet of, and brought home and put down on the ground near a house. In the twinkling of an eye an old cat emerged from under the floor, where she had young kittens, stole the pet, and returned under the floor, where there was no access; in fact, from her looks and peculiar growl, no one thought it worth while to attempt the recovery of the squirrel. But the surprise was some two weeks afterward, when on a fine sunny morning she brought out her little family to play, and lo! one had a bushy tail. She was very partial to it in attention, allowing it to suckle when she would not her kittens. The following spring the same cat, with kittens as before, had young rabbits given to her, and the kittens killed, unknown to her. On examination each morning there would be one less; on the fourth morning she was found devouring one, and she suckled them the same, and to all appearance thought as much of them as if they were her kittens, but ate them all up.

JOHN MITCHELL.

Cleveland, Tenn.

Scraped Surfaces.

MESSRS. EDITORS:—I would like to have a few words to say in regard to scraping as practiced in machine shops.

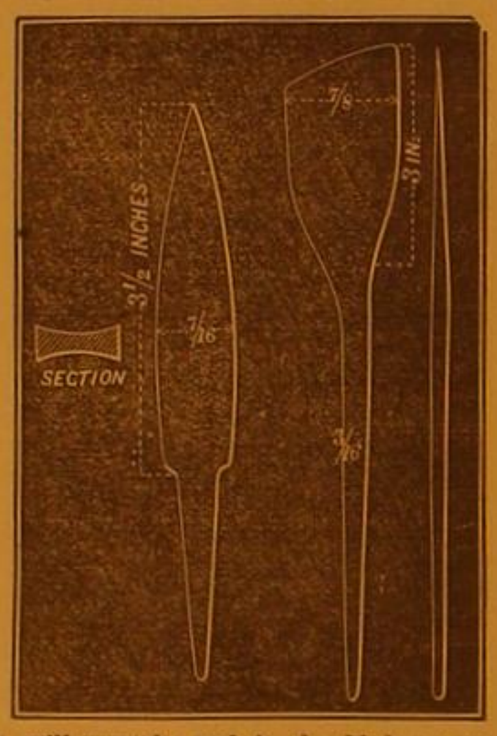
The subject has been opened in your columns. I would not have it stop just where it is, for the matter is very important to machinists generally.

Mr. Wm. P. Cowan knows something about scraping. His observations are correct in regard to valves; it insures a good surface for valves to start with. Whoever has had much to do with steam engines is aware how important it is to have some joints iron and iron in absolute contact, to stay the wasting away of important parts.

I have practiced scraping more generally than I know of others doing for the last twenty years, and I have to say the practice will discontinue the use of fine-cut files used in finishing; to me it is painful to see a man wasting time in trying to finish a piece of work with a fine file worked with oil. I will do his work better with a scraper in one fourth the time.

I know some experienced workmen will object to my statements, which I will prove true to any one who may test them. I scrape cast steel as well as other metals.

To make a good scraper, an extra piece of steel must be



used, as it will scratch; and it should be very carefully forged, plated out very thin, and tempered as high as can be used without breaking.

The above sketch will show forms which can be used most generally. I never could use a three-cornered scraper, except on lead and the like.

I. E. BARBER.

Norwich, Conn.

The Sun-flower as a Prophylactic.

MESSRS. EDITORS:—I noticed an editorial in your paper ridiculing the idea of the sunflower having any influence in purifying malarious air, and you were no doubt right so far as regards the manner in which it was then supposed—by some ignorant philosopher cited—to act, namely, by absorbing deleterious, and giving off healthful, gases.

In the SCIENTIFIC AMERICAN of May 21, page 335, you speak of the benefits of Professor Tyndall's discovery: that malaria may be *strained* out of the air we breathe, it being nothing more or less than germs or sporules floating therein, which enter into our circulation, and either by growing into multiplied numbers clog up the pores of the system or act as direct poisons on the blood.

Now if you were living in a shanty on a Mississippi bottom, and wished to strain all the air coming to it from the swamps around, can you think of any more effectual device for that purpose than a thick grove of tall sunflowers planted on every side? The leaves of this plant are the "perfection of nature" as adapted to this purpose; large, on long petioles which allow them to wave in the breeze, thickly set on the stalk, covered on both sides with minute hairy hooks that catch every little impinging particle, and also viscid to the touch—what more perfect machine could be invented for the purpose desired? I think that a breeze could hardly get through a rod thick of sunflowers without every particle of it having come in contact with the surfaces of the leaves. Planted at the proper season, they attain their best growth for the purpose just at the time when malaria is most prevalent, and are of more certain growth in a rich malarious soil than any other cultivated plant within my knowledge. If this vegetable only produced fruit like the banana, it would be the glory of the middle zones.

Speaking of this matter reminds me that as a general rule those household plants which have a reputation for being "healthy" are all of this character—rough-leaved, like the geranium, for instance, while the glabrous-leaved plants, like live-forever, are said to be unhealthy.

This is not the first example in which the "old woman philosophy" has outstripped the advance of science, nor in which a strong popular faith, based on observation, has proved to be the forerunner of valuable discovery.

Memphis, Tenn. CHAS. BOYNTON.

Curious Electric Phenomenon.

MESSRS. EDITORS:—In No. 22 of the present volume of the SCIENTIFIC AMERICAN my attention was directed to a communication on a "Curious Electrical Phenomenon." I have observed, in testing the American oil feeders in an hydrometer glass, as the oil dropped from the end of the feeder into the glass vessel below, that by rubbing the glass vessel on the outside with dry papers so as to produce friction, the oil will fly off at right angles, or in a horizontal line, from the point of the feeder direct to the inside of the glass vessel in small streams fine as the strands of a spider's web. I use this method to test the electrical condition of the atmosphere, and have noticed that if a thunder-storm is likely to occur throughout the day or night, or if the weather is warm and humid, it will show that the electric condition of the atmosphere is deficient in the locality. If the experiment is made and it fails to act as above stated—showing that clouds draw the electricity in the direction of the storm or the winds that carry it—will this not account for the phenomenon produced by the running belt referred to?

By standing under a large belt which is running at a fast speed, a very singular sensation is produced—it makes the hair of one's head feel as if it were crawling, or about lifting a person off his feet.

T. B. WICKERSHAM.

Philadelphia, Pa.

MESSRS. EDITORS:—In your issue of May 28th, I observed a communication over the signature of Sereno S. Lukens, of a very curious electrical phenomenon.

This same phenomenon came under my notice a few weeks since, and I observed that after a few moments the oil ceases to flow from the can.

The explanation which first presented itself to me was that the air became rarefied about the oil can, consequently the air contained in the can, being at a greater pressure, forced the oil out.

I also observed that the hand held near the belt diminishes the flow of oil. The reason of this I assign to the breaking up of this vacuum by the hand coming in contact with the currents of air which produces this partial vacuum.

Hopkinton, Mass. A. GLEASON.

First Artificial Fire.

MESSRS. EDITORS:—An article on page 316, present volume, on "The First Artificial Fire," leads me to say that I have seen the experiment of producing fire from two sticks a success, the method being as follows: A bed piece an inch thick, notched in ¼ to ⅜ of an inch on one edge, and the other piece a smooth, round stick, 12 or 15 inches long, from ¼ to ⅜ of an inch in diameter. A drill hole above the notch is started so that the powder produced will fall out of the notch.

In this experiment a knife blade was put under to catch the powder. The stick used as a drill was moved rapidly with the hands both ways, in the manner of a drill, commencing at the top until the pressure brought the hands to the bed piece, when they were shifted to the top again. The blackened, charred dust rolled out from the notch and smoked. A few very light shavings were added, and with a light breath the thing was done.

In the tropics some kinds of wood are sharper grained than here, and as dry as perhaps can only be made here by baking. That it can be done I have seen, but those with tender hands had better not attempt it, for blisters will surely be the result.

There is some experience needed after the dust is ignited. Dr. Collas or any other learned gentleman cannot argue away a fact.

A. G. WILLEY.

Murfreesboro, Tenn.

Wear of Front Wheels on Locomotives.

MESSRS. EDITORS:—In reply to the question "Why do the fore wheels of locomotives wear more than the hind ones?" I would suggest the constant jarring or thumping to which they are subjected. It is well known that the fore wheels of locomotives do not hug the track, but advance by a series of jumps, caused by the jerk of the piston rod at the commencement of each stroke. This being communicated to the driving wheel seeks the point of least resistance, which is upward. With long and heavy trains the jarring becomes a source of great annoyance to engineers.

Jersey City, N. J. F. P. DODGE.

How to Kill Currant Worms.

MESSRS. EDITORS:—On page 332 of present volume of your paper appears a communication, signed J. H. P., giving a description of the currant worm, and his manner of destroying them, which requires considerable time and patience. If J. H. P. will try the following plan, I think he will throw away his tin pan, or use it for some other purpose. Keep watch of the bushes, and as soon as you find the eggs all hatched and the worms fairly at work, dust the bushes thoroughly when wet with dew or rain with powdered hellebore, using for the purpose a common flour dredging box or pepper box. That will be the end of that brood of worms. Should another brood appear in the course of the season, repeat the operation. It has been an infallible preventive with me for five years.

Rochester, N. Y. A. G. B.

[For the Scientific American.]

A CHAPTER ON COCKROACHES.

BY JOHN R. GORDON.

There is a tribe of very disagreeable little individuals of a class of insects belonging to the order *Orthoptera*, to which is given the appellation cockroaches. These abominable creatures abound in the West Indies. They are of the tribe called *Blatta*. Several species are found, the most common, however, being the *Blatta gigantea*, and *B. Americana*. The *B. gigantea* is termed by the natives, the drummer cockroach; and the *B. Americana*, the common cockroach. The former makes a most remarkable noise when excluded from light. This noise is similar to that caused by a person rapping on any sonorous object with the fingers, hence its cognomen of drummer.

The drummer is considerably larger than the common cockroach, it being about two inches, while the latter is only about an inch and a half in length. The former has a skin of a dusky brown color, sometimes inclining to an olive tinge, and the latter is of a chestnut color, inclining to red. The antennæ of the common cockroach are more delicately formed than those of the drummer. Both of these species exclude themselves from the light when they can, and prefer the abode of man for the place of their habitation, hence they are found secreted behind all objects of household virtu which are not frequently removed. When roused they emit a very disagreeable odor, not unlike that arising from asafœtida. They are predaceous, and are very destructive, eating almost anything that comes in their way—apparel, provender, all household articles that can be gnawed by their delicate mouths; and even men's fingers and toes do they nibble. Like most others, they have wings, which are mostly employed at night. They may be heard whizzing over one's head in their nocturnal gyrations, particularly during the rainy reasons, which seem to be propitious to their peregrinations.

The earth is not their element, for there are too many enemies to be met with there, principally in the poultry yard. Woe betide the poor roach who setteth foot within the domains of Chanticleer, he is not sooner there than he is gulped down by some greedy denizen of the hen coop.

Cockroaches increase very rapidly, and gather in such clusters that they necessitate frequent cleaning of the habitations of mankind; and it is a source of amusement to the native children at such times to get hold of some fowl, tie a string to its foot by which to hold it, and set it to catch these insects.

Besides being offensive in their predaceousness, they are very objectionable on account of the filth which they deposit in their track. The cockroach brings forth its young by eggs, which it deposits all about. The eggs are inclosed in a horny case, which is generally placed within the angles of any regular-sided object. The case is attached by means of a sort of glutinous matter, which holds it so firmly that if an attempt be made to detach it, the case will be frequently broken before it can be separated from the place where it is fastened.

One night I heard a peculiar grating noise in my bed room. Desirous to ascertain the cause, I jumped up and struck a light, when, to my disgust, I saw one of these creatures gnawing away at my sperm candle. He had actually climbed up the side of a highly polished china candlestick, and was as busy as could be satisfying his appetite. Selecting a good stout pin and a piece of pine board, I killed and pinned him to the board, laid him aside till next day, and took his portrait, which I added to my collection of others I had taken.

I have occasionally heard strangers remark, when rising of a morning, that they could not think what was the matter with the tips of their fingers, they were so sore, little imagining that these greedy things were the sole cause, and being informed, they would hardly believe the assertion that the cockroaches had done the mischief.

Various means are adopted for destroying cockroaches, but there are none so effective as the broom, fire, and fowls for exterminating them.

The common house spider is great enemy to the roach, but it very often finds its match when it meets in combat with some tough-skinned *Blatta Americana*. Although the *B. gigantea* is so much larger than the former, it is not so formidable, as its skin is less hard, and therefore more liable to injury

I have often stood and watched a combat between a cockroach and a spider. Upon a certain occasion one of these flew right into the web of a huge spider. He watched it for a while, then advanced and placed a foot upon it. The roach immediately turned round and charged at him, turning him over; but, by so doing, it became entangled in the spider's web, which the spider perceiving, made haste to take advantage of the opportunity, and, springing upon the inverted roach, sank his fangs into its stomach. After having accomplished this feat, he bore it off to the center of the web, there to terminate its sufferings by sucking it to death.

Beneath a spider's web may frequently be seen the skins of some unfortunates who have perished in this way.

It would be thought that the formidable sting of the *Apis mellifica*, or honey bee, would deter the cockroach from going into its hive, but by some means or other these bugs manage to gain admission to a place to which not many other insects have entrance. Often, in cleaning my hives, have I discovered these demon-like creatures secreted therein, although not in great numbers, for they would then be detected and expelled by the revengeful bees.

I suppose that the honey was the cause of their congregating in the hives. I did not much like these incursions on my bees, and being informed that corn meal saturated with laudanum placed where the roaches could eat it, would destroy them. I tried it, but it was useless. To introduce a fowl to the realms of the queen bee would be disastrous, so I had no other alternative but to sweep them out and exterminate them.

It is impossible to keep cockroaches out of any piece of furniture, unless it be made very tight. Book cases, chiffonniers, escritoires are all infested. Even pianos are not free from their inroads. The backs of upright pianos are generally covered with a light quality of merino, or something of the kind, when purchased. They eat through this and enter the instrument, doing it considerable injury. I had recourse to insect powder, but found it useless, and after trying various dodges to put a stop to the incursions of these voracious things, I bought some wire gauze and placed it on the back of my piano, and likewise beneath the silk of the front; I also made a pedal box to prevent entrance through the apertures below the pedals.

The name of the drummer roach in the Creole patois is, Tucko-tucko, applied to it as characteristic of the noise which it makes. The common roach is termed, Cacka-lacka. Whence this term, I know not.

The noise occasioned by the drummer cockroach is considered by persons who incline to superstition, as token of the death of some acquaintance of those who happen to hear it, and it is held in almost the same awe as is the insect known in northern countries as the death watch—*Atropos pulsatorius.*

The cockroach has ascribed to it by the negroes, medicinal qualities; and, indeed, if an asthmatic person should turn up his nose on finding one of these disgusting creatures in his cup of tea or coffee, he is very coolly informed by his servant who is standing awaiting his call that it will no harm, it is good for the asthma.

The Croton, or water bugs, which resort to American kitchens, bear a strong resemblance to a small roach called the Spanish cockroach in the West Indies. It is of the same size, shape, and color. These are not so numerous as the *Blatta Americana*, nor are they so destructive.

[For the Scientific American.]

BALLOON VARNISHES.

BY JOHN WISE.

There are two ways of preparing linseed oil for balloon varnish. The quick and the slow process. The first is by heating the oil up to a temperature at which it will ignite spontaneously. In order to secure it from burning up it must be heated in an iron or copper vessel, with a lid that can be closed when it begins to emit dense white vapor. If it is desired to have it fast drying, from four to six ounces of litharge per gallon should be boiled in it. This process takes about one hour, and renders the oil thick and tough, giving a good body and glossy surface to the cloth.

The slow process is to boil the oil from twelve to twenty hours, keeping it at a temperature of about 200° Fah., incorporating with it while boiling half an ounce of sulphate of manganese to each gallon of oil. These varnishes shou'd be applied to the cloth tolerably hot.

There are other formularies, such as the incorporation with the oil of some bird-lime, a gelatinous substance made from the inner bark of the white holly. Gum elastic is also used to give the oil body and elasticity. When I desire to make a balloon extraordinarily close, I give it a first coating of compound varnish, made of equal parts of white glue and glycerin.

I filled a balloon last October on the "Union Fair Ground," of Orrville, Ohio, with pure hydrogen, on Wednesday, and ascended with it on Friday following, after it had stood rain and wind, and sailed over a hundred miles with it. This balloon was varnished with the slow process oil, over a first slight dressing of glycerin and glue.

Coal gas, or technically, carbureted hydrogen, does not *exosmose* from the balloon nearly so fast as pure hydrogen. By coating a balloon heavily with either of the above varnishes, it will retain its buoyancy with a loss of about one per cent in twenty-four hours, provided it has a capacity of 30,000 cubic feet. When larger, the *exosmose* is comparatively less; when smaller, comparatively greater, owing, of course, to the disparity of cubic contents to surface.

[For the Scientific American.]

SCIENTIFIC PERIODICALS FOUND IN NEW YORK LIBRARIES.

BY H. CARRINGTON BOLTON.

The following list of the principal scientific journals found in the libraries of this city was compiled for private use, but may prove of value to the readers of the SCIENTIFIC AMERICAN. It by no means pretends to be a *complete* catalogue of periodicals in *all* our libraries, but comprises those most useful for reference in the five libraries mentioned, especially journals relating to chemistry, physics, technology, and natural history.

The abbreviations used are as follows:

A.—Astor Library.
L.—Lyceum of Natural History.
M.—Mercantile Library.
S.—Society Library.
SM.—School of Mines, Columbia College.

When a letter is inclosed in brackets, the sets of journals in the library indicated are not complete.

AMERICAN AND BRITISH.

American Journal of Science (Silliman). 1818-70.....A. SM. [L.] S. M.
Annals of Electricity, Magnetism, etc. (Sturgeon 1836-43..A.]
Annals and Magazine of Natural History (See Magazine Idem). 1838-70.....A.
Annals of N. Y. Lyceum of Natural History. 1824-70.....A. L. SM.
Annals of Philosophy. 1813-36.....A.
Annals of Scientific Discovery. 1850-70.....SM.
Chemical Gazette. 1842-59.....SM.
Chemical News. 1860-70.....SM. A.
Dublin Quarterly Journal of Science. 1861-70.....A.
Edinburgh Journal of Science (Brewster). 1824-32.....A.
Edinburgh Philosophical Journal. 1819-70.....A.
Geological Magazine. 1864-70.....A. [SM.]
Journal of Chemical Society (London). 1849-70.....SM.
Journal of the Franklin Institute. 1825-70.....A.[S.] [SM.][M.]
Journal of Natural Philosophy (Nicholson). 1797-1813.....A.
Journal of Philadelphia Academy of Sciences. 1817-70.....A.
Journal of the Photographic Society. 1854-70.....A.
Journal of Microscopical Science. 1853-70.....A.
London Journal of Arts and Sciences. 1839-70.....A.
Magazine of Natural History (See Annals Idem). 1839-55...A.
Mechanics' Magazine. 1823-70.....A.
Mining Magazine (N. Y.) 1853-58.....A. SM.
Mining and Smelting Magazine. 1862-70.....A. SM.
Patent Specifications of Great Britain. 1623-1870.....A.
Patent Reports, U. S.....A.
Pharmaceutical Journal and Transactions (Bell). 1841-70.A.
Philosophical Magazine. 1793-1870.....A. [SM.]
Philosophical Transactions. 1665-1870.....A. S.
Proceedings of Chemical Society, (See Journal Idem). 1841-48.....SM.
Proceedings of Philadelphia Academy of Sciences. 1841-70.A.
Quarterly Journal of Science (Brandes). 1818-31.....A.
Records of General Science (Thomson). 1835-36.....M.
Report of the British Association for Advancement of Science. 1831-70.....A. SM.
Report of the American Association for Advancement of Science. 1848-70.....A. SM.
Repertory of Arts and Manufactures. 1794-1834.....A. S.
Repertory of Patent Inventions. 1855-70.....A. S.
SCIENTIFIC AMERICAN. 1845-70.....A. SM.
Yearbook of Facts. 1839-70.....SM.

FRENCH.

Annales des Arts et Manufactures. 1800-17.....A.
Annales de Chimie (et de Physique). 1789-1870.....A. [S.] SM. [M.]
Annales des Mines (See Journal Idem). 1816-70.....A. [SM.]
Annales du Musée d'Histoire Naturelle. 1802-70.....A.
Annales du Génie Civil.....A. [SM.]
Annales des Sciences Naturelles. 1824-70.....A.
Annuaire de Chimie (Millon et Reiset). 1845-51.....A.
Archives des Découvertes. 1800-39.....A. S.
Bulletin du Musée de l'Inaustrie de Bruxelles. 1842.....A.
Bulletin de l'Industrie Minerale. 1855-70.....SM.
Bulletin de la Société Chimique de Paris. 1854-70.....A. [SM.]
Bulletin de la Société Géologique de France. 1830-70.....A. [SM.]
Bulletin de la Société d'Encouragement. 1802-70.....A.
Bulletin Universelle, 2eme Section, Géologie. 1824-31.....A.
Compte Rendu de l'Académie des Sciences. 1835-70.....A. [SM.]
Cosmos (Moigno). 1852-70.....A.
Journal de l'Ecole Polytechnique. 1794-1870.....A.
Journal des Mines (See Annales Idem). 1797-1815.....A.
Journal de Physique (Rozier). 1771-1822.....A. L.
Journal de Pharmacie. 1815-1870.....A.
Mémoires de l'Académie des Sciences de Paris. 1666-1870.A.
Repertoire de Chimie pur. 1858-63.....A.
Repertoire de Chimie Appliquée. 1858-63.....A.
Revue des Cours Scientifiques. 1863-70.....A. [SM.]
Revue Universelles des Mines. 1857-70.....SM.
Technologiste. 1840-70.....A.

GERMAN.

Allgemeines Journal der Chemie (Scherer). 1798-1803.....A.
Allgemeine Nordische Annalen der Chemie (St. P.) 1819-23.....A.
Annalen der Chemie und Paarmacie. 1832-70.....A. SM.
Annalen der Physik (Gilbert). 1799-1823.....A. SM.
Annalen der Physik (Poggendorff). 1824-70.....A. SM.
Archiv für Microscopische Anatomie (Schultze). 1865-70.SM.
Archiv für Naturgeschichte (Erichsson). 1835-70.....A.
Archiv für Berg. und Hüttenwesen (Karsten). 1818-31....A. SM.
Archiv für Mineralogie, etc. (Karsten). 1828-55.....A.
Archiv für gesammten Naturwissenschaften. 1824-.....A.
Bergwerk's Freunde. 1839-56.....SM.
Berg. und Hüttenmännische Zeitung (Hartmann). 1842-70.SM.
Bericht über Fortschritte Eisenhütten-Technik. 1861-70..SM.
Bericht Deutsche Chem. Gesell. Berlin. 1868-70.....SM.
Bericht Mittheil. Naturw. (Haldinger). 1846-51.....SM.
Chemisch-Technisch Mittheilungen (Elsner). 1846-70.....SM.
Fortschritte der Physik. 1845-58.....A.
Gesellschaft Naturforsch. Freunde zu Berlin; Beschäftigungen, Schriften, Magazin, Verhandl. der. 1775-1819. A.
Jahrbuch für Berg. und Hüttenwesen (Moll). 1797-1809...A.
Jahresbericht der Chemie (Berzelius). 1822-51.....SM. A.
Jahresbericht der Chemie (Kopp und Will). 1847-70.....SM. A.
Jahresbericht der Chem. Technologie (Wagner). 1855-70.A. SM.
Jahresbericht der Agricult. Chemie. 1858-70.....A.
Jahrbuch der K. K. Geolog. Reichsanstalt Wien. 1850-67..SM.
Jahrbuch f. Mineralogie und Geologie Leonhard. 1829-70..A. [SM.]
Journal der Physik (Gren). 1790-98.....SM. A.
Journal für Chemie und Physik (schweigger). 1811-27....A.
Journal für Techn. und Ökonom. Chemie. 1828-33.....A.
Journal für prakt. Chemie (Erdmann). 1834-70.....A. [SM.]
Keferstein's Deutschland (Geologie). 1821-31.....A.
Kalender für Berg. und Hüttenmänner. 1827-70.....SM.
Magazin f. Bergbaukunde (Lempe). 1765-96.....A.
Oestreich. Zeitschrift f. Berg. H. und Salinenw. 1854-70...SM.
Oryktographie von Sachsen. 1828-48.....SM.
Pharmaceut. und Chem. Centralblatt. 1830-70.....A. SM.
Polytechnisches Centralblatt. 1835-70.....A. [SM.]
Polytechnisches Journal (Dingler). 1820-70.....A. [M.] SM.
Repertorium der Physik (Dove und Moser). 1837-49.....A.
Taschenbuch f. gesammt. Mineralogie (Leonhard). 1807-1834.....A.
Verhandlung. Mineralog. Gesellschaft (St. Petersburg.) 1842.....A.
Zeitschrift f. analyt. Chemie (Fresenius). 1862-70.....A. SM.
Zeitschrift f. Chemie. 1858-70.....[SM.]
Zeitschrift f. Physik und Mathem. (Baumgartner). 1828-.
Zeitschrift d. Verein. Deutsch. Ingenieure.....[SM.]
Zeitschrift f. Mineralogie (Leonhard). 1824-29.....A.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,022.—MEANS FOR BINDING MUSIC, PAMPHLETS, ETC.—A. M. Crowhurst, Boston, Mass. April 13, 1870.

1,165.—STOVES OR FURNACES.—M. C. Hull, New York city. April 21, 1870.

1,170.—MOWING AND REAPING MACHINES.—R. Eickemeyer, Yonkers, N.Y. April 22, 1870.

1,219.—PROCESS FOR CLEANING WOOL AND HAIR.—C. F. A. Simonin Philadelphia, Pa., and E. W. Collis, Glendale, N. J. April 27, 1870.

1,226.—APPARATUS FOR STARTING TREADLE MOTIONS, APPLICABLE TO SEWING MACHINES, ETC.—O. H. Needham and C. N. Brainerd, New York city. April 28, 1870.

1,225.—MECHANISM FOR TRANSMITTING MOTION.—R. B. Hand and J. B. Holden, Jersey City, N. J. April 28, 1870.

1,227.—PIPE WRENCH.—D. C. Stillson, Charlestown, Mass. April 28, 1870.

1,252.—STOP COCK.—J. C. Chapman, Cambridgeport, Mass. May 2, 1870.

1,270.—TRACTION FOR LOCOMOTIVE ENGINES.—J. E. Lake, Chicago, Ill. May 3, 1870.

Keables' Improved Sewing Machine.

Of all the labor-saving machines produced during the last half century, none has worked a greater revolution in the arts than the sewing machine. Its influence is directly or indirectly felt in almost every branch of the mechanic arts, and it has opened up new avenues for the employment of millions of operatives.

We never witness the operation of one of these useful little workers, without a feeling of admiration and pleasure, and we confess to a real delight in personally putting them through their various movements, and watching them as they rain stitches upon the texture they are designed to sew.

It is, therefore, a pleasant task we perform in presenting to our readers an illustrated description of a new member of this now large family of labor savers. The machine under consideration is a single thread machine, its principal and most important feature being the looper hook, which is constructed in a novel manner.

The needle bar has a parallel vertical motion, imparted to it by a crank and slotted cross-head, the crank wheel shaft being driven by a gear and pinion. The feed motion is obtained by a small eccentric on the crank wheel shaft connected with a rock-shaft underneath the table of the machine by a connecting rod.

The looper hook upon which the interest of the invention chiefly centers is shown in detail at the left of the engraving, and also at A, in the principal engraving, in which latter it is shown in conjunction with the point of the needle.

The swinging arm, A, in the detail which carries the hook, B, has a slot in which a part of the hook commonly rigidly connected to the arm, is pivoted at C, and a spring, D, is introduced between the end of the hook projecting rearward of the pivot and the bottom of the slot, to support the said rear end at the required point to maintain the point of the hook in the true position, and to yield and allow the working thread to draw the point upward, at the time the loop is escaping, and at the moment the point moves back to the needle to facilitate and insure the escape of the loop.

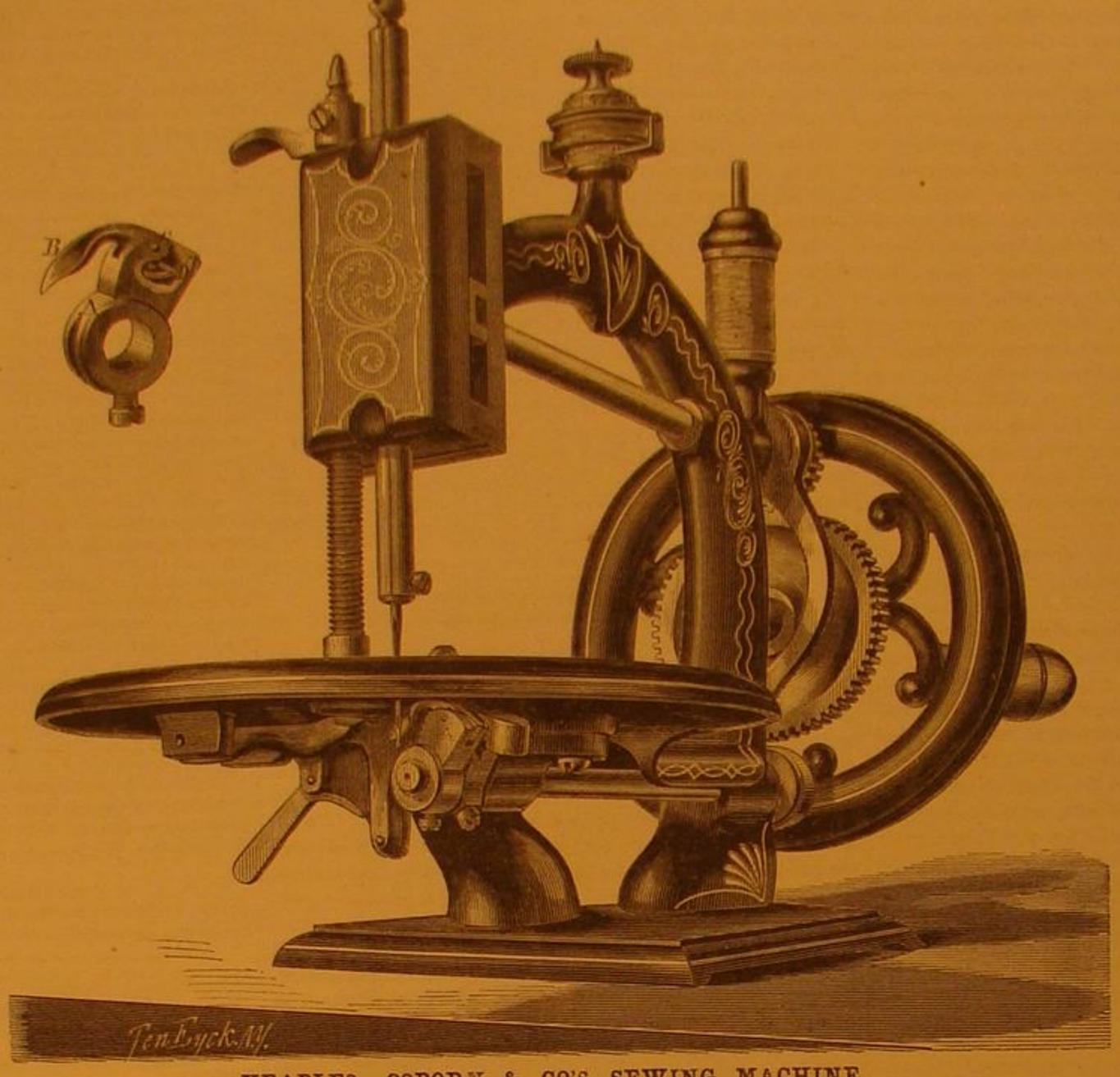
Any suitable stop may be provided to prevent the spring from forcing the point of the hook down too low.

The spring may be attached in a different way, for instance, it may be attached to the arm at the bottom of the slot, and connected to the hook at the front of the pivot, so as to draw it downward thereat, or a spiral spring may be substituted for it and placed either side of the pivot, in the one case forcing upward, and in the other pulling downward. The arrangement first described is however preferred.

It is claimed that the following advantages have been demonstrated for this form of construction by ample tests, and that those who have tried the machine are unanimous in their indorsement of the value of the improvement. We will add our own opinion, based on a personal trial of the machine, that the advantages claimed are secured.

The hook being elastic it is less liable than others to break thread, allows the drawing up of the stitch more regularly and perfectly, obviates the possiblity of catching the loop a second time, and therefore prevents tangling or leaving loose open loops on the under side of the seam. In a word it surmounts difficulties that have hitherto been considered insurmountable, and enables it to do perfect sewing with any kind of thread or any description of goods. It is easily managed and adjusted, running from one to many thicknesses of goods, or over any irregularity of seams or otherwise, perfectly without change of tension.

Patented, through the Scientific American Patent Agency, May 17th, 1870, by Michael Ash Keables, of Brattleboro', Vt. For further information address Keables, Osborn & Co., Guelph, Ontario county, Canada West.



KEABLES, OSBORN & CO'S SEWING MACHINE.

Improved Wagon Wheel.

Among some of the most interesting and practical invensions we have of late been called upon to illustrate and describe are those pertaining to draft vehicles. We this week present still another, which we regard as combining the essentials of a good wheel in a high degree. It is light, strong, and graceful in appearance, while it also provides for convenient and constant lubrication, and the exclusion of dust from the journals of the axle.

The improved construction is confined principally to the central part of the wheel, and Fig. 1 is a perspective view of so much of a wheel as is necessary for purposes of description; Fig. 2 being a sectional view of the same, and Fig. 3 a detail, showing more particularly the method of inserting the spokes.

The hub, A, is of metal, and has the form shown in Figs. 1 and 2. The journal of the axle, B, Fig. 2, has two collars formed at the part where it joins the body of the axle, and the hub, A, has also a collar formed upon its inner end. A clutch C, Figs. 1 and 2, clasps both the collar on the hub and one of the collars on the axle, thus preventing the wheel from slipping off. An oil cup, D, formed in the top of this clutch, and provided with a suitable plug, serves as a reservoir for lubricators, securing not only economy, but convenience in lateral strength to the wheel when subjected to side strains.

The hub can be made very light for light carriages, and when plated or handsomely painted, is quite ornamental in appearance.

The invention is covered by two patents, obtained, through the Scientific American Patent Agency, by Levi Adams. They are respectively dated February 18 and March 31, 1868.

For further information address J. Adams & Sons, manufacturers of wagons, carts, and wheels, Amherst, Mass.

Fig. 1

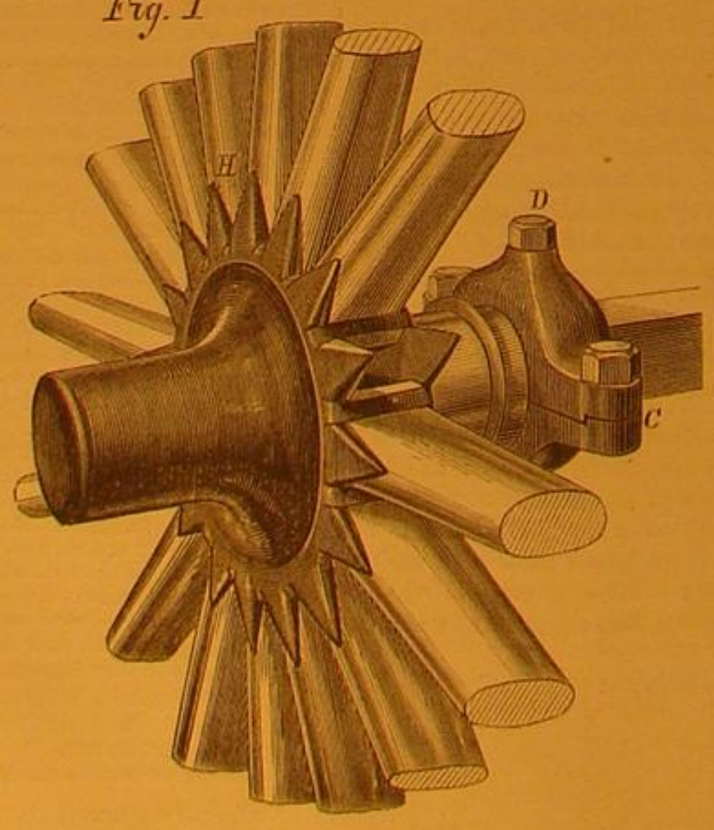


Fig. 2

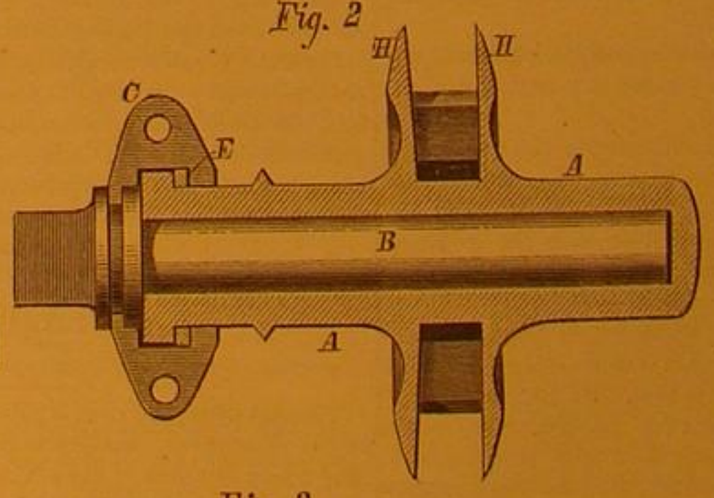
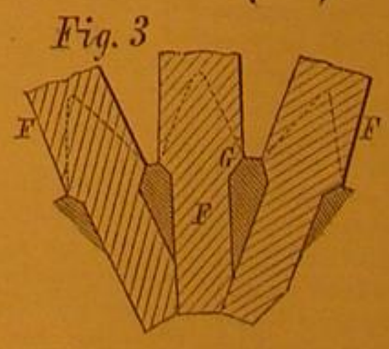


Fig. 3



ADAMS' IMPROVED CARRIAGE WHEEL.

Wanted--Better Artificial Lights.

Civilization, says the *Christian Union*, often brings in necessities, which art is backward in properly providing for. A good artificial light for common use is still to be sought, the myriad advertisements of eurekas which promise to perfectly replace the sun in its absence to the contrary notwithstanding. A very large share of work, reading, studying, and writing, must be done after the sun has set, and the demand, on sanitary grounds, is for a light that will be bright, that will not flicker, that will not emit nauseous odors, and, finally, that will not keep the nerves in a continual state of tension for fear there will be an explosion and a conflagration, to say nothing of the direful results when such an accident does happen. In brightness of indoor illumination we have greatly advanced on our forefathers For cities, gas has long replaced candles, whale oil, and other materials, which now have but a sickly burning to our eyes, and more recently petroleum has been joyfully welcomed as a blessing where gas is not available, and travels all over the world to cheer dark places with its unrivaled brilliance.

For a general lighting up of buildings coal gas has much to commend it; for closer use, where the eyes are intently fixed upon any book or work, it is about as bad for these organs as anything that could be devised. The inevitable flickering, except where it is used in a very expensive manner, strains the nerves to the ruin of the eyes. As contrasted with gas, for those who have to task their eyes severely, kerosene is preeminently superior. It has an illuminating power beyond any known substance within the popular reach, is clear, white, and burns with perfect steadiness. In these regards nothing better could be devised, especially when the flame is properly shaded, and the light cast only on the work. But the introduction of kerosene has brought in a history of fearful destruction to life. Much of this has been due to most reckless carelessness, or wicked cupidity. Manufacturers, unrestrained by conscience or law, sell what they know to be explosive material of the worst kind, in place of what is harmless in this respect. People are so stupid or ignorant that they will fill burning lamps, or throw kerosene into the kitchen fire. Perhaps the number of such is overrated. Kerosene is in use everywhere through our vast population. Every accident by it, from Maine to Texas, is telegraphed by the Associated Press, and, perhaps, if comparisons were made, it would be found that disasters through its careless use are not so out of proportion to disasters from many other articles in common use as would seem.

For illumination and for the safety of the eyesight it is by far the best material within reach of the public; and it is worth a great deal of pains to learn how to use it with safety. The glass lamp needs care to prevent breakage when lit, though in most cases the flame will be harmlessly extinguished by a fall; on the other hand, a metal lamp is more likely to heat, and raise gases from the surface of the oil.

The student's lamp is very near the ideal, only it requires more careful cleaning than most domestics bestow, and should be generally under the immediate care of master or mistress Some gentlemen consider it a nuisance to have anything to do with a lamp, but we like to see such enthusiasm for a good light as will lead a person to keep his lamp under his own charge, just as he does any other appurtenances of his study.

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NEW YORK, SATURDAY, JUNE 11, 1870.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

THE METROPOLITAN MUSEUM OF ART.

This institution was incorporated on the 13th of April, 1870, and has now been fully organized according to law, and is ready to enter into active operations. The great difficulty the corporators encounter at the outset is to prepare a plan that can be accepted by unanimous consent, as thoroughly practical. We have had so many futile schemes proposed during the last twenty years that the public has grown suspicious, and no one is willing to give money until all objections on the score of practicability have been removed. The high character and powerful influence of the gentlemen who have thus far taken part in the movement are the best guarantee of the sincerity of motive and determination to succeed, that the public could demand for the Metropolitan Museum.

What we now want is a well devised scheme that will strike everybody as feasible, and at once elicit general sympathy and practical aid.

The officers consist of such men as John Taylor Johnson, Wm. Cullen Bryant, John A. Dix, Robert Gordon, Wm. T. Blodgett, S. L. M. Barlow, Joseph H. Choate, John F. Kensett, Robert Hoe, Jr., Samuel G. Ward, W. J. Hoppin, J. Q. A. Ward, Geo. P. Putnam, C. E. Detmold, and other well known citizens.

In addition to the Art Museum we now hear of a somewhat analogous enterprise, called the American Exposition Company, with a capital on paper of $7,000,000, and we must not lose sight of the Historical Society, who have the great advantage of a site accorded to them in the Central Park by the Legislature. The American Institute, with its models, library, annual fairs, and interesting scientific meetings, also occupies some of the ground proposed to be covered by the Art Museum; and there is the Mechanics' Library Association, which ought not to be forgotten in this connection.

What we evidently want is a scheme that will unite all of these conflicting interests under one head, and thus insure the hearty co-operation of all who have thought upon the subject, and are earnestly engaged in the work.

The committee of the Metropolitan Museum of Art who have the matter in charge, will naturally refer to European models for illustration and for the suggestion of ideas; but after all, they must create something conforming to the wants of this country, and comprehensive enough to anticipate the great future that is before us. The new plan ought to be adapted to the genius of our institutions, and while it borrows from the past, it must not be unmindful of the present, nor fail to look at the future.

Let us discuss a few of the most famous existing models, and then see how they can be altered to suit American ideas. The Palace of Industry, in Paris, has many good features. It comprises a permanent exhibition of mechanical contrivances, and at stated periods the building can be used for art collections. In the details of its management are many features that can be copied with advantage by us. In Turin the Italian Government has founded a grand technological collection upon a comprehensive and well digested plan, from which we can borrow some good ideas.

All over Germany are art collections, historical museums, technological institutes, and schools for the training of pupils in all of the fine arts; and the field is very rich for any one who is in search of information. Lastly, we come to England, where the Kensington Museum and the Crystal Palace stand out prominently as the creations of modern times, and naturally appear to be within the reach of America.

Kensington Museum was first formed with special reference to ornamental manufactures and schools of design; but it has since been greatly expanded, and is now one of the most interesting and instructive places in the world. One peculiar feature of that museum can be copied to some extent in this country, and that is the loan collection. Many of our wealthy citizens possess rare works of art that they would be willing to loan to a responsible corporation, as has been abundantly proved by their generosity on the occasion of charitable fairs in this city. Many specimens they loaned would be apt to remain indefinitely, and they eventually become the property of the association. The question is, how can all of these models be worked up to suit our wants? It is not an easy problem to solve, and we can only approach the subject with such suggestions as occur to our minds, without attempting to pronounce a final decision upon it.

It is doubtful if an art museum, pure and simple, can be maintained in the city of New York, while a place for the exhibition of machinery would be apt to fell into the hands of persons who had certain inventions to sell, and would thus become a large bazar.

If a School of Design be attached to the Museum, or a school for any other kind of training, then we bring in other elements and greatly add to the expense.

It would be very graceful, very beautiful, and very refined to keep the museum sacred from the touch of manufactures and trades, but in this conntry, and in times like the present, and in a country like ours, it it a question whether it is expedient and wise to follow European nations on this point. Our country is great in consequence of its commerce, its manufactures, its inventions, its labor-saving and humanizing improvements in every department of society, and any plan that omits these things will lose the sympathy of the people, and be wanting in the distinguishing features of our civilization.

We therefore suggest that the Metropolitan Museum of Art must show theory and practice combined to secure success. If there are architectural models and drawings in one part of the building, there ought to be in another an exhibition of the best building material and the machinery used in construction. Designs for calico printing may well be flanked by the goods and the raw material, and the machinery to make them. Fine photographs suggest the camera, the chemicals, the laws of light, and diagrams explanatory of the whole operation. A section devoted to agriculture may be made very comprehensive, so as to include the works of art that ought to adorn a country home, and thus afford an opportunity for the display of imagination. We could further explain our idea by drawing numerous illustrations from all of the decorative and formative arts, but enough has been said to elucidate our meaning, and to offer some suggestions to the committee who have the onerous duty of presenting a comprehensive plan to the corporation. It is to be hoped that the scheme for a Metropolitan Museum of Art will not fall through, but that it will be pushed to a successful termination.

THE ORIGIN OF THE RELUCTANCE WITH WHICH MANKIND RECEIVE NEW IDEAS AND INVENTIONS.

A correspondent who has met with disappointment and trouble in introducing a valuable invention, anxiously inquires why it is "that mechanics and even some scientific men oppose any new invention which differs from their experiences and previous teachings, and which seems to show that something can be accomplished which they have hitherto deemed impossible."

This correspondent has been surprised to hear men who pretend to be mechanics and engineers condemn an invention without even becoming acquainted with its construction. He has heard people say that the results claimed were every way desirable, but fortunes had been expended in the pursuit of the same objects without success, and therefore they were impossible. He thinks this kind of proceeding very illogical and unjust, and wonders why men thus judge prematurely and without evidence upon subjects presented to their consideration.

We do not deem this a matter of surprise. That is only surprising which is unusual. The course pursued by the majority of mankind is precisely that of which our correspondent complains, and this, whether they be mechanics, engineers, theologians, lawyers, or so-called social reformers.

How often have theologians denied demonstrated facts, simply because they feared that some remote—and at the time dimly conceived—conclusion possible to be derived from its admission, would sap the foundations of some favorite dogma, and, reasoning precisely as our correspondent describes, "It conflicts (or may be found to conflict) with our belief, therefore it is impossible it should be true," have sought to erect barriers against the advance of truth, and set themselves to oppose the progress of science.

How often has the medical profession committed the same sin against reason. How frequently have political economists, legislators, and reformers manifested the same blind bigotry.

Prejudice sways far more minds than reason, and this is why there is such an extensive market for ready-made opinion; why doctrines and creeds are put up in assorted packages, like flower seeds, the selection being left to the salesman, who is supposed to know more about the matter than the purchaser.

The anticipation of temporary personal inconvenience resulting from any innovation, prevents many from cordially embracing improvements, which, adopted, would benefit the entire race. Every new improvement limits the application of old things, while it increases the market for labor in its department of industry. But the men accustomed to the old order of things find themselves compelled to suffer some inconvenience in learning the new routine, and they care little for the general benefit, so long as they cannot see that their individual interests will be materially advanced. It they cannot see this, they are indisposed to accept the temporary inconvenience, no matter how much good may result to others. This is profoundly selfish; but, sad as is the admission, selfishness is a universal vice. "What's the odds so long as *I'm* happy," is oftener the rule of life than the sweet rule of "Love thy neighbor as thyself."

Then again, the world is full of powerful vested interests, which universally revolt against all advances which do not strengthen their hold upon the consciences and opinions, and therefore the purses of mankind. Few of these organizations have much in common; so that what one supports the others generally oppose. Thus opposition to advancement of all kinds, in all fields of science or art, is and must be the universal rule until man himself has advanced far beyond his present moral standard.

The work of any man then who would benefit himself by the introduction of any improvement must be a sharp warfare. He must make up his mind to suffer misrepresentation, insidious attacks from unknown quarters, open ridicule, and perhaps attempts to defraud him or his just legal rights. This opposition cannot be met and combated by all men, and there are instances on record of such organized opposition as even the stoutest would shrink to encounter; in which the liberty and even the lives of innovators have been jeopardized or sacrificed. Thank'God! it is not quite so bad as that in our own land and time, but reports reach us that in England, whose boast is that every native-born son is entitled to the protection of the Government, and which sends expensive expeditions to barbarous lands to rescue a few citizens from confinement, even life is not at this moment secure to the man who dares even adopt an improvement, against the will of organized bands, sworn to oppose such improvements.

A correspondent of the *Times* writes:

"Rattening has recommenced at Sheffield, and at Manchester; a master builder has been dogged, watched, warned, so that he dared not sleep in his own house; his coachman did not dare to drive him; his premises have been set on fire, and attempts made to blow them up with gunpowder because he refused to comply with some trade regulation—using stone cut at the quarry or brick made by machinery. Every Englishman is taxed, if not otherwise outraged, by these trade regulations, which cover the island like a net."

This is a sad state of affairs to exist in a highly civilized land, and in the nineteenth century, but it shows that our present civilization is merely a crude experiment, and that until careful and well conducted experiment has been substituted for the belief that a large number of sections in our social code have been permanently settled by divine edict, it is egregious folly to talk about such a thing as social science.

NEW SUGAR REFINING PROCESS.

In the sugar house of Messrs. A. Sommier & Co., of Paris, 200,000 pounds of raw sugar have for a year past been daily refined according to a process invented by Boivin and Loiseau. The process is founded upon the use of a new body, the sucrate of the hydrocarbonate of lime, which the inventor employs for the purification of raw sugar instead of blood, bone-black, etc. For the preparation of this compound, milk of lime is made from the waste sweet liquors of the refinery, and enough sirup added to give the mixture 20° Baumé. This is well agitated and run through a cooler until the temperature sinks to 68° Fah. From the agitators the liquid flows into vats, where it is partially saturated with carbonic acid—the gas is passed through until the desired precipitate of sugar, lime, and carbonate of lime settles as a gelatinous mass. After the purifying agent has been thus prepared, it is applied in the following manner:

The raw sugar is dissolved in a cylindrical pan, similar to a vacuum pan, under diminished pressure. Revolving buckets carry it into receivers over the boilers, and from these it is permitted to flow into the boilers, where it comes in contact with the sucro-carbonate of lime previously introduced, in a quantity proportional to the percentage of raw sugar. They generally take about 650 gallons of the gelatinous sucro-carbonate to 8,000 lbs. of sugar. Water is added if necessary; the whole is boiled, and in this way the solution and clarification are simultaneously accomplished. One great advantage of the operation is that when sirup is boiled in presence of lime, ammonia is evolved, all glucose is decomposed, and anything likely to produce fermentation is destroyed.

The sirup from the boilers is filtered, the excess of lime separated by carbonic acid, and it is further concentrated and finished in the usual manner. The slimy residues and precipitates are squeezed out in filter presses until they contain no trace of sugar, and can be thrown away. The wash water is used in the preparation of new material. The advantages of this new process are that it does away with the use of blood, which is offensive, difficult to obtain, and the soluble constituents of which are finally concentrated in the molasses.

It also yields greatly improved products, which are brighter in color and better in grain. The third crystallization of this process is better than the second in the old way. The expense is if anything less, certainly not more. The process has been patented in the United States.

THE QUESTION OF CITY TRANSIT.

Having given the views of several prominent citizens upon this question in recent issues, which views we think fairly represent the various opinions prevailing upon the several projects lately urged as being each a solution of the question of rapid transit in the city of New York, we will add in brief our own opinion, and drop the present discussion of the subject.

First, in regard to the Pneumatic Tunnel, we would say that its projectors regard the question of the practicability of pneumatic propulsion as settled. If, however, they should be able to obtain a charter, and upon the completion of the work the pneumatic system should fail, as some predict, the main thing, an avenue for transit, the tunnel, will be secured, and it can be worked by locomotives, or any other motive power found most desirable.

We believe tunnels afford the most practicable means for effecting the desired object without interference with property, or obstructing the streets; and if the Pneumatic Railway Company have done nothing else, they are entitled to the gratitude of the public for demonstrating that such tunnels can be built and operated without even temporary inconvenience to surface travel.

We prefer that such tunnels should be constructed under other streets than Broadway, although, as Mr. Martin stated in our last issue, the business of upper Broadway will be, in our opinion, increased by a tunnel under it.

We do not regard with favor elevated railways of any kind. The Arcade plan is, we think, a wildly visionary scheme, one that never can and never will be carried to completion.

The tunnel system has more to support it than any other, and we have no doubt of its ultimate adoption. But *when*, is a question more easily asked than answered. So long as Broadway remains untunneled, so long will capitalists hesitate about building parallel lines, liable to be subsequently placed in competition with that more popular route. So either by some legislative enactment (which seems impossible) any tunnel under Broadway must be prohibited forever, or it were best to grant some good company a charter to push such a tunnel to speedy completion.

While this state of hesitation prevails the city is suffering untold loss from the removal of its citizens to neighboring towns, and the patient public groans, and "grins and bears" a state of things, which disgraces the enterprise and liberality of the American metropolis.

SOMETHING ABOUT HORSESHOES.

History does not reach back to a period when the horse was not a companion and servant of mankind; and in the earliest periods of which we have any reliable record, the ingenuity of men was taxed to invent trappings for the decoration, and armor for the protection of this noble animal, whose services in war are no less conspicuous than his patient labor in peaceful avocations is indispensable alike to civilized and barbarous races.

Precisely when the foot of the horse began to be protected by some form of shoe is unknown, but the necessity for it must have arisen with artificial roads, or when it was found necessary to employ the animal in traversing rocky wastes.

The anatomy of the horse indicates that his natural haunts are broad and grassy plains, where his fleet foot may spurn the yielding turf without injury, and where an ample supply of his favorite forage may be found.

In this state he may now be found on the extensive table-lands of Texas, and the *pampas* of Mexico, where his feet need not the assistance of veterinary art.

The Greeks and Egyptians practiced horse-shoeing in a manner which, so far as can be ascertained, consisted of applying a kind of sock or sandal, fastened about the leg with straps, and shod with iron or other metal, for strength and extra wear. These were probably not generally employed, but were used only in cases of disease or injury. It is highly probable that the primitive horseshoes were made of raw hide, stitched or laced upon the foot.

The ancient Britons do not seem to have known the art of horse-shoeing. The first indications of this practice, so far as archæologists have been able to discover in England, belong to what is known as the Romano-British period. There is, therefore, little doubt that horseshoes were introduced into England by the Romans.

Specimens of these horseshoes, more or less preserved, have been unearthed in various localities. They appear to have been without toe-calks, but have heel-calks like our modern horseshoes. They have mostly three nail holes in each branch of the shoe, and instead of a groove in each branch, like the shoes of the present day, have large oval depressions for the heads of the nails. These depressions were evidently stamped in while the iron was hot, which operation spread the metal so as to form three distinct scallops on each side of the shoe.

The Anglo Saxon horseshoe was in its earlier forms a cumbrous and ill-shaped affair, not comparable in regularity of form to the Roman shoe; but its outer edge is not scalloped like the Roman shoe.

The art of horse-shoeing was considered of the first importance by the Normans, and those who excelled were employed in the royal establishment, and endowed with landed estates and titles of honor.

The efficiency of the horse in battle and his usefulness in times of peace, depending as they do in so great measure upon his being properly shod, justify the importance attached to this art in medieval as well as modern times. The saying of "Poor Richard," "For want of a nail the shoe was lost; for want of a shoe the horse was lost; for want of a horse the rider was lost;" has been verified in many a retreat, and many a traveler has been exposed to imminent peril by the loss of a shoe from the foot of his horse.

That interest in the further improvement of the horseshoe is not yet extinct is proved by the fact that we have illustrated and described within the past year or two several improvements of this kind, and a glance through the records of the Patent Office will show that nearly every year brings forth something of this sort. It is within the last quarter of a century that the extensive manufacture of horseshoes by machinery has been originated and developed, and the article has been much cheapened thereby. Thus this ancient device has probably not yet reached a point beyond the scope of inventive genius and skill, and the time may even come when the manufacture of malleable cast iron may be so perfected as to enable them to be cast at much less than their present cost, and of as good quality as those now made of wrought iron by machinery.

RECENT FOREIGN IMPROVEMENTS.

The removal of the dangers which attend the work of miners has given rise to many recent improvements in ventilating apparatus, safety lamps, etc. Among these we notice an English invention, in the application of which the gas is drawn off by fans, turbines, exhaust pumps, heat, or other mechanical means. Where gas is known to exist the inventor taps, or drills holes in the wall, and connects pipes to the holes, and then exhausts the gas by means before mentioned. He taps known blowers with a large hole either in the solid or at the fracture, but prefers the solid, as there is more certainty in governing the escape, and when it is unsafe for the gas to enter the ordinary air courses he provides pipes, sewers, or passages to allow it to flow away to a safe place, or to be collected in chambers and then drained off in non-working hours or otherwise, as convenient.

A firm in Bristol, England, have invented an improvement in fire-boxes for locomotives, whereby liquid hydrocarbons may be used as fuel. They construct a closed fire-box, or furnace, lined, by preference, with fire-brick or ganister, into which atmospheric air and liquid hydrocarbon are forced by a pump worked by the engine, for which purpose the hydrocarbons may be made to issue from a small pipe situated centrally inside the air pipe, the air and hydrocarbon being made to pass into one or more perforated tubes in the bottom lining into the furnace, from the perforations of which tube, or tubes, they issue through corresponding perforations in the lining into the furnace, where they enter into combustion. Or the air and hydrocarbon may be forced through separate pipes and apertures into the furnace. In the furnace are arranged walls or loosely piled pieces of fire-brick, with interstices between them, into which the flames and hot gases resulting from the combustion rise, so as to heat the fire-brick to a high degree, and thus produce a reservoir of heat.

A Vienna inventor has made a novel improvement in feeding boilers which consists in forming the water nozzle of injectors at that part immediately preceding and following the steam outlet with spiral grooves like the grooves of a rifle, but running out plain.

A curious English device is a wire packing for glands. The inventor constructs gland packing by coiling, rolling up, or twisting woven wire, such as wire gauze, upon a core, or or otherwise, until the coil or roll becomes of such a diameter that when bent in the form of a ring and passed around a rod into the gland it will fill up the space between the two. The sheet of woven wire may be coiled, rolled, or twisted either by hand or machinery and either in the direction in which the wires in the sheet are or in an angular direction, or the wire may be at once woven into a coil, roll, or rope, either in the form of rings of the required size or in lengths to be afterwards bent into the required form and size; the fibers of the wire gauze acting against the rod intercepts a certain portion of the steam, which condensing, remains there, and in that condition serves to lubricate the rod in its reciprocatory or rotary motion.

An invention in pulley blocks made in Sheffield, England, is worthy of notice. The inventor makes use of the well-known principle of the endless screw or worm and worm wheel, and by a novel arrangement of parts he makes them applicable to the purpose for which pulley blocks are ordinarily used, that is, for the purpose of moving or raising heavy weights; thus he makes by casting in malleable, or cast iron, or other metal, a worm wheel of the size required, and then by cutting or casting makes a worm or endless screw to correspond with and work into such wheel. He then makes either in cast or malleable iron, or by forging, a frame which shall contain the hook from which the whole is to be suspended, and likewise the above worm and wheel, the worm being carried in suitable bearings, either in the top or bottom of the frame, and the axis of the worm wheel in bearings in the side cheeks thereof.

An English improvement in dock gates is the formation of the caisson or dock gate in such a manner as to be able to admit water through holes or through a valve or cock in the bottom or lower part of the caisson or dock. The upper part of the same above the water is made air-tight, so that as the water is admitted the air in this upper part or chamber becomes compressed, or by opening a cock is allowed to escape. When it is desired to regulate the buoyancy of the caisson or gate, or empty it of water, the inventor closes this cock and opens another, or he uses a three-way cock, which answers the purposes of the two cocks, which shall be connected by pipes or flexible hose to a chamber of compressed air, or an air pump, and by either of these means compresses air into the space above the water, and thus drives or forces out the water through the holes, cock, or valve through which it entered at the bottom, and thus regulates the depth of immersion of the dock gate or caisson in the water or, if need be, drives out the whole of the water.

SCIENTIFIC INTELLIGENCE.

ALUMINA SALTS FROM CRYOLITE.

One hundred parts of finely pulverized cryolite are mixed with eighty-eight parts of quicklime stirred up to a thin liquid, and the whole is brought to boiling by steam in water tubs. As soon as the fluor-spar has settled, the clear lye is decanted and afterwards neutralized with commercial acetic acid, which operation will require about 236 parts of 6° B. After this has become entirely clear, two thirds of the solution (about 807 parts by weight) are drawn off, and when evaporated will yield pure acetate of soda. With the remaining mass is now one atom soda and one atom alumina, this is decomposed by one equivalent acetic acid and two equivalents sulphuric acid (46 parts of 1·83 specific gravity), and after thorough mixing the salt will form a soda alum with the formula $NaO, SO_3 + Al_2O_3, SO_3$ + acetic acid.

TO BLEACH STRAW.

After soaking in water, boil in a soda solution not so strong as to attack the fiber and bleach by immersion in Javelle water (solution of chloride of potassa—"U. S. Dispensatory)." Remove the smell of chlorine by sulphurous acid. The straw is said not to lose its luster and to remain permanently bleached.

ROLLING MILL SLAG.

This often contains as much as 51 per cent of iron, which is usually wasted. It is proposed to pulverize it, mix it with quicklime, and slake it; the silicic acid, it is thought, would combine with the lime and be liberated in this way, and the iron could be reduced in a furnace. The theory of the operation appears to be all right, and it only remains to prove it by experiment.

BY-PRODUCTS OF CHLORAL.

It is less than a year since chloral was proposed as an anæsthetic and hypnotic agent, and previous to that time a pound of it could not have been found in the world. Since its introduction in medicine, thousands of pounds of it have been manufactured, and the attention of chemists has naturally been called to the incidental products. Some of these are of a purely scientific character, while others can be used in well established industries. Chloral is made by passing chlorine gas for many hours through absolute alcohol; during the operation much hydrochloric acid is given off. This is such a cheap article that it is hardly worth saving, but there are certain ethers formed which can be converted into valuable colors analogous to the much-prized aniline tints made from benzole. The rapid way in which scientific discoveries are now spread abroad is nowhere better illustrated than in the way in which chloral was introduced and everything relating to it made known. There is probably no part of the civilized world in which this valuable medicine cannot now be obtained.

DETECTION OF LOGWOOD COLOR IN WINES BY MEANS OF NEUTRAL ACETATE OF COPPER.

J. Lapeyrère states that, while studying some of the properties of the coloring principle of logwood, he found that the hematine it contains yields a sky-blue color with salts of copper. In order to apply this test to wines for detecting if they are doctored with logwood, it is only necessary to place strips of good filtering paper, Swedish being preferred, into an aqueous solution of neutral acetate of copper, and, after drying, use one of these slips to test the wine suspected to be adulterated with logwood color, by dipping the paper into the wine; and, on removing it from that fluid, care should be taken to cause the adhering drop of wine to flow backwards and forwards over the paper, which is next rapidly but carefully dried. If the wine be as it naturally ought to be, the color exhibited after drying will be gray or rose-red grayish; but, if logwood is present, the tinge will be distinctly sky-blue.

ARTIFICIAL PRODUCTION OF ICE IN INDIA.

Dr. Janssen relates that, in many parts of the Indian Continent, the natives dig shallow pits in such localities which are quite freely open to the sky and distant from trees. The pits are lined with straw, and upon the straw are placed dishes (made of a very porous earthenware) filled with water. During the calm and clear nights prevailing during the period from November to the end of February, the water placed in the dishes freezes, yielding a solid cake of ice, while the temperature of the air is +10°. Dr. Janssen has investigated this curious subject experimentally, and has found that the freezing is principally due to the radiation during the night; but the evaporation of the water, aided by the porosity of the earthenware employed, is not to be overlooked, at the same time.—*Cosmos.*

Tobacco and its Adulterations.

According to John C. Draper, who contributes an able article, against the use of tobacco, to the *Galaxy*, for June, the adulteration of tobacco varies greatly with the character of the preparation. In that intended for chewing, it consists chiefly of molasses or common salt, rarely of leaves of other plants. In cigars and cut tobacco for smoking, it is by no means common, and consists usually of hay, paper, or leaves of the dock, rhubarb, cabbage, elm, and oak, all of which are, comparatively speaking, harmless. In snuff, on the contrary, adulteration is very common, and the substances used are, in many cases, exceedingly injurious, including such articles as chromate of lead, bichromate of potash, powdered glass, and different kinds of ochers or oxides of iron. The latter are nearly always found in the Scotch snuffs, and rarely occur in the Welsh and Irish.

According to Hassal, out of forty-three specimens, chromate of lead occurred in nine, nearly all of which were Scotch; red lead or oxide of lead in three; and bichromate of potash, which is very poisonous, in three, two of which were Scotch. The presence of the lead compounds mentioned has not unfrequently produced lead palsy in those who have used them, and it is of interest to the snuffing tobaccophagoi to note that these poisonous adulterations occur more frequently in Scotch snuffs.

The substances that give its active properties to tobacco are nicotine and nicotianine. The first is a colorless liquid alkaloid, soluble in water, ether, alcohol, and many oils, and possessing an offensive odor and an acrid, burning taste. It is a very dangerous poison, being almost as energetic as prussic acid, and destroying life in equally small doses, a single drop sufficing in the experiments of Dr. Taylor to kill a rabbit in three minutes and a half. In the well known case of the Count and Countess Bocarmé, this poison was administered by force to the brother of the Countess while dining with them at their château. In this instance death occurred in less than five minutes; and though attempts were made to remove the odor and traces of the poison, by pouring strong acetic acid or vinegar down the throat of the victim, and on his person, the possession of the poison and the circumstantial evidence indicated the guilt of the Count so strongly that he was executed for murder.

The proportion of nicotine in 100 parts of different kinds of tobacco dried at 212° Fah. is as follows:

Virginia	6·87	Lot	7·96
Kentucky	6·02	Lot-et-Garonne	7·34
Maryland	2·29	Alsace	3·21
Havana	2·00		

Nicotianine is a concrete volatile oil, sometimes spoken of as tobacco camphor. It is obtained by the distillation of the leaves, six pounds yielding about eleven grains of the oil. It has a bitter taste and the odor of tobacco, and produces the same effect on the tongue and throat as tobacco smoke. It is almost as deadly when applied externally as nicotine is when taken internally, its action being nowhere better described than in "Hamlet" when the ghost tells of the

> . . Juice of cursed hebanon, . .
> . . . . . .
> The leprous distilment, whose effect
> Holds such an enmity with blood of man,
> That, swift as quicksilver, it courses through
> The natural gate and alleys of the body,
> And with a sudden vigor it doth posset
> And curd, like eager droppings into milk,
> The thin and wholesome blood.

Landerer states that this oil does not exist in the fresh leaves, and Pereira remarks that it is probably formed by the action of the air in the process of drying. There is but little satisfaction to be drawn by the tobaccophagoi from these statements, even if they are admitted to be true, since the plant is invariably dried before it is used, and must therefore always contain the oil.

Tobacco smoke being the most common form under which the system is exposed to the action of this plant, it is necessary that we should examine into its composition. The results of many analyses show that while the alkaloid disappears almost entirely in the smoke, the oil is increased; it therefore follows that in chewing, the effects will be chiefly those produced by nicotine, while in smoking nicotianine will be the more active ingredient. In addition to the oil, it has been recently stated that prussic or hydrocyanic acid exists to an appreciable extent in tobacco smoke. This is a possible, but probably exceptional product, its presence being dependent upon some peculiarity in the manner of combustion.

Poisonous Cosmetics.

[Condensed from the American supplement of the Chemical News].

In December last Dr. Lewis A. Sayre inclosed to Dr. Harris, Sanitary Superintendent of the Metropolitan District, a pamphlet in which he described three cases of lead palsy produced by Laird's Bloom of Youth. This communication was laid before the Board of Health, together with notes from Dr. Harris and Sanitary Inspector Dr. Janes, in which attention was called to the great variety and large quantities of poisonous hair dyes, commonly called hair restoratives, etc., consisting essentially of acetate of lead, and enamels consisting of carbonate of lead, which were sold in the Metropolitan District.

The Board at once directed the chemist, Dr. C. F. Chandler, to investigate the subject, and his report, which is here presented, fully confirms the opinions of the physicians. It was found, however, in the course of the investigation, that Laird's Bloom of Youth, the original cause of the investigation, no longer consisted of carbonate of lead, but was composed of oxide of zinc. As soon as this was established by the report, the proprietor, who had admitted to the writer that his preparation had formerly consisted of a lead compound, complained with an air of injured innocence that the Board of Health *had inflicted a great wrong upon him, had almost ruined his business.* Articles have been inserted in the daily papers, in the interest of the Bloom of Youth, which reflect upon the chemist to the Board, as though he had wantonly, or by mistake, attacked an innocent citizen, and interfered with an honest business. We hold that inasmuch as the Bloom of Youth has been for years composed of carbonate of lead, and we know this of our own knowledge, as a bottle was purchased about two years ago, at a drug store on Broadway, and tested at the School of Mines, which had this composition, and as, according to Dr. Sayre and Dr. Hammond, this preparation had produced lead palsy, the proprietor of the article has no just claim for sympathy, even though he has finally, after so much harm has been done, changed its poisonous character.

In response to the resolution of the Board, directing "the chemist to examine the various hair tonics, washes, cosmetics and other toilet preparations in general use, and report what ingredients, if any, they contain of a character injurious or dangerous to those who use them," examined and reported upon various hair tonics, washes, and restoratives; lotions for the skin; enamels; white powders for the skin.

Sixteen were examined, and, with but one exception, all were found to contain lead, generally in the form of acetate or sugar of lead, which metal seems indeed to be the *essential constituent* in most cases. Most of the sediments observed in the bottles, and which require that the bottle "*be well shaken,*" etc., consist of sulphur, which is intended shall ultimately unite with the lead, to produce the dark-colored sulphide of lead, or, as one of the manufacturers has it, "*the original youthful beauty and color.*" The following tabular statement shows how the poisonous hair nostrums compare among themselves:

GRAINS OF LEAD IN ONE FLUID OUNCE.

1. Clark's Distilled Restorative for the Hair	0·11
2. Chevalier's Life for the Hair	1·02
3. Circassian Hair Rejuvenator	2·71
4. Ayer's Hair Vigor	2·89
5. Prof. Wood's Hair Restorative	3·08
6. Dr. J. J. O'Brien's Hair Restorer of America	3·28
7. Gray's Celebrated Hair Restorative	3·39
8. Phalon's Vitalia	4·69
9. Ring's Vegetable Ambrosia	5·00
10. Mrs. S. A. Allen's World's Hair Restorer	5·57
11. L. Knittel's Indian Hair Tonique	6·29
12. Hall's Vegetable Sicilian Hair Renewer	7·13
13. Dr. Tebbett's Physiological Hair Regenerator	7·44
14. Martha Washington Hair Restorative	9·80
15. Singer's Hair Restorative	16·39

With the exception of Perry's Moth and Freckle Lotion, lotions for the skin were found entirely free from lead or other injurious metals.

Seven enamels for the skin consist of white powders suspended in clear liquids; on standing the powders subside, but agitation quickly incorporates them with the liquids again. The following contain lead, mostly, if not entirely, in the form of *carbonate;* they are therefore simply "white lead" ground in water.

GRAINS OF LEAD IN ONE FLUID OUNCE, AFTER SHAKING.

Eugenie's Favorite	108·94 grains.
Phalon's Snow-White Enamel	146·28 "
Phalon's Snow-white Oriental Cream	190·99 "

Seven white powders consist of carbonate of lime, carbonate of magnesia, clay, or "French chalk," either singly or mixed. Nothing injurious was detected in any one of them.

It appears therefore that the hair tonics, washes, and restoratives contain lead in considerable quantities; that they owe their action to this metal, and that they are consequently highly dangerous to the health of persons using them.

That with a single exception, Perry's Moth and Freckle Lotion, which contains corrosive sublimate, the lotions for the skin are free from lead and other injurious metals.

That the enamels are composed of either carbonate of lime, oxide of zinc, or carbonate of lead, suspended in water. The first two classes of enamels are comparatively harmless, as harmless as any other white dirt when plastered over the skin to close the pores and prevent its healthy action. On the other hand, the enamels composed of carbonate of lead are highly dangerous, and their use is very certain to produce disastrous results to those who patronize them.

The white powders for the skin are harmless, except in so far as their application may interfere with the healthy action of the skin.

A Huge Mastodon.

A correspondent informs us that a huge mastodon has been found four miles from Tecumseh, Mich., on the farm of Mr. Wells Goheen. The tusks were exhumed first, but like some of the bones, were too much decayed to be kept whole; but the forms were perfect in the clay, so that the size and shape were taken perfectly.

The tusks are ten feet long, besides two or more feet that entered the skull, which was detached. Their diameter at base was 9½ inches, sections of skull are 2 inches thick, a section of the vertebræ measured 18 by 10 inches, but a portion was decayed and crumbled off, so that a full measurement could not be had, but it was originally 24 inches across. One tooth measures 8 by 4½ inches, and weighs 6 pounds. The thigh bones are 3 feet, 10 inches long, 11½ inches wide at the upper, and 10 inches at the lower end. Ribs 6 feet in length. A tooth, all perfect, in a section of the lower jaw, was found under an oak tree. The circumference of the tree was five feet. Tibia, 2 feet, 6 inches long; the bones are much scattered, only about half are yet found, but Dr. E. Hause, who has the matter in charge, is determined to get all that he can of the monster and send it to the State University of Ann Arbor, Mich.

It is supposed by some scientific men that, as the ground around where the bones were found ascends or rises 1 foot to the hundred with soil heavy, and with 2½ feet of clay and muck over the bones, that the animal died two thousand years ago. As the bones are much broken, they evidently lay uncovered many years.

By the bones found our correspondent judges the mastodon to have been very large, perhaps the largest yet found. The length 30 feet, hight from 13 to 15 feet, and very old, as some of the five teeth found are much worn. A portion of one tusk is 4 feet long; the balance (one or two bushels) is in small pieces.

SAYS Max Müller "for the discovery of truth there is nothing so useful as the study of errors, and we know that in alchemy there lay the seed of chemistry, and that astrology was more or less a yearning and groping after the true science of astronomy.

GEORGIA STATE FAIR.

We are indebted to Messrs. Glenn, Wright & Co., Commission Merchants and Manufacturers of Agricultural Machinery at Atlanta, Georgia, for the premium list of the State Agricultural Society of Georgia, with regulations, special notices, etc. The fair will commence October 19, and close October 26, of the present year. A fine list of premiums is offered in the department of Mechanics' and Farming Implements, as also in Chemical Manufactures and Minerals. Competition is restricted on some articles to Georgia, but on most it is open to all the States. Those desiring to avail themselves of this opportunity to introduce improvements adapted to Southern agriculture, would do well to communicate with the Assistant Secretary, Thomas C. Howard of Atlanta, Ga.

The manufacturers of machines, implements, instruments, tools, etc., are requested to send their latest published illustrated catalogues and price lists. The Secretary requests the contribution of specimens of their machines, etc., for preservation and permanent exhibition in the Museum, upon such terms as to expense of thus advertising for the manufacturers as may be agreed upon with the Secretary. The arrangement of the office and museum will be designed for the exhibition and advertisement to the best advantage of all articles thus intrusted to it. The Secretary will send on orders to the manufacturers for all articles sold by this means of advertisement without commission charged either to the manufacturer or the purchaser. The intention being to make the office and museum a convenience to the members of the Society in making examination and purchase of all articles submitted to it.

A PNEUMATIC TUBE FOUR HUNDRED MILES LONG.

Under this heading a statement is going the rounds of the newspapers, purporting to come from a correspondent of the Boston *Transcript*, relative to a pneumatic tube, said to extend from Glasgow to London, the operation of which was witnessed by the correspondent. He says:—"I inquired if I might see a message sent. 'Oh yes, come round here.' He slipped a number of messages into the pasteboard scroll, popped it into the tube and made a signal. 'I put my ear to the tube, and heard a slight rumbling noise for seventeen seconds, when a bell rang beside me, indicating that the scroll had arrived at the General Postoffice, four hundred miles off! It almost took my breath away to think of it."

We are sorry to be obliged to take the breath out of this story, which seems to be very popular, and everybody wishes it were true.

But, in the first place, there is no pneumatic tube between Glasgow and London. Second, if there were one it would be impossible, by any known means, to cause air to pass through it, at anything like the velocity above stated. Four hundred miles in seventeen seconds, is at the rate of over eighty-four thousand miles an hour. This is a hundred and forty times faster than a cannon ball, which flies 600 miles per hour.

NATIONAL EXHIBITION OF THE ARGENTINE REPUBLIC.

We are in receipt from Mr. Henry I. Zimmermann, one of the directors of the National Exhibition, to be held at the city of Cordova, Argentine Republic, commencing on the 15th of October next—of several copies of the regulations and instructions for foreign exhibitors.

It is hoped that United States manufacturers will be well represented, as there is a probability that from European states there will be a considerable display.

Mr. Zimmermann suggests that all kinds of agricultural instruments of the most improved patterns, as also brick machines, locomotive engines, fire engines, enameled slate mantels, etc., be sent.

Mr. Evans, C. E., Exchange Buildings, New York, who has had much experience in locomotives on the west coast, will be able to furnish any information required respecting the class of engines most suited for the country.

Further information may be obtained on application to Mr. Edward F. Davison, Argentine Consul, New York.

REDUCTION OF THE PUBLIC DEBT.

The report comes from headquarters that during the month of May the public debt of the United States was reduced fourteen million dollars. The Secretary of the Treasury seems determinrd to expend, if not exhaust, the energies of the country in the payment of the debt. On general principles we doubt the wisdom of this policy, and its justice is, to say the least, very questionable. The present generation has already borne its share of the great burden imposed by the recent war. Some regard ought to be shown to the interests of the people at the present time, and a portion of the burden transmitted to posterity.

THE Industrial Classes of the United States have been the subject of a long and interesting report by Mr. Francis Clare Ford, Secretary of the English Legation, at Washington. This report was made in pursuance of a circular addressed by Lord Clarendon, in April, 1869, to the diplomatic and consular agents of Great Britain, instructing them to report upon the condition of the industrial classes in the countries to which they were accredited. Mr. Ford says that the American system of common school education has elevated the condition of the native-born working man, and has disposed him to prefer occupations in which the exercise of the brain is in greater demand than those of the elbow, and asserts that the steady influx of immigrants for the last twenty years has created a disinclination on the part of American workmen to engage in the rough toil of purely muscular labor which the newly-arrived foreigner is ready to exert for his support.

PATENT OFFICE AFFAIRS.

The business of the Patent Office is now in a flourishing condition, and the present is a favorable time to enter applications. Inventors will find the SCIENTIFIC AMERICAN PATENT AGENCY ready to attend to the prosecution of claims with the greatest dispatch. By reference to our register, we find that we have made upwards of twenty-four thousand preliminary examinations into the novelty of alleged new inventions. This great experience, together with the fact that a large proportion of all the business with the Patent Office, for the past twenty years, has been conducted through this Agency, suggests to inventors the surest and best means to secure their rights.

We give opinions free, and all we require is a rough sketch and description of the invention.

Inventions patented through this Agency receive notice in the SCIENTIFIC AMERICAN.

MODELS.—In order to apply for a patent the law requires that a model shall be furnished, not over a foot in any of its dimensions, neatly and substantially made. Send the model by express, prepaid, addressed to Munn & Co., 37 Park Row, New York, together with a description of the operation and merits of the invention.

CAVEATS.—Whenever an inventor is engaged in working out a new improvement, and is fearful that some other party may anticipate him in applying for a patent, it is desirable, under such circumstances, to file a caveat, which is good for one year, and, during that time, will operate to prevent the issue of a patent to other parties for the same invention. The nature of a caveat is fully explained in our pamphlet, which we mail free of charge.

EUROPEAN PATENTS.—Probably three-fourths of all the patents taken by American citizens in Europe have been secured through the SCIENTIFIC AMERICAN PATENT AGENCY. Inventors should be careful to put their cases in the hands of responsible agents, as in England, for example, the first introducer can take the patent, and the rightful inventor has no remedy. We have recently issued a new edition of our Synopsis of European Patent Laws.

All communications and inquiries addressed to Munn & Co., respecting patent business, are considered as strictly confidential.

A Shower of Shell-Fish.

Our authority for the following account is a recent number of the *American Naturalist*. Mr. John Ford exhibited to the Conchological Section, Academy of Natural Sciences, Philadelphia, specimens of *Gemma gemma*, remarkable as having fallen, accompanied by rain, in a storm which occurred at Chester, Pennsylvania, on the afternoon of June 6, 1869. The specimens were perfect, but very minute, measuring one-eighth inch in length by three-sixteenths of an inch in breadth. Though most of the specimens which fell were broken, yet many perfect ones were collected in various places, sheltered from the heavy rain which followed their descent. A witness of the storm, Mr. Y. S. Walter, editor of the *Delaware County Republican*, assured Mr. F. that he noticed the singular character of the storm at its very commencement, and, to use his own words, "it seemed like a storm within a storm." A very fine rain fell rapidly, veiled by the shells, which fell slower and with a whirling motion. Judging from the remains of animal matter attached to some of the specimens, together with the fresh appearance of the epidermis, it is highly probthat many of them were living at the moment of transition. This minute species resembles a quahaug shell, and is common on the seashore between tide marks.

THE imperial printing office at Constantinople is becoming an important institution. The "Arabian Nights" can now be printed amidst the scenes they describe. What genii ever accomplished more? At this office sixteen steam printing presses are now employed, besides several excellent lithographic presses, and a correspondingly large staff of compositors. In addition to the official paper, the *Takvimi Vaki*, and all the government work, it prints a number of commentaries on the Koran and other religious publications, as also general job work for the public. It has recently published two works of special interest, the Arab text of "Abulfeda's History of the Caliphs."

A NUGGET of pure copper, weighing 117 pounds, was discovered in an Iowa field the other day. It had been kicked about for years, under the supposition that it was a stone. Finally, the tooth of a harrow scraped against it, making a bright streak, which revealed its true nature. It is pure metal without the least alloy, stone, or quartz. The locality where discovered is in Cedar township, Monroe county, and hopes are entertained that extensive deposits may underlie the whole region.

STEEL needles first came into England from Spain and Germany. They were first manufactured in London by a German, in 1565.

VIOLINS were invented in 1477, and introduced into England by Charles II.

The Universal Wringer—It gives us pleasure to call special attention to the "Universal Clothes Wringer." We have had it fairly tested, and are, therefore, able to speak of it with confidence, as an article of real and substantial merit, which only needs to be known to become what its name imports, "Universal," in its use, and in the approval with which it shall be received.—[New York Christian Advocate.

Facts for the Ladies.

On the 14th of February, 1854, my husband made me a present of a Wheeler & Wilson Sewing Machine. For nearly fifteen years it has done its work (hundreds, yes, thousands of dollars' worth), and is this day as perfect a sewer as when I first got it. It has never been the least out of repair. During the war I kept one needle in constant use, and I have more than half the original dozen of needles given with the machine on its purchase.

Business and Personal.

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 10c. a line.

Situation Wanted, by a sober, steady man, in a Petroleum Oil Refinery. Understands repairing and keeping machinery in good working order. Address A. Hall, P. O., Williamsburgh, L. I.

For Sale Cheap—1 set Hamilton's Patent Muley Hangings. address Morrison & Harms, No. 386 River ave. Allegheny City, Pa.

For Fourneyron and Jonval Turbine Water Wheels, Mill-work, Shafting, Pulleys and Hangers, apply to J. Cornell & Co., Sandy Hill, N.Y.

For the best Upright Saw Mill, in the world, address Morrison & Harms, No. 386, River ave., Allegheny City, Pa.

Everybody who uses the Broughton Oil Cups speak of them very highly. They are manufactured only by H. Moore, 41 Center st., N.Y.

A valuable patent for cutting files. A Machine in operation. For sale on reasonable terms. E. F. Rost, 22d st. and 2d Avenue, New York.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

Rawhide Carriage Washers are cheaper than leather, and run with less noise than any other. Darrow Manufacturing Co., Bristol, Conn.

Manufacturers of Galvanized Wrought Iron Pipe, and of Rubber Hose, send price lists to A. P. Smith, Rock Falls, Ill.

Parties wishing to manufacture a good article, which will find ready sale, at good profit, should address N. Evinger, Sandford, Ind. See advertisement on another page.

Scientific American.—Back Nos., Vols., and Sets for sale. Address Theo. Tusch, City Agent, 37 Park Row, New York.

Owners of Patents address circulars to Robinson & Beard, Kaufman, Texas.

$100 a day can be made by selling Lloyd's new dollar double maps of America and Europe. See advertisemet on last page.

Pictures for the Sitting Room.—Prang's latest Chromos, "Flowers of Hope," and "Flowers of Memory." Sold in all Art and Book Stores throughout the world.

Tempered Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

Shop, Town, County, or State Rights for sale, for Patent Coal Scuttle. For circular, etc., address T. T. Markland, Jr., 1515 South st., Philadelphia, Pa.

Galvanized iron ventilating skylights, straight and curved extension lights, conservatories, etc., under patents dated 1869-70, are approved by every architect. For Rights address Geo. Hayes, 75 8th ave., New York.

Spools of all kinds, and spiral shade tassel molds made by H. H. Frary, Jonesville, Vt.

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 61 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

L. L. Smith, 6 Howard st., N. Y., Nickel Plater. First Premium awarded at the late Fair of the American Institute. Licenses granted by the United Co., 17 Warren st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-ton propellers, and two Martin boilers, very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

Stiff, heavy, powerful lathes, planers, shapers, slotters, and radial drills, in stock. E. & A. Betts, Wilmington, Del.

Second-hand donkey pumps, 12, 25, and 35-H. engines, leather hose, old style blowers, cocks, valves, etc., etc. Wm. D. Andrews & Bro., 414 Water st., New York.

Steel Makers' Materials—Wolfram ore, oxide manganese, Speigel iron, borax, titanium, chrome, lubricating black lead, for sale by L. & J. W. Feuchtwanger, 55 Cedar st., New York.

An experienced mechanical and railway engineer wishes a position as Master of Machinery, or Manager. Address "Engineer," Station "G," Philadelphia, Pa., Postoffice.

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

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Caldwell's Dryer dries Brick, Fire Brick, Tile, Peat, Whiting, etc., as fast as made. J. K. Caldwell & Co., Philadelphia.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming; 12 years in use. Beware of Imitations.

Answers to Correspondents.

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

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

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

T. K. P., of Mass.—A steel horseshoe magnet may be charged by drawing the poles of another magnet from the poles of the first magnet to the bend, first connecting the poles of the magnet to be charged by its keeper or armature. Or place the poles of the magnet to be charged in contact with one already charged, laying both on a flat surface, and draw a bar of soft iron from the poles of the magnet to be charged toward the bend, keeping the bar in contact with both legs of the magnet, and repeating the process several times, after which turn over the magnet and perform the same operation on the other side. The latter process makes the strongest magnet. There are several other ways besides those described.

G. F. S., of N. Y.—The horse power of boilers depends upon the proportion of grate to heating surface, upon the heating surface, and the efficiency of draft. Assuming all these to be correctly proportioned, it is common to estimate 10 square feet of heating surface as being equal to the development of a horse power in land boilers. But when steam is used expansively, in the best engines this estimate will be found too large in a well constructed boiler. You will see that you have given no data whereby the horse power of your boiler can be estimated.

C. B., of Tenn.—We think an ice machine of the construction you propose might work, but how economically is a question which experiment only can determine. Your second query we cannot fully understand. Please state it more specifically. We think iron and steel might be made in the manner proposed, but there are no doubt practical difficulties which would need to be surmounted, and which only an experiment on a full scale can determine.

O. C., of Tenn.—Whether it will injure a steam boiler to let water stand in it a month when not in use, depends upon the character of the water. More or less rusting would take place with most kinds of water used in boilers. Your second query cannot be answered from the data given.

S. H., of N. Y.—The substance which collects about the manhole of your boiler is scale of carbonate of lime with organic matter. The substance collected from the wall appears to be nitrate of soda. Its exact composition can only be determined by analysis.

J. S. G., of N. Y.—A letter addressed to P. M. Parsons, in care of the editor of *Engineering*, London, England, will probably secure any further information you desire in regard to the white brass, described on page 343, current volume.

H. M. C., of Cal.—The table referred to is probably founded upon the law of falling bodies as mentioned in Bourne's Handbook of the Steam Engine, page 219. The same law is applicable to draft of chimneys. See Silliman's Physics, page 481.

G. E., of Stuttgart.—It is not uncommon in this country to raise and move brick houses of even larger dimensions than the one you name, the occupants meanwhile remaining in the building, and attending to their usual avocations.

C. M. H., of N. Y.—If we understand your query and diagram there would be more power obtained by exposing the sides of the collapsing cylinder as well as the piston, than by simply submitting the piston to pressure.

E. P. W., of Me.—Apothecaries generally use a paste made of gum tragacanth dissolved in water. Book-binders make use of a cement made of gum dextrine (British gum) dissolved in water.

J. F. K., of Pa.—You should send to some book store and procure a work on taxidermy, which will furnish you the information you desire.

C. C. B., of Pa.—The mineral you send is sulphuret of iron, of no value.

Recent American and Foreign Patents.

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

DREDGE.—Andrew M. Hansen, Stockton, Cal.—The invention consists in cutting plates, placed at the ends of a revolving drum or chain wheel, or its journal, located at the lower extremity of the dredge frame; and cutting point or plows placed between the cutting plates, and attached to plates that are secured to the endless chain which revolves around said frame when said cutting plates and points are arranged to throw earth inward directly in the path of the buckets attached to the endless chains intermediately with the plates that bear the cutting points, in order that such buckets may have only loose earth to scoop up. This invention may be found advertised on another page.

SEED SOWER.—Samuel A. Scott, Griffin, Ga.—This invention consists in the combination of a box for containing seed, guano, etc., with a rock shaft furnished with pins and working in the slot in the bottom of the box, so as to keep the passage open, a shovel plow, for running furrows, in which the seed may drop, and hoes, for covering the seed after it has fallen into the furrow.

FRUIT DRYER.—John Hildebrand, Taneytown, Md.—This invention consists mainly in the combination of pans for holding fruit, whose bottoms are perforated, with drums which communicate with the pipe by which the products of combustion are conveyed away from a furnace, when the drums are so located as to radiate heat into the pans for the purpose of drying the fruit—the pans, drums, and furnace being inclosed within a suitable case.

SKATE FASTENING.—Moses Kinsey, Newark, N. J.—This invention has for for its object to provide a simple and reliable means for operating the toe clamps of skates, and consists in the peculiar arrangement of two pairs of pivoted levers, and in the combination therewith of the sliding clamps.

LOCK NUT.—Ulysses B. Vidal Philadelphia, Pa.—This invention has for its object to so construct nuts that the same may be readily locked, to prevent their working loose on the bolts. For railroad rails and cars, the invention is particularly applicable, as the jar of the moving trains is apt to work the nuts loose.

SHUTTLE THREAD-GUIDE AND TENSION.—M. C. Hawkins, Edinboro, Pa.—This invention relates to improvements in attachments to sewing-machine shuttles, for guiding the thread, and regulating the tension thereof, and consists in the application to a bar set in the shuttle at the top, near one side, and parallel therewith, and hinged or pivoted at one end, of a curved thread guide, arranged to cause the thread to be delivered from the bobbin in lines perpendicular to the axis; and a spring tension plate and adjusting screw, so arranged that the tension may be adjusted without removing the shuttle from the race.

FRICTION CLUTCH.—Orrin Lull, Rochester, N. Y.—The object of this invention is to provide suitable means for throwing in and out of gear various kinds of machinery by means of friction, and it consists in moving laterally (by means of proper connections) a friction disk, so that an annular ring, attached to the pulley or gear wheel, is griped, for forming the connection or throwing machinery into gear

METAL TIP FOR SHOES AND BOOTS.—M. Pettingill, Le Roy, Minn.—This invention relates to a new and improved method of constructing copper and other metal tips for the toes of shoes and boots, and it consists in constructing the tip with tough malleable wires attached to its ends, and fastening the tip to the shoe or boot thereby.

STRAW STACKER.—O. Farrall, Daniels & Co., Piqua, Ohio.—This invention consists in the attachment of a straw stacker to a thrashing machine, in such a manner that it may be transported from place to place without being detached from the machine. It also consists in a straw stacker made in two or more sections, hinged together in such a manner, that the upper section or sections may be extended in line with the lower one, for use in connection with a thrashing machine, or may be folded under the lower section, and secured there safely for transportation without being detached from the machine.

BOLT THREADER.—G. W. Mingus, Pomeroy, Ohio.—This invention relates to an improved screw-thread cutter for threading bolts, and consists in a pair of die-carrying pieces hinged to a hollow mandrel, near one end, and arranged for their free ends, which project beyond the end of the mandrel, to work in a slotted transverse bar, or it may be a disk, having a set screw at one end of the slot, and an eccentric bar at the other, working against the outer faces of the die-carrying jaws, to hold them up to the work. The set screw makes the adjustment for the size of the bolt, and the eccentric releases the jaws to discharge the finished bolt. A solid die or wrench may be applied in place of the screw-cutting die, to turn a tap for tapping nuts.

MANUFACTURE OF GLOVES.—John L. Whitten, Essex, Vt.—This invention relates to improvements in the manufacture of gloves, the backs of which are made of woven stuff, and the fronts of leather, the leather also covering the sides, and, partially, the backs of the fingers; and it consists in arranging the leather, which partially covers the backs, and covers the sides of the fingers, so as to tip the fingers, at the ends, with leather, extending over the back of the finger in a manner to better protect the woven stuff of the back, and to avoid the converging of the seams by which the cather backs or sides, and the woven stuff backs are joined, at the tips of the fingers, which are greatly exposed to wear, and soon rip and fray out, spoiling the glove, while the other parts are good. It also consists in improved patterns for cutting these leather parts for the sides, and for partially covering the backs of the fingers. It also consists in cutting the leather side or back for the first finger, together with the leather front, for the same, and is an improved pattern for the same.

MEDICINE CASE.—Alphonzo Button, Dunkirk, N. Y.—This invention relates to improvements in the construction of medicine cases of that class wherein a web of canvas, leather, or other substance for the attachment of the vials, papers, or other things to be carried in the case, is attached to a spool, and wound on and off through a slot in a circular case; and it consists in the application to either one or both of the heads of the spools, in recesses in the said heads, of coiled springs, for winding up the web, and ratchet wheels and spring pawls to hold the springs when the webs are drawn out. It also consists in the arrangement of the web for holding small medicine vials, to be wound up with it on the reel; and the application thereto of a pocket-book.

HAWSE-HOLE COVER.—R. Liston, Albany, N. Y.—This invention relates to improvements in devices for closing the hawse holes of vessels to keep the water from beating upon the deck; and consists in the arrangement upon the inside of the bulwarks, of a circular, or other shaped cover, composed of two equal parts, hinged at the opposite sides, and meeting at the center, where recesses are formed in the edges for filling snugly around the two parts of the link of the cable when closed. One part is provided with a latch which swings down into catches on both parts to hold them closed, and both are provided with packing substance on the side towards the hole, also with hinge points which may be readily disconnected in cases of emergency.

ORE SEPARATOR.—Geo. Copeland, Denver, Colorado.—This invention relates to improvements in an ore separating apparatus, and consists in new and improved means for subjecting the pulverized ore to the action of distributed gusts of air, as it falls from a sieve to a hopper below, by which the gangue is prevented from falling with the heavier particles, and is thrown back to be thrown off by skimmers, and the dust is caused to be taken up by suckers and delivered to water spray for being moistened and conducted to a receiver, and retained for further operation.

HEMMERS.—M. C. Hawkins, Edinboro, Pa.—This inventon relates to improvements in hemmers for sewing machines, and consists in an improved arrangement on a notched plate, of the folder and tongue, whereby the cloth may be inserted more easily at the beginning, and without requiring the corner to be trimmed off; also, whereby a greater number of folds of the hem may be made. The invention also comprises an improved arrangement of the hem guide, whereby the hemming in circular lines is facilitated.

MODE OF FORMING GLASS INSULATORS.—J. M. Brookfield, Brooklyn, N. Y.—This invention relates to an improved mode of constructing glass insulators with internal screw threads for screwing them to their supports on the telegraph poles, and consists in forming the said threads by screwing a screw threaded former into the glass while in the mold, by which the exterior shape is formed, and while the glass is in a plastic state; the said former at the same time either wholly forming the socket in the glass, or giving the finishing shape to a socket previously partly formed, by a smooth plunger forced into the glass and withdrawn. The invention also comprises the combination with the former of a follower for pressing down into the top of the mold to prevent the overflow of the glass, and to give form to the bottom of the insulator.

COMBINED SAW SET, AND COW'S TAIL HOLDER.—J. Knight, Whitestown, N. Y.—This invention has for its object to furnish a simple and convenient device for holding a cow's tail while she is being milked, and which shall be so constructed as to be readily adjusted for use as a saw set.

STEAM PLOWS, ETC.—William Beckett, Kingston, Jamaica.—This invention has for its object to furnish an improved steam plowing apparatus, which shall be so constructed as to do its work thoroughly and well, and which shall be so constructed that it may be used as a power for various other agricultural and mechanical purposes.

PLATFORM SCALE—Albert Assmann, Rahway, N. J.—This invention relates to a self-indicating platform scale, which is made to operate entirely without the use of springs, and which is sufficiently simple to be sensitive to small weights.

TAR RESINATE.—F. M. Hillstream, Lawrence, Kansas.—The object of this invention is to prepare coal tar in such manner that it may be used for building, and for many purposes for which metal, clay, or other minerals are now employed.

SIPHON.—Seth C. Catlin, Cleveland, Ohio.—This invention relates to a new and useful improvement in siphons for drawing or transferring liquids from one vessel to another, and for all the purposes for which siphons are used, and it consists in an extension tube and valve chamber above the crown of the siphon.

DOOR KNOBS.—George Jones, Peekskill, N.Y.—This invention relates to a new and useful improvement in knobs for doors, and consists in an exterior open work, metallic, hemispherical outer end, and an interior hemisphere or plate of other forms of metal or other material, and in making the bulb or knob of two hollow hemispherical parts with one intervening hemisphere or semi-bulb or plate.

STEAM PLOW.—M. N. Lynn, New Albany, Ind.—This invention relates to improvements in steam machines for drawing plows, and other uses, and consists, first in an improved construction of the frames, mainly of tubing, for the purpose of providing the greatest amount of strength with the least weight of metal; also for utilizing the space within the main tubes of the frame for water tanks, for containing the supply water for the boiler; second, in an improved arrangement of the engines, propelling shafts, and gears with the frame and driving wheels, having for its object to work an economy and simplicity of construction; and, third, the invention consists in the combination with the traction wheels of a series of pushing legs of peculiar construction and arrangement, as auxilliary to the said traction wheels for use in soft ground, or at any time when the said wheels fail for any cause to adhere sufficiently.

RECTIFYING APPARATUS.—Luke S. Snediker, New York city.—This invention relates to a new apparatus for disturbing and heating the alcoholic liquors and the coal in rectifying machinery, so that thereby the absorption of the fusel oil will be more rapidly and thoroughly produced. The invention consists in constructing the agitating machinery with hollow arms, through which steam is conducted into the liquor, so that thereby both the heating and the agitating device will be most intimately connected.

COAL SCUTTLE.—Charles Hodgetts, Williamsburgh, N. Y.—This invention has for its object to provide a coal scuttle with a strong bottom and lower part, and a convenient fastening for the bottom and foot. The invention consists in fitting the bottom with an upward projecting flange into the scuttle and upon the supporting base, and in riveting it to the said base.

HOISTING JACK.—Edwin A. Castellaw, Savannah, Ga.—This invention relates to a new and useful improvement in a jack for hoisting weights or heavy bodies.

CAN-SOLDERING APPARATUS.—Jacob Gulden, Keyport, N. J.—This invention relates to a new apparatus for soldering the seams of sheet metal cans, and consists in the use of a tubular furnace, which is combined with sliding soldering irons that work in the tubes for the purpose of being heated therein. The invention consists also in the application to the apparatus of a set of springs for holding the cams on the blocks that are prepared for them on the sides of the furnace.

NEEDLE THREAD TENSION.—M. C. Hawkins, Edinboro, Pa.—This invention relates to improvements in needle-thread tension devices for sewing machines, and consists in an arrangement in the axis of a short tube, suitably constructed and arranged for attachment to the needle-supporting arm of the machine transversely thereof; of an adjusting screw carrying two tension plates or disks at one end of the tube, and having within the tube an adjusting nut and tension spring, so arranged that by turning the screw which has a milled head at the ends supporting the tension plates, the tension may be varied as required, the said nut being capable of moving along the screw in the tube, but incapable of turning with it. The tube is also provided with a guide arm through which the thread passes to the said tension plates.

LOG LOADER.—John Harvey, Chanticleer, Ohio.—The object of this invention is to provide efficient means for loading or rolling logs or other heavy weights (more especially saw logs), but applicable to other purposes.

SEAT HOLDER.—Johiel Jackson, Columbus, Wis.—This invention has for its object to furnish an improved holder for holding the rails of a seat while being made, and which may be adjusted for holding larger or smaller seats, as may be required.

CHURNING APPARATUS.—Nathan S. Hazen, La Fayette, Ind.—This invention has for its object to furnish an improved churning apparatus, which shall be simple in construction, and effective in operation, doing its work quickly and thoroughly.

COMBINATION TOOL.—George W. Stockwell, Natchez, Miss.—This invention relates to a new household tool, which contains a majority of the devices generally required for domestic purposes. The invention consists in the combination of a handle, hammer, and clamping screw with several other useful instruments.

WHEELS FOR TINNERS' BEADING MACHINES.—Benjamin S. Partridge, Pilatka, Fla.—This invention has for its object to provide machinery by which the shoulder required at the lower part of a coffee machine dripper can be formed: and also, the lower edge turned in, without requiring the addition to such dripper of an extra lower piece.

LIFE BOATS.—Theophile Masac, Good Hope Plantation, La.—This invention has for its object to furnish an improved life boat, strong, simple in construction, and effective in use, and which shall be so constructed that it may be closed up into small compass, adapting it to be taken by the passenger into his private cabin, and kept stacked, ready for an emergency.

PONY CARRIAGE PHAETON.—John C. Ham, New York city.—This invention has for its object to improve the construction of pony carriage phaetons, so that the rumble, or servant's seat may be removed from its place in the rear of the carriage body, and placed beneath said body in such a way that when thus placed it may not disfigure the carriage, but rather increase the beauty of the lines of the carriage, and improve its appearance.

MACHINE FOR ENGRAVING, DRILLING, ETC.—Charles J. Coulter, Seville, Ohio.—This invention has for its object to furnish an improved machine which shall be so constructed and arranged that it may be used for engraving, for which use it is especially designed, for drilling straight or oblique holes, and for various other uses.

PIPE JOINT.—Robert B. Coar, Jersey City, N. J.—This invention has for its object to furnish an improved pipe joint, which shall be so constructed that should the joint be found to leak, the water may be drawn off and the joint packed with soft metal from the inside of the pipe.

NUT LOCK.—Henry Beagle, Jr., Philadelphia, Pa.—This invention has for its object to furnish an improved nut lock, designed more especially for locking the nuts of fish plate bolts, but equally applicable for use in other places where the bolts and nuts are exposed to a continual jarring.

BLAST FURNACES.—James Thomas, Parryville, Pa.—This invention has for its object to provide an improved apparatus for automatically raising and lowering the bell that closes the top of the furnace and distributes the stock, so that it will be raised to close the furnace when the pressure of the blast is on, and be lowered when the pressure of the blast is off, thus guarding against danger from explosion when the blast is off the furnace.

AUTOMATIC BOILER FEEDER.—Valerius D. Anderson, Kewanee, Ill.—This invention has for its object to furnish an improved automatic feeder for steam boilers used for heating buildings, steaming feed for stock, and other uses where a low pressure of steam is required.

MEDICAL COMPOUND.—Philip Becker, South Bethlehem, Pa.—This invention consists in a new compound of medicinal substances for the cure of fever and ague, and other kindred diseases.

MACHINERY FOR TOWING CANAL BOATS AND OTHER VESSELS ON A FIXED ROPE OR CHAIN.—Baron Oscar De Mesnil, Brussels, Belgium, and Max Eyth, Stuttgart, Würtemberg.—This invention has for its object to provide simple means, whereby canal tug boats and other vessels can be moved forward along a fixed rope or chain, by the aid of machinery provided on such boat.

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FOR THE WEEK ENDING May 31, 1870.

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103,536.—COMPOSITION FELTING FOR COVERING ROOFS, SHIPS' BOTTOMS, ETC.—Thomas R. Abbott, Lowell, Mass.
103,537.—CULTIVATOR.—Henry A. Adams, Sandwich, Ill.
103,538.—BINDING ATTACHMENT FOR SEWING MACHINES. Lauritz Anderson, Chicago, Ill. Antedated May 3, 1870.
103,539.—BOILER FEEDER AND LOW WATER ALARM.—V. D. Anderson, Kewanee, Ill.
103,540.—BARREL TILTER.—George Armstrong, Liverpool, England, assignor to himself and Wm. H. Eckert, Oswego, N. Y.
103,541.—WEIGHING SCALE.—Albert Assman, Rahway, N. J.
103,542.—LOCK.—Moses O. Baker, New York city.
103,543.—GREEN CORN CUTTER.—Volney Barker, Otisfield, Me.
103,544.—NUT LOCK.—Henry Beagle, Jr., Philadelphia, Pa.
103,545.—MEDICAL COMPOUND.—Philip Becker, South Bethlehem, Pa.
103,546.—WORKMAN'S SCAFFOLD.—Wm. H. Berger, Danville, Pa.
103,547.—SASH HOLDER AND BALANCE.—George W. Bishop, Saratoga Springs, N. Y.
103,548.—SPRING BED BOTTOM.—Orris Blake, Peru, Ind.
103,549.—NEEDLE FOR SEWING MACHINE.—J. B. Blanchard, Boston, Mass.
103,550.—TIGHTENING WHEEL TIRE.—Simeon R. Bolton, Prescott, Wis.
103,551.—REFRIGERATING OYSTER CAN.—Alfred Booth, Chicago, Ill.
103,552.—HAY AND STRAW CUTTER.—Adolph C. Both, Hesse Cassel, Germany.
103,553.—MODE AND MATERIAL FOR CONSTRUCTING FLOORS, CEILINGS, ROOFS, ETC.—Gabriel Charles Bouziat, Vincennes, France.
103,554.—COMPOSITION FOR COATING SHINGLES AND CLAPBOARDS.—Otis E. Bowen, Needham, Mass.
103,555.—MODE OF FORMING INSULATOR.—James M. Brookfield, Brooklyn, N. Y.
103,556.—CORSET SKIRT SUPPORTER.—J. W. Brooks, Boston, Mass.
103,557.—HAY AND COTTON PRESS.—B. R. Brown and James Teone, Jr., Jackson, Tenn.
103,558.—DINNER PAIL AND LANTERN.—Nelson C. Burnap Argusville, N. Y.
103,559.—BELL FOR CLOCKS.—Leonard C. Butch, Lancaster, Ohio.
103,560.—MOLDING PIT FOR CASTING CYLINDERS AND PIPES.—Robert Cartwright, Chicago, Ill.
103,561.—CORN HUSKING MACHINE.—Erastus H. Carver, Preble, N. Y.
103,562.—TREADLE FOR SEWING MACHINE.—Henry J. Case, Auburn, N. Y.
103,563.—HOISTING JACK.—Edwin A. Castellaw, Savannah Ga.
103,564.—SIPHON.—Seth C. Catlin, Cleveland, Ohio.
103,565.—STAND AND CLOTHES DRYER.—M. C. Charles, Hope, Ind.
103,566.—SHOEMAKERS' TOOL.—Alfred Clarke and Arthur Clarke, Philadelphia, Pa.
103,567.—PIPE JOINT.—Robert B. Coar, Jersey City, N. J.
103,568.—RESAWING MACHINE.—Lucius J. Cobb, Chicago, Ill.
103,569.—MACHINERY FOR CALENDERING AND POLISHING PAPER.—Phineas Coburn, East Walpole, Mass.
103,570.—FRUIT BASKET.—Eastman Colby, Brockport, N. Y.
103,571.—BUTTON.—J. F. Collins and Arthur Neill, New York city. Antedated May 27, 1870.
103,572.—COLLECTING, SEPARATING, AND PURIFYING THE GASES FROM FURNACES.—J. H. Connelly and John McLure, Wheeling, West Va.
103,573.—CARRIAGE AND RAILROAD CAR WHEELS.—Almond F. Cooper, San Francisco, Cal.
103,574.—ORE SEPARATOR.—George Copeland, Denver, Colorado Territory.
103,575.—MACHINE FOR CUTTING, PRINTING, AND FOLDING PAPER.—William Pinckney Corsa, Catskill, N. Y.
103,576.—ENGRAVING MACHINE.—Chas. J. Coulter, Seville, Ohio.
103,577.—MANUFACTURE OF SHEET IRON.—Isaac E. Craig, Camden, Ohio.
103,578.—EMBROIDERY ATTACHMENT FOR SEWING MACHINES.—Edwin J. Cubley, Chicago, Ill.
103,579.—SETTING GAS RETORT.—Thomas Curley, Wilmington, Del.
103,580.—MANUFACTURE OF ARTIFICIAL FUEL.—E. J. De Smedt (assignor to New York Improved Anthracite Coal Company) New York city.
103,581.—LAYING ASPHALT OR CONCRETE PAVEMENT ON ROADS.—E. J. De Smedt (assignor to the New York Improved Anthracite Coal Company), New York city.
103,582.—ASPHALT ROADS AND PAVEMENTS.—Edward J. De Smedt (assignor to the New York Improved Anthracite Coal Company), New York city.
103,583.—GATE.—Benjamin F. Dickey, Marshall, Mich.
103,584.—PREVENTING REVERSE MOTION IN SEWING MACHINES.—David A. Dickinson, Baltimore, Md.
103,585.—TONGS FOR RIGGING.—George Dohn, Sacramento, Cal.
103,586.—LATCH.—Thomas Dolan, Albany, N. Y. Antedated May 30, 1870.
103,587.—BEARING FOR SHEAVES.—W. W. Eastman Meadville, Pa.
103,588.—REVOLVING BACK BAND FOR HARNESS SADDLES.—Gustavus Eibel, Pittsburgh, Pa.
103,589.—BRICK CART.—James Evans, Philadelphia, Pa.
103,590.—ATTACHING DOOR KNOBS TO THEIR SPINDLES.—John Evans, New Haven, Conn.
103,591.—MANUFACTURE OF BRICKS, TILES, ETC., FROM SLAG.—François Fabre, Marseilles, France.
103,592.—FILTER.—Enoch S. Farson, Philadelphia, Pa.
103,593.—READING STAND.—Andrew C. Flint, Chelsea, Mass.
103,594.—TAP FOR RUBBER BOOTS.—Francis Flynn, Smithfield, assignor to the Woonsocket Rubber Company, Woonsocket, R. I.
103,595.—DITCHING MACHINE.—Robert G. Forsyth, Clayton, Ind.
103,596.—EXHAUST NOZZLE.—Charles H. Frisbie, Chicago, Ill.
103,597.—HOT BLAST OVEN.—Job Froggett, Youngstown Ohio.
103,598.—LAMP BURNER.—Jim B. Fuller, Norwich, Conn.
103,599.—PERCUSSION FUSE.—William Gardner, San Francisco, Cal.
103,600.—LOOM.—Charles W. Gilbert, Worcester, Mass.
103,601.—BREAD CUTTER.—George D. Goodsell and Noyes E. Babcock, Rockford, Ill.
103,602.—APPARATUS FOR EVAPORATING LIQUIDS.—George F. Grey, Brooklyn, N. Y.
103,603.—SOLDERING APPARATUS.—Jacob Gulden, Key Port, N. J.
103,604.—METHOD OF DISTILLING IN VACUO.—Frederic Gutzkow, San Francisco, Cal.
103,605.—PONY CARRIAGE PHAETON.—John C. Ham, New York city.
103,606.—DOOR BOLT.—William H. Hart, New Britain, Conn.
103,607.—COAL BARGE.—Roger Hartley, Pittsburgh, Pa., assignor to the American Coal Barge Company, Bristol, Conn.
103,608.—LOG LOADER.—John H. Harvey, Chanticleer, Ohio.
103,609.—TENSION DEVICE FOR NEEDLE THREAD IN SEWING MACHINES.—Moses Champero Hawkins, Edinborough, Pa.
103,610.—SHUTTLE FOR SEWING MACHINE.—Moses Champero Hawkins, Edinborough, Pa.
103,611.—HEMMER FOR SEWING MACHINE.—Moses Champero Hawkins, Edinborough, Pa.
103,612.—CHURN.—Nathan S. Hazen, La Fayette, Ind.
103,613.—WATER ELEVATOR.—Morrison Heady, Spencer county, Ky.
103,614.—COMPOSITION MADE FROM COAL TAR.—Francis M Hillstream, Lawrence, Kansas.
103,615.—COAL SCUTTLE.—Charles Hodgetts, Williamsburgh, N. Y.
103,616.—TEMPLE FOR LOOM.—William H. Howard, Media, Pa.
103,617.—SELF-ACTING LUBRICATOR.—William B. Howe, Troy, N. Y.
103,618.—RAILWAY-CAR COUPLING.—George C. Hugg, Berlin, N. J.
103,619.—CHAIN-PUMP BUCKET.—F. P. Hunt, Northborough, Mass.
103,620.—SEAT HOLDER.—Johiel Jackson, Columbus, Wis.

103,621.—COOKING STOVE.—Benjamin F. Johnson, Troy, N. Y.
103,622.—DRYER.—I. B. Kinkead, Watertown, Ohio.
103,623.—SKATE-FASTENING.—Moses Kinsey, Newark, N. J.
103,624.—CORK-SAVING BOTTLE FASTENING.—C. L. Knecht, Lower St. Clair Township, Pa.
103,625.—DINING TABLE.—James L. Knight, Tracy Creek, N. Y.
103,626.—GRINDING MILL.—Philip Kraus, Augusta, Ga.
103,627.—PICTURE HANGER.—George Lamb, Boston, Mass.
103,628.—LANTERN.—L. W. Leary, Norfolk, Va. Antedated May 24, 1870.
103,629.—FASTENING FOR GATES.—John Lintner, Indianapolis, Ind.
103,630.—HAWSE-HOLE COVER.—Robert Liston, Albany, N. Y.
103,631.—HEAD REST.—Caleb V. Littlepage, Austin, Texas.
103,632.—PUMP-ROD ATTACHMENT.—H. H. Locke, Pleasantville, Pa.
103,633.—HARVESTER-KNIFE GRINDER.—Thomas Loring, Blackwoodtown, N. J.
103,634.—FRICTION CLUTCH.—Orrin Lull, Rochester, N. Y.
103,635.—STEAM PLOW.—M. N. Lynn, New Albany, Ind.
103,636.—CART SADDLE.—Charles K. Marshall, New Orleans, La.
103,637.—LIFE BOAT.—Theophile Masac, Good Hope Plantation, La.
103,638.—COTTON GIN.—Robert McKenna, Whites' Station, Tenn.
103,639.—FARMERS' BOILER.—Allen N. Merrill, Batavia, Ill.
103,640.—APPARATUS FOR PAINTING.—Asa P. Merritt, Charlotte, Mich.
103,641.—PRIMER FOR CARTRIDGE.—I. M. Milbank, Greenfield Hill, Conn.
103,642.—BOLT THREADER.—Gideon W. Mingus, Pomeroy, Ohio.
103,643.—TENSION WHEEL FOR SEWING MACHINE.—J. H. Mooney (assignor to Samuel Hill), San Francisco, Cal.
103,644.—OIL-CAN SPOUT.—Samuel Moyle, Jr. (assignor to himself and A. J. Carrier), Bridgeport, Conn.
103,645.—SPIRAL FASTENING.—Chas. S. Muscroft, Cincinnati, Ohio.
103,646.—SPRING BED BOTTOM.—Charles W. Mutell, Springfield, Mass.
103,647.—VALVE-GEAR FOR LOCOMOTIVES.—Adolph Onslow, Jersey City, N. J.
103,648.—WHEEL FOR TINNERS' BEADING MACHINES.—B. S. Partridge (assignor to himself and W. A. Stafford), Pilatka, Fla. Antedated May, 19, 1870.
103,649.—STEAM ENGINE CONNECTION.—Leonard Phleger, Philadelphia, Pa. Antedated May 19, 1870.
103,650.—TREATING SLAG, FROM IRON AND GLASS FURNACES, FOR PRODUCING A USEFUL MATERIAL.—A. A. Player and Henry McAlister, Jr., Philadelphia, Pa., administrators of John Player, deceased.
103,651.—HOT-BLAST OVEN.—A. A. Player and Henry McAlister, Jr., Philadelphia, Pa., administrators of John Player, deceased.
103,652.—LAMP EXTINGUISHER.—David J. Powers, Chicago, Ill.
103,653.—WRENCH.—T. C. Purington, Lincoln, Cal., assignor to himself and A. Mayoux.
103,654.—APPARATUS FOR TEACHING STUDENTS THE USE OF TELEGRAPHIC INSTRUMENTS.—D. W. Putt (assignor to himself, Walter G. Brownson, and Philip Brewer), Wellsville, Ohio.
103,655.—COOKING STOVE.—Josiah M. Reed, Boston, Mass.
103,656.—WRENCH.—Mathias Redlinger, Freeport, Ill.—Antedated May, 19, 1870.
103,657.—WATER WHEEL.—William W. Richardson, Chicago, Ill.
103,658.—SPRING BED BOTTOM.—Gideon B. Richmond, Charlestown, Mass.
103,659.—DOVETAILING CHISEL.—N. H. Robinson, Owasso, Mich.
103,660.—HAMMER.—Oliver Rock, Hudson, Mass.
103,661.—COMPOSITON FOR PREVENTING INCRUSTATION IN STEAM BOILERS.—J. G. Rogers, Madison, Ind.
103,662.—PREVENTING INCRUSTATION IN STEAM BOILERS.—J. G. Rogers, Madison, Ind.
103,663.—PLOW.—Ruffin Roles, Carey, N. C.
103,664.—SEWING MACHINE NEEDLE FOR EMBROIDERING.—Israel M. Rose, Brookhaven, N. Y.
103,665.—APPARATUS TO EFFECT THE HYDRATION OF AIR IN HEATED APARTMENTS.—P. J. Schopp, Louisville, Ky.
103,666.—SEED SOWER.—S. A. Scott, Griffin, Ga.
103,667.—HYDRAULIC HOUSING FOR ROLLS.—G. H. Sellers, Wilmington, Del.
103,668.—KITE STRING HOLDER.—George G. Sheldon, Chicago, Ill.
103,669.—TIRE-SETTING' MACHINE.—Andrew Shogren and H. A. Adams, Sandwich, Ill.
103,670.—MACHINE FOR CUTTING DOVETAILS.—W. E. Sibley, Weston, Mass.
103,671.—WASHING MACHINE.—John Sirrine, Trumansburg, N. Y.
103,672.—SAFETY STOVE.—Charles J. Smith, Norfolk, Va.
103,673.—GRAIN BINDER.—George H. Spaulding, Rockford, Ill.
103,674.—MICA FRAME FOR STOVES.—Gaylord S. Stanard, Buffalo, N. Y.
103,675.—MEDICAL COMPOUND.—J. T. Stewart, Peoria, Ill., assignor to S. R. Whitlow.
103,676.—OIL BOXES FOR CAR AXLES.—T. B. Stewart, Hartford, Conn.
103,677.—SAWING MACHINE.—Nicholas Stilwell, Newark, N. J. Antedated May 31, 1870.
103,678.—COMBINATION TOOL.—Geo. W. Stockwell, Natchez, Miss.
103,679.—SAFETY WHIFFLETREE.—Melvin Stone, Vermillion, Ohio.
103,680.—GRAIN SEPERATOR.—Orrin Stone, Ionia, Mich.
103,681.—MACHINE FOR MAKING HORSESHOES.—J. G. Stowe, Providence, R. I.
103,682.—BOOK REST.—Cornelius Sullivan, Boston, Mass.
103,683.—SAFE AND VAULT.—Timothy J. Sullivan, Albany, N. Y.
103,684.—ROTARY PUMP.—Thomas Swan, Manlius, N. Y.
103,685.—DEVICE FOR CUTTING OFF METALLIC TUBES.—S. P. M. Tasker, Philadelphia, Pa.
103,686.—STOVE-PIPE DAMPER.—William Taylor, Lowell, Mass.
103,687.—TACKLE HOOK.—Henry Thompson, Rockland, Me.
103,688.—CORN AND COTTON PLANTER, FERTILIZER DISTRIBUTER, COTTON CHOPPER, AND CULTIVATOR COMBINED.—James F. Tucker, Monticello, Fla.
103,689.—LOCK NUT.—U. B. Vidal, Philadelphia, Pa.
103,690.—LOW WATER INDICATOR FOR BOILERS.—Chas. S. Watson, Philadelphia, Pa. Antedated January 29, 1870.
103,691.—HORSE HAY RAKE.—David H. Weaver, South Bend, Ind.
103,692.—RAILWAY RAIL CHAIR.—J. S. Weimer, Pleasant Hill, Ohio.
103,693.—PROCESS OF WELDING AND TEMPERING SHEAR-BLADES.—Hermann Wendt, Elizabeth, N. J., assignor to Henry Seymour & Co., New York city.
103,694.—BREECH-LOADING FIRE-ARM.—Frank Wesson, Worcester, Mass.
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REISSUES.

3,998.—MACHINE FOR FORGING OR ROLLING SCREW THREADS UPON METAL BOLTS.—John Cochrane, Wall township, N. J.—Patent No. 63,564, dated March 24, 1867.
3,999.—STEAM CONDENSER.—John Houpt, Springtown, Pa.—Patent No. 102,005, dated April 19, 1870.
4,000.—STEAM GENERATOR.—Wm. Lowe, Bridgeport, Conn.—Patent No. 65,405, dated June 4, 1867.
4,001.—CONSTRUCTION OF SAFES.—F. H. Williams, Syracuse, N. Y.—Patent No. 85,978, dated Jan. 19, 1869.
4,002.—NEEDLE FOR SEWING MACHINES.—Mary P. Carpenter, San Francisco, Cal.—Patent No. 99,158, dated Jan. 25, 1870.
4,003.—TWINE CUTTER.—Thomas B. Doolittle, Bridgeport, Conn., assignee of Geo. C. Taft.—Patent No. 99,494, dated February 1, 1870.
4,004.—HEATING STOVE.—J. M. French, Jr., Rochester, N. Y., assignee, by mesne assignments, of D. L. Stiles.—Patent No. 40,663, dated Nov. 17, 1863.
4,005.—CAR VENTILATOR.—M. T. Hitchcock, Springfield, Mass.—Patent No. 74,534, dated Feb. 18, 1868.
4,006.—COVERS FOR STOVES.—D. G. Littlefield, Albany, N. Y.—Patent No. 53,351, dated March 13, 1866.
4,007.—THRASHING MACHINE.—John O'Ferrall and Thos. L. Daniels, Piqua, Ohio, assignees of A. B. Crawford.—Patent No. 29,865, dated Sept. 4, 1860.
4,008.—HARVESTER.—John G. Perry, Kingston, R. I.—Patent No. 86,584, dated Feb. 2, 1869.
4,009.—Division B.—SCREEN FOR BASE-BURNING FIREPLACE HEATER.—David Stuart and Richard Peterson, Philadelphia, Pa., assignees of David Stuart and Lewis Bridge.—Patent No. 79,275, dated June 23, 1868.

DESIGNS.

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EXTENSIONS.

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CONTINUOUS SHEET METAL LATHING SURFACES.—John B. Cornell, of New York city.—Letters Patent No. 14,894, dated May 13, 1856.
VENTILATING DAMPERS FOR STOVES.—John Magee, of Chelsea, Mass.—Letters Patent No. 14,940, dated May 20, 1856; reissue No. 1,355, dated Nov. 18, 1862.
MAKING BRASS KETTLES.—Frederick J. Seymour, of Wolcottville, Conn.—Letters Patent No. 14,887, dated May 13, 1856; reissue No. 1,183, dated May 14, 1861.
SHINGLE MACHINE.—Edward Hedley, of Philadelphia, Pa.—Letters Patent No. 14,914, dated May 20, 1856.
SURFACE CONDENSERS FOR STEAM ENGINES.—D. D. Foley, of Washington, D. C., assignee by mesne assignments, of Jas. M. Miller.—Letters Patent No. 14,923, dated May 20, 1856.
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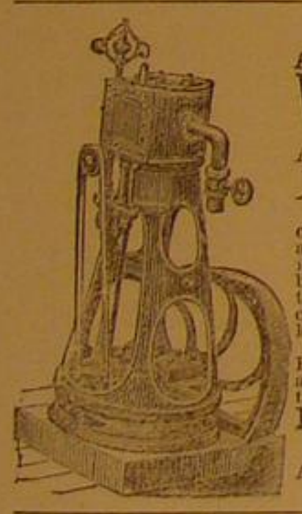
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The Allegheny Bridge at Pittsburgh, Pa.

We believe we express a general opinion among engineers and architects when we say that the bridge which forms the subject of our first page engraving this week, is one of the most elegant structures of its class on this continent. Nothing can exceed the grace of its outline when seen from a favorable point of view. Our engraving, which we reproduce from the *Building News*, gives an excellent idea of this beautiful bridge, which was designed and erected in 1860, by the late John A. Roebling, who lived to erect many such monuments to his great genius, but lost his life from an accident received while surveying the approaches to his last and greatest design, the East River Bridge, now in process of construction,



SUSPENSION BRIDGE OVER THE ALLEGHANY RIVER AT PITTSBURGH, PA.

under the able supervision of Mr. Washington A. Roebling, who, it is said, inherits his father's genius.

The bridge we illustrate crosses the Alleghany about half a mile above its junction with the Monongahela, both of which streams, when united, form the Ohio. The town of Pittsburgh is situated on the promontory made by the convergence of these two rivers, and has, with its suburbs, a population of about 200,000. The distance between the abutments of the bridge is 1,037 feet 5 inches, being divided into two main spans of 344 feet 6 inches each, one half span of 117 feet 5 inches, and a second half span of 171 feet. Four wire cables carry the structure; the two outer ones incline outwards from the towers, and the two inner inwards, to give stability to the bridge. The lighter cables which carry the footway are each 4½ inches diameter, that of the others being 7½ inches. The roadway is 20 feet wide, and the footways each 10 feet. The cables are attached to bell cranks at the towers, instead of by saddles placed upon rollers—a by no means satisfactory arrangement—the vibration of the bridge being increased perceptibly by the lightest passing load. The towers are about 45 feet high. They are of cast-iron, and of an ornate character, the weight they support being entirely carried by the four inclined columns, which are braced together by latticed castings.

Selecting Durable and Perishable Timber.

Todd, in his "Country Homes," makes the following excellent remarks upon the selection of timber:

Many persons could save a vast deal of labor and money, when making preparations to build if they were familiar with the durability of all kinds of materials. Many a farmer has incurred the expense of hauling pine and hemlock lumber twenty or thirty miles, when his own wood lot would have furnished all the timber required. I have known farmers to pay an extortionate price for pine plank for a barn floor, when they could have procured "clear-stuff" basswood on their own land, at less than half the expense of pine. Besides this, good basswood will make beautiful floors for any outbuilding or dwelling, where the floor is not exposed to the influences of wet and heat.

In many localities, durable timber for fence posts or for sills to a building is exceedingly scarce. And yet, there are so many varieties of durable timber that, if oak of any kind can not be obtained, some other kind of timber may be had which will be found quite as durable as oak. Red elm, if seasoned before the timber is employed for fence posts, will last quite as long as oak. When red elm is employed as sills for a building, as the newly hewed sticks are liable to warp and spring, the timber should be hewed, framed, put in its place, and protected from the sun all in one day, if practicable. In case red elm timber can not be secured in a frame soon after it is sawed or hewed out, every stick should be placed on a level foundation, so that stones or heavy timber may be laid above it to hold it straight. Red beech is another kind of durable timber, which will serve satisfactorily for sills of buildings, or for posts or beams, where the timber is liable to be exposed to dampness or the influences of wet and heat. Red beech will be found an excellent substitute for oak. As this kind of timber rarely grows where we find oak forests, it may be sawed into all kinds of timber for dwelling houses or outbuildings. It will make joists, studs, and excellent floor boards, provided they are "stuck up" straightly soon after the logs are sawed, so that the pieces may have an opportunity to season straight without being warped by the sun. Butternut is another kind of timber that is often more durable than any oak, even when employed for fence posts. Butternut is usually a soft wood, often softer than white pine. Therefore, this kind of timber may be employed for roof boards, for flooring, for casing and window sills, or for making doors Yet, as butternut timber is so liable to warp and spring, when the pieces are seasoning, it is always important that this kind of lumber should be stuck up while the timber is green, that it may be straight after the pieces are well seasoned. The grain is so beautiful, that a parlor finished with butternut lumber often looks richer than if wainscoted with the best black walnut. Many a man has purchased black walnut, at an exorbitant price, for making a hand-rail and balusters for his stairs, or for other work in his house, when there were large butternut trees on his own land which would have furnished ten times more lumber than he required, and that, too, of a superior beauty.

A common error is frequently committed in selecting durable building timber for dwelling houses and out-buildings, and then choosing perishable timber for sleepers or cross sills, though the main sills may have been procured of the best quality, at a large expense. We frequently see white oak, or red elm sills, and sleepers of sugar maple, which will decay as soon as basswood or buttonwood. When the ends of sleepers are received in gains cut in the sills, the very ends are more liable to decay than any other part, especially if water is allowed to find its way down in the joints. For this reason, it is always quite as important to select durable timber for joists and sleepers as for sills. But when the sills of a building are resting on a high wall, where the timber will be exposed to the alternate influences of moisture and dryness, almost any kind of wood may be employed; and so long as water can be kept from the surface, from cracks and from mortises, even perishable timber will remain quite sound. Basswood, white beech, maple, and other kinds of timber that are known as perishable, will satisfactorily serve these purposes, and continue sound so long as the sticks can be kept dry.

In numerous instances, persons who have many acres of oak, chestnut, and other durable timber, near by, have gone thirty miles to purchase hemlock scantling and boards for building a barn, when either of the kinds mentioned would have subserved a more satisfactory purpose, and would not have cost one half so much. Oak and chestnut will make excellent roof boards, or vertical boards for any outbuilding. I have in mind a barn that was covered with basswood boards, put on vertically, in 1832, and they are good for another thirty years. Had the boards been seasoned, planed, and painted, as they should have been before they were used, they would have been quite sound at the present writing. I have met with many large barns, at the West, which were built wholly of oak.

PAPER was first made from linen in the year 1302.

SCIENTIFIC INTELLIGENCE.

BROMIDE OF SODIUM.

According to the testimony of physicians this salt is more effective than the bromide of potassium, and hence a cheap way for its preparation has become desirable. Mr. Castelhaz prepares, in the first place, bromide of ammonium by causing bromine to fall drop by drop into dilute, but pure liquid ammonia contained in a series of Wolff's bottles. The liquids after saturation are evaporated in a cast-iron retort, to which an earthenware receiver is fastened, to catch any of the volatile products that may go over.

The bromide of ammonium thus obtained is converted into bromide of sodium by being mixed with pure carbonate of soda, and the carbonate of ammonia produced by the reaction is expelled by heat. Perfectly pure and anhydrous bromide of sodium can be prepared in this way.

CHEMICAL PRIZE OFFERED.

The great confusion that now obtains in the nomenclature of chemistry and in the construction of formulas, has led to the offer in Göttingen of a prize for a new and exact determination of the atomic weights of the metals of the earths, with indication of the limits of errors of the experiments made and a review of the labors of other authors in this direction. The author of the thesis must discuss the question whether the hypotheses of Prout and Dumas are to be retained or rejected, and whether any differences in them can be explained on chemical or physical grounds. The first prize is of the value of £75, and the second of the value of £30, to be awarded on the 11th of March, 1873. Essays in German, French, English, or Latin may be forwarded to Dr. Müller at Göttingen.

SULPHO-CYANIDE OF AMMONIUM.

This salt has been used as a delicate test for iron, and to some extent in photography. It is now proposed to employ it to produce a sudden reduction of temperature. When a considerable quantity of the salt is dissolved in water at 208° Fah., the temperature sinks rapidly to 28° Fah., showing a change of temperature of 180° Fah.

If this salt could be obtained in large quantities it would doubtless find a large consumption for artificial freezing mixtures. At present its manufacture and application are limited, and it is hardly used for any other purpose than those indicated above.

INFLUENCE OF IRON ON WATER.

It is not generally known that a few scraps of iron will prevent the bad odor from forming in water left to stand for days and weeks. The metal removes the free oxygen in the water, and thus prevents the oxidation of the organic matter that may be in the water.

A better agent for rendering river water sweet and healthy is to employ chloride of iron. A very small quantity suffices to throw down the organic matter and thus to purify the water. There are few disinfectants so valuable as the chloride and the sulphate of iron, and they ought to be kept about every household. They are equally important to stop bad cases of bleeding from the nose or from cuts.

A NEW WASH FOR WOOL AND SILK.

Instead of using the fumes of sulphur, M. Frezon proposes the following mixture: 4 lbs. oxalic acid, 4 lbs. table salt, 200 quarts of water. The goods are laid in this mixture for an hour. They are then generally well bleached, and only require to be thoroughly rinsed and washed. For bleaching straw it is best to soak the goods in caustic soda and afterwards to make use of chloride of lime or Javelle water. The excess of chlorine is afterwards to be removed by hyposulphite of soda, called anti-chlor.

American Inventions in England.

A correspondent of the *New York Times* writes that England is not specially wide awake to the introduction of new industries, but a gentleman advertises a book under the title of "Seventy Pounds a Year; How I Make it by my Bees;" and another, who has been engaged for a few years in rearing silk worms in Devonshire, calculates that a hundred acres of land will give an average net profit of $50 an acre. The science of keeping silk worms by means of artificial heat and ventilation has been brought to great perfection. There is also a movement for the cultivation of beet sugar in Southern England and Ireland, and county Cork has some hopes of being permitted to supply the United Kingdom with tobacco.

American inventions are taken up with more readiness than most others, for it is now very thoroughly impressed upon the British mind that we are an ingenious people. Birmingham, for instance, is going into the manufacture of screws in the American style on a large scale, and some time since adopted the iron pins. Cramer, in London, has copied some of the improvements in the American harmoniums, and boasts that he can furnish them forty-five per cent less in price, on account of the greater cheapness in labor and materials. The American street railways, with beautiful cars, made by Stephenson, of New York, have begun to run in London, and in a few months they will radiate to every suburb of the metropolis. On the opening day crowds collected to see them start, and for the first trips they were allowed to pile on in the New York fashion; but after that day no person will be allowed to stand, and the conductor will be prosecuted if he ever exceeds, inside or out, the regulation number. This rule is everywhere strictly enforced. Asphalt pavement is, I believe, a Parisian luxury; but it has been tried with great success—granite laid in asphalt—in some of the most heavily worked streets in London. The stones are solid, unworn, and there is neither mud nor dust.

Strange Noises Heard at Sea off Grey Town.

A correspondent of *Nature* vouches for the recent occurrence of a phenomenon of which we have heard before, but have always regarded as doubtful, as the persons who made the statement were not in our opinion reliable observers. He says:

"I am guided only by the desire of seeking a solution of what to me and to many others appears a very curious phenomenon. The facts related can be vouched for by numbers of the officers and crews of any of the R. M. Company's ships.

"I must premise that this phenomenon only takes place with iron vessels, and then only when at anchor off the port of Grey Town. At least, I have never heard of its occurring elsewhere, and I have made many inquiries.

"Grey Town is a small place, containing but few inhabitants, situated at the mouth of the river St. Juan, which separates Nicaragua from Costa Rica, and empties itself into the Atlantic, lat. 10° 54′ N., and long. 83° 41′ W. In this town there are no belfries or factories of any kind.

"Owing to a shallow bar, vessels cannot enter the harbor or river, and are therefore obliged to anchor in from seven to eight fathoms of water, about two miles from the beach, the bottom consisting of a heavy dark sand and mud containing much vegetable matter brought down by the river. Now, while at anchor in this situation, we hear, commencing with a marvelous punctuality at about midnight, a peculiar metallic vibratory sound, of sufficient loudness to awaken a great majority of the ship's crew, however tired they may be after a hard day's work. This sound continues for about two hours with but one or two very short intervals. It was first noticed some few years ago in the iron-built vessels *Wye*, *Tyne*, *Eider*, and *Danube*. It has never been heard on board the coppered-wooden vessels *Trent*, *Thames*, *Tamar*, or *Solent*. These were steamers formerly employed on the branch of the Company's Intercolonial service, and when any of their officers or crew told of the wonderful music heard on board at Grey Town, it was generally treated as "a yarn" or hoax. Well, for the last two years the company's large Transatlantic ships have called at Grey Town, and remained there on such occasions for from five to six days. We have thus all had ample opportunity of hearing for ourselves. When first heard by the negro sailors they were more frightened than astonished, and they at once gave way to superstitious fears of ghosts and Obeahism. By English sailors it was considered to be caused by the trumpet fish, or what they called such (certainly not the *Centriscus scolopax*, which does not even exist here). They invented a fish to account for it. But if caused by any kind of fish, why only at one place? and why only at certain hours of the night? Everything on board is as still from two to four, as from twelve to two o'clock, yet the sound is heard between twelve and two, but not between two and four. The ship is undoubtedly one of the principal instruments in its production. She is in fact for the time being converted into a great musical sounding board.

"It is by no means easy to describe this sound, and each listener gives a somewhat different account of it.

"It is musical, metallic, with a certain cadence, and a one-two-three time tendency of beat. It is heard most distinctly over open hatchways, over the engine-room, through the coal shoots, and close round the outside of the ship. It cannot be fixed at any one place, always appearing to recede from the observer. On applying the ear to the side of an open bunker, one fancies that it is proceeding from the very bottom of the hold.

"Very different were the comparisons made by the different listeners. The blowing of a conch shell by fishermen at a distance, a shell held to the ear, an æolian harp, the whirr or buzzing sound of wheel machinery in rapid motion, the vibration of a large bell when the first and louder part of the sound has ceased, the echo of chimes in the belfry, the ricocheting of a stone on ice, the wind blowing over telegraph wires, have all been assigned as bearing a more or less close resemblance; it is louder on the second than the first, and reaches its acme on the third night; calm weather and smooth water favor its development. The rippling of the water alongside and the breaking of the surf on the shore are heard quite distinct from it.

"What is, then, this nocturnal music? Is it the result of a molecular change or vibration in the iron acted on by some galvanic agent peculiar to Grey Town? for bear in mind that it is heard nowhere else, not at Colon, some 250 miles distant on the same coast, not at Porto Bello, Carthagena, or St. Marta. The inhabitants on shore know nothing of it. If any of your numerous readers can assign a likely cause, will they be pleased to state by what means, if any, its accuracy may be tested? If required, I can forward a specimen of the mud and sand taken from the anchor."

Sulphur in Street Gas.

Mr. Henry Wurtz, the editor of the American *Gaslight Journal*, has noticed within his experience, more than one instance in which gas as delivered to consumers tinged lead paper strongly, and was complained of as malodorous, whereas at the works the purification was apparently managed with care, and the gas directly from the purifiers sweet. He has been induced to believe that some of the sulphureted compounds known to exist in gas, which do not tinge the test paper and are not taken out by iron or even by lime, may undergo afterwards *spontaneous* decomposition, with formation of sulphureted hydrogen or rather of sulphide of ammonium, and he does not now resign this belief; but what he now wishes to ask of our gas managers is whether the following does not indicate one method by which such a result could readily occur, without constant and competent *chemical* supervision or inspection of their purifying operations; and has not this accident often led to inexplicable, annoying, and *persistent* complaints on the part of their customers? The extract is from the evidence of that eminent gas-chemist, Dr. Letheby, before an English Parliamentary Commission, given April 1, 1870, and relating to a case of this kind, similar to the one he cites from his own experience, which occurred at Rotherham, and which was investigated by another chemist, Mr. A. H. Allen. Dr. Letheby says:

"I am the chief gas examiner appointed by the Board of Trade for the metropolis. I have heard Mr. Allen's evidence. Last October, the gas supplied by the Great Central Gas Company showed a quantity of sulphureted hydrogen, which, from an accident, had been absorbed by the water in the tank, and it took four months to eradicate it. I therefore exonerated the company from the fines to which they were liable. If, from the purifier not acting, foul gas gets into the gas-holder, it so taints the water that sulphureted hydrogen may exist in the gas for a long time. The results of Mr. Allen's examinations show a very small proportion of sulphur. In London there are frequently 20 grains in 100 feet. The ammonia in the gas at Rotherham is also very low, as 5 grains are considered a fair quantity. Copperas is quite a proper material for use in purification, if properly managed; but unless used with sawdust there may be accidents."

American Quercitron and Sumac.

Alex. S. Macrea, Anglo-American Produce Broker at Liverpool, England, sent out circulars last fall, showing the value of these two articles of commerce. Of sumac he states that Liverpool frequently imports from Sicily 6,417 bags in a day, and exports to America in one day 1,200 bags, and then goes on to explain the utter fallacy of our permitting such a foolish work. He says that from actual experiments, the American sumac contains from 10 to 20 per cent more tannin than any other, and yet we import the product of other countries. Mr. Macrea asserts that we should be reaping the benefit of selling thousands of tuns of this article, at $125 per tun, instead of importing the same, as it grows in great quantities in Maryland, Virginia, and other States. Of quercitron (ground black oak bark), he says:

"Our chief supply of quercitron has, ever since its general introduction fifty years ago, reached us from Philadelphia and Baltimore, with occasional consignments from New York. Philadelphia bark comes in hogsheads, as is well known, and from the fact that in Philadelphia it is branded 'first sort,' and must consequently be up to the mark in quality, gives a reputation to that port, which no other rivals. Baltimore comes in bags, and most of it is intrinsically the same as that which comes from Philadelphia, but from the fact that it is not so carefully ground or packed, fetches, as will be seen by the quotations, a much lower price: 1st Philadelphia, in hogsheads, $60 per tun. 1st & 2d Baltimore, in bags, $35 to $45 per tun.

"As this article abounds in untold quantities in Maryland, Pennsylvania, Virginia, etc., and as the consumption in Europe is enormous, it may be well to call attention to a 'new feature,' which will give more general employment, and benefit everybody. The 'new feature' is to send the bark 'pulverized' like flour or florine. This attained, port of shipment or place of production makes no difference, whereas the value increases to $70 or $80 per tun. Indeed, in the first instance, I myself made $90 per tun, and fully believe in perpetuity this will be a nearer value. Wherever bark or sumac mills abound, their present machinery can readily be adjusted to do the work of fine 'grinding;' when nothing remains but its being packed in hogsheads lined with paper, and shipped to England from any contiguous port. The consumption will be largely increased."

Application of Picric Acid for Imparting to Ivory, Bone, and Horn a Beautiful Red Color.

According to C. Mène the following recipe will impart the required color. Take 4 grms. of picric acid, and dissolve in 250 grms. of boiling water; add, after cooling, 8 grms. of liquid ammonia. Dissolve also 2 grms. of crystallized fuchsine (magenta) in 45 grms. of alcohol, dilute with 375 grms. of hot water, and next add 50 grms. of ammonia. As soon as the red color of the magenta solution has disappeared, the two solutions are mixed together, making a bulk of liquid amounting to about ½ liter, which is a sufficient quantity for dyeing from four to six sheep's-skins. Ivory and bone should be placed in very weak nitric or hydrochloric acids first, before being immersed in the ammoniacal liquid; wood cannot be dyed by this liquid, unless it has been previously painted over with paste made from flour. When, to the ammoniacal liquid, some gelatin solution is added, it may serve as a red ink which does not attack steel pens. By varying the proportions of the magenta and picric acid, the tints obtained may be varied from a bluish red to a bright orange red. The desired colors do not appear until the ammonia is evaporated.

A PECULIAR branch of industry flourishes in the Muldenthal, Germany, between Zwickau and Glauchau. This is the growing of willows for basketmakers. The dearest sort, the green osier, goes chiefly to Bavaria, and is there used for basket-work. The coarser sort is made into ordinary baskets, etc., in the valley where it is grown. The acre of willows brings in about a hundred dollars, but requires a great amount of care and work in its cultivation. This industry has been carried on there ever since the twelfth century.

INVENTORS and others visiting the National Capital will find the St. Cloud Hotel, corner 9th and F. St., near the Patent Office, a good place to sojourn. It is located in the midst of many of the public bureaus and the charges are more reasonable than at many other hotels in Washington.

The Royal Albert Hall of Arts and Sciences---A Magnificent System of Heating and Ventilation.

The subject of heating and ventilation is one of ever recurring interest, and of universal importance. We, therefore, copy from *Engineering* the following description of the apparatus employed in the immense Royal Albert Hall, in London, one of the largest public buildings in the world:

When it is considered that the Albert Hall of Arts and Sciences, now in course of erection at South Kensington, is to accommodate about 8,000 persons seated, the magnitude of the arrangements for preserving an equable temperature and a pure atmosphere will be realized. The capacity of the hall amounts to five million cubic feet, so that the warming and ventilation caused the committee some anxiety, and they invited a limited number of engineers to send in plans for effecting those objects. The various plans submitted were carefully considered, and it was finally resolved to adopt that of Mr. Wilson W. Phipson, Assoc. Inst. C. E., which is now being carried out under his immediate superintendence. The main points by which any arrangement had to be governed were economy in warming, and a satisfactory combination of this process with that of ventilation. The heating power determined on by Mr. Phipson consists of an arrangement of distinct coils of hot water pipes, placed in three air chambers. One of these chambers is carried under the main corridor, a second runs beneath the seats of the amphitheater stalls, whilst a third passes under the arena. These three chambers are connected with two fans, the combined supply of air from which will be about three million cubic feet per hour. One of these fans blows to the right and the other to the left, the fresh air drawn from the outer atmosphere being thus distributed through the chambers. This air, warmed by the hot water coils, is conveyed to the body of the hall from the chamber under the main corridor by means of channels built in the walls. These channels are also in communication with the corridors, boxes, and all the adjoining private rooms. From the chamber beneath the amphitheater stalls the warm air finds its way into the hall through perforations in the risers of the seats. From the arena chamber the air enters the building through the interstices between the floor boards. By these arrangements the entire power of the apparatus may be concentrated on the hall, thus thoroughly warming every portion of it; at the same time means are provided for warming the inclosed rooms independently when necessary. The amount of heating surface in the iron pipes required to carry out this arrangement is about 28,000 square feet. The temperature the apparatus is calculated to maintain in the hall is about 58° Fah. as a mean during the winter months.

The fresh air is supplied to the fans through two air shafts, 6 ft. by 6 ft., which are situated at the south-eastern end of the building, near the Horticultural Gardens. In each of these shafts is placed a self-acting valve, fitted with an index dial which registers the amount of air passing into the building. Arrangements are also provided in these shafts for cooling the air in its passage to the hall in summer by means of sprays of water. The fans are 5 ft. 9 in. in diameter, and are to be worked by two direct-acting engines of 3-horse power each. The heating apparatus fixed in the air chambers consists of sixteen distinct coils of 4-inch hot water pipes, heated by condensing boilers so arranged that each condenser has its direct coil of pipes to work. By this means either a part or the whole of the coils may be utilized, according to the temperature of the external air. These condensers are supplied with steam from two boilers belonging to the pumping engines of the Horticultural Gardens. In case of need a supplementary boiler will be provided, which will give a total force of about 75-horse power.

The *modus operandi* will be as follows: The temperature of the hall will be raised to the requisite degree by the time the audiences arrive; as soon as this point is reached, and whilst the public are being admitted, the air entrances to chambers, Nos. 2 and 3, will be partially closed by means of valves. This will allow of only one sixth of the amount of air necessary for ventilation to pass through these sources. The remaining five sixths will be distributed by means of four separate channels to the air chamber, No. 1, under the corridor. From this chamber the air will be distributed equally all through the entire building by means of the air channels formed in the walls, to which we have already alluded. It will thus issue upon every floor into the body of the hall, being admitted as far as possible from the audience.

The ventilation is provided for by an opening, having an area of 120 square feet, for the escape of the vitiated air, which is formed in the center of the ceiling at the highest possible level. This opening is surmounted by a shaft rising some feet above the roof and which is fitted with regulating louvres. The heat generated by the system of lighting the hall will increase the suction of this shaft at night. During day performances, however, continuous circulation will be insured by a ring of gas jets from burners with which the shaft is provided.

From a recent visit to the Albert Hall, we are enabled to report the satisfactory progress of the building generally, under the able superintendence of Colonel Scott, R.E. With regard to Mr. Phipson's arrangements, we found that the pipes for heating were all fixed in the outer circle main heating chamber, and the connexions were being made with the steam pipe to the condensers. About one third of the inner circle chamber is completed, and the remainder of the work is progressing. On Wednesday week the wedges between the crown of the roof of the hall and the scaffolding which had previously supported it were struck. The results of this operation were highly satisfactory, the total deflection being only five sixteenths of an inch. The roof, be it remembered, is of wrought iron, and covers an elliptical area of 220 feet by 185 feet, with a rise of 33 feet.

Music and Musical Instruments.

The first and most powerful instrument is the human voice. This has been acknowledged by the greatest artists, and all composition for single instruments owes its perfection to approximation to the human voice, and every instrumental artist must take a great vocalist for a model. "It is no wonder," says the well-known violinist Rode, addressing the Dresden orchestra, "that your tone is so fine; you are continually listening to great singers."

We might as well attempt to say how much has been thought as to answer the question, how much has been sung or composed for the voice? With the last singer the last man will have departed from the earth, as Anastasius Gruen so beautifully says. It would be impossible to name all the vocalists who have for ages past enchanted all grades of people; and, indeed, are not their names engraved upon the hearts and memories of the millions who had the happiness of listening to them?

Next to the voice the pianoforte claims our attention. This instrument, which, in its completeness, is the representative of the orchestra, and has arrived at a high state of perfection, is universally adopted by all civilized nations. From the middle of the last century some of the finest intellects have exercised themselves upon the perfection of this noble instrument, and we will mention only a few whose names are as familiar as household words. Streicher of Vienna, Erard of Paris, Broadwood of London, and last, but indeed first in this line of artists, Steinway of New York, whose remarkable inventions have transformed the pianoforte and brought the quality of its tone as near the human voice as possible.

The musical catalogues show yearly some three to four thousand new pieces adapted to the pianoforte, but the finest works for this instrument are the productions of the classic masters; still we cannot imagine anything more rounded in beauty, more flowing, more brilliant than a pianoforte performance carried out with all the modern perfection.

The amount of enjoyment, of refreshment, of enlivenment, of dissipation of care, of benefit, the pianoforte has conferred on society, lies beyond the power of imagination to conceive or offer to describe.

Owing to the deficiency of the pianoforte in regard to the retention of tone, and the difficulty of access to the organ, a new instrument has been invented as a substitute, the Physharmonica or Harmonium, which has reached its greatest perfection in Paris.

The origin of stringed instruments goes as far back into antiquity as that of song. Apollo represents both these forms of spiritual manifestation which have their impulse deep within the human heart.

In their various degrees of hight and depth of tone, the violin, the viola, the violoncello, and the double bass, correspond with the various gradations of the human voice—the soprano, alto, tenor, and bass. The violin is the queen of the orchestra and the most esteemed solo instrument in concerts. With a wider range, and less circumscribed in its effects, it is a very appropriate representative of the soprano voice. Its highest aim, therefore, is to compete with song. The violin advanced to its standard of perfection under the hands of the Italians; but the efforts of the French school must also be acknowledged, upon which Spohr improved, transplanting it to German soil.

It is strange that upon this little capriciously-shaped instrument, which will not suffer itself to be modified in the slightest degree, such mighty performances should take place. The well-known Cremona violins made by Stradivari and by Peter and Joseph Guarneri, and Amati, now about two hundred years old, surpass all others, notwithstanding the beauty of finish and structure of those made by Stainer and Villaume.

The violin, in accomplished hands, is undoubtedly the instrument that reveals the fullest emotion; it can be made to touch the chords of the human heart as effectually as the wind does those of the Æolian harp.

Of the most prominent performers on this instrument we mention but a few, such as Rode, Spohr, Viotti, Kreutzer, Baillol, Paganini, De Beriot, Ernst, Vieuxtemps, Molique, Sivori, Ole Bull, Lipinski, Lvoff, Mlilanollo, and in quite recent times, Joachim.

The treatment of the viola and violoncello is similar to that of the violin; but both instruments have their special character and their respective worshipers who give them the preference over the violin.

The viola approaches nearest to the human voice in the quality of its tone, and the great masters have therefore employed it very frequently, although it is but seldom used for solo performances. It occupies a particularly conspicuous position in Weber's and Spontini's operas.

The violoncello is more generally adopted as a solo instrument, and proved a thing of rare beauty under the hands of such performers of the past and present as the following: Romberg, Dotzauer, Servais, Merk, Kummer, etc.

The double bass is the foundation of the whole bass power of the orchestra, and has in recent times received much cultivation, owing principally to Beethoven, who uses it very extensively in his symphonies. It is but seldom used as a solo instrument, although in former days Hindl of Vienna, and, more recently, Bottesini have delighted audiences by their performances.

In passing to the wind instruments we all know the peculiarly soft and clear tones of the flute; the hautboy with the tones of pain and humor; the clarionet with its impassioned notes; the bassoon with its bass voice of pain or good-natured bluster; the horn with its magical tone, full of forest associations; the trumpet with its martial and alarming sounds; and the majestic, profound, and serious trombone.

The significance of the various instruments is best learned by their application. The best study for this purpose is the symphonies of Beethoven and the operas of Weber, wherein the listener discovers the most acute appreciation of the capacities and the finest perception of the use of the different instruments.

In earlier times instrumentation was much more simple than it is at present, and abuses have crept in, the great excess often thwarting its own ends, although great effects have been produced by men like Spontini, Berlioz, and Meyerbeer. The latter has appropriated instruments that occur but seldom in the orchestra, which has frequently resulted in great effects.

The guitar has received considerable cultivation from Guiliani and Stoll; and so has the harp, in more recent times, especially through Parish Alvars, a man of great and surpassing talent.

The impression made by all music depends to a certain extent upon the peculiarities possessed by the instruments enumerated, but still more essentially upon the scale or mode, of which, it is well known, there are two, the major and the minor; the former distinguished for its expresion of cheerfulness, the latter more indicative of melancholy. In these two modes the various gradations of musical thought are depicted, although other conditions assist in varying musical expression, which is far more diversified than that of words.

To overlook the united influences of music upon the life of the people must be impossible, because the part of life so influenced is the best part; it is the inner life—the life of the soul and the mind. To almost every one music brings refreshment and elevation, and often inspiration, and is, at the same time, a relief from the labors of the day. This applies to all classes of society, and beginning with the unpretending dance ascends thence to the higher enjoyment of the opera, or of the symphony. From these higher creations of the art the more susceptible and cultivated people have derived their most complete enjoyment; and it is incalculable how many have received new energy, new thoughts and refreshment, after the toils of the day, comfort in dark hours, and fresh inward life; how many, forsaking the disjointed order and the disturbed harmony of the world, have sought and found a more perfect order, a more complete harmony, in that picture of a more lovely world—the world of tone!—*Stewart's Quarterly.*

Manufacture of Alum.

The alum works of Harrison Brothers' chemical establishment, Philadelphia, Pa., are very extensive. At one end are sheds in which is stored the aluminous earth or clay, procured mostly from New Jersey. It is dried, and then ground and calcined in reverberatory furnaces. When thoroughly calcined and purified, it is, while hot, digested for some hours in immense vats of dilute sulphuric acid. It is then washed with water, and concentrated—sulphate of ammonia having been previously introduced. It is again washed and freed from any remaining impurities, being thus double refined, and then boiled by steam in a Roching kettle to a high degree of concentration; it is finally transferred to the crystallizing tubs. These are about eight feet high, and made of strong staves, which are so put together in sections as to be easily separated. At the end of eight or ten days, the sections being removed, a cylindrical mass of apparently solid alum is revealed. This being pierced near the bottom, the mother-water at the center flows off along the sloping floor into leaden subterranean cisterns, whence it is subsequently pumped and variously utilized. The "Pillars of Salt," or, rather, of ammonia alum, as the product is called in commerce (the article may be more accurately termed a double sulphate of alumina and ammonia), when pierced and cleft, are suffered to stand till the mother-liquor has wholly dried off, and are then broken up and barreled for the market. Each tub produces about twenty-one barrels. This article is largely used by calico printers in the preparation of the mordant for their dyes, by paper and color makers, by tanners, and in medicine.

A very ingenious and important use of alum is for safe fillings. Dry plaster is an excellent non-conductor of heat. Alum, which is broken up and mixed with the plaster in these safes, contains a very large percentage of water of crystallization, which is liberated at a temperature somewhat above 212°, and affords thus the most efficient protection to the contents of a safe that has ever been devised. About 25 to 30 barrels of alum per week are used by Marvin & Co. in the manufacture of their safes.

Birds vs. June Bugs.

Lest the readers of the SCIENTIFIC AMERICAN should think that we misstated the ignorance that prevails, even in this country, regarding birds and insects, let them read the following:

For some days past there has been a man (civilized?) engaged in the neighborhood of the writer's residence shooting robins, ducks, and fowls because they eat his potatoes! His lot, which has only potatoes and apple-trees on it, was turned up from grass this spring; the June bugs, the grubs of which are similar in habit to those of the cockchafer, have been unusually abundant, and the robins have resorted to the turned up ground to feed upon the grubs and beetles, the former of which would probably destroy the young shoots of the potato, the latter, the leaves of the apple-trees. Yet this senseless being shoots the robin. We almost wish to anathematize such foolish ignorance with Athanasian-like energy. But as all anathemas will only, if fulfilled, spread scourges upon ourselves—may some one who knows the laws on the subject prosecute the wretch, and may an honest judge be found to reach the only seat of what glimmering of reason he has—his purse.

[For the Scientific American.]

THE SCORPION.

[By Edward C. H. Day, of the School of Mines, Columbia College.]

Every one has heard or read of the scorpion; there are no natural objects more familiar to us than insects; and yet, we venture to say, that there are but few readers of the SCIENTIFIC AMERICAN, excepting those who have been educated in the technicalities of natural history, that can place the scorpion in its proper position in the animal kingdom, or that can give anything like an accurate definition of the word insect.

The great sub-kingdom or "branch," as some naturalists term it, of the animal kingdom, called the articulates, consists of those animals in which the entire being is divided into a series of joints, inclosed in rings forming, generally speaking, a hard external skeleton. In the lower forms, frequently, each segment possesses a more or less perfect individuality, and the total number of segments may be very great. Thus in the tapeworm they may be counted by hundreds, and most of the joints are capable of a temporary independent existence.

On the other hand, in the spider, the division into segments, although existing, is almost concealed, the animal being apparently divided into but two regions—the one composing the head and the limb-supporting portion of the body, the other constituting the hind-body or abdomen.

Among the creatures included in the articulate sub-kingdom, we thus recognize a primary broad distinction between those in which the ringed character is most apparent, and locomotive organs are altogether wanting, as in the common earthworm; and others, such as the lobster, the spider, and the various winged insects in which the repetition of joints is not necessarily so prominent a feature, and which are all furnished with distinct limbs. To the former group the great Linnæus gave the appropriate name of *Annelida*; the various members of the latter he massed together as *Insecta*. Later observers found, however, that the crustacea of which the lobster is the type, presented such great differences from the rest that these were separated as a class equal to the annelids. Thus the winged insects, the spiders, and the centipedes, were left together as the class of insects—and this classification obtains with many scientific men at the present; others, however, restrict the term insects to those articulates which, in the perfect state, have but six legs and are mostly winged, and class the spiders, scorpions, and mites, which have eight legs, as "arachnids," and the centipedes and galley worms, which have an indefinite number of feet, as "myriapods."

Thus the word insect is used at the present day by scientific men in two senses, and following the maxim that when doctors disagree opinions are free, the reader may consider himself at liberty to use the term indiscriminately. But if he is wise and wishes to avoid confusion and to cultivate accuracy of speech, he will recognize the importance of confining himself to using it in one or the other sense, and in that alone. Popular usage is, from ignorance, so loose on this point as on many others, that it indicates no choice; we would, therefore, recommend that the term "insect" be restricted to the first group, and that the words "arachnid" and "myriapod" be introduced into every-day language to indicate the others. There will be no difficulty in "naturalizing" such words as conversational terms, if taught to children with examples, just as they learn the words bird or fish. Let bees, butterflies, beetles, and bugs, be always spoken of as insects; a spider as an arachnid; a centipede as a myriapod. The two latter words are not harder to learn or less significant, while they will be far more frequently called into use than such words as hippopotamus or rhinoceros, about which many-syllabled compounds of Greek derivation neither old nor young ever make any great difficulty.

According to this system the scorpion is an arachnid, a member of the same group as the spider. The reader perhaps may fail to see much resemblance, and thinking of a lobster may ask: "Here are four pairs of legs and a pair of pinching 'claws,' and a long jointed hind-body, why don't you place this animal with the lobster among the crustacea instead of with the spiders, which have no such large pincers and a rounded unjointed abdomen?" These resemblances are only apparent; the differences are essential. The claws of the lobster are modified legs, those of the scorpion are greatly developed mouth organs—the latter belong to the head, the former to the creature's body. Again, if you examine the so-called tails, each segment of that of the lobster is provided underneath with a pair of little fins, while those of the scorpion are as free from such appendages as the abdomen of the spider. The respiration of the crustacean is by gills within its body—it breathes air from the water in which it lives, drawing in the water through its mouth, or even in some cases through its shell; whereas the scorpion breathes air directly by means of openings in its sides leading into (loosely speaking) lung-like sacs. Finally the lobster arrives at its adult state only after passing through a series of wonderful transformations, while the scorpion is viviparous, or rather ovo-viviparous—the eggs being fully developed and hatched within the body of the parent, and the young scorpion thus born begins life in its adult form, altering but little afterwards save in size. In this fact the reader will notice that there is a very essential difference from the development of the six-footed insects as described in a former paper. The difference between the spider and the scorpion is similar in its nature to that between the crab and the lobster. As the long, powerful, tail-like abdomen of the latter is represented by the almost unseen one of the former tucked away under the real body, so the rounded abdomen of the spider represents the long-jointed tail of the scorpion with all the parts concentrated and brought nearer the central governing head.

The spider, therefore, stands higher in the scale of existence than the scorpion—the formidable-looking though really harmless claws of the latter are represented by certain mouth organs called "palpi" in the spider. Instead of the sting at the end of the tail that gives the former its evil fame, the latter has hollow jaws, associated with venom glands, in its mouth. The scorpion's sting consists of a hollow claw, underneath which is the poison gland, and when the creature strikes its foe or its prey, the venom is injected into the puncture. The effects of this venom have been much exaggerated. In some cases of enfeebled or peculiarly susceptible constitution a bite may prove fatal, though such is seldom the case, the wound, however, generally producing very disagreeable effects. The most curious fact is, that the poison acts strongly on the creatures themselves. It is said that if several be confined together they will soon be all killed excepting perhaps a solitary survivor. So well was this susceptibility to its own poison recognized formerly, that the story was originated that when a scorpion becomes tired of life it commits suicide. Thus stated we fully assent to the statement, the little conditioned word "when" being, according to our idea, a sufficient guarantee against a very frequent occurrence of such scorpionic hari-kari.

[At least this is the opinion of M. E. Blanchard, as expressed in his beautiful work on insects and their metamorphoses, but Rev. Dr. Smith, President of Dartmouth College, who spent the past winter at the Island of Jamaica, informed us he had ocular proof that, under peculiar circumstances, the scorpion stung itself to death.—EDS.



THE RED SCORPION.

Insects Injurious to Grape-Vines.

[From the Second Missouri Entomological Report].

During the months of July and August, the leaves of the grape-vine may often be found denuded of their softer parts,



with nothing but the veins, and sometimes only a few of the larger ribs left skeleton-like, to tell of the mischief that has been done. Very frequently, only portions of the leaf will be thus denuded, and in that event, if we examine such a leaf closely, we shall find the authors of the mischief drawn up in line upon the yet leafy tissue, with their heads all toward the margin, cutting away with their little jaws and retreating as they feed.

These little soldier-like files are formed by worms in black and yellow uniforms which produce a moth popularly known as the American Procris. The eggs from which they hatch are laid in small clusters on the underside of the leaves, and while the worms are small, they leave untouched the most delicate veins of the leaf, which then presents a fine network appearance, as shown at the left in the cut; but when they become older and stronger they devour all but the larger ribs as at the right of the figure.

When full grown these worms disperse over the vines or forsake them entirely, and each spins for itself a small, tough, whitish, flattened cocoon, within which, in about three days, it changes to a chrysalis 0·30 inch long, broad, flattened, and of a light shiny yellowish-brown color. In about ten days afterward the moths (shown in the figure) begin to issue. This little moth is the American representative of the European *Procris vitis;* it is wholly of a black color, except the collar, which is of a deep orange, and the body ends in a broad, fan-like, notched tuft, especially in the male. The wings are of a delicate texture, reminding one of crape, and when the insect is at rest they generally form a perfect cross with the body, the hind wings being completely hidden by the front ones, which are stretched out straight at right angles, as in the genus *Pterophorus*, to which belongs the Grape-vine Plume.

The full grown larva measures rather more than half an inch, and tapers a little towards each end. It is of a sulphur yellow color, with a transverse row of six velvety-black, prickly tufts on each of the principal segments, the lower tufts being less distinct than those on the back. The first segment is entirely black with a yellow edge, while the spots on segments 11 and 12 usually run into one another. Head small, brown, and retractile, being usually hidden in the first segment. Fine scattering hairs anteriorly, laterally, and posteriorly. The young worm is of a very pale yellow, covered with numerous fine white hairs, with a slight grayish-brown tint on the head, and with the fifth and seventh segments paler than the rest, and having the black spots scarcely visible.

This is the only North American grape-vine feeding caterpillar which has a gregarious habit, and as gregarious insects are always more easily subdued than those of a solitary nature, the American Procris need never become very destructive. Its natural food is undoubtedly the wild grape-vines of our forests, and the Virginia Creeper, and Mr. J. M. Jordan of St. Louis, has noticed that while it very commonly attacks the foliage of the Concord, yet it never touches the Clinton and Taylor in his vineyard—a taste which is remarkable and not easily accounted for, since the foliage of the latter kinds is more tender and generally more subject to insect depredations than that of the former.

There are two broods of this insect each year with us, some of the moths from the second brood of worms issuing in the fall, but the greater part not leaving their cocoons till the following summer.

Perpetual Motion.

We have received from John C. Gardner a copy of his neatly printed pamphlet of 52 pages, entitled "Perpetual Motion," of which he is an earnest advocate. He employs a variety of mathematical demonstrations in support of the doctrine, but gives us no clew to the particular form of machine which is to be a practical illustration of his theories. He however affirms that aerial navigation is a natural consequence of his discovery of perpetual motion, and we therefore expect before long to see him flying about from point to point, and showing his feathers. His concluding deductions that his perpetual motion theories must be correct because nobody has disproved them, remind us very forcibly of Mark Twain at the grave of Adam.

"It is a singular circumstance," says Mark, "that right under the roof of this same great church, and not far away from that illustrious column, Adam himself, the father of the human race, lies buried. There is no question that he is actually buried in the grave which is pointed out as his—there can be none—because it has never yet been proven that that grave is not the grave in which he is buried. I leaned upon a pillar and burst into tears. I deem it no shame to have wept over the grave of my poor dead relative."

Arsenic in the Soda of Commerce.

Dr. Fresenius calls attention to a fact, accidentally discovered by him, that the carbonate of soda (neutral), as met with in a crystallized state, and as manufactured at the alkali works, now often contains a very perceptible quantity of arseniate, or arsenite of soda, undoubtedly due to the use of sulphuric acid for converting the common salt into sulphate of soda, which acid contains arsenic, derived from the pyrites of which few are quite free from arsenic, and some of which contain that substance in considerable quantity. The tests applied for the detection of this arsenic were not the most delicate in use for this purpose; and the quantity found, though small, is sufficient to affect the purity of preparations for medicinal and chemical use.

PROF. CHANDLER, of the School Mines, Columbia College, recently gave a very delightful afternoon reception at his residence in 49th street to Dr. Vogel, of Prussia, who is now on a visit to this country as a delegate to the convention of photographers at Cleveland. President Barnard, of the College, Dr. Doremus, Prof. Silliman, and other distinguished gentlemen were present.

Improved Steam Excavator.

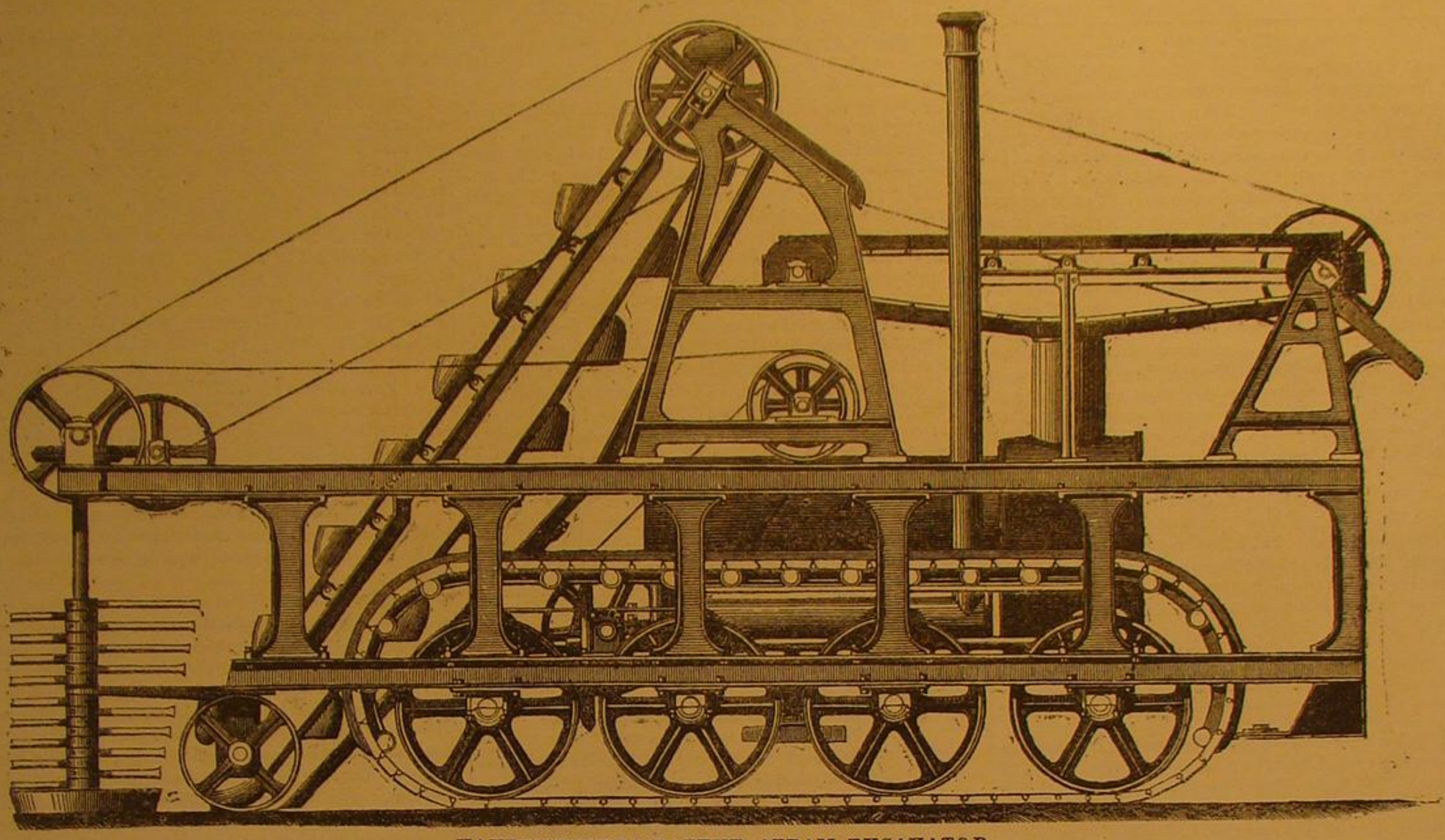
[From The Engineer, London.]

If the question were asked, is it possible to supersede every description of manual labor by the substitution of machinery, the correct answer would be to the effect that there is no doubt about the absolute possibility, but very considerable doubts regarding the expediency of the measure. No people have pushed this principle so far as the Americans—not so much from choice as from sheer necessity—and yet they find that there are some operations which must either continue to be performed by hand, as of old, or not performed at all. The price of labor is one of the most important circumstances bearing upon this subject, although it is equally affected by other considerations. One thing is certain, that, but for the higher cost or the absence of labor, a great number of present admirable inventions and plans in practice for employing machine *vice* hand labor would never have seen the day. It is not difficult to conceive the application of machinery to purposes of manufacture, and there is a certain amount of fitness in so employing it. But it requires a great stretch of the imaginative faculties to consider it as applied to land. Yet for large tracts of country it is now universally recognized as the only proper agent. Steam plows and steel cultivators are, after a hard fight, overcoming the prejudices and almost hatred entertained towards them by the agricultural population. Farming implements on a less pretentious scale, which have for their object the reduction of the laborers' toil, are now to be seen in and about the premises attached to every farm laying any claim to the epithet "large," and even small ones are provided with pulpers, bruisers, grinders, and other small machines, to an extent our grandfathers little imagined.

Engineers are continually being put in mind of the fact that the surface of the earth and its physical features require a good deal of alteration and modification before they can be rendered subservient to the wants and requirements of this age of progress. Excavating and embanking, or, in other words, the transport of some portion of the earth's surface to some other spot than where nature has placed it, is a perpetually recurring operation in all works of engineering and construction generally. The making up of embankments is simply a work of time; it is in the excavation that the navvy has to put forth his bone and muscle; it is by digging that the necessary material for the bank is obtained. We have the highest authority for knowing that in early times digging was, as it is now, the last resource for men who had no other means of gaining a livelihood but by manual labor; it cannot, therefore, be regarded as a very gentlemanly pursuit. Whether M. J. Vandenvinne has been actuated by these considerations we do not know, but he has recently invented and patented a machine for excavating earth which promises to be of great value and practical utility. The accompanying illustration represents it in elevation, and a brief description will render perfectly clear the manner in which it operates. In the first place there is no engine required. A glance at the cut will indicate that it is a steam engine as well as an excavating machine, and combines the motive power and the excavating agent all in one. The whole principle of the apparatus may be explained briefly by stating that the earth is excavated by a double series of horizontal picks rotating in opposite directions, which literally claw away the earth in front of them as the machine advances. It consists of a strong cast-iron frame-work, to the back of which is attached a steam engine for giving a forward or backward motion to the machine, and for driving its working parts. A pulley is keyed on the shaft of the steam engine which drives another pulley fixed on a horizontal shaft placed in the front of the machine; this shaft carries at each end a bevel pinion, which gears into two bevel wheels fixed on two vertical wrought-iron shafts, around each of which are fixed a certain number of picks or mattocks. These picks are arranged screw-wise, forming about a quarter of a revolution, and turning in opposite directions in such a manner that the picks of one of the shafts fit into the corresponding spaces left between the picks of the other shaft. These picks are in the form of a shovel, and as they dig out the earth horizontally it is thrown back and falls into buckets placed to receive it. Curved sheets of iron are arranged so as to prevent the loose earth from falling at the sides, and impeding the advance of the machine. The buckets are fixed on an endless chain passing over two drums, one at the bottom and the other at the top of the machine; the shaft of the top drum is driven by a band passing over a pulley fixed on the horizontal shaft before mentioned. The buckets are thus in incessant motion, and carry up the earth to the top of the machine, and turn it over on an endless chain which passes over two drums, on the shaft of one of which is fixed a pulley driven by a band from a pulley on the drum shaft of the trough chain. This endless chain carries the earth to the back of the machine, whence it may be carted away.

When required the apparatus can be so arranged as to deliver the earth at the side instead of at the back. Friction rollers are placed in suitable supports under the endless chain of the dredge, and also under the endless chain carrying the earth to the back of the machine. At each side of the latter chain, sheets of iron are fixed to prevent the earth from falling off, and two iron sheets, moved by a screw, are placed under the troughs on their descending side to prevent any earth falling into the machine. The forward movement of the machine is effected by means of a pulley fixed on the shaft of the steam engine, which drives a pulley fixed on a shaft in the lower part of the framework. The latter shaft drives by means of a wheel and pinion another shaft furnished with a bevel pinion gearing into and driving a bevel wheel fixed on a shaft carrying three endless screws. By these means motion is given to three gearing wheels fixed on the axles of the six wheels or cylinders on which the machine moves upon the endless floor. The machine has besides two other wheels placed towards the front part. A screw jack is adapted to the machine to raise it up when required to make it pivot on itself.

The necessity for enabling a machine of this description to work to any required gradient has been foreseen and provided for, as well as the case of curves, which, in the present day of railway making, approximate closely to what might be termed turning corners. In the engraving is represented a small machine weighing rather more than four tuns, and only about three-horse power. We witnessed its performance at the Ashburnham grounds at Chelsea some time ago, when it excavated the ground to a depth of 2½ feet. It broke the earth up small, and threw it into the buckets or hoppers, by which it was conveyed to the rear. One of the large-sized machines, weighing twelve tuns, is at work in Belgium, where it is performing in a most satisfactory manner. The speed of the advance can be regulated by the engine at pleasure. From the exceeding neat, clean cut made by this machine it appears to be admirably adapted for the cutting of trenches, for laying gas, water, and other pipes and drains, as there need never be any more earth excavated than what is actually required.



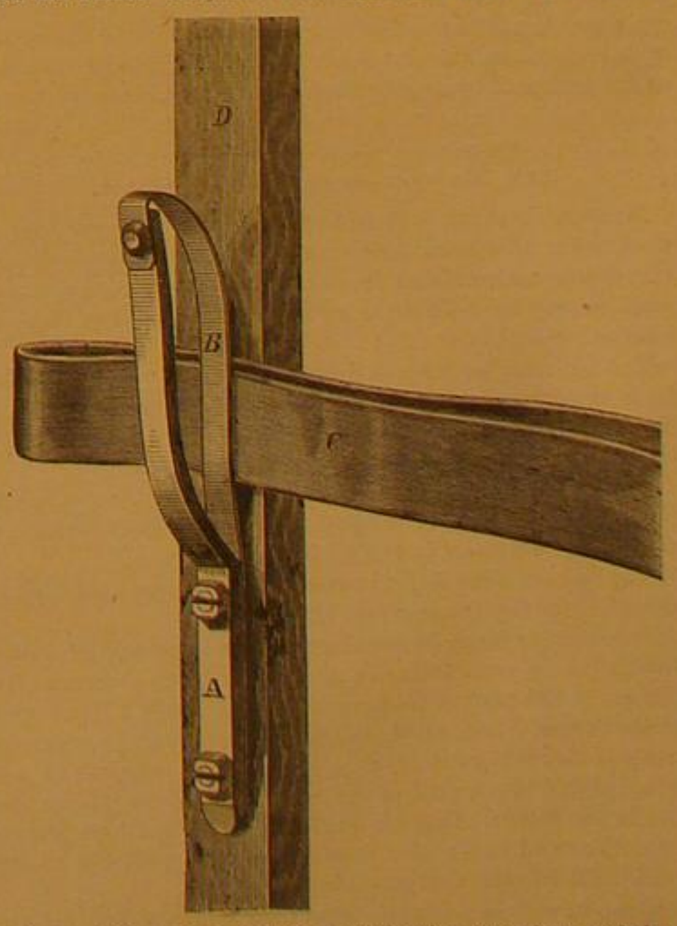
VANDENVINNE'S PATENT STEAM EXCAVATOR.

The Largest Pump Manufactory in the World.

The catalogue of Rumsey & Co., Seneca Falls, N.Y., embraces over 200 different styles and sizes of lift and force pumps. They are now turning out 1500 pumps per week, which range in price from $3 to $400, employing 130 hands in the business. John A. Rumsey has recently patented an improved galvanized non-corrosive cast iron pump which is safe from rust. An improved Hand Fire Engine, of great efficiency, is also on their list. The machinery in Rumsey & Co's factory is of the most efficient kind—much of it being of their own invention, and is driven by an unfailing water power. They are now building a new factory, 84 by 42 feet and 4 stories. When this is completed they will increase their working force to 250 hands. The business now carried on by this firm was established by Rumsey about 30 years ago.—*Boston Commercial Bulletin.*

ACHENBACH'S REIN HOLDER.

The fastening of the reins is one of the annoyances of horsemen. It is by no means conducive to good nature to return after leaving a horse hitched for a short space, to find the reins which you had endeavored to tie up securely, down under the horses' feet, foul with mud and filth. Yet in the usual way of fastening, unless special pains are taken, and the flies are less than usually annoying, such unpleasant consequences are almost sure to result. Besides, the knotting of the reins crumples and wrinkles them greatly, injuring their appearance.



Our engraving illustrates a neat little device, which completely removes all the disadvantages we have named.

A is a metallic bracket bolted to the bow, D, of the carriage top, dashboard, or other convenient part of the carriage. From the inside of this bracket rises a spring, B, the upper end of which is turned over and riveted to the upper end of

the bracket so that it cannot catch upon the clothing or injure the hand. When it is desired to secure the reins, C, all that is necessary is to press them down behind the spring, B, as shown in the engraving. It is done in an instant, and the fastening is perfectly secure as the spring holds with great force. The attachment may be made ornamental in appearance.

Patented, through the Scientific American Patent Agency, June 7th, 1870. Address, for further information, John R. Achenbach, Saddle River, N. J.

Correspondence.

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

Immortality of the Soul.

MESSRS. EDITORS:—Upon page 353, current volume, SCIENTIFIC AMERICAN, there appeared an article under the following caption, "A Clever Hoax—Who is Dr. Ivan Slavonski?" Let the doctor be whomsoever he may, there is one thing certain, and that is, the viciousness of his atomic theory of the universe. It is not only vicious, but unthinkable. We cannot imagine an atom so small as to be without an upper and an under side, a right and a left, hence it is impossible for us to conceive an indivisible atom. But I digress. I wish to call your attention to "The Hydropollusis." From the tenor of your remarks, I judged that your faith in that prophecy was somewhat diluted. Now, do you mean to assert that it is only a postulate—a mere figment of the "fine metaphysical mind?" Do you deny that there is a constant and uniform change in the inclination of the earth's axis? If you do not, then there is no alternative—you must indorse the prediction. True, the prediction extends to a very remote, but not an inconceivable future. Geologists have discovered traces of a "Glacial Period," and have revealed the cause; then why may we not predict the effect? Unless I am very much mistaken, there will be an astromical calculation made public ere long, that will dwarf the above prediction into infinitesimal proportions. I allude to the measurement of the solar orbit. Just think of it, that will be a prophecy all but transcending human comprehension.

Allow me to refer to a prediction made by the poet Longfellow:

> A traveler, by the faithful hound,
> Half-buried in the snow was found,
> Still grasping in his hand of ice
> That banner with the strange device
> Excelsior!

The traveler is the State of New York, or at least that portion of the State which shall be most elevated six thousand years hence. The faithful hound will be some future Arctic explorer, and that banner with the strange device, nothing less than the ruins of our superior civilization. Don't you believe it? Then you needn't that's all. P. L. B.

New York City.

[We do not disbelieve in the change in the inclination of the poles of the earth, as our correspondent seems to think. But we more than believe that the theory of life ascribed to Dr. Meissner, a mythical German professor, the Hydropollusis, and the mathematical demonstration of the immortality of the soul, by the celebrated Dr. Slavonski, were written as clever hoaxes, with a basis of truth at the bottom sufficient to give them an air of reality, and that they went as far and duped as many people as the celebrated Locke moon hoax, which many of our readers will remember. This is what we know. We have little doubt some future generation will get a wetting from the change in the inclination of the earth's orbit referred to, but that the catastrophe will be as extensive as the author of hydropollusis sets forth we have some doubts. [EDS.

The Universe--Comets--Meteorites.

MESSRS. EDITORS:—Men of science everywhere are busy at work upon the great problems of nature—microscopic and telescopic—material and mental. The following brief suggestions may be useful to those who are engaged in these recondite researches.

The *Universe* has been well enough defined, "*that whose center is everywhere and whose circumference is nowhere.*" Yet, it is plain that the thing thus defined is an inexplicable mystery; but there can be no doubt of its existence.

The present is eternity; and hence any time, so to speak, (for time is a fiction) in the past has been, and any future period will be precisely in the midst of eternity.

The universe never had a beginning; and, being unlimited in extent, of course it never can cease to exist.

There are as many material organisms in process of formation in the universe to-day as were ever formed during a similar era in the past, or that ever will originate in a like period in the future. And, on the other hand, there are as many organic bodies being destroyed in the universe to-day as at any equal period in the past, or that ever will be destroyed on any day in the future. Organic productions, destructions, and reproductions of every kind throughout the universe follow each other in rapid and unending succession.

The numberless material organisms which constitute the universe—past, present, and future—began, and of necessity must originate in rudiment. This is likewise true of the mind, of the arts and sciences, and of all human knowledge. *Everything begins in rudiment.*

By means of the foregoing wide generalizations, most of the phenomena of the visible universe may be rationally explained. The earth, for example, had neither an aqueous nor igneous origin, but it is probable that it sprung spontaneously from favorable chaotic molecular conditions—the peculiar nature of which is inscrutable to the human intellect—the cohesion of its elemental materials being effected by the action of that innate function of matter, called gravity, and thus simultaneously developing the threefold constituents of all organized bodies, namely—*matter, principle,* and *motion.* For a long period the inchoate organism gradually developed by molecular accretions, which, being powerfully compacted together in the sphere form and thereby producing heat, at a comparatively early period of its existence, the matter constituting the nucleus or center of the body spontanously fused; and as the asteroid increased in size, the internal fusion progressed *pari passu,* with only a superficial crust of cold materials upon the surface at any time. In this manner the rudimental earth at length attained maturity, or what may be more properly called its second stage of existence, and in which it became prolific of life—vegetable and animal. The third stage of our planet will be that of its spontaneous combustion, which will transform it into a *sun-star,* and thenceforward it will constitute, either alone or in combination with others, one of the self-luminous bodies in space which do perpetually, but only partially, illuminate the universe. And, finally, after the materials constituting the flaming orb have been greatly reduced by this destructive process, and its illuminating power correspondingly diminished, it will gradually decline till it reaches the fourth and last stage of its existence—that of a comet. In this latter condition, like that of an old man worn and wasted by the weight of long accumulated years till he reaches a sort of second childhood, the star will wander away from its old stellar home, distributing its residuary matter far and wide through the limitless field of *black chaotic space,* and at last disappear in a gaseous mist!

Hence, it is more than probable that there are now, ever have been, and always will be innumerable rudimental heavenly bodies in the universe. Meteorites, I imagine, are but the fragments of such inchoate organisms, casually broken in pieces by collisions with each other, and scattered through the unending planetary systems revolving in boundless space. Like feeble and tottering infants which are not subject to the laws that govern adults, the children of the universe are not so rigidly controlled by gravity as the older systematized heavenly bodies; and consequently in their erratic motions they sometimes pass between our earth and the sun, and thus produce those dark spots which occasionally appear on the face of the latter body.

The foregoing views, when fully elucidated, will serve to resolve the problems of the universe—as far as they may be comprehended by the mind of man. R. O. D.

Subjects for Investigation.

MESSRS. EDITORS:—We frequently see in scientific works that light and heat are spoken of as "things" *per se,* or, in other words, as entities of themselves.

To one who has for over thirty years held the opinion that light and heat are only *conditions* of matter, the question, Where does all the heat go? is just as foolish as to ask "Where does the motion go when a train of car stops?"

When we move our arms, we have motion. When we cease to move it, the motion is non-existent. When we ignite a candle, we have light and heat; blow it out, *both cease to exist.* We have no knowledge of either apart from matter in a state of combustion or friction, and to treat of them otherwise seems unphilosophical.

We hear and see a good deal about the "Law of Gravitation." Is there such a law? Gravitation is supposed to be a property of matter, and to emanate from it, like an odor or heat, inversely as the square of the distance. What proof can be afforded that such is the fact?

"About the year 1805 it occurred to Sir Richard Phillips that, as the fall of bodies is a mere phenomenon of motion on a moving globe, itself subject to two great motions; so, any variance in the direction of these, would, as in all such cases, produce an *increase* of velocity in a body surrendered to their free action; and the direction to the center would be likely to be the constant diagonal of both."—[See "Million of Facts."]

If you desire it, Sir Richard's proof can be given; of which he says, "No other proof resembles this, in the whole circle of natural philosophy." There are other subjects that more immediately concern us, which might be investigated with profit. For example, several thousands of laborers are without employment in San Francisco, Cal. It is said that "labor is the only legitimate source of wealth." If so, why is it that these people are unemployed? Is wealth so abundant that their labor is not required? Certainly not, for we learn that many of them are in poverty. What then is the cause of this stoppage of production? A. R.

Washington, Texas.

Lancaster Beer.

MESSRS. EDITORS:—I send you the result of an analysis of the celebrated Lancaster beer of Pennsylvania, that I have recently made. It is as follows:

	Parts.
Alcohol	3·8000
Dextrine and gums	4·3060
Sugar { cane, ·4698 / grape, ·7840 } Total	1·2538
Free acetic acid	·0316
Albumious matter	·0238
Lupuline (bitter principle of hops)	·0229
Ash (chiefly phosphates and sulphates)	·5993
Total	10·6366
Water	89·3634
	100·0000

I believe this is the first analysis ever made of this beer. I think it may prove interesting to some of your many readers.

I have been very much interested in the Notes on Science, in your valuable paper. F. G. DU PONT.

Wilmington, Del.

Professor Henry of the Smithsonian Institute on Lightning Rods.

In answer to a letter of inquiry as to the best method of erecting and constructing lightning rods, Professor Henry gives the following instructions:

1. The rod should consist of round iron of about one inch in diameter; its parts, throughout the *whole* length, should be in perfect metallic continuity, by being secured together by coupling ferrules.

2. To secure it from rust the rod should be coated with black paint, itself a good conductor.

3. It should terminate in a single platinum point.

4. The shorter and more direct the course of the rod to the earth the better; bendings should be rounded, and not formed in acute angles.

5. It should be fastened to the building by iron eyes, and may be insulated from these by cylinders of glass (I don't, however, consider the latter of much importance).

6. The rod should be connected with the earth in the most perfect manner possible, and nothing is better for this purpose than to place it in metallic contact with the gas-pipes, or, better, the water-pipes of the city. This connection may be made by a ribbon of copper or iron soldered to the end of the rod at one of its extremities, and wrapped around the pipe at the other. If a connection of this kind is impracticable, the rod should be continued horizontally to the nearest well, and then turned vertically downward until the end enters the water as deep as its lowest level. The horizontal part of the rod may be buried in a stratum of pounded charcoal and ashes. The rod should be placed, in preference, on the west side of the building. A rod of this kind may be put up by an ordinary blacksmith. The rod in question is in accordance with our latest knowledge of all the facts of electricity. Attempted improvements on it are worthless, and, as a general thing, are proposed by those who are but slightly acquainted with the subject.

Photographing on Wood.

Anthony's *Photographic Bulletin* gives the following process by A. J. Searing for photographing on wood for engraving purposes:

"The block on which the picture is to be made is first dampened with water, then whitened with enamel, rubbed from the surface of good enameled visiting cards. Rub gently, removing only the enamel, after which it is brushed smooth with a moderately stiff brush, from right to left and up and down, making a smooth, even, and very thin surface. Allow this to dry, after which it is flowed with a solution of albumen, made with the white of one egg and sixteen ounces of water, dried by heat or allowed to dry spontaneously. Now coat it with another albumen solution made as follows:

FORMULA No. 1.—White of one egg; water, 4 ounces; chloride of ammonia, 40 grains. Beat the whole to a thick froth. Allow to subside, then decant or filter through a fine sponge placed in a glass funnel. Pour a sufficient quantity on one corner of the block to cover it, when spread around with the aid of a $\frac{1}{2}$ or $\frac{1}{6}$ glass (using the edge). Allow the surplus solution to drain back into the bottle. Dry this by a gentle heat.

FORMULA No. 2.—Ether, 1 ounce; alcohol, 1 ounce; gun cotton, 8 grains; nitrate of silver, 30 grains; dissolved in as small a quantity of water as possible, and allowed to settle for a few days, protected from the light. Flow the salted block with formula No. 2, in the dark room, and dry by gentle heat. It is now ready for exposure under the negative. A porcelain printing-frame, or any other suitable method, may be used to print it. After printing, formula No. 2 is removed from the surface of the block by dissolving in ether and alcohol, assisted by rubbing gently with a soft sponge. The picture can now be toned and fixed in the ordinary way, or fixed and toned at one operation, by the hypo and gold bath. After being allowed to dry, it is ready for the engraver.

The Multiplication of Insects.

A writer in the N. Y. *Evening Post* calls public attention again to this subject, and maintains that it is one of the principal causes of failure in fruit crops. He says so far as our observation extends their number seems to increase with every successive year. They attack the leaves; they attack the fruit, often as soon as it begins to set; they do not spare the branches, or even the trunks. They cause the apple and the pear to become small, knobby, and wormy, or to fall prematurely; they make the fruit of the cherry wormy, and worthless, or cause it to decay on the tree, and prevent the plum from ripening. We have seen medlar trees on Long Island covered with fruit, which was not in a single instance perfected, every medlar being bored through and through by insects, and made apparently as woody as the trunk. Downing's ever-bearing mulberry tree, in the same neighborhood, has its bark pierced in every direction with insects, and unless it is protected from them by some wash impregnated with substances distasteful or fatal to them, the tree perishes. Even the wild red mulberry trees in the wood suffer from the same cause, and die before they come to their full growth.

One of the causes of this extraordinary increase of insects injurious to vegetation is the destruction of the birds that feed upon them. We must take our choice between the insects and the birds. Birds multiply with comparative slowness, and if they prey upon the crops they can be seen and scared away. Insects multiply by myriads, and evade the attempts of man to destroy them. Birds take a small part of the fruit or ripened grain; insects destroy both by wholesale. There is nothing for us to do but to take the birds into partnership, allowing them a part of the annual product on condition of their protecting the remainder, as the traveler in the East pays a tribute to the Bedouin chief on condition of being protected by him from the robberies of his tribe.

On Long Island the farmers have the habit of soaking corn in strychnine or some other poisonous substance and strewing it about their fields to prevent the depredations of the crows. There could be nothing more ill-judged than this. Not only crows, but other birds that make war upon the insect race, swallow the poisoned kernels and perish in consequence. But even if the crow only was destroyed, the effect would be mischievous. Crows feed upon grasshoppers, crickets, and other insects, and their stomachs are found full of them. A single insect which escapes them becomes the parent of thousands, and each one of these is the progenitor of thousands more, which move silently and surely to the work of destruction. If the crow cannot be kept from pulling up Indian corn by the old expedient of scarecrows, there is no other method but to replant, and set down the plants which he has pulled up to the account of profit and loss. The uprooting of a few plants would be a loss of far less consequence than the mischief from millions of destructive insects propagated without check.

In some parts of the country where the soil affords a convenient lodgment for insects, cultivators have abandoned the attempt to raise certains kinds of fruit. A gentleman living in the neighborhood of New Haven said to us not long since: "We have given up planting orchards of the apple-tree in our region. We find that we cannot raise fair, handsome, perfect fruit, on account of the mischief done by insects." On account of curculio, it is next to impossible for a plum to ripen on Long Island, where that fruit is now only known through tradition. The only way to remedy the evil seems to be to encourage the multiplication of birds.

Zerah Colburn.

It seldom falls to the lot of the journalist to discharge a sadder duty than that which we have to perform to-day in announcing the death of an engineer for several years connected with this paper, and whose name will be familiar to each one of our readers. On the 25th of April, Zerah Colburn was found lying in an orchard at Belmont, near Boston, U.S., whither he had wandered a day or two before from New York, mortally wounded in the head by a pistol shot fired by his own hand. Not yet dead, though dying, he was borne to the county hospital, where he expired a few hours afterwards. In this way has passed from among us an engineer whose abilities were sufficient, had they been but wisely directed, to raise him to any position that a member of the profession can reasonably hope to attain. Of the causes that led him to commit suicide it is not our place to speak.

To tell the tale of Mr. Colburn's life would be to place on record the biography of a man blessed with enormous mental powers; but, alas! too little permitted to be governed by those influences which tend to make a man not only great, but good. Such a narrative must proceed from other pens than ours. Of his connection with this journal it is, however, necessary that we should say something, and that something we may preface by stating that Mr. Colburn was born in Saratoga, State of New York, in 1832. As a boy he early manifested wonderful powers of memory, a passion for mechanics which influenced his whole life, and extraordinary energy and fitfulness of character. All things by turns—office boy, clerk, actor, poet, agent, engineer—but nothing long—he found his way to this country in 1857. For some time previously he had devoted his attention with considerable steadiness to journalism, and in 1858 he was already a practiced writer for the scientific press. His abilities attracted the attention of the founder and editor of this journal, and, at his request, Zerah Colburn wrote several articles, which were of so high a character that he was ultimately appointed to an influential position on the staff of *The Engineer*—eventually, for a time, occupying the post of editor in charge, while the responsible editor and proprietor was absent on the Continent through ill-health. The leading articles written by Mr. Colburn during this period have never been excelled in vigor, accuracy, and elegance of style. Nothing like them had ever before appeared in a scientific journal. It is to be regretted that they subsequently manifested in a few cases a lack on the part of their author of that spirit of strict impartiality which should be a distinguishing feature in an influential journal. Owing to this, and other causes, on the consideration of which it is not necessary to enter, Mr. Colburn ceased, in November, 1864, to have any connection whatever with the editorial department of *The Engineer*, although for a few months he was an occasional contributor to its pages. But even this connection, slight as it was, ceased in the spring of 1865.

Of the attitude subsequently assumed by Mr. Colburn towards *The Engineer* we prefer to say little or nothing. To speak favorably of it would be affectation; to tell the truth would be ungenerous to the memory of the dead. The facts are already familiar enough to many, beyond whom it is needless that any knowledge of them should extend. It is, however, not unreasonable to suppose that even at that time his mind, naturally ever restless and impulsive, had begun to lose its balance—that the insanity which has culminated in this last sad tragedy had already begun to develop itself.

Those who best know us will be most ready to believe that we find it impossible to speak of Mr. Colburn's melancholy death without deep sorrow. That in this country he has left few friends and many foes, as the result of a peculiar temperament which would not brook a moment's contradiction, is, we fear, but too certain. We trust that the good angel Charity will efface with tender hand the record of poor Colburn's faults, and leave for another generation the memory only of his virtues, his talents, and his good deeds.—*The Engineer.*

ACCORDING to Herodotus, coined money was invented by the Lydians.

Colored Fires.

The *Druggists' Circular* gives the following formulæ for the benefit of those persons who have occasion to prepare materials for Fourth-of-July displays or other *fire exhibitions:*

BLUE FIRE.—1. Tersulphuret of antimony, 1 part; sulphur, 2 parts; dry niter, 6 parts. This is the composition used for the Bengal or blue signal light employed at sea.

2. Sulphur, sulphate of potassa, and ammonio-sulphate of copper, of each, 15 parts; niter, 27 parts; chlorate of potassa, 28 parts. For theatrical illuminations. This may be rendered either lighter or darker colored by lessening or increasing the quantities of the sulphate of potassa and ammonio-sulphate of copper.

3. *Dark Blue*—Calcined alum and carbonate of copper, of each, 12 parts; sulphur, 16 parts; chlorate of potassa, 60 parts.

CRIMSON FIRE.—1. Chlorate of potassa, 4½ parts; charcoal (alder or willow), 5¼ parts; sulphur, 22½ parts; nitrate of strontia, 67½ parts. For pots.

2. Charcoal, 4½ parts; sulphuret of antimony, 5½ parts; chlorate of potassa, 17¼ parts; sulphur, 18 parts; nitrate of strontia, 55 parts. For boxes and stars.

GREEN FIRE.—1. Nitrate of baryta, 77 parts; chlorate of potassa, 8 parts; fine charcoal, 3 parts; sulphur, 13 parts.

2. Boracic acid, 10 parts; sulphur, 17 parts; chlorate of potassa, 73 parts. Very beautiful.

3. Chlorate of potassa, 18 parts; sulphur, 22; nitrate of baryta, 60 parts. For theatrical illuminations.

4. *Light Green*—Sulphur, 16 parts; carbonate of baryta, 24 parts; chlorate of potassa, 60 parts. Extremely delicate.

LILAC FIRE.—1. Black oxide of copper, 6 parts; dry chalk, 20 parts; sulphur, 26 parts; chlorate of potassa, 49 parts. For pans.

2. Black oxide of copper, 3 parts; dried chalk, 22 parts; sulphur, 25 parts; chlorate of potassa, 50 parts. For stars.

PURPLE FIRE.—Lampblack, realgar, and niter, of each, 1 part; sulphur, 2 parts; chlorate of potassa, 5 parts; fused nitrate of strontia, 16 parts.

RED FIRE.—1. Sulphur, sulphuret of antimony, and niter, of each 1 part; dried nitrate of strontia, 5 parts.

2. Chlorate of potassa, 20 parts; sulphur 24 parts; nitrate of strontia, 56 parts. For theatrical illuminations.

3. *Orange Red*—Sulphur, 14 parts; chalk, 34 parts; chlorate of potassa, 52 parts.

VIOLET FIRE.—1. *Dark Violet*—Alum and carbonate of potassa, of each, 12 parts; sulphur, 16 parts; chlorate of potassa, 60 parts.

2. *Pale Violet*—Sulphur, 14 parts; alum and carbonate of potassa, 16 parts; chlorate of potassa, 54 parts.

WHITE FIRE.—1. Charcoal, 2 parts; sulphur, 23 parts; niter, 76 parts. For theatrical illuminations.

2. Sulphur, 13¼ parts; sulphuret of antimony, 17¼ parts; niter, 48 parts.

YELLOW FIRE.—1. Charcoal, 1½ parts; sulphur, 17½ parts; dried soda, 20 parts; niter, 61 parts.

2. Charcoal, 6 parts; sulphur, 19½ parts. For pans. Very beautiful.

The ingredients of the above compounds are to be separately reduced to powder, and sifted through lawn, after which they should be kept in well-corked, wide-mouthed bottles, until the time of mixing them for use. The chlorate of potassa, more especially, must be separately treated, and cautiously handled, in order to prevent the possibility of explosion from friction while it is in contact with combustible matter. The requisite quantity of each of the ingredients being weighed out and placed on a clean sheet of white paper, the whole is to be thoroughly but carefully mixed together, with a "light hand," by means of a bone or wooden knife. The compound is next "lightly" packed into small cups or pans for illuminations, or into small pill boxes for stars and trains, a little priming or quick match being lastly attached to each. To *insure success*, the several ingredients must be dry and commercially pure; and though reduced to the state of a uniform powder, care must be taken that they are not absolutely "dusty," or too finely pulverized.

The nitrate of strontia, alum, carbonate of soda, etc., before being weighed, require to be gently heated in an iron pot or pan, until they fall to powder and lose their water of crystallization.

As the materials for colored fires rapidly deteriorate by by keeping, and even sometimes inflame spontaneously, to prevent disappointment and accidents they should not prepared long before they will be required for use, and should be stored in some situation in which their spontaneous combustion would be productive of no disastrous consequences.

The Electric Faro Box---The Greatest Gambling Invention of the Age.

One of the most ingenious inventions for fraud and deceit ever introduced to the "sporting fraternity" has recently been placed on private exhibition for the inspection of a few select gamblers. It consists of an electric faro box, so constructed as to permit cards to be secretly drawn, at the will of the dealer, without the possibility of the manner in which the movement is made being detected.

It will be first necessary to say to those who have never "fought the tiger" that a faro box is a very simple affair, usually made of some kind of metal, and is used to hold the cards which are presumed to be drawn singly while the game is being played, until the whole pack is exhausted. Every second card shown, except the first card, which is called the "soda," wins throughout the game. The first card shown loses.

This is the rule, although there are a few technical exceptions. The box is usually about 4 inches by 3 inches in size, and is fitted with springs which press the cards to the top whence they are released by being passed through a slot. In all square games but one card is passed through the slot at a time, although there are accommodation boxes which permit of all being drawn.

The electric faro box is very similar in construction to the box now in ordinary use among gamblers, except that it is is invariably made of steel or iron, and the springs for pressing the cards up are spiral instead of elliptic. Through one of these springs runs a wire which controls the magnet in the box. The table upon which the box rests is fitted in the usual plain way with the lay-out, the check-rack, and cases. Upon the lay-out, however, depends very much of the success of the fraud. This unpretending article is usually only a board covered with cloth, upon which is fastened one of each of the several denominations of cards in a full pack. These cards when used in connection with the electro faro box are oxidized and placed upon the cloth in such a way as to completely dispel all suspicion of their character. This is a part of the secret of the invention, and is claimed to be an entirely new thing in the science of electricity. Attached to these cards and running from each separately, are fine copper wires, which are placed under the lay-out board and run down through one of the table legs, where they connect with a battery under the floor.

The cards used may be of the common kind, but before being placed in the box they are immersed in a powerful magnetic solution, which is also held as a secret. When the game is about to open, and the dealer takes his seat, the table has the appearance of a very ordinary piece of gambling furniture. The box is produced and placed upon the table, immediately over a strip of oxidized cloth, highly charged with electricity, and the game begins. All the cards being magnetized, both in and out of the box, the current of electricity is made complete by a magnet skillfully adjusted in the box, which is always under the control of the dealer.

As all money at a faro bank is usually represented by chips some weight is placed upon a card when a bet of any importance is made—for ten or a dozen chips will weigh several ounces. So sensitive are the cards on the lay-out that the slightest pressure is at once telegraphed to the representative cards in the box, and in consequence of their becoming magnetized they cannot be made to win unless the dealer breaks the current of electricity. This is done by an ingenious contrivance which detaches the magnet in the box when the current is off. Otherwise the cards, having been prepared for the purpose, would come out in pairs or double, very much after the fashion of braces used in all "skin games." This is not easy of explanation, except that every card on the lay-out corresponds with four similar cards in the pack, and that they are severally magnetized, so that any card upon which a bet is made must lose if permitted to come out double with another card. This is done through the slot, which is so arranged that a slight piece of steel can be moved so as to increase or diminish the aperture. In this manner the deal can be changed—a proceeding that all gamblers will readily understand.—*Electro-Telegraphic Review.*

A Concrete from Gas Lime.

It is well known that gas companies turn out of their works a quantity of lime which has absorbed certain impurities from the crude gas. Hitherto, the only use found for this offensive smelling gas lime, has been the very limited one of spreading it on the land and at the roots of trees for killing insects hurtful to vegetation. Of course this is out of the question in the case of the large city gas works, whose plant is too far removed from fields and orchards, and, although it is acknowledged that gas can be better purified by lime than by any other material, the trouble of removal of the waste product has forced the adoption of other methods which do not involve so much expense in carriage.

According to the London *Builder*, Mr. Thomas Prideaux, of Sheffield, has been exhibiting blocks of concrete, moldings, artificial stone slabs for hearthstones, and other objects, all made from this refuse gas lime; and as it is now the subject of a patent, and promises to furnish a useful material for building purposes, a short account of the results obtained up to this time may be useful. The gas lime is ground under edge stones, and presents at first a uniform green color. In this state it forms the raw material for making plaster or cement of various qualities and capabilities. According to the purpose required, it is used in this state, or it is calcined and reground and mixed with silicous matters. A wall may be covered with a smooth coat, which hardens free from cracks, for interiors; basements may be covered with a dry coat of cement, impervious, it is asserted, to damp, and quite obnoxious, be it remarked, to cockroaches. A hearthstone may be formed, and sets in a few days into a hard block of stone, as well as mantel-pieces and jambs, which, without any coloring matter, present a neat and stone-like appearance.

It is remarkable that the peculiar odor of the gas lime is no longer to be detected when the cement has set. The sulphur compounds are oxidized rapidly, and some of the adhesive qualities of the cement are no doubt due to the formation of calcium sulphate or plaster of Paris throughout the mass of the material in the process of hardening. A rubble wall can be built up and plastered over to resist the action of water in the interval of a tide, as the properly prepared cement will set even under water. The latter property has induced Mr. Prideaux to propose its use for building sea walls.

A number of houses in Sheffield, where trial has been made of this material, have been visited and inspected since its first application to walls, floors, and hearthstones, now about twelve months ago, and time only appears to tell in favor of its durability.

Improved Street Pavement.

Our readers are well aware that one of the principal, as well as one of the most difficult problems with which inventive genius is at present grappling, is that of street pavements. Innumerable experiments and numerous failures are circumscribing the means whereby the desired end can be secured within constantly narrowing limits, and impossibilities as well as possibilities are becoming daily more defined.

So far nothing has been able to take the place of stone where pavements are required to undergo heavy trucking, and nothing has yet been discovered which makes so luxurious a road for pleasure driving as wood. Each of these pavements have their weak as well as their strong points. The weak points of the wood pavements are that they will not endure heavy work as well as stone, and many of them interpose serious obstacles to repairing sewer, water, and gas pipes. The weak point of the stone pavement is that for any thing but heavy trucking it is an abomination intolerable to the spirit of progress, general refinement and advanced civilization of the age.

Combining the good points of both these kinds of pavement, the inventor of the pavement herewith illustrated has sought to eliminate their defects.

The pavement is not designed for streets through which the heaviest kind of traffic passes, where stone alone is suitable; but for suburban towns and many of the quieter streets of New York and other large cities, it offers advantages which in our opinion entitle it to careful examination and trial.

It also is not liable to an objection which lies with more or less force against all kinds of composition pavements, namely, the difficulty of raising it for making repairs to water and gas pipes, and sewers. It consists of a composite pavement of longitudinal sections of Belgian or other stone pavement, arranged with special reference to gas, water, and sewer pipes, with intervening sections of wood or composition pavement of suitable width for pleasure driving.

The engraving represents a section and plan of a street of ordinary width, divided into longitudinal sections of suitable width, the stone-ways as well as the wood portions to be used when needed as drive-ways.

The central one, A, is laid with stone pavement of the Belgian or other style, under which the sewer is placed, as shown at B, in the section, Fig. 2.

On either side of this central way are laid wood sections, C, of the Nicolson, or any other style of pavement which may be preferred; or any other smooth kind of pavement of concrete may be used if thought best. Between these sections and the curb stones are laid the stone sections, D, which complete the road and form the gutters. Underneath these sections are placed the water and gas pipes.

Thus when repairs are needed in any of these pipes they are reached by removing the stone portions of the road, which may readily be replaced, while the wooden sections remain entirely undisturbed. They consequently endure much longer than when they are required to be taken up and relaid, and they afford ample, pleasant, and inviting surfaces for pleasure driving.

It is thought that this system will facilitate traffic and diminish the danger of collision by keeping the heavy trucks, on streets where heaviest trucking is done, entirely distinct from the lighter vehicles, and that travel might be so regulated that turning out could in great measure be avoided on such streets. It is also thought that the system would greatly increase the comfort of the traveling public, while increased durability and improved appearance of streets may be secured without material increase of first cost over that of stone pavements, while the cost would be considerably less than that of pavements made entirely of wood.

The cost of maintenance, which is the chief thing to be considered in connection with the expense of roadways, would be very much less than that of any other road of equal smoothness of surface and affording equal comfort and facility to travel.

Patented, April 26, 1870, by James C. Blake, Elizabeth, N. J., whom address for further information.

Fig. 1

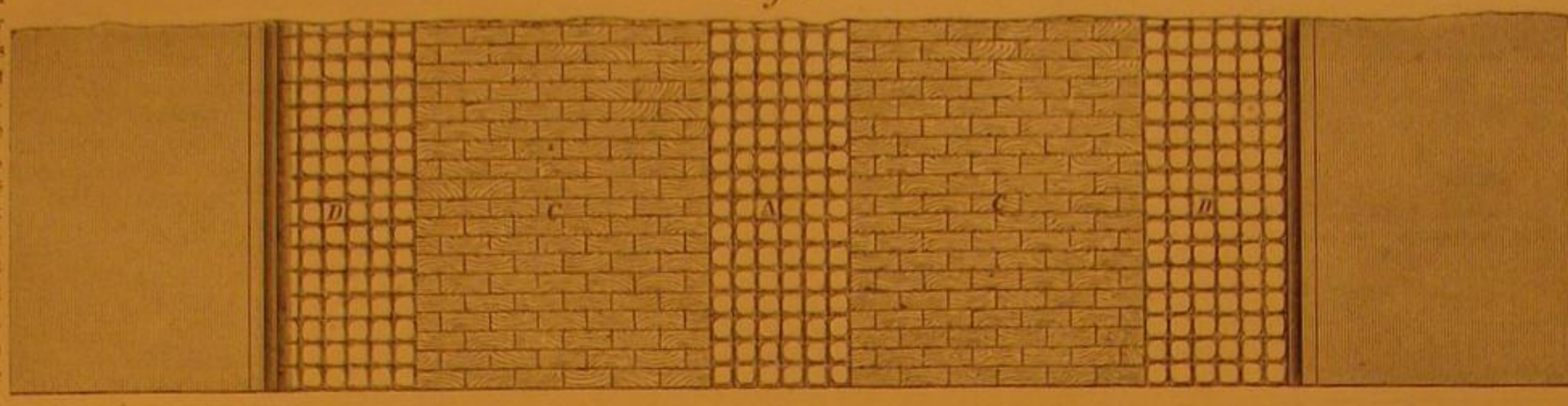
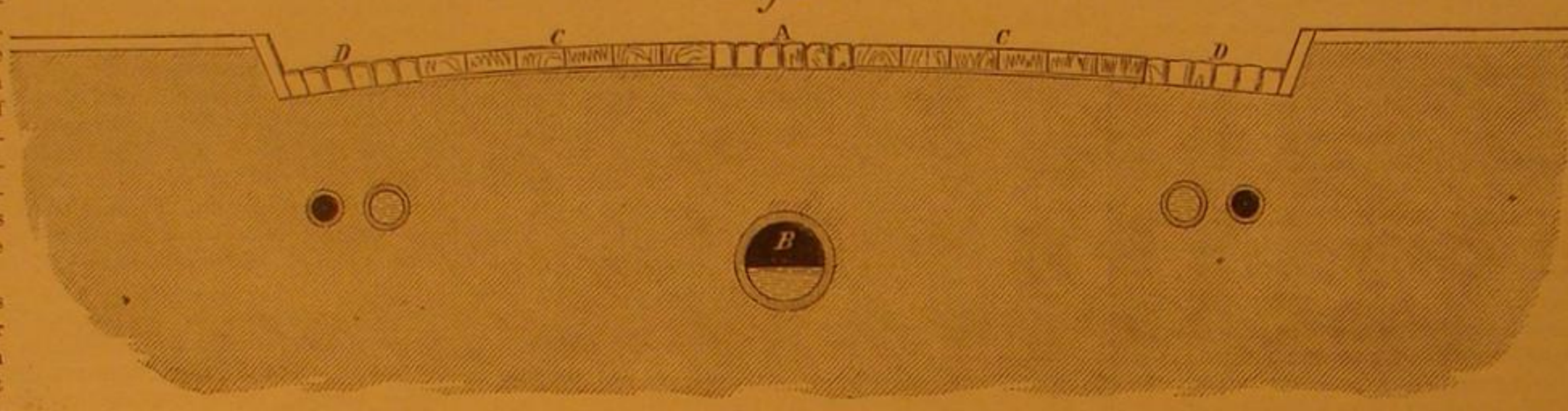


Fig. 2



BLAKE'S COMBINED WOOD AND STONE BLOCK PAVEMENT.

How They Do in France--A Valuable Suggestion.

They are adopting a system in France, in the manufacture of beet root sugar, not unlike our cheese factories in this country, to diminish the number of manufactories and build up fewer, but larger ones, at more convenient points. This is accomplished by laying down tubes from the farms to the factories, so that each farmer presses out his juice, and the underground tubes convey it to the factories. The Central Society of Agriculture of France of April 20, adopted a report detailing the operation of this singular process, and highly commended it and the inventor, M. Linard. About 180 miles of tubes have been in operation the past year, and have proved highly satisfactory. Five hundred miles will be completed the coming year. The advantages of it are, that it avoids all cost and trouble of transportation of the beets; it leaves all the refuse on the farm for the food of cattle or for manure; it avoids all danger of freezing, as the tubes are laid below frost. It enables factories to be located on navigable rivers or railroads, so that transportation is made easy at a minimum of expense.

In the first operation the juice was found to be changed in its passage through the tubes; but by adding one per cent of quick lime, all injurious change is prevented, and the juice arrives at the factories, not only not injured, but in a great measure purified. In one factory, 26,400,000 pounds of beets were used, which were supplied with about fifteen miles of tubes.

HOTTE'S IMPROVED COFFEEPOT.

This improvement is designed to afford a cheap means whereby people who are obliged to rise early and hurry off to business, and others obliged to take their lunch in works distant from home, and who cannot conveniently avail themselves of a restaurant, may be able to regale themselves at short notice with that most refreshing beverage good coffee.



It is also adapted for general domestic use in the extreme heat of the summer, when the use of a fire of the ordinary kind would be attended with much discomfort.

It is perfectly simple in its construction, and three or four ounces of charcoal is ample fuel to make and keep hot for a reasonable time, about a quart of the infusion.

The coffeepot is made with double walls, as shown in the engraving, leaving a chamber in the center. This chamber when the pot is in use is slipped over a tapering tube, A, a portion of which is broken away to show the fuel in its interior. The tube, A, rises from a stand, both it and the stand being made of sheet iron, and both being joined together by rolled joints. At the bottom of the tube, A, there is a perforated sheet iron plate, which forms a grate upon which the charcoal rests. Below the grate is a chamber, B, with apertures through which air is fed to the ignited charcoal, and through which, by means of lighted paper, the charcoal is readily kindled. An annular cover, C, is fitted to the top of the coffeepot, and a cover, D, is used to close the top of the tube, A, when the apparatus is not in use.

The burning of the charcoal gives rise to no smoke or ill odor, and the small quantity of gas generated may be allowed to escape through an open window or door, if found necessary. Patented, through the Scientific American Patent Agency, February 1, 1870, by George Hotte, whom address for further information, at 571 Hudson street, New York city.

Electric Light.

It is well known that, when bars of two different metals are made to touch each other and heat is applied at the point of contact, a comparatively powerful current of electricity is developed. A thermo-electric pile is a battery essentially made up of a number of such couples, the junctions of which can be heated at the same time. In the galena pile above referred to, a compound body—galena—is substituted for a simple metal. It may be generally stated that the amount of electricity produced on heating a thermo-electric pile is proportional to the number of couples employed. In the apparatus we have experimented with there happen to be one hundred and twenty couples.

When the pile was heated by an ordinary Bunsen gas burner and the electricity produced made to circulate round a very large electro-magnet, we were able to make the latter easily support a hundred-weight. Again: the current was passed through a small induction coil and a tolerably good succession of sparks obtained. Other experiments were made to test the power of the apparatus, but these we need not detail here. It is sufficient for our purpose to know that a comparatively intense electric current can be obtained in this way. If, then, one hundred and twenty couples are capable of producing a strong electric current, it is obviously only necessary to greatly increase the number of plates in order to obtain an amount of electricity capable of affording a strong electric light. This is the direction in which Mr. Fowler informs us two French physicists are working, and we have learned from other sources that they have already obtained very satisfactory results. If this be so, we may expect soon to see the thermo-electric apparatus employed in every well-fitted photographic studio, as the apparatus could be easily made to occupy but little space, and yet would be ready for use almost at a moment's notice.

At present the electric light is much less used for photographic purposes than it might be, as few persons care to expend much time in getting up a large galvanic battery, and the fumes which are sure to escape from it are by no means useful in a photographic *atelier*. Even Wilde's ingenious and beautiful machine cannot be much employed in the production of the electric light, owing to the necessity for using a steam or gas engine as a source of power. If, however, it was only necessary to heat a small gas furnace, in order to have the command of a powerful actinic light, we have no doubt many would employ the electric beam who now scarcely think of using it.

The above, from the *British Journal of Photography*, will, we trust, be a reminder to some of our American philosophers to continue their studies in the line of thermo-batteries. We believe that Moses G. Farmer, of Boston, Mass., is the inventor of one of the best batteries of this kind ever made; but we have heard nothing of its operations for three or four years past.

It is indeed desirable that we should be able to produce a strong electric light, without the nuisance of a great acid battery, or the steam boiler and engine. Perhaps it can be done by heat only, but we are inclined to think that a fire rather larger than that needed to operate the steam engine will be required.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

MOLECULAR MOTION.

There are many who seem to find a difficulty in forming a conception of molecular motion, or how it can possibly have any relation to the form, color, or any of the physical characteristics of bodies. Such people examine a piece of glass, steel, or other hard substance, and mentally regard it as a continuous aggregation without pores and without mobility of parts, and therefore can make nothing of the simple doctrine that all masses are aggregations of molecules or little masses, placed at wide distances compared with the dimensions of the molecules themselves. So we find that there still remain those who deny that there is aught in nature to justify the doctrine of universal molecular motion, and who can see no connection whatever between the properties of aggregated matter and motions of the particles which make up the mass.

It is undoubtedly true that of the molecules themselves we know nothing except their deportment toward each other as manifested in chemical reactions. We know neither their form nor their color. We do not know the peculiar motions they undergo; yet to believe that matter as manifested to our senses, is not made up of insensible masses, but is continuous, or to believe that its parts do not at all times move among themselves, is to deny some of the plainest and most obvious indications.

As we write, the whole structure in which we sit is in a state of vibration. Wave after wave rolls through it. Some of the waves are sound waves, some are light waves, and some are heat waves; while there are tremors transmitted through earth, stone, bricks, mortar, and table, from the wheels of heavy trucks in the adjoining streets, plainly sensible to our hand. When we consider how extremely sensitive to motion are all the kinds of matter known to man; when we reflect how the most solid and inflexible substances obey the influence of the most delicate pulsations of—so far as man's sense of feeling is able to determine—perfectly still air, it appears to us a far more violent conception to regard matter as existing anywhere in a state of rest, than to conceive of its infinite and constant activity.

But let us attempt to conceive of the relation of motion to form, solidity, etc. If it were possible for us to rotate a rectangular piece of any solid material at the rate of a million times per second, there would be presented to our senses a cylinder with a uniform surface, hard and impenetrable, with color depending upon the nature of the material. Any one may convince himself of this by revolving a wheel with numerous spokes at high speed, and observing its appearance. The spokes no longer appear as spokes, but present the appearance of a continuous disk. If the speed be sufficient, it is impossible to thrust a rod through between the spokes, for the resistance of each spoke is so quickly followed by that of the succeeding one, that the aggregate resistance is apparently continuous. A ring rapidly revolved about its diameter generates a sphere in the same manner.

These are simple experiments which prove that motion has much to do with apparent form, and the apparent physical properties of matter

If we spin a large flat metallic disk on its edge, we may witness the gradual transition of mass motion into molecular motion. The mass, as it loses its rotary motion, gradually moves through smaller and smaller arcs of vibration; the rapidity of the vibrations gradually increasing until they pass into the limits of molecular motion.

This extreme sensitiveness of all matter to the effect of external motion, renders it probable that nowhere in the universe is matter in a state of absolute rest. So far as we can determine by observation, every particle of matter is whirling through space at a rate which is almost inconceivable. Everything upon the surface of the earth is rushing around its axis at a rate of more than a thousand miles an hour, and the entire mass is shooting through space, in its orbit about the sun, at a rate of nearly two millions of miles per day. The slightest change in the position of the center of gravity would produce immense results at this enormous velocity.

When we connect such stupendous mass motion with the known sensitiveness of matter to motion in its parts, or molecules, how is it possible to entertain the notion that matter is anywhere at rest?

POTASH FROM FELDSPAR.

A correspondent asks the following question: "By what method may potash be extracted from feldspar, and is there any means by which granite may be treated to make it possess an agricultural value on account of the potash it contains?"

The mineral feldspar is widely distributed over the globe, and since the supply of potash from wood has greatly diminished, more attention has been paid to the extraction of this alkali from the rocks, such as granite and feldspar, that contain it in considerable quantity. Ordinary flesh-colored feldspar contains 13 or 14 per cent of potash. The white variety, called albite, has a large admixture of soda, hence, for potash, the reddish feldspar is preferred. A cheap method for decomposing the mineral and obtaining the potash does not appear even yet to have been devised; but several of the plans that have been tried are worthy of mention, and may serve as models to any one who is disposed to pursue the subject.

Sprengel, as long ago as 1830, prepared alum by submitting feldspar to the action of sulphuric acid. The mineral was reduced to a fine powder, and mixed with concentrated sulphuric acid to a paste, and the two substances left in contact with each other for several months. Treated with water, the mixture furnished a solution of potash-alum, so pure that re-crystallization was not necessary. A great difficulty to be encountered in this process was to grind the feldspar to a powder. In order to do this it is first necessary to heat it red hot, then to cool it suddenly in water, by which operation it is rendered friable, and can be ground under a mill-stone to a fine powder. In all of the processes employed for extracting potash from feldspar the same difficulty of reducing the mineral to powder presents itself, and the method indicated above is the one usually followed.

Another way of making alum was suggested by Turner, who fused the finely divided mineral with neutral sulphate of potash, and thus obtained on the one hand soluble silicate of potash, and, on the other hand, an insoluble double silicate of aluminum and potassium, capable of yielding under the influence of sulphuric acid, alum and silica. The soluble silicate of potash was digested with lime, when insoluble silicate of lime was formed, leaving potash in solution.

Another way that has been successfully tried in the Laboratory of Columbia College, was to fuse two parts of feldspar, with one part of quicklime and one part of gypsum, and to extract the potash by water. Much of the sulphuric acid of the gypsum will go to the potash of the feldspar and render it soluble. Kuhlmann, in a similar way, decomposed the feldspar by fusing it with chloride of calcium, by which an interchange of elements was effected, and chloride of potassium formed.

It has also been proposed to treat an intimate mixture of powdered feldspar and fluor spar with sulphuric acid—in this way the silica is got rid of as fluoride of silicon, and the sulphuric acid, which at first combines with the lime, afterwards unites with the potash and alumina to form alum. This process is capable of being worked out on a large scale, if the fluoride of silicon were to be economized and converted into hydrofluosilicic acid, as that acid is destined to have extensive and important applications in the arts—one of which applications would be the separation and saving of the potash in the beet sugar manufactory.

Mr. Meyer fuses feldspar with lime in the proportions of 139 to 188 parts of lime to 100 parts of feldspar—and extracting the potash by means of water under pressure. This process involves lixiviating 288 tuns of calcined product, at from seven to eight atmospheres of pressure, in order to obtain nine to eleven tuns of potash—which must greatly interfere with its introduction on a large scale.

Ward in England calcines a mixture of pulverized fluor-spar, feldspar, chalk, and quick lime, and lixiviates the first with water, by which all of the potash is extracted. Professor Hofmann pronounces this to be the only method by which any of the experiments had succeded in obtaining all of the potash known to exist in the mineral; but although it had the sanction of his great name, it does not appear to have been conducted on a large scale by the inventor.

We have been led to speak of the various methods resorted to for the purpose of obtaining potash from feldspar, because we have frequent inquiries on the subject.

The operation cannot be carried on economically by any of the known methods, particularly since the discovery of the famous Stassfurt mines, where potash occurs in endless quantity, and can be manufactured cheaper than by any process hitherto known. The time is approaching when the greater portion of the potash of commerce will be obtained from the Stassfurt mines.

THE SCHOOL OF MINES, COLUMBIA COLLEGE.

This institution is under the direction of the trustees of Columbia College, and although of comparatively recent growth, has already advanced to the front rank of our American schools. It was originally founded, as its name indicates, to fit young men for the profession of mining, but in process of time it was found necessary to enlarge its scope so as to include engineering, technology, and natural history as well as mining. During the first year all pupils alike pursue mathematics, physics, chemistry, French, and German. This is looked upon as a preparatory year for what is to come. The second year makes some changes and opens the door to the selection of a certain class of optional studies for those who are to be mining engineers or civil engineers. The class still adhere closely to the study of chemistry, physics, mathematics, French, and German, and they commence their practical studies in the laboratory. The first year in the laboratory is devoted to instruction in manipulation, in qualitative analysis, in the determination of minerals, and certain glimpses of geology are obtained.

From the outset the students are taught drawing, and are urged to devote much attention to this important branch of education. The last two years of the course are full of instruction in geology, mineralogy, chemistry, assaying, and metallurgy, and by the time the student is prepared to graduate, he will have received a thorough instruction in all departments of natural science, in mathematics, in modern languages, and in everything that fits a man for the practical details of a profession.

The collections of the school are unusually rich in rare and valuable specimens. The mineralogical cabinet is said not to be excelled by more than one or two in the country, while the geological collection is believed to be the best in the United States. The library is well stocked with books of reference and the leading scientific periodicals of the day. The laboratories of the school are more extensive than any in this country, as they afford accommodations for one hundred working students. An important feature of the school is the fact that a thoroughly worthy student who can show that he cannot pay, is permitted to attend gratuitously. The trustees of Columbia College have sufficient income to carry on the institution without taking any fees from the students if at any time it were deemed expedient to do so. A goodly number of free students are constantly in attendance at the school, and no one is aware of the fact but the President and treasurers. The school will soon close for the year to be re-opened in October.

CONDUCTION AND CONVECTION OF HEAT.

The distinction between these terms is not popularly well understood. Thus it is common to hear people speak of water or air as conducting heat, while on the contrary talk about metals conveying heat is nearly as common and still more absurd.

The distinction between these terms is a very important one, and lies at the very foundation of a correct understanding of the laws of the transmission of heat. A short space may therefore be profitably occupied in the discussion of this subject.

Heat motion, or that "peculiar shivering motion of the ultimate particles of bodies" as Helmholtz so aptly defines it, is communicated in only three ways. These are called respectively *conduction*, *convection*, and *radiation*.

The conduction of heat is that form of transmission in which heat motion passes from particle to particle through a mass, the particles themselves sensibly maintaining their relative position. If a metallic bar has one end thrust in a fire, portions of the bar remote from the fire become hot. The bar meanwhile retains its form, save that its bulk is increased by the expansive force of the heat. There is no sensible evidence that the particles have changed their relations of position except that expansion of the bar indicates that they have separated somewhat. The motion is transmitted throughout the mass precisely as the vibration caused by the blow of a hammer would be, or the vibration caused by drawing a fiddle-bow over one end of the bar, with this exception, that the rapidity of the vibrations and the rates of transmission vary from causes not necessary to be here discussed.

Convection, or the carrying of heat, is quite a different process. In this case the particles change their positions in regard to each other. When those nearest the source of heat become heated, they expand, and becoming lighter in proportion to their bulk than the non-heated particles, they rise and colder particles take their place. Of course this cannot occur except in bodies the particles of which move freely among each other; and as fluid bodies are the only ones that answer this condition, it follows that they are the only conveyers of heat.

We see then that the best conducters of heat must be solids, and the worst liquids or gases, which are the best conveyers of heat; and that convection depends upon gravity which pulls down the specifically heavier particles and thereby pushes up the specifically lighter ones.

It does not follow that liquids or gases inclosing a space are therefore efficient in imprisoning heat within it, or preventing heat from entering. Such efficiency would depend upon collateral circumstances as well as the non-conducting power of the surrounding medium.

A non-conducting but a conveying medium, placed between two good conducting surfaces—these surfaces being kept at different temperatures—would be in constant motion, conveying heat from the hotter to the colder surface; and the philosophy of filling such a space with some loose material as wool, is that it imprisons the conveying medium in its interstices and prevents in a very great degree its circulation.

Mistakes in the construction of refrigerators have been recently brought to our notice, caused by the supposition that a space filled with air between two metallic cases would be more effective than any other filling, while superior lightness would thereby be secured.

Mistakes in the construction of steam boilers are also common results of want of knowledge of the laws of transmission of heat.

But the most absurd errors occur and abound in the construction and erection of heating and ventilating apparatus. We scarcely ever see anything of this kind in public or private buildings which is not open to criticism in some important particular. It would almost seem that intentional violation of natural laws was the object in some of these arrangements. The old saying that heat *rises* seems to be generally accepted as truth by constructors of heating apparatus. Thus we know of a case where it is expected that heat will rise through a long, narrow, vertical passage, the bottom of which surrounds a fire-box, and has no communication with the external air.

In the case cited, which is a fair sample of blunders to be met with in school-houses, churches, etc., throughout the country, a very little heat escapes from the open mouth of the tube above; the amount thus imparted to the room it is intended to warm being only that due to a little radiation, and the circulation of the air in the tube, which latter, under the circumstances, is very slight. The consequence is that the upper room is never warm while the lower one is continually overheated in a vain attempt to warm the upper one. A good sized hole in the bottom of the tube, and another in the bottom of the upper floor, with a tube leading from it down nearly to the floor below, would enable the heat to be equally distributed thoughout the building, and necessitate much less expenditure of fuel.

Heat does not always rise any more than it always falls or moves laterally. It goes just as it is conducted, conveyed, or radiated, and it is only by understanding this truth and acting in accordance with it that any apparatus intended to transmit heat, or to prevent its transmission can be made efficient.

ARE TIN FRUIT CANS A SOURCE OF METALLIC POISONING?

Our attention has been called to this subject by a note of inquiry from a lady in Brooklyn, Miss Julia Colman, who has achieved considerable popularity as a temperance lecturer, and has made the subjects of food and nutrition a favorite study.

The queries she propounds are, we think, of sufficient importance to merit public attention, which, once aroused to the subject, will not, we trust, be content until a positive answer is obtained to the query which forms the heading of the present article.

Tin has long been justly regarded as one of the metals from the ordinary uses of which mankind have nothing to fear. But the present age is characterized by its factitious imitations. That which goes by the name of tinfoil is mostly an alloy of tin and lead, and it is charged that many of the caps used for glass fruit jars are made of zinc instead of tin. It is well known also that lead is used in soldering cans, and that this metal is attacked by certain organic acids, which are contained in fruits. The tin of commerce is also by no means pure, and housekeepers will vouch that the tin cans are often attacked by these acids, and eaten through so as to leak their fluid contents. In the case of impurities in the tin used to coat the iron of the tin plates of commerce, when the cans are thus attacked, it may well be doubted whether the cumulated effects of metallic poisoning do not sometimes result from this cause.

Our correspondent writes as follows:

"So far as the evidence of the senses goes, housekeepers know that cooking tomatoes in tin 'ruins the basins' as one good woman said; and another admitted that she commonly used up at least one 'basin' in a season for this purpose. How much injury the partaker receives we do not know, but so much has been said of the sad effects of metallic poisoning, even in small though long continued doses, that we would like to be assured of safety. Professor Youmans thinks it a small matter, but I find that many medical authorities disagree with him. One of the latter says: 'It ought to be known to housekeepers that acid, fatty, saline, and even albuminous substances may occasion colic, vomiting, etc., after having remained some time in tin vessels.'

"We see that the inner surface of the tin can is discolored after having been used for fruit, and we find that the flavors of the more delicate fruits are injured when they have been kept in tin cans, but whether the acid acts after the expulsion of the free oxygen, or only during the canning process, we do not know.

"Zinc is more readily oxidized than tin, and yet the caps of some of our glass cans are made of that substance.

"Many if not all the tin cans are freely soldered with lead, and it *seems* inevitable that the usual galvanic action must result when they are filled with an acid.

"I have no desire to raise a false alarm, indeed I should be much gratified to learn that such a use of tin cans is perfectly safe, since many depend on them for all their canned fruit.

"If the amount of tin that may enter the system, as a result of its domestic use, is not likely to prove injurious, the questions are narrowed down to the purity of the article used and the actual results of using the various cans prepared for our market.

"I had an opportunity recently to make some inquiries of Professor Edwards of the 'Woman's Medical College of the N. Y. Infirmary,' and he said that the tin cans, *as prepared*, are very unsafe, that the acids dissolve the lead solder and sometimes eat through the entire plate, making the cans leak (a new fact to me), and also that serious cases of poisoning had occurred from using their contents. If facts like these could be called out from scientific men they would arrest public attention, and they might suggest to manufacturers of glass cans the desirability of protecting the inner surfaces of their metallic caps in some way. Those with metallic caps work so much more easily than others, that they will long be more or less in demand. (Professor Edwards, however, said that the metal used in them is lead). I line mine with stiff white paper, a small protection of course."

We believe the subject thus broached by our correspondent is one of importance. If manufacturers are presuming upon popular ignorance, and palming off upon the public zinc and lead for tin in vessels intended to contain food, the fact ought to be known. Acetic acid acts slowly upon lead, but its action is hastened by exposure of the metal to air. Acid fluids act with more violence upon zinc.

According to Miller commercial tin may and usually does contain (except the Banca tin, which is not used for tin plates) small quantities of copper, arsenic, iron, and lead. Of these adulterations all but the iron are poisonous. The copper as well as the lead is acted upon by vegetable acids. In the gradual destruction of vessels made of tin plates by culinary use, it would seem that more or less of the poisonous salts of the metals named must enter the food prepared in them. Whether this amount is sufficient to affect health is a question that ought to be decided.

THE MYSTERY OF SLEEP.

What are the differences between sleeping and waking? What is the peculiar nature of that mysterious condition which we call sleep? These are questions long and earnestly asked but never answered. There is something about this phenomenon that seems to defy investigation. The distinctions between the sleeping and waking state are, save a few external differences, as entirely unrecognized to-day as they were ages ago.

Sit by the cradle of a child and watch it as it sinks into quiet slumber. The muscles gradually relax; the eyelids fall; and voluntary motion ceases. The breathing is slower, as is also the action of the heart. The temperature of the body is slightly depressed; and a state of apparent unconsciousness accompanies the physical changes specified. That is all we can see, and yet it seems hard to believe these things are all that constitute sleep. If so, sleep might be accurately defined as a simple cessation of volition, or the action of the will, so that thought and motion of all muscles except those of the vital organs is impossible. But a little thought will show that cessation of will is only one of the manifestations of sleep, and that the will may and frequently does only partially cease to act, retaining command of the voluntary muscles, and giving rise to the phenomenon of somnambulism. At times also the mind becomes active in sleep, and often reasons with surprising coherence, and dreams, more or less approximating to realities of waking hours, are produced.

But the mystery of mysteries pertaining to sleep, is the fact that it renovates the system from fatigue. And after all, this is no greater mystery than fatigue itself. What is fatigue? In what state of mind or body, or of both, does it consist are questions the answers to which still puzzle the profoundest physiologists.

The periodicity of the desire for sleep is another peculiarity which is still involved in mystery. Why is it that darkness, monotonous noises, the fixing of the eyes upon some stationary object, all favor the approach of sleep? On all these points there is still no certain light. Upon respiration, digestion, circulation, reproduction, and assimilation, some accurate knowledge exists, but of sleep almost nothing. This function which influences more or less every other, and which has been aptly described as "a partial death from which springs a fresher life," is apparently no less remote from present means of scientific investigation than the greatest mystery of all, life itself.

PRIMARY SCHOOL EDUCATION.

If we analyze the working of the mind in performing a train of reasoning, we shall find that comparison or contrast is the principal part of the operation. Thus, in classification we first compare the object or idea to be classed with similar ideas or objects, and place it in the category with which it corresponds. In ascertaining the differences between objects or ideas we compare them. Says Max Muller, "all higher knowledge is gained by comparison, and rests on comparison. If it is said that the character of scientific research in our age is pre-eminently comparative; this really means that our researches are now based on the widest evidence that can be obtained, on the broadest inductions that can be grasped by the human mind. What can be gained by comparison?—Why, look at the study of languages.—If you go back but a hundred years and examine the folios of the most learned writers on questions connected with language, and then open a book written by the merest tyro in Comparative Philology, you will see what can be gained, what has been gained, by the comparative method."

It is thus that we form judgment upon relative size, weight and color of bodies, as also texture, form, and all other physical properties which our senses are able to detect in masses of matter.

And even when we pass beyond the realm of physics and indulge in metaphysical speculation—which it is to be hoped few are often tempted to do—we shall find that we cannot even speculate without comparison.

If then we learn so much and reason so much through this operation, it is of the first importance that we should be able to do it correctly. We venture to affirm that in the want of ability to make just comparisons is found the explanation of the inferior judgment of the masses upon all great questions, and their willingness to accept opinions ready made, from the, so to speak, "slop shops" of pseudo philosophers and political economists, and quacks who live upon public credulity and grow rich upon the sale of manufactured opinion to those too indolent or too weak to think for themselves.

We recently read a leading article in a daily cotemporary lauding the immense benefits of trial by jury, because—as it maintained—by this means, whatever the law may be, a decision in accordance with the public opinion of average men is certain to be obtained. Something might be said in regard to a doubt whether in the present system of impanneling juries we really get average men. For our own part we feel that if this is the case, the average intellect is humiliatingly, if not dangerously, small in this country. But admitting that average intellect and average integrity are secured in the jury-box, we have still graver doubts as to whether questions of law and medical jurisprudence are subjects with which the average intellect is competent to deal. When a man begins to think independently, and to accept his conclusions without reference to popular prejudice, his intellect may be set down as above the average.

It will be seen from what we have said that we believe the power of making just comparisons, of contrasting things and ideas to detect their specific points of similarity or difference, is small in the majority of minds, and as we further believe that this is a fault rather of education than of natural endowment, we should not have done much good in pointing out the defect without we could suggest a remedy.

There has latterly been developing in this country a system of primary training known as object teaching. This system makes the first and principle end in the instruction of youth to the development of the power of comparing things and ideas. To this end it brings skilled minds into contact with untrained mind, the skilled directing the unskilled, and correcting its errors, and by practice teaching the infant mind to use judiciously the avenues by which knowledge enters the mind. Thus the sense of touch, of sight, of smell, of taste, and of hearing, are each educated as they should be, for it is our firm belief that the basis of a sound system of instruction is education of these senses. Let a child be first trained to gain correct impressions of external objects, and there is little fear that when he comes to finally apply his intellect to abstract ideas, that he will be satisfied with imperfect and crude notions.

This system of instruction has however met with serious obstacles from the prejudices of people, who imagine that a book is the only medium through which knowledge can be gained, and who are content to measure progress by pages, and problems traversed, rather than by growth of mind and strength to grapple with facts.

It is one of the most encouraging signs of the times that the progress of science is remodeling systems of instruction, sweeping away old barriers and disseminating new views on the subject of education, and we believe the time will come when it will be generally seen and conceded, that primary instruction may be better accomplished by the oral system, and by directing the young mind to think and observe for itself, than in the method of compulsory cramming so long in vogue, and soon we hope to become obsolete.

A NEW ALKALOID IN OPIUM.

In 1803 Derosene discovered a crystalline body in opium, and, in 1817, Serturner described its properties. This was the first discovery of a new class of bodies called vegetable alkaloids, and, consequently, points an era in the history of chemistry. Since then, more than one hundred analogous bodies have been discovered, and we count among them some of our most prized medicines. We need only mention quinine, narcotine, strychnine, brucine, theine, nicotine, conine, morphine, codeine, etc. Since attention was directed to opium by the labors of Serturner, chemists have discovered in that gum a large number of different alkaloids, representing the peculiar properties of the medicine, and it was supposed that this field of research was exhausted. It appears, however, that still another base has been discovered. The new body has the same chemical composition as morphine, minus the elements of water. Its special therapeutical property is, that it is deprived of the narcotic effects of morphine, and acts as a powerful emetic. Injected sub-cutaneously in minute quantities, it produces violent vomiting in the course of five minutes. This property is so strong that the chemists who prepared it had great difficulty to overcome the constant feeling of nausea superinduced by it. The new body was discovered by Messrs. Matthiessen & Wright, of Saint Bartholomew's Hospital, London; and if all that has been said of it be confirmed by subsequent experiments, it is destined to play an important part in medicine.

Skilled Industry in America.

The position given in this country to skilled industry is awakening general attention. Now that measures are taken to place permanently a National Exhibition in this city, public men of other countries are calling attention to the matter. It is generally overlooked that a large proportion of the population of the Atlantic States are classed as artisans, who comprise no less than two thirds of the workingmen in Maine, one-third in Massachusetts, one-fourth in this State, three-fifths in Maryland, and five-sixths in the city of Philadelphia.

Lord Clarendon, Secretary of the British Legation, in his report to Parliament, makes the following statement:

"There are few countries in which the workingman is held

in such repute as in the United States of America. The laboring classes may be said to embrace the entire American nation. The American prefers the occupations in which the exercise of the brain is in greater demand than that of the elbow. His chief ambition is to attain to the position of a master workman."

THIRTY-NINTH INDUSTRIAL EXHIBITION OF THE AMERICAN INSTITUTE.

The Board of Managers of this association have issued circulars announcing their thirty-ninth exhibition, which will be held at the Empire Skating Rink, on the Third avenue, between Sixty-third and Sixty-fourth streets. The premises, lately enlarged and improved, will be opened for the reception of goods on Monday, August 29th, 1870, and on Wednesday, September 7th, the Grand Exhibition will be formally opened to the public by an address at 12 o'clock, M. It will remain open every secular day from 9 A. M. to 10 P. M., until Wednesday evening, November 2, 1870, when the closing address will be delivered, and awards to successful competitors announced.

Circulars containing full information may be had on application to the "Corresponding Secretary of the American Institute, New York," who will also send blanks and give any desired information to parties desiring to become exhibitors, and will receive and file all applications for space.

CINCINNATI INDUSTRIAL EXHIBITION.

This exposition will be held under the joint auspices of the Chamber of Commerce and the Board of Trade of the city of Cincinnati, and the Ohio Mechanics' Institute, commencing Wednesday, September 21, 1870.

It is the expressed desire of the managers to make this exposition of art and industry superior in point of attraction and practical benefit to all concerned, to any display of a similar nature which has ever been held in that city.

They hope to see art and mechanism fully represented. Steam power for driving machinery will be furnished. Any desired information will be obtained by addressing the "Secretary of the Cincinnati Industrial Exposition," who will furnish rules and blank applications for space.

NEW MECHANICAL MOVEMENTS.

On page 192, present volume, we gave the following problems for solution:

"PROBLEM 1.—Required to convert the rotary motion of a pulley into a horizontal intermittent rectilinear motion, first in one direction and then in the opposite direction, without the use of a pitman, pulley, toothed wheel, cam, cam groove in a pulley, or a flexible band, the first rotary motion to be constant and uniform. In other words, let it be required to move a piece of metal, wood, or other material, to a certain point where it shall pause, and then again move on a certain distance and again pause, and so on successively as far as desired, when it shall return to the point from which it originally started in the same intermittent manner and under the conditions above specified.

"PROBLEM 2.—Required to produce a variable rotary motion in a shaft driven directly by a belt from a pulley having a uniform constant rotary motion, without the use of anything but the one belt and the two pulleys; no cone pulleys or their equivalent to be allowed. All the motions to be continuous and in the same direction.

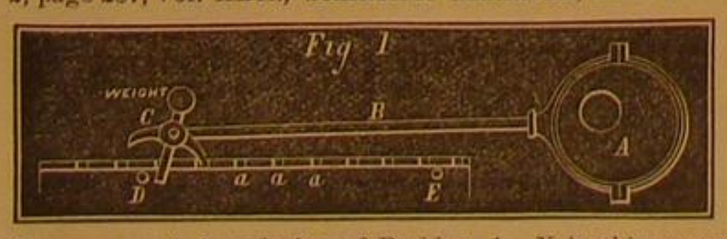
"PROBLEM 3.—From a reciprocating body to communicate reciprocation to another body, so that the second shall make four reciprocating movements for every reciprocation of the first; the motions of these bodies to be in lines parallel to each other, and the pieces to be connected by only three moving parts, which parts shall be neither wheels nor pulleys of any kind, and no inclined planes, cams, belts, or flexible cords, cranks or bell cranks to be allowed, and no radial motion from a fixed center in any piece employed."

We are happy to announce that each of these problems has received a correct solution, and we have engraved some which could hardly be understood by a mere verbal description.

Problem 1 seems to have received the greatest share of attention, and we have received a number of solutions which do not comply with the enunciation of the problem. One of these is, however, sufficiently ingenious to be noticed, notwithstanding it is an

IMPERFECT SOLUTION.

"An eccentric pulley is allowed in the solution of Problem 2, page 287, Vol. XXII., SCIENTIFIC AMERICAN, and I there-



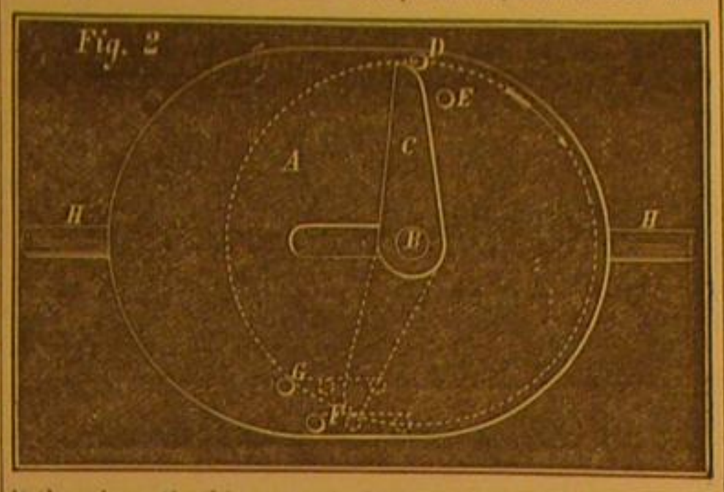
fore use one, A, in solution of Problem 1. Yoke this eccentric pulley to a rod, B, in the usual manner; on this rod is the simple double pawl, C, which engages in the notches, a, a, a, a, etc., and gives horizontal, intermittent, rectilinear motion in one direction as above. At the next stroke of the eccentric, a pin at D may trip the pawl, and we will then have horizontal intermittent motion in the other direction, until another pin, say at E, again reverses the motion.

Salem, N. C. J. W. FRIES."

We consider this solution faulty because the eccentric may be regarded as the equivalent of a crank in this instance, and if so regarded, the rod, B, is the equivalent of a pitman. The latter is not allowed by the conditions of the problem.

TRUE SOLUTION OF PROBLEM 1.

"A, Fig. 2, represents the piece that has the intermittent, rectilinear motion, sliding with the rod, H. B is the shaft having the constant uniform rotary motion, and carries with

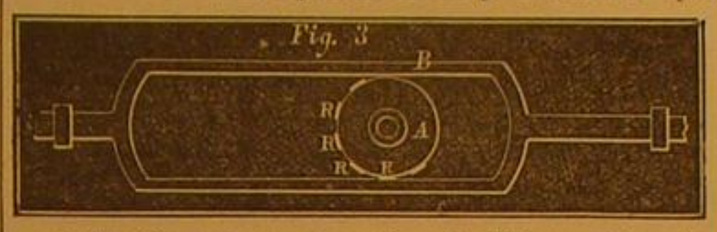


it the wiper, C; this successively engaging with the pins, D, E, F, G, imparts the motion required, the number of intermissions being varied with the number of pins. I have made a model of this movement, and it works in all respects as described. WM. M. MOORE."

Niles, Mich.

SECOND SOLUTION OF PROBLEM 1.

"The wheel, A, Fig. 3, is the given pulley, having a uniform rotary motion. R, R, represent rubber pieces fastened upon

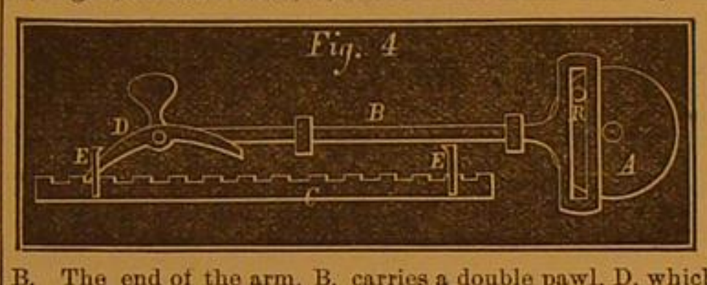


one half of its perimeter, the action of which upon the yoke, B, will produce the intermittent reciprocating motion required.

Toledo, Ohio. COURTNEY HEATH."

THIRD SOLUTION OF PROBLEM 1.

"The following is another form of movement, which I believe to be a true solution of problem 1. The given pulley, A, Fig. 4, carries a wrist, R, which works in the slotted yoke,



B. The end of the arm, B, carries a double pawl, D, which works in the rack, C. E, E, are stops for removing the pawl, D. IBID."

PROBLEM 2.

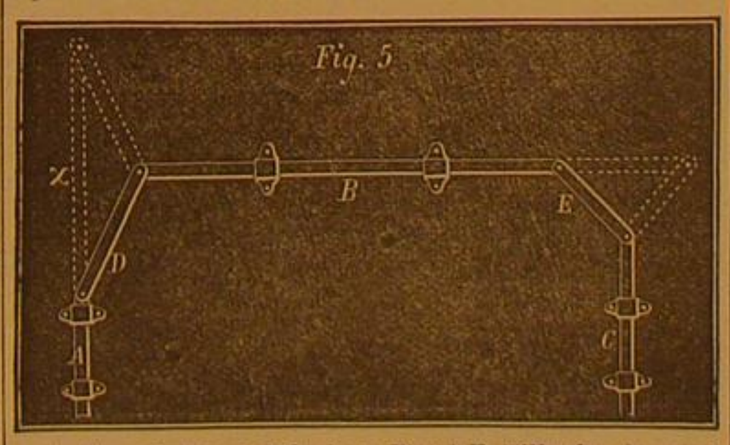
Several solutions have already been published for this problem, see page 287. E.A. T. of Philadelphia, Pa., sends still another, which we are inclined to think is not new, but will nevertheless give it. It is simply two eccentric pulleys of equal throws, connected by an inelastic belt.

PROBLEM 3.

But one solution for this problem has been received that can be accepted as new, and also as correct. The author of the movement, shown in Fig. 1, favored us with one, but it has a radial movement from a fixed center in one of the pieces, which is not allowed in the specified conditions.

TRUE SOLUTION OF PROBLEM 3.

The bar, C, Fig. 5. is the body required to make four reciprocations, while the bar, A, makes one. Move the bar, A,



up to the point x, and the bars, B and E, will take the position shown by the broken lines on the right. The bar, C, will have made one whole reciprocation. Continue the motion of A to the position shown by the broken lines on the left; C will then have made two reciprocations. Move A back to its original position, and C will have made four reciprocations, while A has made but one. This beautiful link motion is the invention of the author of the movement shown in Figs. 3 and 4.

Sweet Potato Experiments.

The *Western Rural* states that Colonel Baylor, of Georgia, aided by some scientific gentlemen in Boston, has been for some time conducting a series of experiments upon the sweet potato. The articles produced are starch, dextrine sugar powder, a sweet kind of vegetable flour. It is said that there is a variety of sweet potato cultivated in the Southern States which will yield ten per cent of cane sugar.

It is estimated that the sweet potato crop of Georgia, properly manufactured for commercial purposes, would add from $10,000,000 to $15,000,000 to the wealth of that State. The value of the manufactured crop in North Carolina would exceed this sum.

PATENT OFFICE AFFAIRS.

The business of the Patent Office is now in a flourishing condition, and the present is a favorable time to enter applications. Inventors will find the SCIENTIFIC AMERICAN PATENT AGENCY ready to attend to the prosecution of claims with the greatest dispatch. By reference to our register, we find that we have made upwards of twenty-four thousand preliminary examinations into the novelty of alleged new inventions. This great experience, together with the fact that a large proportion of all the business with the Patent Office, for the past twenty years, has been conducted through this Agency, suggests to inventors the surest and best means to secure their rights.

We give opinions free, and all we require is a rough sketch and description of the invention.

Inventions patented through this Agency receive notice in the SCIENTIFIC AMERICAN.

MODELS.—In order to apply for a patent the law requires that a model shall be furnished, not over a foot in any of its dimensions, neatly and substantially made. Send the model by express, prepaid, addressed to Munn & Co., 37 Park Row, New York, together with a description of the operation and merits of the invention.

CAVEATS.—Whenever an inventor is engaged in working out a new improvement, and is fearful that some other party may anticipate him in applying for a patent, it is desirable, under such circumstances, to file a caveat, which is good for one year, and, during that time, will operate to prevent the issue of a patent to other parties for the same invention. The nature of a caveat is fully explained in our pamphlet, which we mail free of charge.

EUROPEAN PATENTS.—Probably three-fourths of all the patents taken by American citizens in Europe have been secured through the SCIENTIFIC AMERICAN PATENT AGENCY. Inventors should be careful to put their cases in the hands of responsible agents, as in England, for example, the first introducer can take the patent, and the rightful inventor has no remedy. We have recently issued a new edition of our Synopsis of European Patent Laws.

All communications and inquiries addressed to Munn & Co., respecting patent business, are considered as strictly confidential.

Death of Mr. Dickens.

As we go to press the telegraph brings us news of the death of the great novelist, Charles Dickens, than whom no writer of his time has become more widely known and admired. The writings of Mr. Dickens have all been in the interest of humanity, and no more fitting epitaph could be engraved upon his tomb than

"Write me as one that loved his fellow man."

His death will be lamented by the intellectual and the good of both hemispheres.

AN express train on the Alleghany Valley Railroad, running at the rate of forty miles an hour, was lately brought up all standing against an obstruction on the track, consisting of rocks and dirt, the result of a land-slide. This train was fitted with Miller's platforms, buffers, and couplers. Notwithstanding the fearful velocity of the train no lives were lost, as the cars did not telescope, as ordinary fastened cars would have done under the same circumstances. Miller's inventions should be adopted on all railroads without delay. On the Missouri Pacific Railroad nineteen passengers were lately killed by the telescoping of the cars.

HARD ON THE M.D.'s.—Dr. Charles Elam has lately written a work in which he undertakes to prove, and asserts he does prove, that the practice of medicine of to-day is less efficient, performs fewer cures, and is less able to check disease than it was thirty years ago.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,237.—SUPPORTING AND GUIDING APPARATUS FOR MACHINES FOR SEWING BOOTS AND SHOES.—Daniel Mills, New York city. April 30, 1870.

1,255.—BUCKLES OR BALE TIES.—E. J. Beard, St. Louis, Mo. May 2, 1870.

1,257.—HOISTING MACHINE.—Henry Reedy, Cincinnati, Ohio. May 2, 1870.

1,261.—MACHINERY FOR PRINTING UPON SPOOLS FOR THREAD, ETC.—Ira Dimock, Florence, Mass. May 3, 1870.

1,286.—STEAM ENGINES.—Babcock and Wilcox, Providence, R. I. May 5, 1870.

1,324.—MACHINERY FOR KNITTING LOOPED FABRICS.—John Pepper, Lake Village, N. H. May 9, 1870.

1,215.—APPARATUS FOR ABSORBING THE OVERFLOW OF OIL IN HYDRO CARBON AND OTHER LAMPS.—L. E. C. Moore and J. S. Hamilton, Pittston Pa. April 27, 1870.

1,289.—SAFES, ETC.—T. Hyatt, New York city. May 5, 1870.

1,313.—STAMP.—Towle and Harding, New York city. May 7, 1870.

1,323.—NUT LOCK.—R. Rutter, Vallejo, Solano county, Cal. May 9, 1870.

1,335.—ILLUMINATING GAS APPARATUS.—M. H. Strong, T. Barbour, and C. C. Conner, New York city. May 10, 1870.

1,336.—BREWING ALE AND OTHER MALT LIQUORS.—James McCormick Boston, Mass. May 10, 1870.

1,331.—MACHINERY FOR POINTING AND FINISHING NAILS.—Sebastian Schlesinger, Boston, Mass. May 11, 1870.

1,338.—GRATE BARS.—Jonathan Cone, Bristol, Pa., and John McEldery, Jersey City, N. J. May 12, 1870.

3,610.—PROJECTILES.—A. F. Potter, San Francisco, Cal. May 12, 1870.

1,345.—PADDLE WHEELS.—W. F. Knowlton and M. McComb, St. Cloud, Minn. May 11, 1870.

Universal Clothes Wringer.

But one invention has held its own in the household, and that is the Clothes Wringer. We have used one of those whose name heads this article, for ten years, and it has done good service during that time, although in weekly use. We consider the fact, that the frame and all parts of the machine are made of wood, to be in its favor. There can be no possibility of injury to the clothes by rust. Another advantge of this Wringer, is that of a patent stop, in the form of a screw, placed over the wheels, preventing them from getting out of gear. But the principal advantage of this wringer over others, is the patent double gear. This is the invention of the late Dr. Warren Rowell, and one of the best devices in mechanical movements that has come under our observation for a long time.—(N. Y. Mechanic, Dec. 1, 1869.

Business and Personal.

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

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

Glass Cutters' Grindstones, made by machinery—Craigleith, 40c.; Newcastle and Nova Scotia, 8c. an inch. J. E. Mitchell, 310 York avenue, Philadelphia.

Catlin's Patent Self-closing Barrel Filler for filling packages with liquids of any kind. See other advertisement, and address, for circular, S. C. Catlin, Cleveland, Ohio.

Keane's Silver-plating Compound plates metals with pure silver instantaneously. Keane, Silver Plater, 73 Bleecker st., New York.

Rawhide Sash Cord has no equal for heavy windows or dumb-waiters. Makes the very best round belting. Darrow M'f'g Co., Bristol, Ct."

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

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

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

For Fourneyron and Jonval Turbine Water Wheels, Mill-work, Shafting, Pulleys and Hangers, apply to J. Cornell & Co., Sandy Hill, N.Y.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

Scientific American.—Back Nos., Vols., and Sets for sale. Address Theo. Tusch, City Agent, 37 Park Row, New York.

Pictures for the Sitting Room.—Prang's latest Chromos, "Flowers of Hope," and "Flowers of Memory." Sold in all Art and Book Stores throughout the world.

Tempered Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

Shop, Town, County, or State Rights for sale, for Patent Coal Scuttle. For circular, etc., address T. T. Markland, Jr., 1515 South st., Philadelphia, Pa.

Galvanized iron ventilating skylights, straight and curved extension lights, conservatories, etc., under patents dated 1869-70, are approved by every architect. For Rights address Geo. Hayes, 75 8th ave., New York.

Grindstones made by machinery, perfectly true, at reduced prices. Send ½oz. sample of grit wanted, by mail. J. E. Mitchell, 310 York avenue, Philadelphia.

L. L. Smith, 6 Howard st., N. Y., Nickel Plater. First Premium awarded at the late Fair of the American Institute. Licenses granted by the United Co., 17 Warren st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-ton propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

Stiff, heavy, powerful lathes, planers, shapers, slotters, and radial drills, in stock. E. & A. Betts, Wilmington, Del.

Second-hand donkey pumps, 12, 25, and 35-H. engines, leather hose, old style blowers, cocks, valves, etc., etc. Wm. D. Andrews & Bro., 414 Water st., New York.

Kitchen Grindstones, for sharpening table knives, Loring's pat., best article out. J. E. Mitchell, Agent, 310 York avenue, Philadelphia.

An experienced mechanical and railway engineer wishes a position as Master of Machinery, or Manager. Address "Engineer," Station "G," Philadelphia, Pa., Postoffice.

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

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Cutlers' Grindstones, made by machinery. Wichersly, Newcastle, or Nova Scotia, at 8c. an inch. J. E. Mitchell, 301 York ave., Phil'a.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Caldwell's Dryer dries Brick, Fire Brick, Tile, Peat, Whiting, etc., as fast as made. J. K. Caldwell & Co., Philadelphia.

Harvester Grinders—Loring's patent—grinds automatically, and any boy can sharpen a cutter perfectly. J. E. Mitchell, 310 York ave., Philadelphia.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming. 12 years in use. Beware of Imitations.

Notice to the Purchasers and Manufacturers of Ice Machines.

As the holder of Letters Patent from the United States, under date April 12, 1870, I hereby caution all parties manufacturing or purchasing Ice Machines, operated with Chimogene, against infringements of said Letters Patent. This public caution is specially intended for the notice of the Arctic Ice and Refrigerating Company, of the City of New York, and of parties who may contemplate the purchase from them of the Ice Machine at present manufactured by them, which clearly infringes my Letters Patent.

D. L. HOLDEN, P. O. Box 6049, New York city.

Answers to Correspondents.

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

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

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

R. R. S., of Va., and others.—We are receiving many inquiries upon the subject of cement for aquariums, not containing lead. Can anybody give us a good recipe of this kind? The following is highly recommended by a correspondent of the Boston *Journal of Chemistry*, but it contains the objectionable substance. Take 10 parts by measure of litharge, 10 parts of plaster of Paris, 10 parts of dry white sand, 1 part of finely powdered resin, and mix them, *when wanted for use*, into a pretty stiff putty with boiled linseed oil. This will stick to wood, stone, metal, or glass, and hardens under water. It is also good for marine aquaria, as it resists the action of salt water. It is better not to use the tank until three days after it has been made.

C. A. L., of Tenn., finds that his bolting cloths (No. 9) recently clog on all occasions, with good wheat flour properly ground on best French burrs. The cloths have been in use about twelve months. He wishes to ascertain, if possible, a way to prevent this. He says he has to stop and brush them off very often, and attributes the mischief (we think correctly) to having ground a very damp lot of wheat, which he thinks soured on the bolting cloths. He is a miller of long experience and served a regular apprenticeship at the business, but knows of no way to remedy the evil complained of. If any of our correspondents can prescribe a remedy, we shall be glad to hear from them.

C. D. C., of W. Va.—There are various proportions for speculum metal for reflecting telescopes. We give you four. First: copper 64 parts, pure tin, 29 parts; melt separately with the use of black flux, and mix. Second: copper, 2 parts, pure tin, 1 part; mix as before. Third: copper, 64, tin 29 to 33 parts. Fourth: according to Lord Rosse, the constructor of the great reflecting telescope which bears his name, the best proportions are, copper, 1,264 parts, tin, 589 parts. Sometimes a little arsenic is added to increase the whiteness of the alloy. These alloys are very difficult to manipulate, as they are likely to crack in cooling.

W. A. B., of Mass.—We do not believe mere age hardens stereotype metal. We think it probable, however, that plates which have been used in the press for some time would be somewhat more dense and hard than those fresh from the mold. In the cold state, and remaining at rest, all the change that could occur would, in our opinion, be a slight oxidation of the surface. It is barely possible, however, that a slow crystallization may go on in such metal, under favoring circumstances, analogous to that which is known to take place in other metals; but we do not think this very probable.

D. D. S., of Ill.—You may bleach beeswax by exposing it for a sufficient time to the action of the air and light after cutting it into thin shavings. A quicker way is to melt the wax and add for each pound two ounces of nitrate of soda, and one ounce of sulphuric acid diluted with nine parts of water. The latter should be added very slowly, while the melted wax is constantly stirred with a glass rod. It is then cooled and set aside after filling the vessel with boiling water. Washing the wax with boiling water until no trace of the acid remains completes the process.

W. R. B., of Va.—The combustion of a lamp may be kept up in a close vessel by forcing oxygen into the vessel, and the carbonic acid gas, expanded by heat, might be used as motive power. There would, however, be serious practical difficulties in applying this principle to the propulsion of machinery. This correspondent writes that the mountains about Waynesboro, Va., abound in the black oxide of manganese.

D. R., of N. B.—It is not good practice to make the induction pipe to a steam cylinder too large, as you thereby increase the area of radiating surface. We therefore answer that it is not just as well to make these pipes larger than necessary. Such kind of loose practice in anything relating to steam is intolerable at the present day, when the whole subject is reduced to a science.

C. L. P., of La.—We believe the best paper-hangers' paste, as well as a paste for general purposes, is simply wheat or rye flour beaten into cold water to perfect smoothness, and the whole just brought to a boil, while being constantly stirred to prevent burning. A little creosote, or carbolic acid, will make it keep much better. Any addition to this paste fails to improve it.

White Brass.—We are in receipt of numerous inquiries as to where the white brass described on page 343, current volume, can be obtained. Parties interested in its sale would do well to advertise it. We cannot answer these inquiries, as we know of no one in this country or in Europe who sells the article. We gave in the article referred to all the information we are in possession of in regard to it.

W. S. H., of N. Y.—One hundred and thirty revolutions per minute is a very low speed for a steam engine with cylinders of nine inches diameter and twelve inch stroke. If properly constructed in all respects, no economy would result from the reduction of speed. Reduction of the speed would reduce the power of the engine.

F. A. C., of Mass.—The best way to keep rain water sweet in a cistern, is to first collect it in a tank, and filter it before receiving it into the cistern below the surface. This will remove the organic matters, and prevent fermentation. Care should also be taken to prevent surface drainage into it.

F. H., of N. Y.—Gold plate may have its color restored without polishing after annealing, by dipping it for a moment in a solution of cyanide of potassium, and then washing it thoroughly in water. Care should be taken not to touch the hands with the solution, as it is a deadly poison.

D. L., of Vt.—The extent to which expansion of steam may be carried by the lap of the valve alone, with convenience and economy, does not exceed a cut off at one third of the stroke. It is better to use a cut-off valve, actuated by a second eccentric, than to use lap beyond this limit.

J. McF., of Pa.—The soft material that you send looks as if it had some resemblance to bauxite, but we could not determine with certainty without making a careful chemical analysis; expense, $20. The other substance appears to be iron ore, perhaps of value.

L. M., of Mo.—The term regulus is an old name applied by the alchemists to metallic antimony, arsenic, cobalt, etc. Thus, regulus of antimony is metallic antimony, etc.

R. G. P., of Miss.—You will probably secure the business information you seek by a notice in our "Business and Personal" column.

Recent American and Foreign Patents.

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

WOOD PAVEMENT.—John W. Brocklebank, New York city, and G. W. Tubbs, Elizabeth, N. J.—This invention relates to improvements in wood pavements of that kind wherein blocks arranged vertically in rows across the road bed, either with or without spaces between, to be filled with gravel, etc., are placed upon a superstructure intermediate between the graded road bed and the blocks, and it consists in an arrangement of the said blocks on a foundation of sills laid across the roadbed parallel with each other, on the graded surface, with spaces between filled with sharp sand, the said spaces being as wide as the thickness of the blocks which are set upon the sand; and they are supported at the edges, which are placed together in forming the continuous row, by short joists laid across the sills, the corners of the blocks being recessed for the purpose, each joist supporting two blocks.

MOWERS AND REAPERS.—Wm. Michael, Murrysville, Penn.—This invention relates to improvements in the driving mechanism for mowers and reapers, and consists, in an arrangement of the driving wheels on short, independent axles, concealed by adjusting screw caps, and gearing them with loose pinions on a counter shaft, having spring ratchet clutches, communicating the motion from both driving wheels together, or one independently of the other when moving in curved lines, so that one driving wheel goes faster than the other, the said clutches being held in gear by springs which allow them to slip out when the machine is backed.

PAPER BOXES.—John Root, New Haven, Conn.—This invention relates to improvement in securing the parts of paper boxes together where they lap each other, and consists in fastening them by metal clasps consisting of strips of thin sheet metal bent over the edges, and pressed together so as to clamp the parts between them.

SHADES FOR GAS LIGHT.—Wm. Fullager, Brooklyn, N. Y.—This invention relates to improvements in shades for gas lights, and consists in the combination with the ordinary conical porcelain or other shades, which shade the lights at the sides, of a bottom shade of porcelain arranged for the support of the conical shade, and calculated to shade that part of the light thrown down, and not shaded by the present shades. The said upward shade may also be used with lamps, with slight changes in adaptation to the bras rings or supports, and is applicable without change of the form represented, to what are known as the student lamps.

SUBMARINE DRILLING APPARATUS.—Samuel Lewis, Williamsburgh, N. Y.—This invention has for its object to furnish an improvment in the apparatus for raising the boat, or other floating platform, from which a gang of drills is operated, so that it may be unaffected by the rise and fall of the tide.

STEAM PUMPING ENGINES.—S. D. Gilson, Syracuse, N. Y.—This invention relates to a new and important improvement in engines for pumping and forcing water, more especially designed as a steam fire engine, but applicable to other purposes, and it consists in such a construction and arrangement of parts that the motion of a reciprocating engine is duplicated by a simple crank movement from the shaft of an oscillating piston.

APPARATUS FOR PACKING PRESERVES, ETC.—C. T. Provost, New York city.—The object of this invention is to facilitate the packing of tomatoes and other vegetables or fruit in the preserving cans. At present vegetables are packed so loosely that in many cases the value of the can exceeds by far that of its contents. By means of this invention the cans can be thoroughly and closely packed, and the useless water removed, without improperly mashing the fruit or vegetables to be preserved.

SKATE FASTENING.—Thomas Almond, Fitchburg, Mass.—This invention relates to a new device for clamping and securing skates to the soles and heels of boots or shoes. The invention consists in the use of adjustable toe clamps and of a heel jaw all pivoted directly to the skate runner, so that the latter can be secured to the boot or shoe, without the use of straps or projecting levers.

REIN HOLDER.—I. B. Achenbach, Saddle River, N. J.—This invention has for its object to furnish a simple and convenient device for holding the reins when the team is standing, which shall be simple in construction, easily attached to the wagon, and which will hold the reins securely, and at the same time in such a way that they may be instantly detached when required.

ELECTRIC DECOMPOSITION OF COPPER AND BRASS.—Wm. Henry Walenn, London, England.—This invention consists in improvements in the electric deposition of copper and brass upon iron and other substances, to be made with less battery power, with greater economy, and more solidly and perfectly than has hitherto been done.

HOT BLAST OVENS.—Job Froggett, Youngstown, Ohio.—This invention relates to improvements in hot blast ovens, and consists, first, in inclosing the air pipe connections in the oven together with the main parts thereof; second, in providing two or more pipes or sets of pipes for dividing the blast, to lessen the friction; and third, in arranging air flues through the hot blast oven with holes admitting air immediately or directly to the gas where it enters the oven, or to the combustion chamber of hot blast ovens using other fuel.

SHEET METAL SPOON, FORK, AND OTHER HANDLES.—H. C. Milligan, Brooklyn, N. Y.—This invention relates to improvements in the construction of the handles of spoons, forks, and other implements made of sheet metal, or handles only made of sheet metal, and consists in making them with oblique corrugations stamped into them on one side and raised on the other, between the edges which are left plane for a narrow space, the said corrugations being made for strengthening and ornamenting the handles, and in the case of spoons is designed to produce a sufficiently strong handle from the thinnest sheet metal of which the bowl may be made.

BARK MILL.—Lewis N. Hermance, Kingston, N. Y.—This invention relates to an important improvement in the ordinary bark mill, and has for its object to facilitate the adjustment of every mill to fine or coarse work, and to allow the runners to be raised when they should have become dull by wear, so that by being brought nearer to the grinders they may again be made useful.

SEWING MACHINE POWER.—John W. Jordan, Lexington, Va.—This invention relates to improvements in means for propelling sewing machines, and consists in an apparatus for imparting rotary motion to a driving shaft mounted together with the sewing machine on a rocking or swinging frame, either by the rocking or swinging of the said frame to which motion is imparted by the operators mounted on the said frame in a suitable seat.

MOTION POWER FOR CARRIAGES.—George Kilner and F. H. Simmons, Sullivan, Ill.—This invention relates to improvements in motive power apparatus for land carriages, and consists in a combination of foot treadles, crank shaft, pinion master, wheel pinions, and cog rims, applicable to the propulsion of all land carriages, whether for road use or agricultural purposes, and applicable also for drawing other machinery. The invention consists in improved steering apparatus for the carriages to be propelled by the said improved motive power.

WARMING INSOLE FOR BOOTS AND SHOES.—Philipp Martin Ernst, New York city.—This invention relates to a new straw insole for boots and shoes, which, on account of its being a bad conductor of heat, serves to keep the feet warm without preventing their ventilation.

WINDOW BLIND.—Thos. Donato, New York city.—This invention relates to a new manner of securing pivoted slats in the frames of window blinds. The invention has for its object to provide a more secure fastening for the slats, and, at the same time, greater facility for removing the same for repair.

THRASHING MACHINE.—John S. Fulton, Gallatin, N. Y.—This invention relates to a new thrashing machine, into which the straw is fed transversely, so that it will not in the least be injured or broken by the thrashing process.

PRINTING PRESS.—William Anderson Kerr, Easton, Pa.—This invention relates to a new rotary press for printing both sides of one sheet by one process. The invention consists chiefly in the peculiar arrangement of the vertically reciprocating type frames which operate in conjunction with rotary platens, in such manner that they will be automatically inked during their reciprocating motion. The invention consists also in the arrangement of inking mechanism, whereby the ink is transferred from the lower part of each type frame to the type at the upper part of the same.

METAL ROOFING.—Seymour Hughes, Hudson City, N. J.—This invention has for its object to so construct the plates of a metallic roofing that the oints formed between them may be entirely water-tight.

FUSE COMPOSITION.—William H. Rogers, Brooklyn, N. Y.—This invention relates to a new and useful improvement in a composition for fuses for blasting and other purposes.

BOOK REPOSITORY.—Robert L. Dodge, Gallatin, Mo.—The object of this invention is to furnish means for supporting and preserving books, and rendering them accessible, and consists in arranging in a casing of suitable size a series of hinged frames, so constructed as to receive and support the books.

OSCILLATING ENGINE.—Henry Broomell, Christiana, Pa.—This invention relates to a new and useful improvement in the class of steam engines known as "oscillating engines," and consists in the peculiar manner of arranging the steam ports and regulating the motion of the engine.

TIDY PIN.—Hial H. Newton, Cleveland, Ohio.—This invention relates to a new and useful improvement in a devise for fastening tidies to upholstered furniture, for the protection of such furniture, and it consists in a pin with an elastic head, constructed with double prongs.

BABY CARRIAGES.—James Higgins, Salem Crossing, Ind.—This invention relates to a new and useful improvement in carriages for babies, whereby they are rendered much more useful and convenient than they have hitherto been,and it consists in combining rockers with the body of the carriage, and so constructing the carriage, otherwise, that the body may be readily removed, and a baby cradle formed of it.

FELLY SAW.—Geo. Steck, Hughesville, Pa.—This invention has for its object to saw out of plank, fellies or other pieces that require to be curved in the direction of their length, and, at the same time, to have straight sides.

COMBINED ABDOMINAL AND BACK SUPPORTER AND TRUSS.—R. J. Cundiff, Lynchburg, Va.—This invention consists in a variety of constructions and and arrangementsof a hernia truss, back supporter, abdominal supporter, and elastic bar.

MECHANICAL MOVEMENT.—Nathaniel Bradford, Addison, Me.—This invention has for its object the proportioning of power to resistance,in such manner that, when resistance is small power may be reduced in order to the gaining of speed, and, when resistance is great, power may be increased by the sacrifice of speed.

NAIL HAMMER.—E. S. Morton, Plymouth, Mass.—This invention relates to a new and useful improvement in nail hammers, and consists in a slot formed at the base of the claws, and at about right angles therewith, by means of which a nail may be held in the hammer and started in the wood with one hand, thus rendering the hammer very convenient in driving nails in places where but one hand can be used.

CIRCUMFLEXOR.—Stephen R. Kirby, East Saginaw, Mich.—This invention relates to a new and useful improvement in an instrument for describing regular and irregular curves, for obtaining the profile or face of irregularly curved or undulating surfaces or curves, and straight lines combined, and consists in the combination of adjustable tressle-work with a flexible rod or ribbon, and in connection therewith, an adjustable straight-edge and connecting rod, by means of which a series of parallel irregular or regular curves, either with or without straight lines, may be described.

FENCE.—Benning Rowell, Byersville, N. Y.—This invention consists of panels, each composed of two parallel rails bearing a lattice work of slats; said panels being sustained at their ends by trusses having upper and lower cross bars for the support of the parallel rails; and said panels being connected at their ends by perpendicular rods passing through said rails, and between the cross bars of the trusses.

BAR FOR CASTING PIPES.—John Enright, Louisville, Ky.—This invention relates to a core bar, that may be made to collapse, after a pipe has been cast around it, in order that the bar may be readily withdrawn from within the pipe, and that may be expanded again to the required size previous to being inserted in the mold, whereby the use of hay, rope, or other elastic body, wound around the core, to be afterward burned, in order to permit the withdrawal of the core bar, is rendered unnecessary,and a metallic surface presented for the loam coating to be placed upon.

COTTON CARDING MACHINE.—Gilman Jaquith, Concord, Mass.—The object of this invention is to obviate some difficulties which are met with in carding cotton on ordinary machines, and improve them in various particulars, and consists in the means provided for cleaning the cotton from dirt and foreign substances.

LOCK.—John Gérard, Trenton, N. J.—This invention relates to improvements in mortise and rein locks, and consists in pivoting one end of the lever which works the latch bolt to an eccentric or cam, in a novel manner, by which the said end may be thrown back by raising the cam to let the other end move forward to allow the latch bolt to be drawn forward for reversing. It also consists in improvements in the construction of the tails or shanks of the latch and locking bolts whereby the size is reduced while maintaining the requisite strength, to economize in metal, and to insure better adhesion of the composition heads which are cast on the said tails, the said adhesion being more perfect when cast upon small rods, which do not cause the metal to "blow" as much as the larger ones do. The invention also consists in the application to the striking plate of a friction spring which presses against the lock plate when the door is shut, and prevents rattling.

DRAWING OFF TALLOW, LARD, ETC., FROM PRESSURE TANKS.—J. H. Archer, Beaumont, Texas.—This invention has for its object to furnish an improved method of drawing off tallow, lard, etc., from the rendering, or pressure tanks, by means of which the time and labor required for removing the tallow, lard, etc., will be greatly lessened; by which the tallow etc., will be all drawn from the tank, and will be free from dirt and water, thus requiring no manipulation to free it from water.

IRON TENDER FRAME.—Benjamin W. Healey, Providence, R. I.—This invention has for its object to furnish an improved iron tender frame, which shall be lighter, stronger, and more durable than the frames constructed in the ordinary manner.

COFFEE AND TEA STEEPER.—Joseph B. Wakeman and Alonzo M. Bush, Hancock, N. Y.—This invention has for its object to furnish an improved device for containing coffee or tea while being steeped, which shall be simple in construction, and more effective and satisfactory in operation than the steepers as heretofore made.

BALING PRESS.—E. J. Marsters, Shaw's Flat, Cal.—This invention has for its object to furnish a simple, convenient, and powerful baling press for cotton, hay, etc., and which shall be so constructed as to remove the necessity for the heavy side doors now required in presses.

COMBINED SOWER, PLANTER, CULTIVATOR, SCRAPER, AND GANG PLOW.—J. P. Eddleman, Pilot Point, Texas.—This invention has for its object to furnish a strong, simple, durable, and effective machine which shall be so constructed and arranged that it may be readily adjusted for use as a gang plow, seed sower, seed planter, cultivator, and cotton scraper, and which will do its work thoroughly and well in either capacity.

STUD NIPPERS.—Granville T. Shepley, West Groton, Mass.—This invention relates to a new and useful improvement in nippers or pliers for inserting studs in rubber or leather belting, and consists in forming indentations or channels in the face of each of the jaws of the nippers, which correspond with the end of the stud in shape and size, so arranged in the jaws that they correspond with each other when the jaws are closed.

TONGS.—Joshua J. Percival, Speedwell, Va.—This invention has for its object to overcome the deficiencies of tongs, which are produced by the lateral play of the shanks.

CIRCULAR SAW MILLS.—C. E. Grandy, Upton, Mass.—This invention has for its object to furnish an improved attachment for the frames of circular saw mills, in front of the saw, which shall be so constructed and arranged that while supporting the side of the log from which the board or other lumber is being cut, as it is being carried past it by the carriage, it may also serve as a set gage when setting up the log for another cut.

PORTABLE TOBACCO PRESS.—William S. Ford, Evansville, Ind.—This invention has for its object to furnish a simple, strong, and convenient press, designed especially for pressing leaf tobacco, into the hogsheads, and which shall be so constructed that the entire strain may be borne by the tobacco being pressed.

CARRIAGE AXLES.—Lomax Littlejohn, New York city.—This invention has for its object to improve the construction of carriage axles so as to obtain a longer bearing surface without lengthening the axle, or to obtain an equal bearing surface and at the same time shorten the axle.

RAILROAD CAR STOVE.—Adolph Brase and Lemuel Salladey, Sciotoville, Ohio.—This invention has for its object to furnish an improved stove which shall be so constructed that should the said stove be overturned, by the overturning of the car in which it may have been placed, the fire will be prevented from escaping through the stove pipe hole, and the danger of the car's being set on fire will be removed.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING June 7, 1870.

Reported Officially for the Scientific American

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103,820.—REIN HOLDER.—John R. Achenbach, Saddle River, N. J.

103,821.—CONSTRUCTION OF HORSE POWER FOR COTTON GINS, ETC.—J. M. Albertson, New London, Conn. Antedated May 30, 1870.

103,822.—SKATE FASTENING.—Thomas Almond, Fitchburg, Mass.

103,823.—DRAWING OFF TALLOW, LARD, ETC., FROM RENDERING TANKS.—J. H. Archer, Beaumont, Texas.

103,824.—CONDENSER FOR THE MANUFACTURE OF COAL GAS.—Avery Babbett and W. W. Binny, Auburn, N. Y.

103,825.—ORE SEPARATOR.—Hosea Ball, New York city.

103,826.—LETTER BOX.—C. R. Bancroft (assignor to C. C. Dickerman and C. W. Munroe), Boston, Mass.

103,827.—REMOVABLE CALK FOR HORSESHOES.—J. D. Barnum, Amenia Union, N. Y.

103,828.—LANTERN FOR STREETS.—Joseph W. Bartlett, New York city.

103,829.—TYPE CABINET.—Chauncey Bassett, Kewanee, Ill.

103,830.—MACHINE FOR PARING FRUIT AND VEGETABLES.—A. G. Batchelder, Lowell, Mass.

103,831.—APPARATUS FOR LIGHTING GAS BY ELECTRICITY.—W. W. Bachelder, Boston, Mass.

103,832.—THRASHING MACHINE.—David C. Baughman, Tiffin, Ohio.

103,833.—MILL BOLT.—W. H. Bordan, Mooreville, Mich.

103,834.—DERRICK FOR HOISTING CRANE.—H. S. Blood, New Orleans, La.

103,835.—POST FOR PEGGING-JACK—Daniel Bowker, Boston, Mass.

103,836.—PNEUMATIC GAS MACHINE.—David Boyle, San Francisco. Cal.

103,837.—DOOR KEY.—James Brady (assignor to the Branford Lock Works), Branford, Conn.

103,838.—LOCK.—James Brady (assignor to the Branford Lock Works), Branford, Conn.

103,839.—STOVE.—Adolph Brase and Lemuel Salladey, Sciotoville, Ohio.

103,840.—VALVE MECHANISM FOR OSCILLATING ENGINE.—Henry Broomell, Christiana, Pa.

103,841.—BOLTING DEVICE FOR SAFES.—S. J. Burton, Charlestown, assignor to American Steam Fire-Proof-Safe Company, Boston, Mass.

103,842.—REFRIGERATOR.—James C. Campbell, New York city.

103,843.—SAWING MACHINE.—James Chase, Rochester, N. Y. Antedated May, 23, 1870.

103,844.—HAY-LOADING DEVICE.—A. B. Clark, Grass Lake, Mich.

103,845.—CASK-FILLER.—David Cope, Liverpool, England.

103,846.—BUGGY-TOP BED.—A. M. Cory, New Providence, N. J.

103,847.—MECHANICAL MOVEMENT FOR SEWING MACHINES, ETC.—Edwin Cowles, Cleveland, Ohio.

103,848.—MACHINE FOR TRIMMING BLIND RODS.—B. C. Davis, Binghamton, N. Y.

103,849.—ROSETTE.—J. W. Dayton, (assignor to the American Suspender Company), Waterbury, Conn.

103,850.—CAR COUPLING.—Thomas W. Defrees, South Bend, Ind.

103,851.—SAW SET.—J. T. Dickey, Farmington, Ill.

103,852.—MANUFACTURE OF GLUE.—Andrew Dietz, New York city.

103,853.—BOOK REPOSITORY.—Robert L. Dodge, Gallatin, Mo.

103,854.—WINDOW BLIND.—Thomas Donato, New York city.

103,855.—COMBINED SOWER, PLANTER, CULTIVATOR, SCRAPER, AND GANG PLOW.—J. P. Eddleman, Pilot Point, Texas.

103,856.—VENTILATOR OR COWL.—Jacob Edson, Boston, Mass.

103,857.—INSOLE FOR BOOTS AND SHOES.—P. M. Ernst (assignor to himself and Ernst Schmidt), New York city.

103,858.—SPINNING MACHINE.—L. W. Felt, Keene, N. H.

103,859.—DOOR SPRING.—J. T. Folwell, Camden, N. J.

103,860.—PORTABLE TOBACCO PRESS.—W. S. Ford, Evansville, Ind.

103,861.—MACHINE FOR BINDING GRAIN.—Thaddeus Fowler, Tottensville, N. Y.

103,862.—METHOD OF BINDING GRAIN.—Thaddeus Fowler, Tottensville, N. Y.

103,863.—COVER FOR SEWING MACHINE.—E. F. French, New York city.

103,864.—UMBRELLA RIB.—Henry S. Frost (assignor to himself, A. G. Davis, and A. N. Woolson), Watertown, Conn.

103,865.—SHADE FOR GASLIGHT.—Wm. Fullagar, Brooklyn, N. Y.

103,866.—THRASHING MACHINE.—John S. Fulton, Gallatin, N. Y.

103,867.—ATTACHING HANDLES TO CUTLERY.—J. W. Gardner, Shelburne Falls, Mass.

103,868.—LOCK.—John Gerard, Trenton, N. J.

103,969.—ROTARY ENGINE.—Samuel D. Gilson, Syracuse, N. Y.

103,870.—BOILER.—Myron Gore, Batavia, Ill.

103,871.—HEAD BLOCK FOR SAW-MILL.—C. E. Grandy, Upton, assignor to S. Heald & Sons, Barre, Mass.

103,872.—CHECK VALVE.—Darwin Alanson Greene, New York city.

103,873.—PRUNING KNIFE.—Manasseh Grover, Clyde, Ohio.

103,874.—STREET RAILWAY CAR.—J. J. Gutierrez, Jefferson Parish, La.

103,875.—ELECTRO-MAGNETIC SIGNAL APPARATUS FOR RAILROADS.—T. S. Hall, Stamford, assignor to Hall's Electric Railway-Switch and Draw-Bridge Signal Company, New Haven, Conn.

103,876.—COMPOUND TROCHE OR BUCHU.—H. J. Hamilton, Brooklyn, N. Y.

103,877.—COTTON SCRAPER OR CULTIVATOR.—T. J. Harris, Guntown, Miss.

103,878.—IRON TENDER-FRAME.—B. W. Healey, Providence, R. I.

103,879.—PROCESS FOR MAKING MOLDS FOR CASTINGS OF ALTO-RELIEVO FIGURES, ETC.—Nicholas Heintzelman, New York city Antedated May 24, 1870.

103,880.—LOOM.—John J. Herbert, Philadelphia, Pa.

103,881.—BARK MILL.—L. N. Hermance, Kingston, N. Y.

103,882.—BABY CARRIAGE.—James Higgins, Salem Crossing, Ind., assignor to himself and W. S. Medaras.

103,883.—STEAM RAM.—Thomas Hill, Vallejo, Cal.

103,884.—HEATING STOVE.—Robert Hillson, Albany, N. Y.

103,885.—LAMP SHADE SUPPORTER.—E. W. Holt, Corinna, Me.

103,886.—RAILWAY CAR BRAKE.—Thomas Hopper, Hatfield Hopper, and Chandler C. Coats, Newark, N. J.

103,887.—METAL ROOFING.—Seymour Hughes, Hudson City, N. J.

108,888.—PATTERN FOR CASTINGS.—J. L. Jackson, New York city.

103,889.—CARDING MACHINE.—Gilman Jaquith, Concord, Mass.

103,890.—CUTTER FOR WOOD-MOLDING MACHINES.—Dedrick Jordan, Charlestown, Mass., assignor to A. S. and J. Gear & Co., New Haven, Conn.

103,891.—MOTIVE MECHANISM FOR SEWING MACHINES.—J. W. Jordan, Lexington, Va.

103,892.—SAWING MACHINE.—Jacob Kauffmann, Gilboa, Ohio.

103,893.—PRESSURE-GAGE AND SAFETY VALVE.—A. A. Kent, Lyons, Iowa.

103,894.—PRINTING PRESS.—William Anderson Kerr, Easton, Pa.

103,895.—MOTIVE MECHANISM FOR CARRIAGES.—George Kilner and F. H. Simmons, Sullivan, Ill.

103,896.—ADJUSTABLE CURVE FOR USE OF DRAFTSMEN.—S. R. Kirby, East Saginaw, Mich.

103,897.—STREET-CAR STARTER.—Benjamin Lepper, St. Louis, Mo.

103,898.—CHURN.—J. S. Lewis, Elkport, Iowa.

103,899.—SUBMARINE DRILLING APPARATUS—Samuel Lewis, Williamsburg, N. Y.

103,900.—CARRIAGE AXLE.—Lomax Littlejohn, New York city.

103,901.—PACKING FOR ROTARY ENGINE.—John Loader (assignor to himself, W. H. Child, and A. W. C. Williams), London, Eng.

103,902.—STEAM GENERATOR.—John Loader and Wm. H. Child (assignors for one third their right to A. W. C. Williams), London England.

103,903.—FENCE.—L. E. Lockling, Perrysburg, and N. N Whitaker, Sheridan, N. Y.

103,904.—VARIABLE CUT-OFF VALVE GEAR.—G. E. Long Harrisburg, Pa.

103,905.—LOCOMOTIVE HEAD LIGHT.—Roger W. Love, Windsor, Vt.

103,906.—HAND SPINNING MACHINE.—Wm. H. Main, Marietta, Wis.

103,907.—BALING PRESS.—Enoch J. Marsters, Shaw's Flat, Cal.

103,908.—CHURN.—H. B. McFall, Mount Solon, Va.

103,909.—PASTE FOR POLISHING METALS.—Peter McManus and G. W. Latimer, Detroit, Mich.

103,910.—CLUTCH MECHANISM FOR HARVESTER.—William Michael, Murrysville, Pa.

103,911.—IRON BRIDGE.—Mahlon Miller, Cleveland, Ohio.

103,912.—MACHINE FOR CUTTING OUT GRINDSTONES.—J. E. Mitchell, Philadelphia, Pa.

103,913.—FUEL PRESS.—T. M. Mitchell, Philadelphia, Pa.

103,914.—NAIL HAMMER.—Ephraim S. Morton, Plymouth, Mass.

103,915.—TIDY PIN.—H. H. Ne[illegible], Cleveland, Ohio.

103,916.—DOOR MAT.—A. P. Noyes, Middletown, assignor to J. S. Andrews, Chelsea, Mass.

103,917.—LAMP GAS BURNER.—Rufus Nutting, Randolph, Vt.

103,918.—CULTIVATOR.—Henry W. Ostrom, Grand Rapids, Mich.

103,919.—BRAND FOR CANCELING STAMPS.—Amos D. Owen, Thorntown, Ind.

103,920.—FIRE TONGS.—J. J. Percival, Speedwell, Va.

103,921.—METALLIC BOOT AND SHOE HEEL.—A. T. Perrine, Louisville, Ky.

103,922.—GRAIN CLEANER.—Chauncey Perry, Rochester, N.Y. Antedated May 23, 1870.

103,923.—HOT-BLAST APPARATUS.—Jonas J. Pierce, Sharpsville, Pa.

103,924.—PRINTING TELEGRAPH INSTRUMENT.—F. L. Pope, Elizabeth, N. J., and T. A. Edison, New York city.

103,925.—SAWSET.—H. K. Porter, Boston, Mass.

103,926.—CALIPER.—H. K. Porter, Boston, Mass.

103,927.—APPARATUS FOR PACKING PRESERVES.—C. T. Provost, New York city.

103,928.—LAMP SHADE.—Wm. Reed, Jr., Boston, Mass, assignor to himself and Wm. Reed, M.D.

103,929.—GAS RETORT.—James Rigby and P. A. Palmer, Marietta, Ohio.

103,930.—COTTON SCRAPER.—D.G. Rittenhouse, Shelby Depot, Tenn.

103,931.—FUSE COMPOSITION.—William H. Rogers, Brooklyn, N. Y.

103,932.—PAPER BOX.—John Root (assignor to himself and Andrew Martin), New Haven, Conn.

103,933.—MILK-CAN HANDLE.—H. W. Shepard, Mannsville, N. Y.

103,934.—STUD NIPPER.—Granville T. Shepley, West Groton, Mass.

103,935.—COMBINED FEED AND WATER TROUGH.—Joseph Sherman, Coopersville, Mich., assignor to himself and William Sherman.

103,936.—CORN DROPPER.—J. L. Smith, Pemberton, N. J.

103,937.—VALVE.—August Snyder (assignor to Atwood & McCaffrey), Pittsburgh, Pa.

103,938.—SASH FASTENING.—Wm. B. Snyder and Robert Hubbard, Bridgeport, Conn.

103,939.—GEARING FOR CARPET-SWEEPING MACHINES.—G.F. Tayler, New York city.

103,940.—APPARATUS FOR SPLITTING ROCK.—Eber Thayer, Union City, Mich.

103,941.—CORN SHELLER.—Ambrose B. Thompson, Owego, N. Y.

103,942.—MOLD-BOARD PRESS.—Andrew Thompson, Ottawa Ill.

103,943.—STOVEPIPE VENTILATOR.—D.V.Thrift, Monroe,Iowa, assignor for one half to Levi Fisher.

103,944.—VOLUTE SPRING.—Joseph Trent, Millerton, N. Y Antedated June 1, 1870.

103,945.—WASHING MACHINE.—David Vogt, Trenton, Mich.

103,946.—COFFEE AND TEA STEEPER.—J. B. Wakeman and A. M. Bush, Hancock, N. Y.

103,947.—ELECTRO-DEPOSITION OF COPPER AND BRASS ON IRON AND STEEL.—W. H. Walenn, London, England. Patented in England Dec. 24, 1868.

103,948.—CONCEALED HINGE FOR LANDAU CARRIAGE.—Edward Wells, New Haven, Conn.

103,949.—THREAD CONTROLLER FOR SEWING MACHINES.—Washington Wendell, Milwaukee, Wis., assignor to the Finkle & Lyon Manufacturing Co., Middletown, Conn.

103,950.—BOOTS AND SHOES.—Levi H. Whitney, Washington, D. C.

103,951.—FIRE-KINDLING FAGOTS.—W. J. Wiggins and Chas. Stout, St. Louis, Mo.

103,952.—SAW MILL.—W. M. Wilkin, Detroit, Mich.

103,953.—LIME BARREL OR KIBBLE.—F. K. Winsor, Hillsdale, Mich.

103,954.—MACHINE FOR MAKING OXSHOES.—A. L. Wooding, Bristol, Conn.
103,955.—APPARATUS FOR COOLING ALE, BEER, ETC.—F. Zeitz, Philadelphia, Pa.
103,956.—MANGER.—C. E. Albright, Muncy, Pa.
103,957.—VELOCIPEDE.—A. M. Allen, New York city.
103,958.—SIDEBOARD AND EXTENSION TABLE.—Derk Arnaud, Boston, Mass.
103,959.—WASHING MACHINE.—Frank M. Bacon, Plainfield, N. J.
103,960.—PUMP.—B. C. Bailey, Constitution, Ohio.
103,961.—PRINTING PRESS.—Amos H. Bangle, Brooklyn, Cal.
103,962.—CANDY MACHINE.—Jesse S. Batchelder, Fort Wayne, Ind.
103,963.—FIRE-PROOF CEILING.—F. Bauman and G. F. Letz, Chicago, Ill.
103,964.—FLOUR SIFTER.—Peter Becker, Mount Vernon, N. Y.
103,965.—COPY BOOK.—N. P. Beers, New York city.
103,966.—PATTERN FOR MOLDING STOVE PLATES.—R. W. Belson, Philadelphia, Pa.
103,967.—LAMP BURNER.—George Berkstresser (assignor to himself, F. W. Irvine, Jacob Reed, and R. W. Berkstresser), Bedford, Pa.
103,968.—MANUFACTURE OF WOOD PAPER STOCK.—Geo. H. Bliss and Martin Rees, West Stockbridge, Mass.
103,969.—REEL FOR HARVESTER.—J. W. Bope, South Bend, Ind., assignor to himself and C. Aultman, Canton, Ohio.
103,970.—REST FOR HARVESTER.—J. W. Bope, South Bend, Ind., assignor to himself and C. Aultman, Canton, Ohio.
103,971.—MECHANICAL MOVEMENT.—Nathaniel Bradford, Addison, Me.
103,972.—WATER WHEEL.—Wm. Braidwood and H. J. Hewitt, New York city.
103,973.—CHAIR SEAT.—W. G. Bulgin, Vienna, N. J.
103,974.—COMPOUND FOR PREVENTING AND REMOVING INCRUSTATION IN STEAM BOILERS.—William H. Burridge, Cleveland, Ohio, assignor to A. L. Kingman, C. G. Dodge, and H. C. Hartwell.
103,975.—TOOL HOLDER.—R. P. Buttles, Mansfield, Pa.
103,976.—COMBINED LIQUID GAGE AND HYDROMETER.—S. R. P. Camp, New York city.
103,977.—COMPUTING SPRING BALANCE.—S. R. P. Camp, New York city.
103,978.—BEEHIVE.—H. F. Carpenter, Greencastle, Pa.
103,979.—WOOD PAVEMENT.—Louis A. Cauvet, New York city.
103,980.—TOILET MIRROR.—G. H. Chinnock, New York city, and E. P. Williams, Elizabeth, N. J.
103,981.—COTTON GIN.—J. M. Clough, Ilion, N. Y.
103,982.—PLOW.—H. C. Cloyd, West Alexandria, Ohio.
103,983.—CHILL BOSH FOR BOILING AND PUDDLING FURNACES.—Thos. Coates, Ironton, Ohio.
103,984.—SEWING MACHINE.—J. J. Cobb, Boston, Mass.
103,985.—CARRIAGE CURTAIN BUTTON.—Alonzo Comstock and J. H. Nicholson, Chicopee, Mass.
103,986.—ELECTRICAL COTTON-PICKING MACHINE.—R. F. Cooke, Brooklyn, N. Y.
103,987.—QUILTING FRAME.—John A. Cookerly, Frederick, Md.
103,988.—METALLIC CAP AND NOZZLE.—Edward T. Covell, Brooklyn, N. Y.
103,989.—LIQUID METER.—Robert Creuzbaur, Brooklyn, E.D., N. Y.
103,990.—LIQUID METER.—Robert Creuzbaur, Brooklyn, E.D., N. Y.
103,991.—PENMAN'S WRIST SUPPORTER.—Henry F. Cristy, Charlestown, Mass.
103,992.—COMBINED ABDOMINAL AND BACK SUPPORTER AND TRUSS.—R. J. Candiff, Lynchburg, Va.
103,993.—WICK ADJUSTER FOR ARGAND LAMP BURNER.—W. B. Curtiss, Bridgeport, Conn.
103,994.—APPARATUS FOR THE MANUFACTURE OF ILLUMINATING GAS.—John Dailey, St. Louis, Mo.
103,995.—SPOOLING MACHINE.—G. W. Daugherty, Wilmington, Del.
103,996.—SPINDLE FOR SPINNING MACHINE.—George W. Daugherty, Wilmington, Del.
103,997.—LAUNDRY IRON HEATER.—Robert Diven, New York city.
103,998.—COMBINED ROASTER AND BROILER.—Thos. Drake, Cincinnati, Ohio.
103,999.—MANUFACTURE OF FROSTED PLUSH, PAPER, ETC.—H. V. Edmond, Norwich, Conn.
104,000.—HORSE COLLAR.—Joseph Englaender (assignor to self and Eugene Lungstras), Sedalia, Mo.
104,001.—DOVETAILING MACHINE.—H. H. Evarts, Chicago, Ill.
104,002.—PAPER FILE.—Thomas C. Fahnestock, Cincinnati, Ohio.
104,003.—STUMP EXTRACTOR.—Enoch Farnsworth, Sabbath Rest, Pa.
104,004.—TAILING ELEVATOR FOR SEPARATORS.—Arthur B. Farquhar, York, Pa.
104,005.—WAGON AXLE.—C. W. Fillmore, Marengo, and T. M. Jones, Chicago, Ill.
104,006.—COLORING AND DRYING PAPER.—C. C. Fitzgerald, New York city.
104,007.—TREATING MARBLE TO PRESERVE IT.—C. C. Fitzgerald (assignor to the Fletcher Marble Co.), New York city.
104,008.—PRODUCING MOSAICS UPON MARBLE.—C. C. Fitzgerald (assignor to the Fletcher Marble Co.), New York city.
104,009.—VAPOR BURNER.—David R. Fletcher, Covington, Ky.
104,010.—TEA AND COFFEE SERVICE.—Ira Yeamans, Brooklyn, N. Y.
104,011.—BEEHIVE.—Thomas H. Foster, Indianapolis, Ind.
104,012.—HYDRANT.—Jacob Fricker and Americus Warden, Cincinnati, Ohio.
104,013.—EYELET.—Thomas Garrick, Providence, R. I.
104,014.—SETTING-UP AND TENSION COMBS FOR KNITTING MACHINES.—William Gaskill, Cincinnati, Ohio.
104,015.—THILL COUPLING.—John H. Gee, Cortland, N. Y., assignor to G. T. Chapman, New York city.
104,016.—FRUIT BOX.—L. L. Gilliland, Dayton, Ohio.
104,017.—EMBROIDERING ATTACHMENT FOR SEWING MACHINES.—H. C. Goodrich, Chicago, Ill.
104,018.—ENVELOPE OPENER.—John P. Gruger (assignor to himself and Frederick Rodrigo), Philadelphia, Pa. Antedated May 27, 1870.
104,019.—WATER-SUPPLYING APPARATUS.—John C. Hagan, Nashville, Tenn.
104,020.—SPINDLE FOR SAFE LOCK.—Robert Haile (assignor to Charles Diebold and Jacob Kienzle), Cincinnati, Ohio.
104,021.—COOKING STOVE.—William Hailes, Albany, N. Y.
104,022.—CORSET SPRING.—Joseph Hanauer and N. Sartor, New York city.
104,023.—HARNESS SADDLE.—Emery E. Hardy, Joliet, Ill.
104,024.—RAILWAY CAR COUPLING.—Daniel Hart (assignor to himself and Jesse Yerkes), Romulus, N. Y.
104,025.—FAUCET.—Irus W. Harvey, Norwich, Conn.
104,026.—WATER WHEEL.—William Haslup, Sidney, Ohio.
104,027.—RUBBER DOOR SPRING.—Joel B. Hayden, Schaghticoke, N. Y.
104,028.—HAND SEED PLANTER.—John Heberling, Mount Pleasant, Ohio.
104,029.—MACHINE FOR SHIRRING FABRICS.—Ansel Hecht, New York city
104,030.—SETTER, GAGE, AND CASE FOR SEWING MACHINE NEEDLES.—Eli E. Hendrick, Carbondale, Pa.
104,031.—ANIMAL TRAP.—N. F. Hersh, Round Hill, assignor to himself and A. B. Lerew, York Sulphur Springs, Pa.
104,032.—SPRING CLOSING CAP FOR OIL CUPS AND INKSTANDS.—H. H. Hesketh, Le Roy, Ill.
104,033.—NUT LOCK.—Daniel Hoffman, Noblestown, and W. Johnston, Havelock, Pa.
104,034.—MANUFACTURE OF A NON-HYGROSCOPIC PULVERULENT ACID PHOSPHATE.—E. N. Horsford, Cambridge, Mass.
104,035.—HORSE COLLAR.—Wm. Kayes (assignor to himself, Charles Irving, and J. B. Forsyth), Boston, Mass.
104,036.—TRUSS FRAME BRIDGE.—Chas. Kellogg, Athens, Pa.
104,037.—GLOBE VALVE.—Norman King (assignor to himself and Daniel Romire), Etna, Pa.
104,038.—SEAL LOCK.—G. L. Kitson, Joshua F. Laning, and Joseph Bennor, Philadelphia, Pa., assignors for one half their right to C. A. Wolborn.
104,039.—JOINTED SPRING GUARD.—U. B. Kline, Reamstown, Pa. Antedated June 3, 1870.
104,040.—METHOD OF FORMING CARRIAGE STEP.—Wilson W. Knowles, Plantsville, Conn.
104,041.—MOVABLE STORE SHELVING.—George Koch and Wm. Koch, Franklin, Pa.
104,042.—CULTIVATING HOOK.—J. Fred. Leitch, Oxford, N. Y.
104,043.—LETTER BOX.—E. T. Marsh, Rochester, N. Y.
104,044.—ADJUSTABLE HANGER FOR SHAFTING.—Volney W. Mason, Providence, R. I. Antedated May 30, 1870.
104,045.—THILL COUPLING.—H. Z. Mast, Fork Meeting House, Md.
104,046.—SOCKET PIPE MACHINERY.—F. M. Mattice, Cleveland, Ohio.
104,047.—RULING MACHINE.—John McAdams, Brooklyn, N. Y.
104,048.—SPRING BED BOTTOM.—Wm. McArthur (assignor to himself and J. A. Smith), Philadelphia, Pa.
104,049.—MEAT CHOPPER.—Arthur McCarter, Salem, Ohio.
104,050.—FAUCET.—William McKay, Newburyport, Mass., assignor to himself and C. E. Bayley.
104,051.—HANDLE OF SHEET METAL SPOONS, FORKS, ETC.—H. C. Milligan, Brooklyn, N. Y.
104,052.—TUBING AND FILTERING ARRANGEMENT FOR WELLS.—M. C. Monson, Chicago, Ill.
104,053.—CAR WHEEL.—H. W. Moore, Jersey City, N. J.
104,054.—PHOTOGRAPHIC PLATE HOLDER.—John W. Moore, Bellefonte, Pa.
104,055.—MACHINE FOR CUTTING AND DRESSING STONE.—Archibald Munro, Arbroath, and Wm. B. Adamson, Glasgow, North Britain.
104,056.—MANUFACTURE OF RUBBER-COATED CARRIAGE TRIMMINGS.—John W. Munson, Bridgeport, Conn.
104,057.—RAILWAY RAIL CHAIR AND JOINT.—John M. Orr Leesburg, Va.
104,058.—MACHINE FOR UNTWISTING AND SEPARATING HAIR ROPE.—Joseph Paradis and W. H. Drew, Brooklyn, N. Y.
104,059.—FARE RECORDER FOR CARS, ETC.—O. S. Peas, Xenia, Ohio.
104,060.—ORGAN BELLOWS.—Joseph R. Perry, Wilkesbarre, Pa.
104,061.—TOOL FOR CUTTING OFF BOLTS, RODS, ETC.—Henry Peters, Davenport, Iowa.
104,062.—MACHINE FOR PITCHING LAGER BEER AND OTHER CASKS.—Henry Rattermann, Cincinnati, Ohio.
104,063.—LATHE CHUCK.—John Rich, Painesville, Ohio.
104,064.—DOOR HANGER.—Samuel P. Robinson, Canterbury, Conn.
104,065.—FENCE.—Benning Rowell, Byersville, N. Y.
104,066.—SCREW COLLAR FOR LAMPS.—Wm. H. Russell, Brooklyn, N. Y.
104,067.—HARVESTER.—Jacob Seibel, Manlius, Ill.
104,068.—HEAD BLOCK FOR SAW MILLS.—George Selden and H. O. Kelsey, Erie, Pa., assignors to George Selden.
104,069.—BENCH HOOK.—H. J. Skinner, Dunkirk, N. Y.
104,070.—GRATE AND BACK FOR COOKING STOVES.—Jas. B. Slusser and W. H. Meech, Roanoke, Ind.
104,071.—GRATER.—J. M. Smith, Seymour, Conn.
104,072.—MACHINE FOR CLEANING CAST-IRON PIPE.—Wm. Smith, Alleghany City, Pa.
104,073.—ALARM FOR SAFES.—William Spear, Cape Elizabeth, Me.
104,074.—SAW FOR SAWING FELLIES.—Geo. Steck, Hughesville, Pa.
104,075.—BROILER.—William C. Stiver and John S. Williams, Brooklyn, N. Y.
104,076.—GAGE ATTACHMENT FOR TINSMITHS' SHEARS.—Orson W. Stow, Plantsville, Conn.
104,077.—SAWING MACHINE.—Jacob Strausbaugh, Jr., Tiffin, Ohio.
104,078.—BLOW PIPES.—J. R. Streett (assignor to James Vermillion), Washington, D. C.
104,079.—SAWING MACHINE.—Monroe Sweney, Warren, Ohio.
104,080.—COMBINED CRANK WRIST FOR HARVESTING MACHINES.—J. Oscar Taber, Salem, Ohio.
104,081.—SCAFFOLD BRACKET.—Joseph M. Taylor, Dublin, Ind.
104,082.—BEDSTEAD FASTENING.—John C. Turner, Newark, N. J.
104,083.—BAKER'S OVEN.—Joseph Vale and Charles L. Vale, Chicago, Ill.
104,084.—HEATING STOVE.—Nicholas S. Vedder, Troy, N. Y.
104,085.—MACHINE FOR HUSKING CORN.—Ralph Warriner, J. H. Baker, and G. B. Slocum, Saratoga Springs, N. Y.
104,086.—BRIDGE GATE.—Hubert Wermerskirchen, Chicago, Ill.
104,087.—CANE GUN.—William H. Werner, Nazareth, Pa.
104,088.—SEED PLANTER.—John E. White, Clinton, Ill.
104,089.—EARTH URINAL.—John G. White, Cambridge, Mass.
104,090.—REVOLVING STEAM GAGE COCK.—Daniel Williams and Edward Joseph, Gallipolis, Ohio.
104,091.—MANUFACTURE OF IRON.—John De Witt Williams (assignor to himself and John W. Butler), Philadelphia, Pa.
104,092.—DUSTING BRUSH.—Loren R. Witherell and Amasa B. Crandall, Galesburg, Ill.
104,093.—MACHINERY FOR MOVING COAL OR OTHER MINERALS.—John E. Wootten, Reading, Pa.
104,094.—CONDITION POWDER FOR HORSES AND CATTLE.—John H. Woolrich, Woburn, Mass.

REISSUES.

4,010.—Division A.—APPARATUS FOR EVAPORATING THE MOISTURE FROM ANIMAL AND VEGETABLE SUBSTANCES.—Charles Alden, Newburgh, for himself and Alden Fruit-Preserving Company, New York city, assignees of Charles Alden.—Patent No. 100,855, dated March 15, 1870.
4,011.—Division B.—PROCESS FOR EVAPORATING THE MOISTURE FROM ANIMAL AND VEGETABLE SUBSTANCES.—Charles Alden, Newburgh, for himself and Alden Fruit-Preserving Company, New York city, assignees of Charles Alden.—Patent No. 100,855, dated March 15, 1870.
4,012.—Division A.—FIRE ALARM SIGNAL AND APPARATUS.—Alexander Allen, Rochester, N. Y.—Patent No. 90,808, dated June 1, 1869.
4,013.—Division B.—FIRE ALARM SIGNAL AND APPARATUS.—Alexander Allen, Rochester, N. Y.—Patent No. 90,808, dated June 1, 1869.
4,014.—TAPS FOR OIL VESSELS.—Matthew Andrew, Melbourne, Australia.—Patent No. 94,059, dated August 24, 1869.
4,015.—PISTON ROD ADJUSTER.—Douglas Bly, Shambourg, Pa.—Patent No. 78,045, dated May 19, 1868.
4,016.—SLEEVE BUTTON AND STUD.—Barnes Clayton, Philadelphia, Pa.—Patent No. 62,998, dated February 12, 1867; antedated February 2, 1867.
4,017.—Division B.—PITMAN CONNECTION FOR HARVESTER.—J. W. Doty, Lockport, N. Y.—Patent No. 59,132, dated October 30, 1866.
4,018.—LOCK.—Hall's Safe and Lock Company, Cincinnati, Ohio, assignees of Joseph L. Hall.—Patent No. 38,264, dated May 5, 1863.
4,019.—CURTAIN KNOB.—Calvin Z. Krob, Tiffin, Ohio.—Patent No. 49,634, dated August 29, 1865.
4,020.—DEODORIZING PETROLEUM.—Thomas Restieaux, Boston, Mass.—Patent No. 63,749, dated April 9, 1867.
4,021.—DEVICE FOR SHEARING AND CLIPPING HORSES AND OTHER ANIMALS.—Roswell T. Smith, William Earl, Joseph K. Priest, and John G. Blunt, Nashua, N. H., assignees of Roswell T. Smith and Joseph K. Priest.—Patent No. 72,150, dated December 10, 1867.
4,022.—FAUCET.—Edward A. Sterry, Norwich, Conn.—Patent No. 15,017, dated June 17, 1855; extended seven years.
4,023.—DYE FOR COLORING WOOL AND OTHER FIBROUS MATERIAL.—Albert Knight and George W. Talbot, Providence, R. I., assignees of George W. Talbot.—Patent No. 99,486, dated February 1, 1870.
4,024.—LINING FOR FIREPLACE.—Charles Truesdale and Wm. Heser & Co., Cincinnati, Ohio, assignees of Charles Truesdale.—Patent No. 91,569, dated June 22, 1869.

DESIGNS.

4,095.—SEAL OR BANNER.—Fred Walton Bacon, New Haven, Conn.
4,096.—SPOON.—Bennet Jerald (assignor to Charles Parker), Meriden, Conn.

4,097 to 4,100.—DOOR KNOB.—Ludwig Kreuzinger, Cambridge, assignor to the Metallic Compression Casting Company, Boston Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Four patents.
4,101 to 4,103.—DOOR KNOB ROSE.—Ludwig Kreuzinger, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Three patents.
4,104 to 4,106.—ESCUTCHEON.—Ludwig Kreuzinger, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Three patents.
4,107.—DOOR KNOB.—Charles Kunze, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,108.—DOOR KNOB.—Joseph L. Leger, Somerville, assigno to the Metallic Compression Casting Company; Boston, Mass., assigno to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,109 and 4,110.—BELL-PULL KNOB.—J. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Two patents.
4,111 and 4,112.—BELL-PULL BACK PLATE.—Joseph A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Two patents.
4,113 to 4,118.—DOOR KNOB.—Joseph A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Six patents.
4,119.—DOOR KNOB ROSE.—J. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,120.—DOOR BUTT.—J. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,121 and 4,122.—ESCUTCHEON.—Jos. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Two patents.
4,123.—DOOR LATCH.—Jos. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,124 to 4,126.—SHUTTER KNOB.—Jos. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Three patents.
4,127.—SHUTTER BAR.—Jos. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,128.—SASH LIFT.—J. A. Ruff, Cambridge, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.
4,129 and 4,130.—BELL-PULL KNOB.—John Joseph C. Smith, Somerville, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Two patents.
4,131 to 4,138.—DOOR KNOB.—John. J. C. Smith, Somerville, assignor to the Metallic Compression Casting Company, Boston, Mass., assignor to Russell & Erwin Manufacturing Company, New Britain, Conn. Eight patents.
4,139 and 4,140.—FLOOR CLOTH PATTERN.—J. T. Webster, New York city, assignor to Page, Wilder & Co., Hallowell, Me. Two patents.
4,141.—GRINDING MILL STAND OR FRAME.—John G. Baker, Philadelphia, Pa.
4,142.—HAND STAMP.—S. J. Hoggson, New Haven, Conn.
4,143.—THUMB OF GLOVE.—Edward Hulbert, Wm. F. Steele, and Henry C. Day, Gloversville, N. Y.
4,144.—TILE.—Wm. H. Humphrey, Lansingburg, N. Y.
4,145.—BAND SAW FRAME.—John Richards, Philadelphia, Pa.
4,146.—COLLAR BOX.—Geo. K. Snow, Watertown, Mass.
4,147.—CIDER, WINE, AND OTHER PRESSES.—Hermon Thomas, Philadelphia, Pa.

EXTENSIONS.

ELASTIC BOTTOMS FOR CHAIRS AND OTHER ARTICLES.—Lysander Spooner, Boston, Mass.—Letters Patent No. 15,021, dated June 3, 1856.

COUPLING FOR VEHICLES.—Harvey Miner and H. M. Stevens, of New York city, and Mary Saunders, of Hastings, N. Y. (executrix of Wm. H. Saunders, deceased).—Letters Patent No. 14,865, dated May 27, 1856.

NAIL MACHINE.—Daniel Dodge, of Keesville, N. Y.—Letters Patent No. 15,054, dated June 3, 1856.

REAPING MACHINE.—W. C. Martin, Westville, Ind., administrator of Jacob J. Mann, deceased, and Henry F. Mann, of Pittsburgh Pa.—Letters Patent No. 15,044, dated June 3, 1856.

NEW BOOKS AND PUBLICATIONS.

THE SHEET METAL WORKER'S INSTRUCTOR. For Zinc, Sheet Iron, Copper, and Tin Plate Workers and others; containing a Selection of Geometrical Problems, also Practical and Simple Rules for Describing the various Patterns required in the different branches of the above Trades. By Reuben Henry Warn, Practical Tin Plate Worker. To which is added an Appendix, containing Instructions for Boiler Making, Mensuration of Surfaces and Solids, Rules for Calculating the Weights of different Figures of Iron and Steel, Tables of the Weights of Iron, Steel, etc. Illustrated by Thirty-two Plates and Thirty-seven Wood Engravings. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. Price, by mail, free of postage, $3·00.

This enterprising publisher evidently intends to supply every branch of industrial arts with an appropriate work of reference and guide. The book under present consideration is, so far as we are aware, the only one published upon sheet metal working in the English language, which treats its subject scientifically, practically, and accurately. It is an American edition of an English work, of well-recognized and standard merit. The present edition includes all the matter contained in the English edition and has added to it an important and useful appendix, including instructions for boiler making, mensuration of surfaces, tables, etc., very useful for reference. The book is thoroughly indexed, which adds greatly to its convenience in use. It is printed in bold clear type, and its contents are so well classified that it cannot fail to be a most useful hand-book for artizans in sheet metal.

CONTRIBUTIONS TO THE THEORY OF NATURAL SELECTION. A Series of Essays. By Alfred Russell Wallace, author of "The Malay Archipelago," etc., etc. Macmillan & Co., London, and 63 Bleecker street, New York city.

This book merits an elaborate review, and we have kept it upon our table for some weeks, hoping to gain leisure to give it a thorough reading and to place in the form of a review its salient points before our readers. We have not yet found time to do this, but we can assure all lovers of natural history, and all who delight in original investigation of the kind, that no time can be better improved than by the perusal of this work. The author candidly and modestly sets forth his claims to the origination of the origin of species, while acknowledging that few men but Mr. Darwin—and perhaps none now living—could have accomplished the great work from which that great philosopher derives his fame. The book is therefore written in no spirit of rivalry or detraction, but with an earnest desire to advance true science. The author takes issue with Mr. Darwin and others upon the origin of the human species. And his remarks upon this subject are full of facts of great interest. The book is a small octavo printed in handsome style on tinted paper and tastefully bound.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

HARVESTING MACHINES.—William A. Kirby, Auburn, N. Y., has applied for an extension of the above patent. Day of hearing Aug. 17, 1870.

DESIGN FOR A KNIFE OR FORK HANDLE, ETC.—Egbert W. Sperry, Wolcottville, Conn., has applied for an extension of the above patent. Day of hearing Oct. 12, 1870.

DESIGN FOR A KNIFE, FORK, OR SPOON HANDLE.—Egbert W. Sperry, Wolcottville, Conn., has applied for an extension of the above patent. Day of hearing Oct. 12, 1870.

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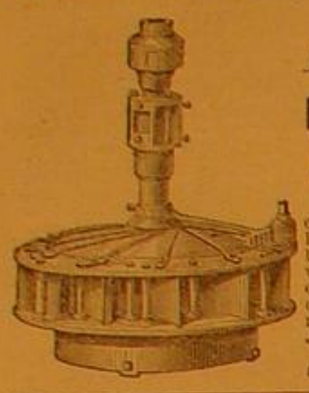
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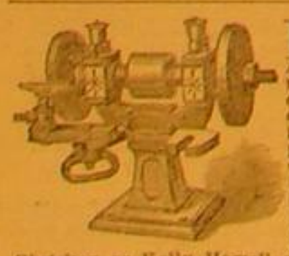
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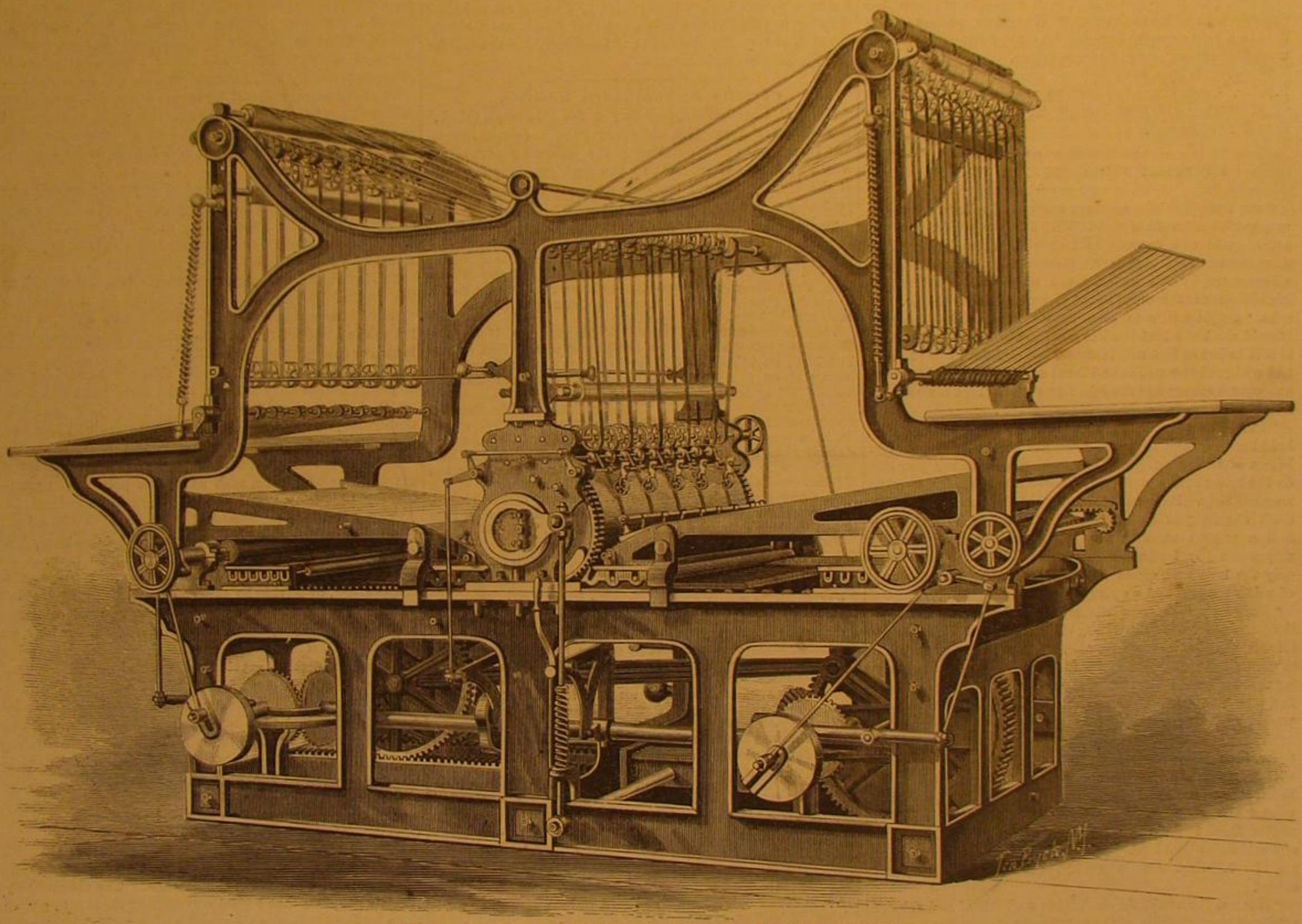
SCIENTIFIC AMERICAN

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

Vol. XXII.—No. 26. [NEW SERIES.] NEW YORK, JUNE 25, 1870. $3 per Annum. [IN ADVANCE.]

The Wharfdale Two-Feeder Printing Press.

Much as has been said and written upon the immense influence of the modern printing press upon modern civilization, and trite as anything further upon this topic must necessarily be, we doubt if all that lecturers, essayists, and poets have said or sung has impressed any just conception of the magnitude of this influence upon the popular mind. For ourselves, every time we contemplate the effect of printing upon the manners, morals, and intellect of the age, we fail to see any bounds to it within the limits of human thought. For the press is the chief avenue for the expression of the thought of



THE WHARFDALE TWO-FEEDER PRINTING PRESS.

the present time, and through it more minds are reached and placed in contact with the minds that mold popular opinion than through all other channels put together.

It follows that any improvement in the printing press at once raises the entire human race upon a higher plane than it previously occupied. What shall be said then of the value of an improvement which doubles the capacity of presses employed for printing the illustrated literature which forms so large a share of the popular reading of the period. This class of books and periodicals, it is true, includes much that is worthless and even harmful, but on the other hand almost the entire literature of science is included in it. Art has also naturalized itself here, and in a thousand forms adds to the pleasure and improves the tastes of mankind. To destroy the illustrated literature of the age would be to set the world back a century; a century of such advancement as the world has never before known.

Our engraving shows a press designed for printing illustrated books and periodicals, which is capable of performing in a superior manner twice the work of presses employed for the same work previous to its invention. That the general reader as well as professional printer may understand the nature of the improvement, we will notice briefly the general styles of presses that have been employed for this class of work. These may be divided into three classes. First, the old platen press and its improved modern forms, employing a flat bed plate upon which the forms containing the types and engravings are placed, and upon which the paper being laid by hand or by automatic devices, and the whole being brought under the platen, the latter is forced down upon it with sufficient force to make the ink from the types adhere to the paper. This class of presses does the best printing of any, where impressions of engravings are to be taken; but its work is extremely slow in comparison to that accomplished by a second class known as cylinder presses.

Cylinder presses use the flat bed plate for the forms as in the first class described, but the impressions are taken either by the passage of the bed plate under a revolving cylinder in fixed bearings, which rolls over the paper after it has been laid upon the types in the forms, or, the bed plate remaining stationary, the cylinder is rolled from end to end of the forms over the paper, the cylinder being guided by parallel ways placed upon either side of the forms, or their equivalent. The method of rolling the cylinders over the forms, is employed in proof presses, and sometimes in copper plate printing. Power presses in which this principle has been tried have not met with general approval.

Presses of this class cannot fully compete in the quality of their work with those of the first class, but they perform with so much greater rapidity, that for all kinds of newspaper and periodical printing they have become indispensable, and for the kind of illustration usually found in this class of work they perform admirably.

A third class of presses are those known as rotary presses, in which the paper is run between cylinders, upon which the types are arranged, and other cylinders which give the impressions. These do the most rapid work of all, but are utterly unfit for printing a fine engraving.

The reason for this defect in rotary presses is, that the strength of the impression upon engravings and upon different parts of the same engraving cannot be regulated upon them. This can only be accomplished where the engraved plates or blocks are flat, and it is done by what printers style underlaying and overlaying. Underlaying consists in pasting paper upon the back of the block to raise its general level. Overlaying, on the contrary, consists in pasting paper upon the tympans of platen presses, or the cylinders of cylinder presses, in positions corresponding to the parts of the engraving of which it is desired to obtain a heavier impression. Thus if the pressman finds, say, the foreground of the impression too light, he overlays that part and thus deepens the tint, and so for other parts of the engraving, underlaying and overlaying until the required tone is produced.

Until the invention of the press which forms the subject of the present article, cylinder presses, in which the bed plates move under a cylinder turning in fixed bearings, could make only a single impression for every full reciprocation of the bed plate. The bed plate passing under the inking rollers in such presses, next passes under the impression cylinder around which the paper sheet winds, being thus brought between the impression cylinder and the inked types. While the paper, having received its impression, is unwound from the cylinder and automatically delivered upon a table, the bed plate travels back to receive a new charge of ink. In this case only a small proportion of the motion of the drum and impression cylinder is used in making the impression, and as the movement of the bed plate in one direction accomplishes no useful work while it absorbs just as much time as though an impression were taken, it follows that a construction whereby an impression could be taken during both movements of the bed plate, would double the work, while it would involve very little if any more expense of power than the old form of press.

This the Wharfdale Two-Feeder Press does. The bed-plate at each movement passes through from under the impression cylinder just far enough to come under the inking-rollers, and to receive ink clear out to the edge of the forms. The cylinder is turned, with the bed plate, first in one direction and then in the other by a rack and pinion connection between it and the bed plate, the bed plate being moved by a

spur wheel and rack, the spur wheel being driven by a crank in such a manner that the crank pin is brought down to the dead center just at the end of each movement of the bed plate. By this means a gradual, instead of a sudden absorption of the momentum is accomplished, and a very quiet motion is produced.

The feed tables slide back on ways, so that the bed plate is easily reached for putting on or taking off, and adjusting the forms.

The apparatus for the distribution of ink to the forms does this work in a very superior manner, and does not produce that sticky condition of the ink caused by some methods used in the ordinary cylinder presses.

The press is beautifully finished, and its action is an interesting thing to witness. The paper is fed into the press from the lower tables, and each ascending upon the opposite side of the cylinder to that on which it is fed in, is delivered upon the upper table on that side, the papers following each other in so rapid a succession that they produce the effect of almost a constant stream.

It is perhaps as high a recommendation of the quality of the work performed on this press as we can give, to state that the SCIENTIFIC AMERICAN is printed upon it, and that it has impressed its own image in the engraving accompanying the present article. To the professional printer this work speaks for itself, and it would be entirely superfluous to descant upon its merits.

A two-cylinder double-feeder, with a single flat form, has recently been added to the line of Wharfdale presses, which does in a very superior manner *four times* the work possible upon the ordinary one-cylinder machine.

The press is from the celebrated manufactory of Hughes & Kimber, London, and imported by their sole agent, Mr. Victor E. Mauger, 110 Reade street, N. Y., to whom all orders should be addressed.

SCIENTIFIC EDUCATION FOR WOMEN.

Scott Russell thinks a certain amount of science is a necessary qualification for a good wife. In other words, that the art of good and economical living which mainly depends upon the exertions of the wife, no matter how liberal the provision made by the husband, can only be secured in the highest degree through the aid of technical knowledge. He asks "Ought a wife to know anything about fuel or not? Should she know that there is good and bad coal?—that what is sold to her as best coal is oftener bad coal than good?—that bad coal produces smoke and flame and not heat, and that the one wastes money and the other uses it? Ought a woman to know this knowledge, or is it beneath her?

"I must answer once for all, that I do not think any household knowledge of this sort is beneath any well-born woman. When of two things you have to choose, whether you will do the better or the worse, it seems to me you have a grave responsibility. It seems to me, if you choose the worse, or don't choose, you are to blame. It seems to me, then, that a woman should know good coal from bad, or she may waste her husband's earnings. But next, if she buys only the best coal, comes the question, Is there a right way of using the coal and a wrong?

"Ought a wife to know how to use good coal? to use it to the purpose for which it is bought? to use it for light, cheerfulness, ventilation, warmth, cookery, cleanliness, or to use it to waste, smoke, discomfort? Is any knowledge necessary for that? Cannot anybody make a good fire?—keep a good fire, prevent smoke, maintain cheerful heat, warmth without waste?

"Verily, there are few women who know this: the art to make, to maintain a good fire without excess, without waste, without smoke. Much science goes to understand a fire. 1. What is fuel made of? 2. What feeds the fire? 3. What wastes the fire? 4. What regulates the fire? 5. What makes flame? 6. What wastes heat? 7. What preserves and maintains heat? 8. What spreads it equally around a room? 9. What creates smoke, drafts, rheumatism, and colds?

"It is not the work of a moment to understand and answer all these questions. A wise housekeeper should have asked them all, and get a good answer to each; that is one element of a home, health, and comfort. Can every housekeeper solve all this?

"To feed her household well, agreeably, wholesomely, without stint, without waste, there is a technical problem of home life. What does each kind of food cost? What parts of food are the more wholesome, the more nutritious? What kinds of food do harm?—to the young, the middle-aged, the old? What quantity should be cooked, so as to give plenty without waste? What is the real value of each kind of food compared to its price? What is the price of food bought wholesale and bought at retail? What is the true weight of good kinds of food? How do I know good food from bad? How can I tell adulterated food from pure and wholesome food?

"What are the wholesome ways of cookery? What kinds of cooking render wholesome food more or less nutritious, palatable? What dishes are comely, elegant, clumsy, gross, vulgar? How can I use the least sum of my husband's earnings in housekeeping, and yet never make him feel in want of anything?

"Shall I be told that all these things come by intuition, by experience, by practice? That they are for the servants to study, not for the mistress? That in every household they are already perfectly well done? If I am assured that this is already known and done, I have only to admit that no technical education in housekeeping is required by women.

"Should the mother of a family know anything about her own clothes—her husband's—her family's? What sort, quality, price of stuff, they should be made of? What stuffs wear well? what wash well? what wash out? Which parts wear out first? How to make these parts last the longest? What sewing holds? How many yards of stuff go to each piece of dress?—how much for lining, how much for trimming, how much for shaping how much for sewing?

"Should the head of a household know how to make anything with her own hands—out of her own head? to cut out, to shape and fashion, to use a sewing machine, to sew, embroider, mend?

"All about clothes I think woman's work and woman's duty: price, stuff, shaping, sewing, durability, washing, ironing, and mending. A woman who cannot do all these things, and teach them to servants and daughters by example and precept, has not, to my mind, got a good technical education.

"There is no such physician as a wise wife or mother. Not to cure disease—that is a doctor's work—but to prevent disease, or to stop it at starting. What are our gravest illnesses?—neglected colds, indigestion, headaches. Who first finds out that we are ill? Who knows what has caused our illness? Who first takes alarm? Why should not every wife know the early symptoms of disease, the cause, the cure? There—not by the sick bed or in the hospital, but there, by the family fireside, the kindly mother should wisely watch the first symptoms of disease, wisely give the early warning, wisely apply the simple cure. Which is better in the house, a wise wife, or a perpetual physician? There is no technical training so valuable to a woman as that which shall enable her both to keep the doctor out of the house, and to send for him the moment he is wanted."

Curculio Extermination Possible.

Mr. J. E. Chamberlain, Secretary of the St. Joseph (Mich.) Fruit Growers' Association and editor of the St. Joseph *Herald*, has issued an extra containing the following statements which we deem so important to the fruit growing interests of the country that we probably cannot occupy space more profitably to our readers than by reprinting it.

The importance of this subject; the demand for prompt and persistent action; the absolute necessity of arousing every peach, plum, and stone-fruit grower to destroy the curculio, has led the editor of the *Herald*, as Secretary of the St. Joseph Fruit Growers' Association, to issue this extra. Not a single day should be lost, for, with united action, 500,000 curculio may be killed in a single day.

There is no doubt on this point. This morning, Hon. John Whittlesey called at the *Herald* office and stated that on the 14th inst., he killed 2,715 curculio about the roots of 200 trees, and on the 15th, in four hours on the same trees he killed 1,566 by actual count.

Mr. Whittlesey also stated that Mr. Ransom, Mr. Bonelle, and himself had in five hours killed upwards of 5,000 curculio in a proportion of three small orchards. That he had himself alone in two days of eight hours each killed one half more curculio than were ever taken by three men with the old-fashioned sheet in a week. Mr. Whittlesey is one of the most successful and scientific fruit growers of St. Joseph, whose word is a bond; but he said, "Do not believe me; go to Mr. Ransom's orchard and see for yourself."

Entering Mr. Ransom's orchard the editor met Dr. Lyman Collins coming out. Dr. Collins is widely known for his successful peach culture.

"Well, Doctor, is it a success?"

"Most assuredly. I tried the experiment on eight of my trees in the evening and the next morning took 104 curculio. I am going home to bug my whole orchard in this manner."

Wm. B. Ransom, the discoverer of the new method of exterminating the curculio, was found on his knees in the back of his orchard examining his curculio traps. This was at 10 o'clock A.M., and he had already killed 1,357 on 300 trees. The editor stooped down and lifted a corn not six inches long and found and killed 7 curculio. There is no doubt whatever that the long-desired means of exterminating the curculio is discovered.

HERE IT IS.

Put the orchard in the best order; level down the soil about root of every peach tree, and smooth a circle for a diameter of two and a half feet from the tree as a center. Have the ground very clean around the base of the tree. Do not leave a single hole next the tree. Leave no place where the curculio can hide except under the shelter you provide. Now lay close to the tree, and close to the ground, about four pieces to a tree, either chip, or bark, or board, or lath, or rag, or corncob, or old leather, or anything for a covert.

The curculio will conceal itself under this shelter and may be destroyed by the thousand. Go around every day and turn over each chip, kill every curculio. They will generally adhere to the chip, but may often be found on the ground under the chip.

Probably no person in the United States has studied the curculio and its habits more carefully than William B. Ransom. Some fifteen years he has been trying newspaper experiments unsuccessfully. Last year, when bugging, he discovered that all the curculio dropped within two or three feet of the roots of the peach tree, and on examination found the little Turk sheltered on the trunk and in holes near the base and the under side of the principal limbs.

For the last fortnight, Mr. Ransom has spent almost all the hours of the day lying on the ground in his orchard patiently watching and waiting for the first curculio to show himself. On the 4th of May a few single curculio were discovered, but not a single pair; on the 5th a few pair were found coupling. Constant, careful observation has led Mr. Ransom to these conclusions.

In the fall the curculio seeks a warm and safe shelter to hibernate. This is either the ground, or leaves, stumps, logs, old fences, woods, and other congenial places of concealment. The first warm day in spring that starts vegetable life calls the curculio forth, and it proceeds to its feeding and breeding ground. They walk very fast, and they fly and feed generally at night, eating the young and tender leaves. The first warm days this year they fed, then the weather fell cold, and for a week Mr. Ransom found no indication of their feeding. Since Friday night, the 13th, the weather warm, the curculios have been feeding. They scatter all over the tree to feed, and come down towards morning and as late as 7 A.M. to hide.

They crawl on cold days and nights, and hide under the shelter of the trunk of the tree, waiting to feed when the nights become sufficiently warm. The curculio uses the green peach only to hold its egg. It sometimes eats the ripe peach, also blackberries, quinces, and other fruits.

Some idea of the quantity to be taken from a single tree may be found from the following: Mr. Ransom states that on the 14th he took 25; on the 15th in the morning 50; in the evening about sundown 15; and on the 16th, 60 were killed from the same tree, and of these 41 were taken in a cluster under a chip two by three inches.

The editor of the *Herald* visited Mr. Ransom at 1½ P.M., and found he had in about four hours killed 2,100 by actual count, and went himself into the orchard and found curculio lying asleep under the traps in the intense heat of a boiling sun.

Improvement in Enameling Iron and Steel.

The process of Benjamin Baugh, of Chadwick, England, of enameling iron and steel, patented recently in the United States, is as follows:

Lay upon the surface of the plate of the metal to be enameled a uniform ground, of any color required to produce the intended design, as, for instance, a name-plate, or tablet, with the ground white and the inscription in blue. The white ground, having been fused on in the melting-furnace and allowed to cool, there is then applied with a brush evenly over the whole surface a coating of blue enamel, the materials of which are finely levigated and mixed with gum-arabic and water, or other mucilage, to form a paste of slightly adherent properties.

When dry, a stencil of the inscription, or of each letter separately, is laid on, and the enamel paste is removed from the parts which are unprotected by the stencil, by the application of a stiff brush, leaving the ground clean, except the letters. The plate is then again subjected to heat, whereby the paste, which is fusible at a lower temperature than the ground previously laid, becomes permanently fixed upon it.

The mechanical removal, by means of a brush, enables very delicate lines to be formed through the paste, to expose the enamel ground, and admits of the use of ornaments having sharp angles and minute points and details to be distinctly and perfectly rendered.

The ground may be dark, and of any color, as well as of the kind described, and the subsequent coat of a lighter color; as, for instance, the ground may be of blue and the inscription white and a succession of colors may be given, to produce a variously-colored design, by the same method.

The inscription or design may be cut out in the stencil, and the ground thereby exposed be removed by the brush, instead of the surrounding parts, with a like effect, it being left to the choice of the designer whether this process be followed, or that previously described.

The stencils are formed of very thin sheet-metal (or even of paper, where they require to be used but a few times), which, by their flexibility, lie more closely in contact with the surface, and leave the lines and margins of the figures perfect, while they conform to convex and irregular surfaces.

He combines with the method described, the use of artistic graphic representations, such as views, portraits, or groups, thereby producing metal tablets decorated in enamel, in a manner adapted to architectural purposes, as the finishing of interiors, panels for cabinet-work, etc. Such designs are produced upon stone in the usual lithographic manner, and printed in successive impressions upon paper prepared for transferring, by having its surface coated with gum-arabic, or other substance that is soluble in water, mineral colors and fluxes being used, which are adapted to fuse under heat, and combine to form the picture in enamel, of appropriate colors.

The enamel ground having been fused on, as previously described, for stenciling, it is covered with copal or other suitable varnish, and the face of the prepared picture is laid upon it and pressed, to insure adhesion of all parts, when the paper is removed by wetting, as is ordinarily done in transferring prints. The plate is then subjected to heat until the colors of the picture are fused, and become incorporated with the previously enameled surface.

Care of Brushes.

Brushes used for applying finishing varnishes should be cared for with the utmost pains, as good work depends much upon the good condition of the brushes. The *Coach-Makers' Monthly* suggests that a good way to keep them is to suspend them by the handles in a covered can, keeping the points at least half an inch from the bottom, and apart from each other. The can should be filled with slow drying varnish up to a line about a sixteenth of an inch above the bristles or hair. The can should then be kept in a close cupboard, or in a box fitted for the purpose.

As wiping a brush on a sharp edge of tin will gradually split the bristles, cause them to curl backward and eventually ruin the brush, the top of the can should have a wire soldered along the edge of the tin turned over, in order to prevent injury. Finishing brushes should not be cleansed in turpentine, except in extreme cases. When taken from the can, prepare them for use by working them out in varnish, and before replacing them cleanse the handles and binding with turpentine.

The Season of Fairs.

The season of fairs and exhibitions is at hand. The more enterprising associations under whose auspices these exhibitions are held, are beginning to issue prospectuses, and it appears that the coming summer and autumn will be more fruitful than usual in agricultural and mechanical displays of this kind. If the managers of such associations will please forward information concerning any contemplated display to be held by them, we shall be happy to give it brief mention in our columns.

IT is said that the Mexican Government has ordered Mr Williams, an engineer, to survey the Isthmus of Tehuantepec for a ship canal.

HABITS OF THE STRIPED SQUIRREL---A WHITE WOODCHUCK.

Mr. Ira Sayles, of Rushford, N. Y., writes to the *American Naturalist* as follows:

"I lately noticed in my garden a bright-eyed chipmunk, *Sciurus striatus*, advancing along a line directly towards me. He came briskly forward, without deviating a hair's breadth to the right or the left, till within two feet of me; then turned square towards my left—his right—and went about three feet or less. Here he paused a moment and gave a sharp look all around him, as if to detect any lurking spy on his movements. (His distended cheeks revealed his business; he had been out foraging). He now put his nose to the ground, and, aiding this member with both forepaws, thrust his head and shoulders down through the soft muck, half burying himself in an instant.

"At first, I thought him after the bulb of an *erythronium*, that grew directly in front of his face and about three inches from it. I was the more confirmed in this supposition, by the shaking of the plant.

"Presently, however, he became comparatively quiet. In this state he remained, possibly, half a minute. He then commenced a vigorous action, as if digging deeper; but I noticed that he did not get deeper; on the contrary, he was gradually backing out. I was surprised that, in all his apparent hard work (he worked like a man on a wager) he threw back no dirt. But this vigorous labor could not last long. He was very soon completely above ground; and then became manifest the object of his earnest work; he was refilling the hole he had made, and repacking the dirt and leaves he had disturbed. Nor was he content with simply refilling and repacking the hole. With his two little hand-like feet he patted the surface, and so exactly *replaced the leaves* that, when he had completed his task, my eye could not detect the slightest difference between the surface he had so cunningly manipulated, and that surrounding it. Having completed his task, he raised himself into a sitting posture, looked with a very satisfied air, and then silently dodged off into a bush-heap, some ten feet distant. Here, he ventured to stop, and set up a triumphant "chip! chip! chip!"

"It was now my turn to dig, in order to discover the little miser's treasures. I gently removed enough of the leaves and fine muck to expose his hoard—half a pint of buttercup seeds, *Ranunculus acris*. I took out a dozen seeds or so, recovered the treasure as well as my bungling hands could, and withdrew filled with astonishment at the exhibition of the cunning, skill, and instinct of this little abused denizen of our field-borders.

"In my boyhood days I had killed many of the little fellows; had unearthed the treasures in their burrows many times; had seen them, as I supposed, under every variety of aspect; in short, I thought I knew the chipmunk, every inch; but here was a new revelation of chipmunk character, for which I was totally unprepared.

"It grieves me that I find it utterly impossible with words to convey adequately to you and your readers anything like a complete picture of the motions, the skill, the carefulness, the completeness of effect, and the consequent satisfaction exhibited by this little harvester. I have never read or heard of any other man's having witnessed a similar scene, nor do I expect myself ever again to witness one. My opportunity for observation was as perfect as it could possibly be; for he was so near me that I could almost stoop over and lay my hand on him, while he was half buried under the leaves.

"The lesson is perfect; for what our chipmunk does, all chipmunks do, under the same circumstances. Where does instinct stop, and reason begin? Wherein does instinctive, *irrational* skill differ from rational skill?"

Mr. S. Tenney, of Williams College, writes to the same journal:

"It may interest you and some of your readers to know that I have obtained a perfectly white woodchuck, a perfect albino of *Arctomys monax* of Gmelin. There is not a dark hair on his body or tail, and his eyes are of a clear, rich, carnelian color. He was caught on Northwest hill, Williamstown, Mass., and brought to me alive. From the first he fed freely on clover, especially the clover heads, and made a nice nest for himself from the part discarded as food; in this nest he spent most of his time, taking nearly the form of a ball. He always exhibited a readiness to bite, and it was not safe to touch him with the hand. One day I carried him, in his small cage, to my lecture room, and afterwards put him in my private room and left him alone. When I returned I found him out of the box or cage, and bottles and trays of natural history specimens scattered upon the floor. After disturbing things generally he had taken up his position behind a large box of fossils. From his retreat he looked as unconcerned as if nothing had happened. Without much trouble I secured him in his box again, and carried him home and put him in a large cage in my cellar, which is well lighted and ventilated. About midway between the top and bottom of this cage is a shelf which touches the bars or slats in front, and extends backwards about half the depth of the cage. This shelf was put in so that the woodchuck might have something to rest upon besides the floor of the cage. After the cage was done it was desired to turn it so that what is naturally the back should be the bottom, the slats or bars thus being on the top instead of at the side; this brought the shelf into a vertical instead of a horizontal position. Now observe what this woodchuck did: he gnawed through the edge of this shelf, which was against the bars, in order to get into the other part of his cage, although there was a space of eight or ten inches below the lower edge of the vertical shelf for the whole width of the cage, and when he was disturbed he often run through this hole instead of going along on the bottom.

"I was interested to see that he used everything he could get to enlarge and perfect his nest, not only all of his discarded clover stalks, and the rags which I gave him, but also all the chips which he gnawed from his cage. But he did not get thoroughly tamed, and so availing himself of the absence of a board, which had covered a hole which he had been gnawing, he squeezed out through the hole, scaled the cellar wall, and escaped through an open cellar window. A few weeks afterwards he was killed by a farmer's dog, and I have sent his skin to Mr. Jillson to be mounted.

"Mr. Hitchcock, of this town, informs me that he has seen a living white woodchuck in New Lebanon, N. Y."

ANCIENT AND MODERN COINAGE.

Platinum was coined in Russia from 1828 to 1845. But the metals best adapted and most generally used as coin, are copper, nickel, silver, and gold; the first two being now used for coins of small value, to make change, the two latter, commonly designated "the precious metals," as measures of value and legal tender. On the continent of Europe a composition of silver and copper, called bullion, has long been used for small coins; which are made current at a much higher value than that of the metals they contain. In China Sysee, silver is the principal currency, which is merely ingot silver of a uniform fineness, paid and received by weight.

Spanish and Mexican dollars also circulate there, but only after they had been assayed and stamped as proof that they are of the standard fineness. As Asia Minor produced gold, its earliest coinage was of that metal. Italy and Sicily possessing copper, bronze was first coined there.

The Lydians had gold coins at the close of the ninth century B. C.; Greece proper only at the close of the eighth century B. C. Servius Tullius, King of Rome, made the pound weight of copper current money.

The Romans first coined silver 281 B. C., and gold 207 B. C. Some nations, although they worked the metals with skill, seem never to have coined money, and such was the case with the Irish, of whom no coins are known prior to the English invasion in the twelfth century.

The amount of specie existing in Europe, A. D. 14, was equal in value to but £358.

After the Augustan era the product of the European mines failed, and the stock of coin gradually disappeared until the ninth century, each step of its fall being marked by the greater poverty and social degradation of the people, until at last such was the scarcity of coin, *human beings* in Britain were made a legal tender at specified rates.

INVENTION OF BANK NOTES.

This dearth of the precious metals contributed largely toward establishing the dark ages. Out of these depths arose the great modern institutions—the mercantile theory and credit—the one a palliative and the other a cure. No increase in the stock of coin occurred until after the discovery of America, but the invention of paper credit largely alleviated the prevailing misery. This invention is due to the Jews, who, in 1160, introduced bills of exchange, and who were the only persons, from the institution of the canon law against the taking of interest for the loans of money to the sixteenth century, who, in Western Europe, durst make a business of giving credit.

The same people established the first banks in Europe. That of Venice was established in 1157, that of Geneva in 1345, that of Barcelona in 1401, and that of Genoa in 1407. The discovery of America in 1492, produced no immediate increase in the European stock of coin. The mines of Potosi were opened in 1545, but it was not until near the seventeenth century that the stock of coin sensibly increased. The taking of interest was totally forbidden in England until 1571, and the device of extending credit by means of indorsement was not practiced until a century later, when it was introduced from Holland.

INCREASE OF COIN.

The stock of coin steadily increased until 1827, when it reached its highest point, and then declined until the opening of the Pacific coast mines in 1848, when it again increased, passing in 1860 its greatest previous hight, and obtaining in 1867 the enormous sum of two thousand six hundred millions of dollars.

Copper coins, few in number, were used by the Mint of the United States as early as 1792; but these are now so rare that one of them sold at auction in Philadelphia, in January, 1860, for sixty-five dollars and fifty cents, and another for fifty dollars. The Mint did not get fairly into operation until 1793, when the first copper cent appeared.

The estimated amount of gold in existence at the commencement of the Christian era was $427,000,000. At the discovery of America, in 1492, this amount had diminished to $57,000,000. In 1600 the amount had risen to $105,000,000; in 1700 to $351,000,000; in 1800 to $1,251,000,000. The Russian mines extending over one third of the surface of the globe, on parallel fifty degrees north latitude, were discovered in 1819.

In 1843, the estimated amount of gold in existence was $2,000,000,000.

Next followed the discoveries in California, February 9th, 1848, and in Australia, February 12th, 1851, which added enormously to the gold production. In 1853, the amount in existence was computed at $3,000,000,000; and in 1860 it was $4,000,000,000.

From the commencement of the Christian era to the discovery of America, it was estimated that gold had been taken from the surface, and mined to the amount of $3,800,000,000. From that date to the close of 1842, $2,800,000,000; to 1860, Russia adds $746,000,000 and California and Australia, $2,000,000,000 more. The amount of gold at present in existence is estimated at $5,950,000,000. The quantity of gold and silver, of all denominations, in all quarters of the globe, is set down, by the best authorities, at from three to four hundred millions pounds sterling; and the quantity of plate and ornaments at about $400,000,000.

WHAT BECOMES OF THE COIN.

In the reign of Darius gold was thirteen times more valuable, weight for weight, than silver. In the time of Plato it was twelve times as valuable. In that of Julius Cæsar gold was only nine times more valuable, owing, perhaps to the enormous quantities of gold seized by him in his wars. It is a natural question to ask, what became of the gold and silver? A paper read before the Polytechnic Association by Dr. Stephens, recently, is calculated to meet this inquiry He says, of our annual gold product, full fifteen per cent is melted down for manufacture; thirty-five per cent goes to Europe; twenty-five per cent to Cuba; fifteen per cent to Brazil; five per cent direct to Japan, China, and the Indies; leaving but five per cent for circulation in this country. Of that which goes to Cuba, the West Indies, Brazil, full fifty per cent finds its way to Europe, where, after deducting a large percentage used in manufacturing, four fifths of the remainder is exported to India. Here the transit of the precious metal is at an end. Here the supply, however vast, is absorbed, and never returns to the civilized world.

The Orientals consume but little, while their productions have ever been in demand among the Western nations. As mere recipients, therefore, these nations have acquired the desire of accumulation and hoarding, a passion common alike to all classes among the Egyptians, Indians, Chinese, and Persians. A French economist states that in his opinion the former nation alone hide away $20,000,000 of gold and silver annually, and the present Emperor of Morocco is reported as so addicted to this avaricious mania that he has filled seventeen large chambers with the precious metals. The passion of princes, it is not surprising that the same spirit is shared by their subjects, and it is in this predilection that we discover the solution of the problem as to the ultimate disposition of the precious metals. This absorption by the Eastern nations has been uninterruptedly going on since the most remote historical period. According to Pliny, as much as $100,000,000, in gold, was, in his days, annually exported to the East. The balance of trade in favor of those nations is now given as $80,000,000.

A system of international coinage is proposed, and a congress has recently been held in Paris, at which the several nationalities were represented, including the United States.

If our Government shall indorse the proposed system, there will be a national change in our coinage, if we shall ever return to hard money times. The proposed standard of coinage—the *franc*—is equal in value to about nineteen and one fifth cents. A five franc piece is accordingly worth four cents less than the American dollar, which is our present standard of coinage. Under the proposed plan, our present half-dollar would be represented by a piece worth forty-eight cents, etc.

The ancient English penny was the first silver coin struck in England. It was equal in weight to the present three-penny piece.—*Christian Union.*

Faraday in Private Life.

About 1823, when my uncle Faraday was studying elocution under Smart, he took great trouble to teach me, a little girl of seven, to read with good emphasis, and I well remember how unweariedly he would go over and over one sentence, and make me repeat it with the upward and downward inflections, till he was satisfied; and then perhaps would follow a good romp, which pleased the little girl much better than elocution.

My uncle read aloud delightfully. Sometimes he gave us one of Shakespeare's plays or Scott's novels. But of all things I used to like to hear him read "Childe Harold;" and never shall I forget the way in which he read the description of the storm on Lake Leman. He took great pleasure in Byron, and Coleridge's "Hymn to Mont Blanc" delighted him. When anything touched his feelings as he read—and it happened not unfrequently—he would show it not only in his voice, but by tears in his eyes also.

Nothing vexed him more than any kind of subterfuge or prevarication, or glossing over things. Once I told him of a professor, previously of high repute, who had been found abstracting some manuscript from a library. He instantly said—"What do you mean by abstracting? You should say stealing; use the right word, my dear."

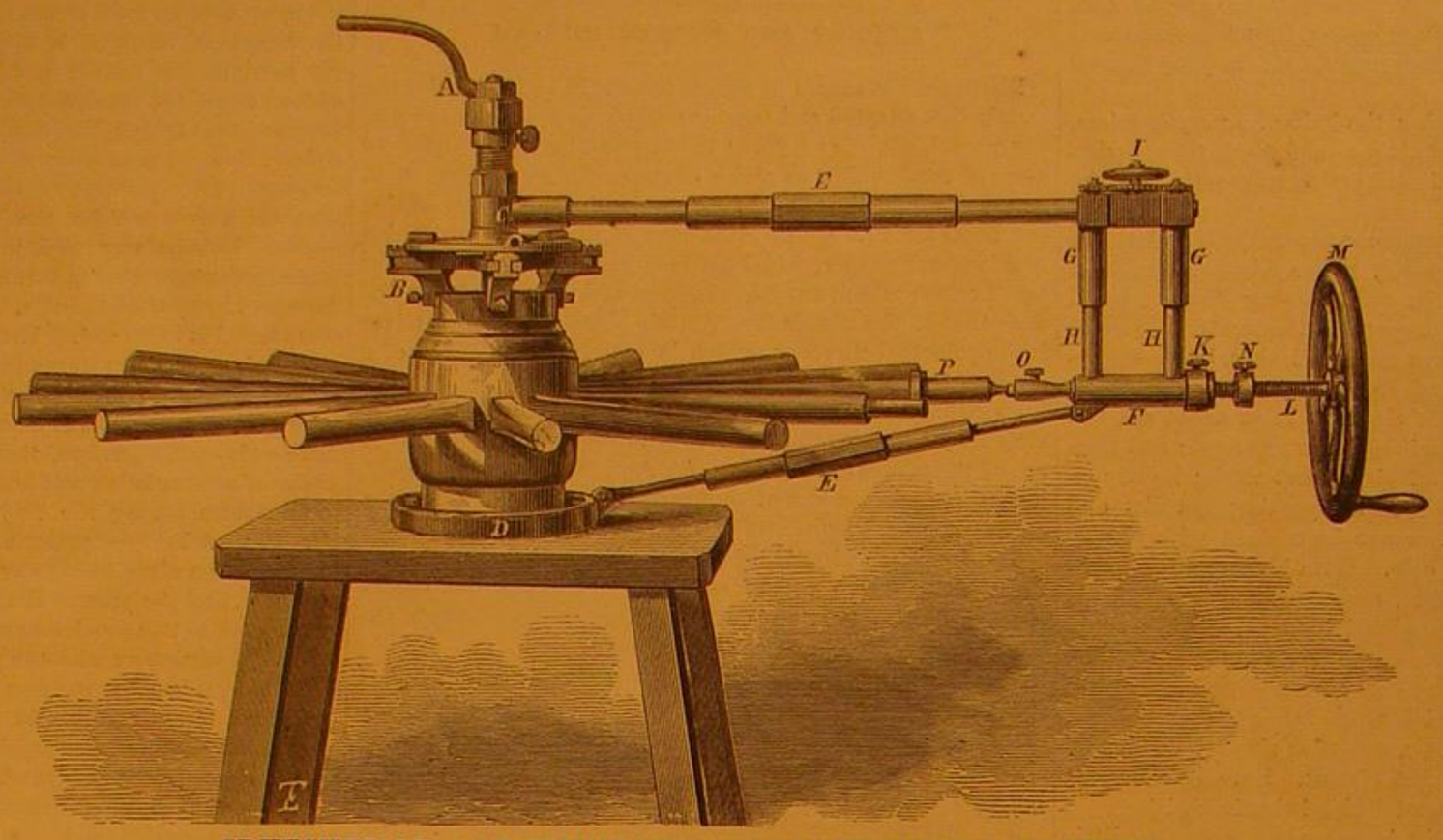
If he gave me my choice in anything, he could not bear indecision, and I had not only to decide, but to decide quickly. He thought that in trifles quickness of decision was important, and a bad decision was better than none. When my uncle left his study and came into the sitting-room, he would enter into all the nonsense that was going on as heartily as any one, and, as we sat round the fire, he would often play some childish game, at which he was usually the best performer; or he would take a part in a charade, and I well recollect his being dressed up to act the villain, and very fierce he looked. Another time I recollect him as the learned pig. In times of grief or distress his sympathy was always quick, and no scientific occupation ever prevented him from sharing personally in all our sorrows, and comforting us in every way in his power. Time, thoughts, purse—everything was freely given to those who had need of them.—*Miss Reid's Recollections.*

THE first steamboat used in Great Britain was the *Comet*, a small vessel of forty feet keel, and ten feet and a half beam with an engine of three-horse power, which carried passengers on the river Clyde, Scotland, in 1814.

Improved Spoke Tenoning Machine.

Our engraving is a good delineation of an excellent device for tenoning the ends of spokes, intended to facilitate this operation, and to enable it to be more accurately performed. This device is simple in its parts, is portable and easily applied, comprises nothing liable to get out of order, and will, it is claimed, enable the workman to do more and better work than hitherto.

A bench is employed, similar to the old style of bench used by carriage makers while tenoning the spokes and putting on the fellies of wheels. The hub rests upon a metallic plate fixed upon the center of the bench, and a rod rises through the center of the bench plate and hub, having a screw thread cut upon it, so that the whole apparatus is secured to the bench by means of the nut and lever, A, the top of the hub being gripped by a series of adjustable clutches, B, and held by set screws, as shown, the clutches and the plate to which they are attached forming a centering chuck for the hub. This chuck has rising from it a hollow stem, around which a collar, C, is fitted. A collar, or rim, D, is also fitted around the plate upon which the hub rests.



CRUTCHFIELD AND WHITTEN'S SPOKE TENONING MACHINE.

From these collars extend jointed adjustable arms, their lengths being made variable by making each of them in three parts, the middle part, E, of each being a right and left hand nut, fitting right and left hand screws on the other portions of the arms. These arms carry at their outer ends the brace guide, which by their aid is adjusted to any required length of spoke. F is the brace guide, made adjustable vertically to suit varying lengths of hubs. This adjustment is accomplished by means of screws working in hollow tubes, G, into which the tubes, H, telescope. The screws are made to work simultaneously, and keep the brace guide square with the hub, by means of two small gears fitting a middle gear which is worked by a hand wheel, I, the two small gears being keyed to the screw. Thus both screws move together and traverse equal distances.

Into the end of the brace guide, F, is fitted a nut, which, having no thread upon its outer side, turns freely in F when not held by a set screw, K. Upon the inner surface of this nut a very fine thread is cut, into which the shaft, L, of the brace, having a corresponding thread, fits. When the set screw, K, being tightened, holds the nut from turning, the screw shaft, L, feeds backward or forward, according as the hand wheel, M, is turned to the right or the left.

A collar, N, with a set screw is adjusted upon the screw shaft, L, which gages the depth of the tenon, for when it meets the nut in the end of J, no further movement is possible until K is loosened, when the shaft, L, will turn but not advance. This secures the exact squaring of the shoulders at the bases of the tenons.

The brace, O, is made to receive and hold, first, a pointing tool, and then a hollow tenoning auger, P, by which the tenons are cut.

It will be seen that the important principle of working from a fixed center in the execution of circular work, is fully observed in this device, and that the machine being set for a single spoke, no further care is necessary, as each successive spoke will be cut precisely like the preceding one.

Patented, through the Scientific American Patent Agency, January 11, 1870, by J. P. Crutchfield and C. T. Whitten, whom address for further information, at Longmire's store, Edgefield county, S. C.

Curiosities of Eating.

An old beau, formerly well known in Washington City, was accustomed to eat but one meal in twenty-four hours; if, after this, he had to go to a party and take a second dinner, he ate nothing at all next day. He died at the age of seventy years.

A lady of culture, refinement, and unusual powers of observation and comparison, became a widow. Reduced from affluence to poverty, with a large family of small children dependent on her manual labor for daily food, she made a variety of experiments to ascertain what articles could be purchased for the least money, and would, at the same time, "go the farthest," by keeping her children longest from crying for something to eat. She soon discovered that when they ate buckwheat cakes and molasses, they were quiet for a longer time than after eating any other kind of food.

A distinguished Judge of the United States District Court observed that, when he took buckwheat cakes for breakfast, he could sit on the bench the whole day without being uncomfortably hungry; if the cakes were omitted, he felt obliged to take a lunch about noon. Buckwheat cakes are a universal favorite at the winter breakfast table, and scientific investigation and analysis have shown that they abound in the heat-forming principle, hence nature takes away our appetite for them in summer.

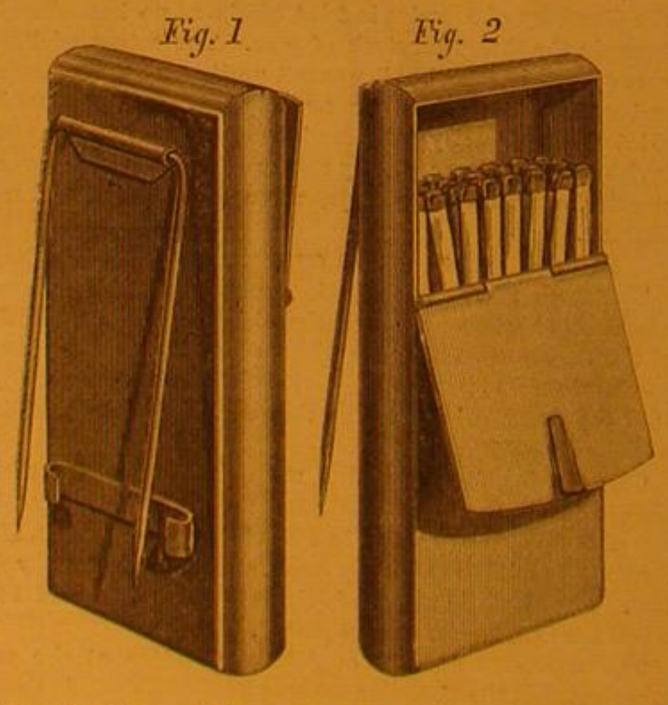
During the Irish famine, when many died of hunger, the poor were often found spending their last shilling for tea and and tobacco and spirits. It has also been often observed in New York, by those connected with charitable institutions, that when money was paid to the poor, they often laid out every cent in tea or coffee instead of procuring the more substantial food, such as meal, and flour, and potatoes. On being reproved for this apparent extravagance and improvidence, the reply, in both cases, was identical; their own observation had shown them that a penny's worth of tea, or tobacco, or liquor, would keep off the sense of hunger longer than a penny's worth of anything else. Scientific men express the idea by saying, "Tea, like alcohol, retards the metamorphosis of the tissues;" in other words, it gives fuel to the flame of life, and thus prevents it from consuming the fat and flesh of the body.

If a person gets into the habit of taking a lunch between breakfast and dinner, he will very soon find himself getting faint about the regular luncheon time; but let him be so pressed with important engagements for several days in succession as to take nothing between meals, it will not be long before he can dispense with his lunch altogether. These things seem to show that, to a certain extent, eating often is a mere matter of habit. Whole tribes of Indian hunters and trappers have been known to eat but once in twenty-four hours, and that at night.—*Dr. Hall's Tracts.*

IMPROVED MATCH SAFE.

Our engraving illustrates a new patent match safe, intended to be easily attached to the garments of the carrier by a pin clasp.

The invention consists in hinged pins and catches for the same, formed upon the side of the safe to which the pins are attached, as shown in the engraving. A match safe is thus



produced, which will be a great convenience to smokers, and others who in driving, hunting, fishing, etc, desire to reach matches without disturbing their outer garments For lamplighters in cities during inclement weather it will also prove serviceable.

Patented, through the Scientific American Patent Agency, July 6, 1869. The entire right will be sold. For further information apply to J. W. Durham, Ripley, Tenn.

AN invention has recently been introduced for the purpose of increasing the illuminating power of gas. The apparatus is simply a thin disk of some incombustible material—glass, porcelain, or metal—which is pierced with one or several holes, the apertures or aperture being proportioned to the diameters of the different burners. The size of the pierced disk may be the internal diameter of the chimney, so that it may be fixed at the upper part; or it may be a little larger, so that it may be placed directly upon the chimney.

Singular Periodical Mortality of Fish.

In the *séance* of the 11th April M. Duchemin brought before the Academy of Sciences of Paris the following curious fact in Natural History: In the park of the Château de Montigny (Eure) belonging to M. Deroche, there is a large piece of water, through which a gentle current of beautifully clear water flows. In this lake numerous carp are reared, which thrive well, except during the first days of spring, when each year an extraordinary mortality occurs amongst them. In each animal one morbid symptom is always observable in the dead animals as they float on the surface of the water. In every case the animal is blind; a kind of film covers the eyes and even a part of the head. An examination of the body brings to light no internal disease, beyond a slight fatty degeneration of the tissues. The viscera appear healthy, and contain no intestinal worms. The cause of this strange malady has not hitherto received any notice; but from M. Duchemin's researches, in conjunction with M. Deroche, it seems that the toad (*Bufo calamita*) is an enemy, if not of all fishes, at least of the carp in spring. It attacks it, exhausts it, conquers, and kills it. To determine the point, they examined all the carp in the pond, and found squatting on the head of each of those that were diseased an enormous toad, the fore-paws of which were placed on the two eyes of the unfortunate fish. Thus, this ugly Batrachian, which presents so stupid an aspect, has yet sufficient intelligence to assume the offensive, and to overcome a large fish. If it has not agility and energy, it has cunning and perseverance. It would appear to kill by exhaustion, but it remains to be ascertained whether the acrid secretion of its skin assists in the conquest.

In a still more recent *séance* of the Academy of Sciences, M. Duchemin, reverting to the above communication in regard to the mortality of the carp being in some instances due to the attacks of the toad, supplies observations which have been forwarded to him in support of his statements, and relates that from investigations undertaken at the Château de Montigny, the toad does not always remain permanently fixed on the head of the dead fish, but only so long as it gives signs of life. He observes, too, that all the carps from which the attacking toads had been removed were more or less blind. They were placed with care in another pond, but none of them recovered from the injuries received. No author has hitherto noted this animosity of the toad for the carp, who perhaps themselves consume the eggs of the toad. He has obtained additional evidence from M. Mermet, Directeur des Eaux at Contrexville (Vosges), who states that it has been found impossible to preserve carp in a sheet of water in that neighborhood in consequence of the presence of numerous toads. M. l'Abbé Caillet, Curé of Rosoy (Haute Marne), whilst confirming the above statements, writes to him. "The toad is a villainous beast. One day I observed one that had crawled beneath a hive. There, with his two forepaws advanced and his throat wide open, he attracted the innocent bees, with which his sides were distended."—*Nature.*

Weights of Different Figures of Wrought-Iron and Steel.

RULE 1. *For Round Iron.*—Multiply the square of the diameter in inches, by the length in feet, and by 2·63, and the product will the weight in pounds, avoirdupois, *nearly.*

RULE 2. *For Square Iron.*—Multiply the area of the end of the bar in inches, by the length in feet, and by 3·36; the product will be the weight in pounds avoirdupois, *nearly.*

RULE 3. *For Square, Angled, T, Convex, or any figure of Beam Iron.*—Ascertain the area of the end of each figure of bar, in inches, then multiply the area by the length in feet, and that product by 10, and divide by three; the remainder will be the weight in pounds avoirdupois, *nearly.*

RULE 4. *For Square Cast Steel.*—Multiply the area of the end of the bar in inches, by the length in feet, and that product by 3·4; the product will be the weight in pounds avoirdupois, *nearly.*

RULE 5. *For Round Cast Steel.*—Multiply the square of the diameter in inches, by the length in feet, and that product by 2·67; the product will give the weight in pounds avoirdupois, *nearly.*—*Warn's Sheet-Metal Worker's Instructor.*

THE Viceroy of India recently visited the ancient salt mines of Pind-Dadun-Khan, in the Punjab, 110 miles northwest of Lahore. These mines are interesting as dating from the days of Alexander, and as being worked by the actual descendants of the original miners. One of the mines (nine in all) contains a circular hall 90 feet across and 40 feet high The supply of salt seems inexhaustible.

A CONTRACT has been signed by the Turkish Director of Telegraphs and Mr. Galotti, for laying a submarine cable between Constantinople and Odessa. The line is to be open for traffic within a year from July 1, 1870.

The Carrier Potato Digger.

Our readers are pretty generally informed how long and arduously inventors have sought to produce a potato digging machine which should work satisfactorily in all respects, and what ill success has attended the greater number of these efforts. Now it was the dirt which clogged, and again it was the vines which tangled, or perhaps it would only work when the soil was extremely dry. The difficulties have been numerous, yet the inventor of the machine herewith illustrated claims to have surmounted them all, and to have produced a machine that is thoroughly practicable, and one by which six acres per day can be dug by any farm team.

A shovel, A, Figs. 1 and 2, which is attached to the body of the machine, scoops up the whole hill to the depth of five or six inches, or to whatever depth may be requisite, it being adjustable to any required depth.

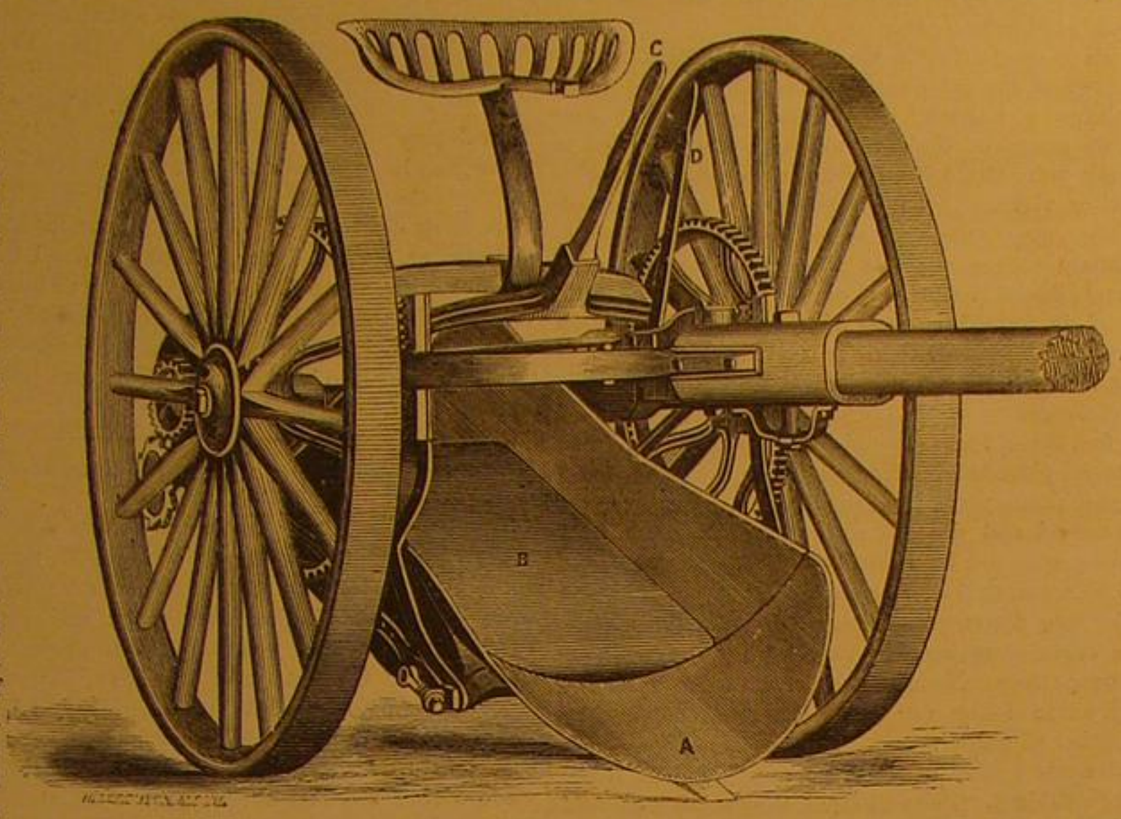
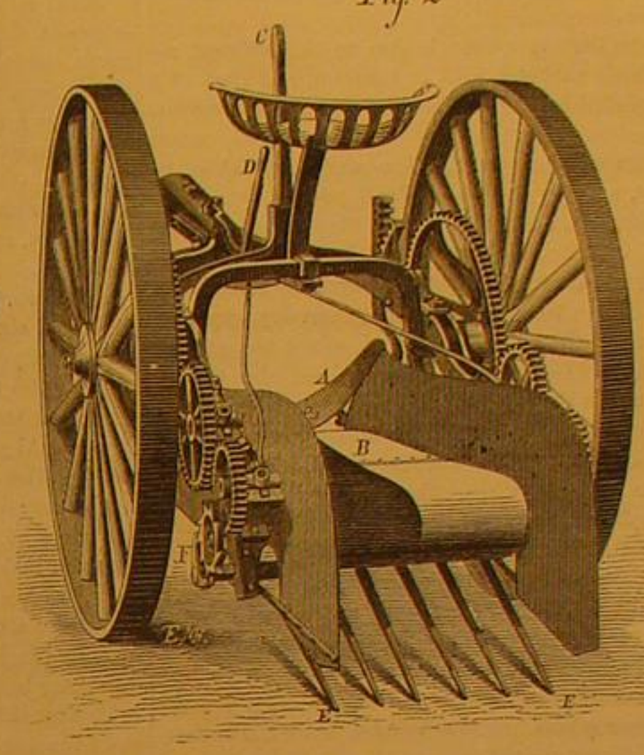


Fig. 2



THE CARRIER POTATO DIGGER.

The potatoes and dirt thus scooped up are pushed back upon an elevator, B, which consists of an endless belt or apron shown in the rear view of the machine, Fig. 2, and also in Fig. 1.

This apron carries the mingled soil and potatoes back to a series of fingers, E, Fig. 2, which, by a series of radial wipers, shown at F, is made to rise and fall with a jerking motion, by which means the potatoes are separated from the soil and left in a continuous row upon the top of the ground, at the rear of the machine. Behind the wiper wheel, is a small pinion which meshes into the large cog wheel above, A hook or finger at the end of the shaker shaft rides over the wipers, and gives motion to the shaker.

The lever, C, is used to raise the shovel when it is desired to move the machine from place to place in intervals of work, and the lever, D, is used to run the shaker out of gear.

The machine has been thoroughly tested, and testimonials from a number of practical farmers vouch that it does all that is claimed for it. In an experiment at Mentor, Ohio, seven citizens who witnessed the trial attest that although the soil was in a bad condition, being very wet, the machine dug potatoes at the rate of five or six acres per day, digging the potatoes as well as the work could be done by hand, for which reason they unanimously indorse the merits of the machine in the warmest terms.

We think the machine embodies the correct principle upon which depends the successful construction of a machine for digging potatoes; namely, the combination of a scoop for raising the hills, with an endless apron for carrying them back, and a vertical movement of the shaker which separates the dirt from the tubers; and therefore, though we have not seen the machine in operation, we think it will accomplish what is claimed for it. It is perfectly simple in its construction, and not likely to soon get out of order. Patented June 15, 1869.

For further particulars address J. T. Carrier, 658 Broadway, Albany, N. Y.

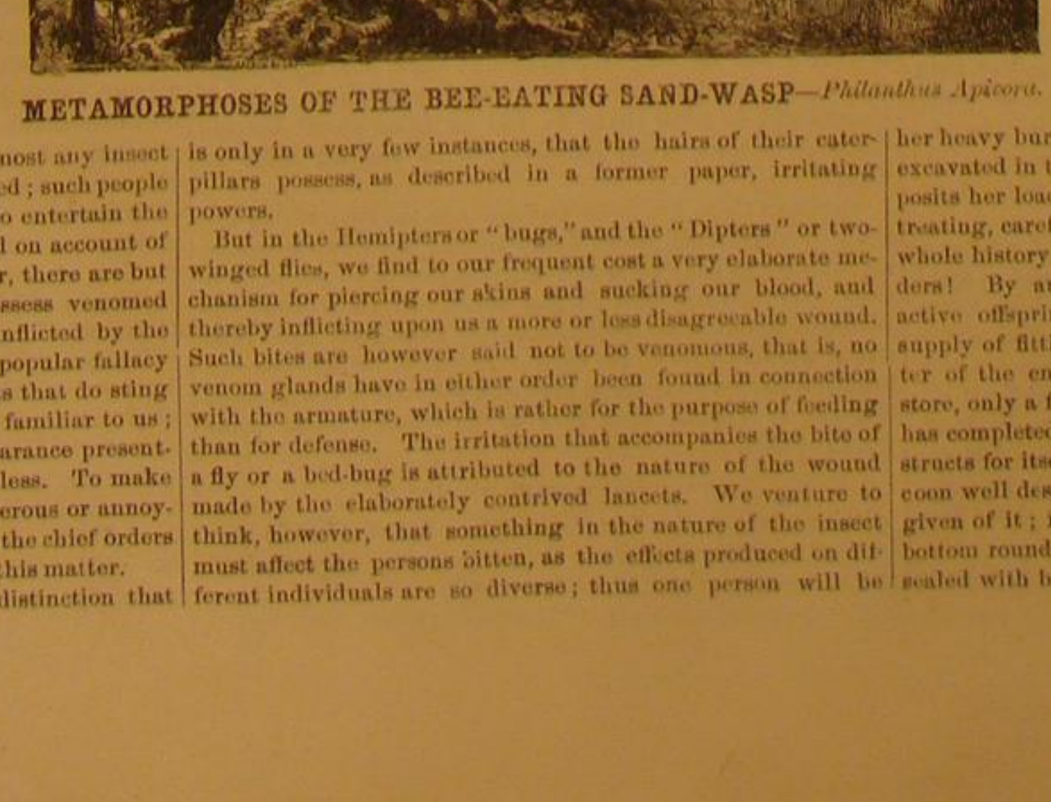
[For the Scientific American.]

By Edward C.H. Day, of the School of Mines, Columbia College].

THE BEE-EATING SAND-WASP.

In our last article we wrote of stinging Arachnids; in this we propose to say a few words about stinging insects. Does it not sting? or is it not venomous? are questions that are constantly asked of the collector, of almost any insect that he may chance to point out to the uninitiated; such people—and they are the vast majority—appearing to entertain the idea that insects as a rule are to be dreaded on account of their poisonous properties. In reality, however, there are but few insects, comparatively speaking, that possess venomed stings; whilst wounds from bites are only inflicted by the members of two orders out of seven. The popular fallacy appears to arise from the fact, that the insects that do sting or bite mankind are amongst the ones most familiar to us; and also from the repulsive or formidable appearance presented by many, that are in reality perfectly harmless. To make the comparative scarcity of the kinds of dangerous or annoying insects more apparent, we will enumerate the chief orders and the facts relating to each that bear upon this matter.

Aristotle, amongst the ancients, drew the distinction that in the two-winged flies the sting was in the anterior part of the body; in the four-winged it was in the rear; but this generalization hardly extends far enough for our modern ideas, nor is it sufficiently exact. A bite is by no means synonymous with a sting, and the distinction applies only between Hymenopters and the flies properly so called. Among the *Neuroptera* or "nerve-winged" insects, of which the dragon-fly is an example; the *Orthoptera* or "straight-winged," such as grasshoppers; and the bettles, three orders the members of which possess biting jaws, sometimes of very formidable proportions; we find no insects that inflict anything more than a momentary nip if incautiously handled. A few beetles, however, are capable of discharging an acrid secretion of a more or less irritating nature. A small black beetle that, on occasional nights in July and August, swarms into our houses, attracted by the lights, is remarkable on this account. If one of them be interfered with whilst crawling over the bare skin its acrid discharge produces a very uncomfortable smarting sensation, accompanied by a reddening and slight inflammation of the spot affected, and these disagreeable symptoms endure for several hours. The irritating properties of the blistering-beetles or cantharides, belonging to this order, are known to every one. The Lepidopters, or butterflies, again are quite innoxious in the perfect form; and it is only in a very few instances, that the hairs of their caterpillars possess, as described in a former paper, irritating powers.



METAMORPHOSES OF THE BEE-EATING SAND-WASP—*Philanthus Apicora.*

But in the Hemipters or "bugs," and the "Dipters" or two-winged flies, we find to our frequent cost a very elaborate mechanism for piercing our skins and sucking our blood, and thereby inflicting upon us a more or less disagreeable wound. Such bites are however said not to be venomous, that is, no venom glands have in either order been found in connection with the armature, which is rather for the purpose of feeding than for defense. The irritation that accompanies the bite of a fly or a bed-bug is attributed to the nature of the wound made by the elaborately contrived lancets. We venture to think, however, that something in the nature of the insect must affect the persons bitten, as the effects produced on different individuals are so diverse; thus one person will be greatly inconvenienced by the bite of a bed-bug and not at all by the bite of a flea, while in another it will be exactly the reverse. It seems impossible to account for this fact on the theory of simple mechanical injury. Again, it is a common joke that mosquitoes prefer foreigners, originating from the fact that persons lately arrived in the country suffer most from their bites. We know that one may in time become "naturalized" to the bites, but we can hardly realize a man's body becoming habituated to having fine needles periodically run into it without producing the same irritation at the last as at the first. Moreover we have noticed a peculiarity in mosquito bites that we have not in those of other insects—that their effects are intermittent. The effects may last for several days, but the irritation and pain will only recur at intervals, and most notably, as it has seemed to ourselves (and to others), at about the return of the hour at which the bite was inflicted. Now the mosquito is bred amidst decaying vegetable matter, in stagnant waters, and it flourishes amidst the very hotbeds of malarious and intermittent diseases. Can it be that the mosquito contains in its juices traces of a poison miasmatic in its nature? and may not the nature of the birthplace account for the greater or less virulence of the effects of the bite? This matter of whence an insect comes, suggests unpleasant thoughts about biting flies. When they swarm around us in summer we cannot get rid of the involuntary question, Where did they alight last, or upon what did they last feed? We have a shuddering dread that these summer pests, like a dirty paper currency, must be efficient aids in the dissemination of disease.

We have now only left one order, the Hymenopters or "membrane-winged," and it is in these insects alone, that we find a sting connected with poison glands and situated at the end of the hind body or abdomen. Nor do we find this in all the members of this one order, for in a large number the sting is represented by a piercer, used to aid in the safe disposition of the eggs; and in those kinds in which the poison glands are present, they are confined to the females and neuters. This sting serves mostly as a weapon of defense, but in many cases is also an aid in securing prey. Such is the case with the insect figured in the accompanying engraving—the Bee-eating Philanthus or sand-wasp; but the prey which it obtains by the use of its sting is not for its own immediate purpose but as food for its offspring. The proceedings of this insect are most graphically given by Professor Blanchard. The Philanthus awaits on a flower the arrival of a bee coming in search of pollen, it watches its opportunity and suddenly pounces upon the honest gatherer; "it seizes her with its mandibles between the head and the thorax and almost always succeeds in turning her on her back and in piercing her with its sting. The bee makes the most energetic resistance, but the Philanthus is the more agile and rarely fails in its attempt. After being stung the bee writhes a few times convulsively, endeavors to strike with her sting, extends her proboscis, and the next moment ends by falling lifeless. The assassin then taking up her victim with her mandibles and between her feet flies off with her heavy burden." She carries her victim to her nest, a gallery excavated in the earth, as represented in the engraving, deposits her load therein, lays an egg in the dead body and retreating, carefully walls up the entrance to the vault. The whole history recalls the most cold-blooded of human murders! By and bye the egg is hatched and the helpless, inactive offspring of the sand-wasp finds itself born amidst a supply of fitting food. In the cavity to the right of the center of the engraving the grub is represented finishing its store, only a few fragments of the bee being still left. "It has completed its growth in devouring its bee; it then constructs for itself a silken cocoon, almost transparent—this cocoon well deserves a description that has hitherto never been given of it; it is a veritable little elongated bottle, with its bottom rounded and its neck well defined and appearing to be sealed with black wax!" M. Blanchard cannot see these co-

coons without thinking of the stock-in-trade of a homeopathist; for our part we seem to read here a sad sarcasm on humanity—the bottle containing the elements of the future robber and assassin. But the Hymenopters in the variety and strangeness of their powers and instincts give us endless lessons, and we propose on a future occasion to select some details regarding this interesting order.

[For the Scientific American.]

THE MAMMOTH CAVE AND THE CAVE REGIONS OF KENTUCKY.

TILGHMAN B. VESTAL.

Thousands of tourists visit the Mammoth Cave annually, and it is a good place to appreciate subterranean mystery. Not only the business man and mechanic, but the chemist and geologist are overwhelmed with wonder by this grand display of nature.

The chemist says that its origin is due to the solvent action of water holding carbonic acid in solution, and that this cause has been assisted by the mechanical agency of running water.

The geologist traces the stratification and lamination of rocks indefinitely, and by means of fossil shells found imbedded in the solid rock, determines that they belong to the silurian system.

The philosopher attributes the want of eyes in the fishes to the absence of light; but the formation, from dry gypsum, of thousands of snowballs and roses which adorn the ceiling of Snowball Room, and Cleveland's Cabinet, and the Geologist's Puzzle of Indian Cave, defy explanation. The Geologist's Puzzle is a rock projecting six or eight feet obliquely from the bed of what was formerly a river covered with very delicate stalactitic crystals, while other rocks level with it, and but a few feet distant, are worn perfectly smooth. Humbuggery in the case of this puzzle is apparently impossible.

The Mammoth Cave is probably crossed by the Louisville and Nashville Railroad, but the present entrance is seven miles from the nearest station, namely, Glasgow Junction. Although the total length of all the avenues of this cave has been estimated to exceed one hundred miles, it does not comprise the entire cave regions. It is estimated by Mr. Proctor, who lives at Cave Hotel, that there are two hundred caves within ten miles of his residence.

Many of these smaller caves contain a great abundance of beautiful crystalline specimens of stalactites and stalagmites, which are by far superior to any in the noted Mammoth Cave.

The formations in Indian Cave are grand beyond description; they assume every variety of form, from round to thin translucent sheets, resembling a curtain which extends from floor to ceiling.

The most important of these minor caves are, Indian, Diamond, Proctor's, and White's. Indian Cave was discovered in 1861 by B. R. Young, Jr., who was at the time a boy eleven years of age. He descended by means of a hole fifteen inches in diameter, through a rock ten feet thick. A larger entrance was made by digging away the dirt at the edge of the rock, and the cave has since been open for visitors.

This, and probably many others, have impassable communications with Mammoth Cave.

The temperature of these caves is uniformly about fifty-nine degrees. Accordingly in winter, when the outer air is colder, it is more dense, and air is forced into the cave. In summer, when the outer air is warmer, it is more rare, and an outward draft is formed. This motion of the air ventilates the cave, and renders its atmosphere salubrious and bracing, it is called the cave's respiration.

This underground tour is divided into two routes, the short and the long. The long route cannot be made in winter because of high water in Echo River. Sometimes the water rises sixty feet; but a rise of eighteen feet cuts off all communication beyond the river.

A young married couple and a guide were lost in a cave in Missouri by the sudden rise of a stream while they were beyond it. The cave was filled to the ceiling, and they were never heard of any more. Nothing of this kind has ever occurred here; the guides are trustworthy, and never lead people into danger. We visited the cave early this season when the draft was inward. Two guides were necessary as ours was the first trip across the river since last fall.

About 8 o'clock we left the hotel, and three minutes' walk brought us to the entrance. Lamps were lighted and placed directly in front to prevent their being extinguished by the draft. The foremost guide, giving a gentle hint to the whole party, cries to his comrade in the rear, "Come on, Saint, we are all young, and we'll make it easy."

After traveling one mile, we saw the vats that were used for making saltpeter for powder to carry on the war of 1812.

The Rotunda was the first large room we entered. The Chapel and Acute Angle are, indeed, spacious halls. The Star Chamber looks exactly like the heavens on a starry night when we go out and look a long time into their blue. The Moon and Comet, too, are there.

The guide takes all our lights, and, going behind a ledge of rocks, permits the reflection to give just light enough to make the illusion complete. Then, as he, holding the lights before him, ascends a hill, the morning dawns, the sun rises, and it is again day in our ideal world. But, alas! a storm arises, and the day is darkened by huge black clouds which fill the soul with doubt. These clouds are formed by immense shadows, which, owing to their intense darkness, want but the flash of lightning and roar of thunder to finish our subterranean cloudy day. Standing at one point we look down into two pits which appear fabulous in dimension. When illuminated by a Bengal light it wearies the eye and exhausts the imagination to look into their depths. Above, below, beyond—all is vast and wonderful. It is the most enrapturing, soul-reviving scene ever pictured. It seems that nature has been endeavoring to create a universe within a world of rock. All ideas of vastness are bankrupted in beholding the most imposing and stupendous objects eye ever witnessed.

We crossed the River Styx and Lake Lethe in boats, and passed over great sand walk to Echo River, "but how shall I speak of it?" Oh, the beautiful sounds which echo up, down, and across the smooth water as we merrily glide over its crystal form.

The stillness and evenness of its surface, arched, as it is, by huge rock, dividing it into a thousand rooms and avenues, render it a most propitious hall for music. A single word sounds, resounds, and re-resounds till it comes back converted into the most harmonious notes.

After a ride of one half mile, we climbed the bank on the opposite shore and entered Cascade Hall, which is a large room containing a waterfall. We were now nearly four miles from the mouth of the cave, but were not fatigued in the least; the pure atmosphere and the exciting views give an astonishing vivacity, even to invalids. On we passed, through domes, over hills, and across valleys, all of which had appropriate names, such as Mammoth Dome, Rocky Mountain, and Dismal Hollow. Rocky Mountain is one hundred feet high, and is formed entirely of rocks that have fallen from above. On the summit there is a stalagmite two feet high and six inches in diameter, called Cleopatra's Needle.

For long distances we stepped from rock to rock, where misplacing the foot three inches would have occasioned a fall. The most fearful place is a ladder over Dead Sea, where one step would precipitate you a hundred feet. It is strange, but timid ladies ascend and descend without assistance or fear. A reverent awe, attended by a cautious habit, seems to take the place of fear, and still it prevents accidents.

Seven miles from the cave's mouth we find Martha's Vineyard, which contains stalagmites running up the wall exactly like a grape vine. Nodules of carbonate of lime, colored by black oxide of iron are on and around the vine, resembling bunches of grapes.

The most beautiful parts of the cave are, Snowball Room and Cleveland's Cabinet. "The ceiling of the former is covered with pure white nodules of gypsum, varying from two to four inches in diameter, which, viewed at a distance of twenty feet, cannot be distinguished from the snowballs that grow in the flower garden.

"Cleveland's Cabinet is nearly two miles long, sixty feet wide, and from ten to twenty in hight." The walls and ceiling are literally lined with alabaster flowers of every conceivable variety and indescribable beauty. The rosettes vary from one fourth of an inch to eight inches in diameter.

One of the guides said that he had noticed a particular



group of the smaller ones—given in the figure—for twenty years, and that they had not perceivably increased in size or numbers.

How very old must be the Last Rose of Summer, B, which is eight inches in diameter. These flowers grow, no doubt, like the crystal, by the addition of particle to particle. The process is slow, but there is nothing to impede: "Time's effacing fingers" sweep no lines here, for where there is no variation of temperature, no water, and no light, the three great forces of geological transformation cannot operate. Although nations, kingdoms, and empires have passed away, leaving these beauties for coming generations, there are those among the thousands who visit the cave, who fain would tear the gems from their mother earth and leave her as bare and ugly as themselves.

Different parts of the avenue are named Mary's Bower, Diamond Grotto, The Cross, Bacchus' Glory, and the Dining Table.

The Pass of El Ghor presents a very broken appearance. It is two miles in length, and communicates with Mystic River, a body of water the extent of which is unknown. Pits one hundred and seventy-five feet deep, may be seen from top to bottom by throwing into them a lighted paper ball saturated with coal oil. Some of these pits have avenues leading from them at various depths which have never been explored. We have not attempted to describe more than one tenth of what is now known of the Mammoth Cave. No two avenues or rooms resemble each other, yet a description of their lengths and breadths given in feet or miles would become monotonous, and "their grandeur to be realized must be seen."

Although there are some curiosities in the cave which are not well understood, yet as the scientific man is conducted through its lengthy halls and majestic domes he peeps, as it were, into the very heart of the earth, and reads from the bosom of nature those well-established geological facts relative to the structure of the earth. Lovers of the sublime and beautiful have a wide scope here, and the soul of the meanest is made to expand with love as he beholds these noble works of God.

IT is said that the first horse ever seen in Canada was brought to that country from France, in a ship which arrived at Tadoussac, on the 20th of June, 1647.

Adjustable Car Wheels.

There arrived here recently from New York, *en route* to San Francisco, a car belonging to the New York & Erie Railroad, which is on an experimental trip. To run a car through from ocean to ocean, it is necessary to accommodate its wheels to the different gages over which it will necessarily pass; and while the idea of cars with adjustable gage wheels is by no means a novelty, the construction of the car mentioned is new and worthy of description.

In all devices heretofore used for changing gage, grooves have been cut around the axle according to the number of changes necessary to be made. It is claimed that these notches destroy the strength of the outside fiber of iron, and consequently weaken the axle. The device on the car which arrived yesterday obviates this trouble, by inserting a steel feather key laterally on the axle and thus securing the wheel at any point desired by means of a band at each end of the hub, fitting in notches on the key. The "feather" extends into the axle five-eighths of an inch. The car was built in New Jersey and freighted with boots and shoes. Mr. W. B. Snow, the inventor of this new patent, has accompanied the car from the East here, and will continue with it until it arrives at its destination. The trip thus far has been entirely satisfactory, and the inventor looks forward to a safe arrival at the Pacific, when the utility and practicability of his device will, he thinks, be satisfactorily demonstrated. If successful, the Erie company will put 1,000 cars with this device on the freight line between New York and this city.—*Chicago Evening Post.*

American Institute of Civil Engineering--Annual Convention.

The second annual Convention of the American Institute of Civil Engineering was held on the 15th inst. at the Chamber of Commerce. The present officers are: Alfred W. Craven, President; A. P. Boller, Secretary; and James O. Morse, Treasurer. Over fifty gentlemen were present—among them, Gen. Barnard, Col. Adams of Brooklyn, Horatio Allen, J. D. Steel of Pennsylvania, W. J. McAlpine, and W. E. Worthen.

After some ordinary business had been disposed of, the President reviewed the immense strides the Institute had made within the last three years. Established in 1852, it struggled for a few years, in spite of drawbacks, till it died a natural death in 1856. In 1867, a dozen of the old members reorganized it on a new basis, and since then its progress has been remarkable—179 members are now on the roll, and comprise nearly every engineer of note in the States; its library is so extensive that the bookcases will not hold the works, while the papers read are of great importance, and their publications are sought after by every kindred society here and in Europe. There are 52 subscribers to the fellowship fund to aid in the publication of its papers, including A. A. Low, W. B. Ogden, W. H. Aspinwall, W. G. Fargo, A. S. Diven, and J. Howland.

After the President's address, W. J. McAlpine read a paper on the "Waves of Translation in Fresh Water," in which were embodied some remarks on the construction of reservoir dams and the causes of leaks in canals.

Mr. F. C. Lowthorpe made a long address on the "Use of Cast and Wrought Iron in Bridge Construction," and exhibited a diagram of one built by him in 1856, and which was the first of the kind erected in America and is now standing as solidly as when first built.

Mr. J. W. Dutton Steel made some remarks on the "use of compressed air as a motor," and was of opinion that compressed air would eventually take an important place as a motor. It has been tried in mines in England with such success that 100 miles of shaft are already under construction, and he trusted that its use as a motor in underground traffic would soon be considered seriously. Its advantage over steam is under certain conditions incalculable.

After some remarks by several present, Gen. Barnard described the "Construction of Fort Tompkins Wharf," and maintained that, in spite of all said to the contrary, the old method was the best.

He was followed by Mr. Squire Whipple, who made a short address on "Iron and Truss Bridges," and, after a well prepared paper on "The Transmission of Sand by Water from a Caisson," had been read by Mr. Collingwood, in which he proved conclusively that not only coarse sand but pebbles can be removed from a dam by a current of water, the meeting adjourned.

Opening of Connecticut River Railroad Bridge.

The New York and Boston Shore Line Railroad bridge over the Connecticut River was formally opened on June 11. The length of the bridge is 1,130 feet, and it cost about $225,000. The substructure consists of fourteen column piers to support the stationary spans, besides the abutments at the shore ends, and eleven column piers to support the turn-table and swing span. Each column pier is formed by driving a number of piles in close proximity, covering in the aggregate an area of five feet square. The piles are firmly bolted together; iron cylinders, some seven or eight feet in diameter, are then let down in sections over the piles so as to completely surround them, and the space between the cylinder and piles is filled up with concrete.

The stationary spans are constructed of wood and iron on the truss principle. With the exception of the flooring, which is of wood, the swing span is of wrought iron; it is built on the Pratt style, is 280 feet long, and can be turned by two men. The bridge will bear a strain of 2,500 pounds to the running foot; but the breaking weight is estimated at about five times the bearing strain. Although the weather was unfavorable, the opening ceremonies passed off very pleasantly.

Grinding Edge Tools.

The *American Builder* thinks that in finishing the grinding of cutting tools, the stone should revolve toward the edge of the tool. This is its argument:

Edge tools are fitted up by grinding, very much as a plank would be reduced in thickness, were a large plane employed, in which were set a hundred or more very small gouges, each cutting a narrow groove. The sharp grit of the grindstone being harder than the iron or steel, cuts very small channels in the surface of the metal, and the revolving disk carries away all the minute particles that are detached by the grit. If we were to examine the surface of a tool that has just been removed from a grindstone, under the lenses of a powerful microscope, it would appear as it were like the rough surface of a field which has recently been scarified with some implement which formed alternate ridges and furrows. Hence, as these ridges and furrows run together from both sides, at the cutting edge, the newly ground edge seems to be formed of a a system of minute teeth, rather than to consist of a smooth edge. For this reason,a tool is first ground on a coarse stone, so as to wear the surface of the steel away rapidly. Then, it is polished on a wheel of much finer grit. And finally, in order to reduce the serrature as much as possible, a whetstone of the finest grit must be employed. This gives a cutting edge having the smallest possible serration. A razor, for example, does not have a perfect cutting edge, as one may perceive by viewing it through a microscope. And yet, the serrations are actually so much smaller than a human hair, that the minute teeth cut the hair in twain. But, when the serrations on the edge of the razor become so battered up and dull that they will not sever a hair,or cut a man's beard off, the edge must be honed and strapped until the system of minute teeth will be so much smaller than a hair,that several of them will take hold of the smallest hair at once. These suggestions will furnish something of an idea of the operation in grinding and whetting edge tools.

Beginners are sometimes instructed, when grinding edge tools, to have the stone revolve toward the cutting edge, and sometimes from it. When the first grinding is being done, it is a matter of indifference whether this is done or not. But, when the finishing touches are applied near, and at the very edge, a grinder can always complete his task with more accuracy, if the periphery of the grindstone revolves toward the cutting edge, as the steel that is worn away will be removed more easily. Whereas, when a stone runs in the opposite direction, the grinder can not always tell exactly when the side of the tool is fully ground up to the edge. This is more especially true, when the steel has a rather low or soft temper. The stone, when running from the edge, will not sweep away every particle of the metal that hangs as a "feather." But, when the stone revolves toward the edge, there will be no "feather edge" to deceive the eye of the grinder.

Chinese Vehicles.

A contributor to the *Coach-Makers' Monthly* describes in a humorous manner the vehicles used by the Chinese. He says: "The vehicles used for the journey are carts, one to each man; and each cart drawn by two mules. The hubs of the carts, although designed to carry but one man and the driver, are as large as those of our strongest drays in the United States, and the wheels as strong and full of rivets as the wheels in Ezekiel's vision were of eyes. Through these ponderous hubs the axles project for a distance of seven inches, being three inches in diameter where they come through. What good this projection of the axle does, except to hit against everything in the way, belongs to Chinese civilization to determine. On to these axles, which are very heavy and strong, are attached heavy frames, made of two scantlings running from the mules' heads across the axle, to which the frame is made fast by strong bands and bolts of iron. There is nothing in the shape of a spring, or thorough-brace, or any such thing. The Chinese have not got along to these things yet in their civilization. On to this frame is fastened the thing to which you are to be imprisoned during your trip to the capital of the Celestial Empire. It is only large enough for one person, who is expected to sit with crossed legs on the bottom of the machine.

"This strange cage is a kind of a cross between a hen coop and a dog kennel. It is made of hard wood, and very strong, the sides being made to resemble the windows in a penitentiary, the checkered bars being of hard, strong wood instead of iron. There is no seat of any kind, nor anything on which you can lay hold to steady yourself, as a protection against the terrible jerks you suddenly get from side to side as your cart drops into the ruts of ages, and is jerked out again by mule power. Your prison somewhat resembles an old-fashioned Pennsylvania or Kentucky freight wagon, bating the size, only the ribs of your inclosure are much nearer together and stronger. Then over all is placed a covering of strong, blue cotton muslin, to prevent the rain or dust from coming in, or you from seeing out except in front. This cover is made to come down in front of you, so that you must crouch to see out even in front, like a dog looking out of his kennel, or a chicken looking out from under the old hen on a rainy day. You must first get on to the shaft, and then crawl backward through this hole to your quarters.

"Bed and bed-clothes, carpet-sacks and shawls are packed away in this little cramped concern, and you endeavor to adjust them so that your bones may escape being broken against the rough sides of your narrow cage. But the roof is so low that if you put in enough to make anything like a comfortable seat, your head will hit against the top, and if your head barely escapes the top of the roof in the middle, it will be sure to hit the sloping sides as soon as the lateral motion begins, and that is the moment the cart gets under way."

Mosaic and Enamel.

Mosaic is a kind of inlay, producing a picture or pattern by the due selection of colors in the pieces employed. The substance may be wood, stone, marble, porcelain, terra-cotta, enamel, or colored glass; and it may be cut into cubes, hexagons, triangles, or various other forms; the chief conditions being that the pieces should be small in size, variously colored, and placed in such juxtaposition as to bring the proper tints into the proper places. The marble pavement under the dome of St. Paul's, the wooden flooring and paneling done in marquetry, the inlaying of cabinet work known by the names of marquetry and buhl work, the intricate patterns of Tunbridgeware toys, the nicely fitting lids of Scotch snuff boxes—all are examples of mosaic so far as the principle is concerned; but it is generally meant, in art, that a mosaic is a picture, which must have the mind of an artist thrown into it before the mechanical working begins.

Enamel is really nothing more than opaque glass, the opacity being produced by the addition of some one or more among many metallic oxides to the other ingredients. According to the color required, so is the metallic element chosen—lead or antimony to produce yellow, iron to produce red, gold for a more intense and beautiful red, copper for green, cobalt for blue, and various combinations for other colors. Enamel paintings are plates of copper, silver, or gold, on which the picture is produced by using the enamel in the form of paint, and then vitrifying it by the heat of an oven. Enameled watch dials have a thin coating of white enamel on a copper disk or plate, while the figures and spots are painted in black enamel, vitrified by heat.

Now the use of enamel for mosaic is simply the substitution of cubes or small pieces of colored enamel for pieces of other substances. They are occasionally employed, like colored glass, with a part of the effect due to semi-transparency; but more frequently they are quite opaque, only to be looked at by reflected light. The beautiful Pompeiian mosaic of the "Battle of Issus" is of enamel. The mosaics of St. Peter's are also of enamel. So numerous are the gradations of tint necessary to produce all the lights and shades of an elaborate picture, that the mosaic workshops at the Vatican are said to contain no less than twenty thousand varieties, all methodically sorted and arranged. Some of the larger and more ambitious works have taken ten, fifteen, or even twenty years to execute. The durability of the material is fully as great as that of stone itself; insomuch that the mosaic pictures of St. Peter's, so far as atmospheric or climatic influences are concerned, may possibly last as long as the structures which they adorn. The mode of proceeding is pretty much as follows: A ground or support is prepared, either a metal plate or a slab. of travertine, the proper size and shape of the picture; and this is surrounded with a raised rim of iron. Into the recess thus formed is introduced a cement or stucco mixed to a pasty state, and consisting of pounded travertine, carbonate of lime, mastic, and linseed oil. The tesseræ, cubes, or small pieces of enamel (some barely larger than a pin's head) are selected of the proper colors, tints, and shades, and imbedded one by one in the cement. Only so much cement is laid in as can be filled with tesseræ in one day, in order that it may retain sufficient softness. It eventually hardens to the consistence of stone. When the whole picture is finished, the surface is rubbed smooth and made dull or polished according to the kind of effect intended to be produced.

The Gloss on Silk.

"The method of giving an artificial gloss to the woven pieces of silk," says the *Druggists' Circular*, "was invented in 1663. The discovery of the method was purely accidental. Octavio Mey, a merchant of Lyons, being one day deep in meditation, mechanically put a small bunch of silk threads into his mouth and began to chew them. On taking them out again in his hand he was struck by the peculiar luster which they had acquired, and was not a little astonished to find that this luster continued to adhere to the threads even after they had become dry. He at once saw that in this fact there was a secret worth unraveling, and being a man of ingenuity, he applied himself to the study of the question. The result of his experiments was the *procédé de lustrage*, or 'glossing method.' The manner of imparting the artificial gloss has, like all other details of the weaving art, undergone certain changes in the course of years. At present, it is done in this wise: Two rollers revolving on their axes are set up a few feet from the ground, and at about ten yards, in a straight line, from each other. Round the first of these rollers is wound the piece of silk, of twenty, forty, or one hundred yards in length, as the case may be. Ten yards of the silk are then unwound, and fixed by means of a brass rod in a groove on the second roller, care being taken to stretch the silk between the two cylinders as tightly as possible. A workman with a thin blade of metal in his hand daintily covers the uppermost side of the silk (that which will form the inside of the piece) with a coating of gum. On the floor under the outstretched silk is a small tramway, upon which runs a sort of tender filled with glowing coals. As fast as one man covers the silk with gum, another works the tender up and down, so as to dry the mucilage before it has had time to permeate the texture. This is a very delicate operation; for if, on the one hand, the gum is allowed to run through the silk, or if, on the other, the coals are kept too long under one place, the piece is spoiled. In the first instance, it would be stained beyond all power of cleaning, and in the second, it would be burned. None but trusty workmen are confided with this task; and even with the most proved hands there is sometimes damage. When ten yards of the piece have been gummed and dried, they are rolled around the second cylinder and ten more are unwound. This is repeated till the end. But the silk, with its coating of dry gum, is then stiff to the touch and crackles like cream-laid note-paper when folded. To make it soft and pliant again, it is rolled anew, some six or seven times, under two different cylinders, one of which has been warmed by the introduction of hot coals inside, and this is sufficient to give it that bright new look which we all so much admire in fresh silk."

PATENT OFFICE AFFAIRS.

The business of the Patent Office is now in a flourishing condition, and the present is a favorable time to enter applications. Inventors will find the SCIENTIFIC AMERICAN PATENT AGENCY ready to attend to the prosecution of claims with the greatest dispatch. By reference to our register, we find that we have made upwards of twenty-four thousand preliminary examinations into the novelty of alleged new inventions. This great experience, together with the fact that a large proportion of all the business with the Patent Office, for the past twenty years, has been conducted through this Agency, suggests to inventors the surest and best means to secure their rights.

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MODELS.—In order to apply for a patent the law requires that a model shall be furnished, not over a foot in any of its dimensions, neatly and substantially made. Send the model by express, prepaid, addressed to Munn & Co., 37 Park Row-New York, together with a description of the operation and merits of the invention.

CAVEATS.—Whenever an inventor is engaged in working out a new improvement, and is fearful that some other party may anticipate him in applying for a patent, it is desirable, under such circumstances, to file a caveat, which is good for one year, and, during that time, will operate to prevent the issue of a patent to other parties for the same invention. The nature of a caveat is fully explained in our pamphlet, which we mail free of charge.

EUROPEAN PATENTS.—Probably three-fourths of all the patents taken by American citizens in Europe have been secured through the SCIENTIFIC AMERICAN PATENT AGENCY. Inventors should be careful to put their cases in the hands of responsible agents, as in England, for example, the first introducer can take the patent, and the rightful inventor has no remedy. We have recently issued a new edition of our Synopsis of European Patent Laws.

All communications and inquiries addressed to Munn & Co., respecting patent business, are considered as strictly confidential.

American and English Mowing Machines.

Reaping and mowing machines have now become standard implements on English farms, but in France they are still regarded somewhat as innovations; the lower rate of wages across the Channel having hitherto acted as a barrier to the introduction of labor-saving machines in agriculture. Wages, however, are rising in France, as in most other countries, and the attention, therefore, of agriculturists is directed to the best form of reaping and mowing machines. Several international trials of these machines are announced for the coming summer. The first came off last week at Bourges, 123 miles south of Paris, at which there was a very sharp contest between the English and American machines. The *Ironmonger* states that after a long and careful trial the award was given in favor of the English machine of Messrs. Howard, of Bedford, which in mowing an acre beat the far-famed American machines of Mr. W. A. Wood and Mr. M'Cormick by eighteen minutes. American manufacturers must look to their laurels.

Flies on Horses.

The *Journal of Chemistry* gives the following as a preventitive of horses being teased by flies: Take two or three small handfuls of walnut leaves, upon which pour two or three quarts of cold water; let it infuse one night, and pour the whole next morning into a kettle, and let it boil for a quarter of an hour. When cold it will be fit for use. No more is required than to moisten a sponge, and before the horse goes out of the stable, let those parts which are most irritable be smeared over with the liquor, namely, between and upon the ears, the neck, the flanks, etc. Not only the gentleman or lady who rides out for pleasure will derive pleasure from the walnut leaves thus prepared, but the coachman, the wagoner, and all others who use horses during the hot months.

THE MANUFACTURE OF CHLOROFORM.—According to the late Jas. Y. Simpson, there is a single manufactory of chloroform, located in Edinburgh, which makes as many as eight thousand doses a day, or between two millions and three millions of doses every year—evidence to what an extent the practice is now carried of wrapping men, women, and children in a painless sleep during some of the most trying moments and hours of human existence.

Improved Sectional Mills.

We might fill more space than can be allotted to the present description, with comments upon the importance of mills for the pulverization of hard substances, and with even the briefest allusion to the various improvements by which the rude appliances of the ancients have been superseded, but we shall not attempt to discuss this fertile topic. Suffice it to say that the employment of iron and steel as a substitute for stone grinding surfaces is one of the most modern improvements in this field.

The earliest of these were made with a dress of straight fillets or grooves. The disadvantages of this style of dress, and the advantage of the sectional system, are so well set forth by the inventor in the general description of the mill, furnished by him as the basis of the present article, that we cannot do better than to use his own language upon this point. He says:

"It will be somewhat difficult to indicate all the peculiar advantages to be derived from the use of sectional grinding surfaces, without a personal examination of the machine.

"In nearly every form of iron mills heretofore in use, the grinding surfaces have been confined to a system of straight fillets or grooves. This form of dress was adopted and continued in use, not because it was the best form of grinding surface, but from the impossibility of casting a cylindrical grinder with corrugations and indentations, without making it too expensive for practical use. With such mills, having the old system of grinding surfaces, no matter what the nature of the substance to be ground, whether it was hard, greasy, and tough bones, grain, plaster, or brittle minerals—all was done with the same description of surface, or at least the variance was so slight that practically the operation was the same with all. With ordinary discernment, the merest observer may see that this common way was entirely wrong. Business demands, practical and imperative in their nature soon pointed the inventor of the sectional mills to the fact that changes in the system were necessary; certain results were desired, and they could only be obtained by the most thorough experiment. For grinding substances of given character, a definite configuration of surface was demanded; and as the substance to be ground varied in character and condition, so also must the appropriate surface be supplied. This general advantage was attained by having the grinding surfaces cast in sections. By this means any pattern of tooth suitable to the material to be ground could be furnished. The concave or shell in which the *outer* surface is placed, or the cone upon which the *inner* surface is placed, being turned upon a lathe to perfect truth of circle, insures the running of the machine with an exactness impossible to exceed by any other system.

"Another great advantage in the sectional system lies in the facility with which changes can be made—no part of the body of the mill having to be removed, but merely raised sufficiently by a screw to allow the sections to be slipped to or from their places. A change made thus in a few minutes, renders very obvious the advantage over the old system. Were the inner and outer surfaces each cast in one piece, it would involve the lifting of the heavy parts of the mill, so as to allow them to be placed in the inside, taking the work of several men and a delay of several hours to accomplish. In the sectional mills the work can be easily done by one man.

"A great advantage claimed for the sectional mills lies in the fact, that should a piece of iron (which in grinding bones is very probable) accidentally get into the mill, and the grinding surface be broken, the broken section or sections may be removed, and sound ones replaced, without the necessity of renewing the whole. Practical men will see that this is a saving of time and expense not easily over-estimated."

Perhaps no material tries a mill so much as raw bones. These are not only hard, but they also possess a toughness that renders them peculiarly intractable. The machines we are about to describe are in successful operation in the manufactories of the proprietors, in Philadelphia and Chicago, upon raw bones, where their great capacity and strength are demonstrated. The mills are also working upon guano, plaster, fire brick, sumac, bark, dye-woods, ores, fish scraps, etc., in other manufactories in Philadelphia, Chicago, and other cities. Their efficiency in grinding ores has been, we are informed, well tested.

Fig. 2 is a sectional view of the mill, by the inspection of which its construction will be clearly perceived, in connection with the following description.

In the larger sizes the lower grinding surface of the crusher is curved, in order that iron or other foreign substances than that which the mill is working on may be quickly discharged without injuring the dress when the pressure is made upon them; while in the smaller sizes the grinding surfaces are in a straight line, or at least not curved.

A, is the top breaker, with a projecting arm. This arm is varied in shape to suit different material. It is made to slip easily over a sleeve which fits snugly on the shaft, so as to protect the shaft from abrasion from the continued jar of the breaker, and it also obviates the need of renewing that much iron with every breaker.

The large screw-nut, B, is used to hold the breaker down to its place. This is a left hand screw and tightens itself in working.

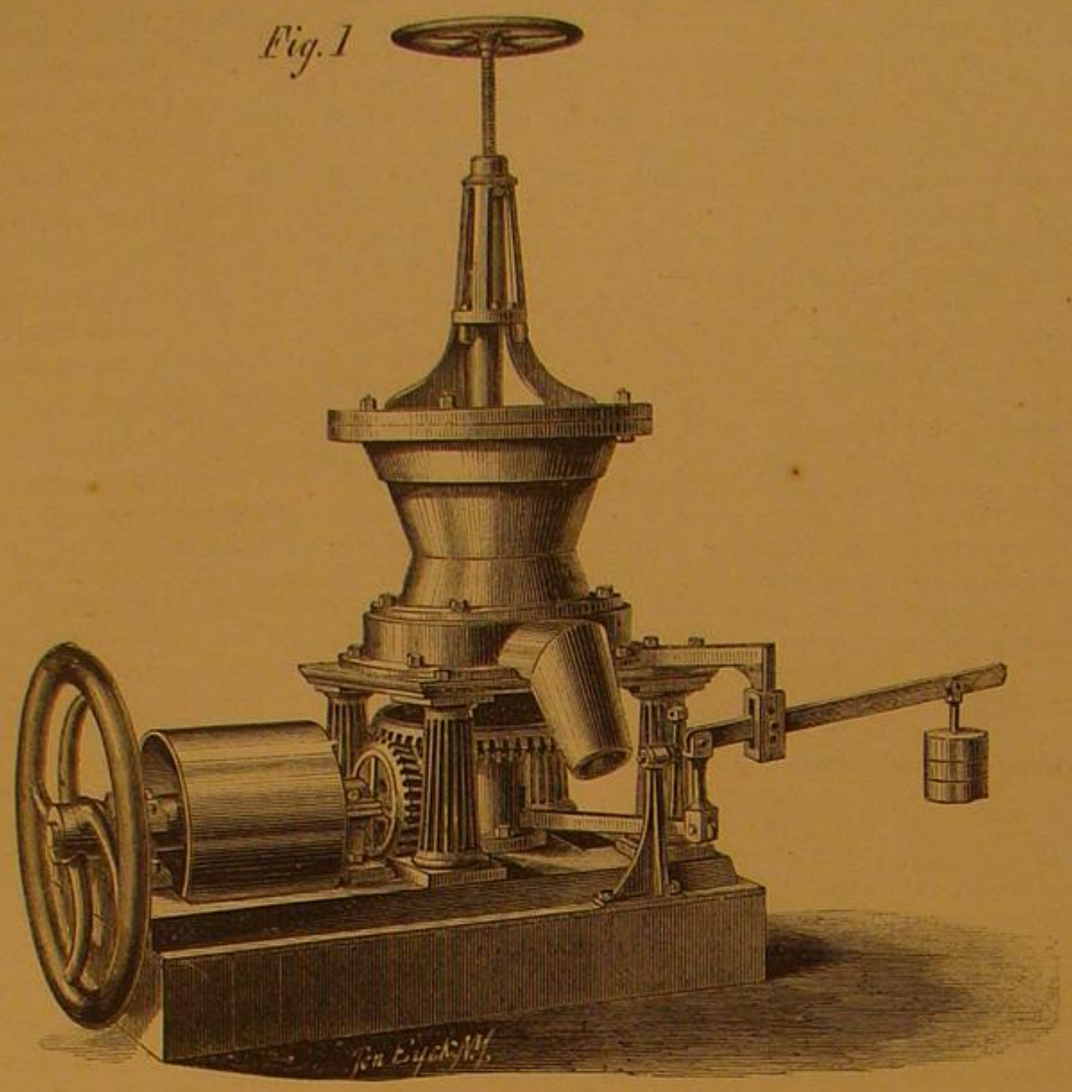
C is the circular grinder, with holes for stud-bolts (only one of which is shown) used to tighten the grinding sections, D.

E is the stationary sectional dress in the upper part of the shell, eight of which form a circle. The corrugations in these sections are made very deep, so as to admit of a great amount of wear. The lower or full sections, D, are eight in number, and are held in place by stud bolts, one of which is shown passing through C.

The outside or stationary sections, G, are held in place by the nuts, H. The circular shape of the bottom of the dresses marked D and G, admits of a great amount of wear at the bottom, where they come first in contact, and, should iron get into the mill, gives greater space on raising the lever to allow it to get out.

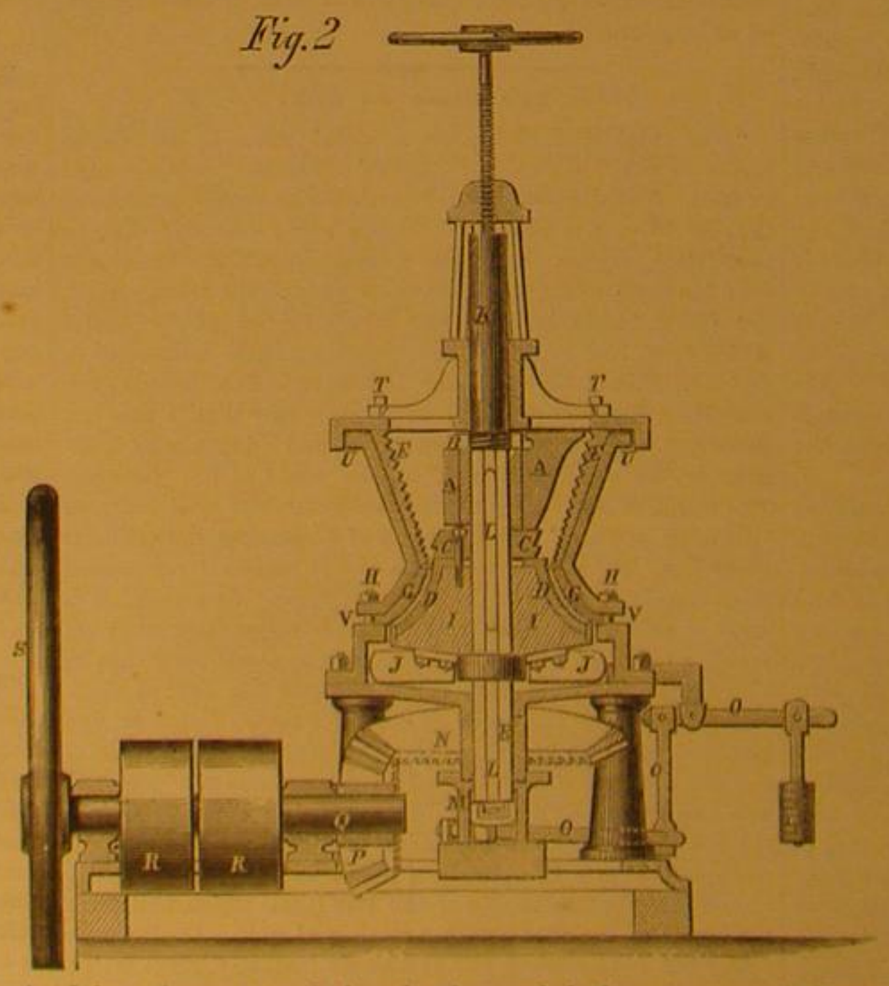
I is the cone to which the dress castings, D, are attached.

Fig. 1



E. P. BAUGH'S SECTIONAL MILLS.

Fig. 2



It has a heavy wrought-iron band around the base to support the dress, and is held in place by two feathers, L, in the shaft, and a tight collar below. Wipers, J, carry the ground material to the spout.

K is the perpendicular or main shaft, made of wrought-iron, the lower end of which, that works in the step, being made of solid steel. There are two feathers, L, let into it to hold the cone and breakers in place.

A steel, conical anti-friction disk is placed under the shaft, which effectually prevents heating. The step-box, which has a steel lining, is movable. The step moves up and down in a hollow column, M, in closing and opening the mill to adjust the grinding; the shaft working freely through the bevel cog-wheel, N, which is supported by M. Levers for adjusting the mill with weights are shown at O; or screws may be used in their place. P is the driving cogwheel, which being half the size of the other wheel, doubles the power of the belt.

Q is a wrought-iron counter shaft, to which are attached the fixed and loose pulleys, R.

S is the fly-wheel, which, with its shaft, is supported by pedestal boxes fitted with anti-friction metal.

The large screw at the top of the mill is used for raising the different parts to change the dress. In order to change the upper sections of the dress the bolts, T, are loosened, allowing the mill to be opened at U. To change the lower grinding surface, the bolts, H, are unscrewed, allowing the mill to be opened at V. Then the large nut, B, is loosened, and the breaker and sleeve are raised. Next the stud-bolts passing through C are unscrewed, when all the dress can be removed.

The perpendicular or main shaft of the No. 1 mill is of wrought-iron, four feet six inches long and five inches in diameter. The counter shaft is also of wrought-iron, three and one-half inches in diameter. The fly-wheel weighs nine hundred pounds. The fixed and loose pulleys are twenty-two inches in diameter and ten inches face.

It will be seen that the proportions are such as to give great power and strength. This sized mill is intended to prepare all hard substances for smaller mills, although it is claimed that a large percentage of its product does not ordinarily require another operation. It weighs four tuns and is constructed sufficiently strong to crush rough raw bones, logwood (cut in lengths of 18 inches), the hardest quartz rock and all minerals, hard guanos, slag from furnaces, and, indeed, all substances which industrial science demands to be reduced. It is claimed that the hardest substance susceptible at all of grinding or breaking, can be crushed without risk of breakage to the mill. The power required to run the machine to its full capacity, is from *ten to twelve horses;* yet, its main shaft being *solid wrought-iron five inches in diameter,* it can be attached and run safely with power of twenty-five horses. It is stated by the manufacturers that the amount of work capable of being performed in a day of ten hours is, for raw bones, twenty tuns and upwards, varying with the condition of dryness; hard guanos, quartz, and other mineral substances, thirty to forty tuns; plaster, fifty or sixty tuns. The mill is especially adapted to the pulverization of the South Carolina deposit of guano; the grinding surface upon this may be run closely together, and a large proportion reduced to powder by the first process. Of this latter substance 25 tuns may be reduced in ten hours.

This mill has been secured by patents in Great Britain, France, and the United States, and is manufactured by Baugh & Sons, No. 20 South Delaware avenue, Philadelphia, Pa.

Influence of Colored Lights on Insects.

The discussion of the change produced in animal and vegetable forms by the influence of varying conditions of temperature, moisture, light, locality, etc., especially as connected with the Darwinian hypothesis, has induced a great variety of experiments, from which some interesting results have been derived. In some of these experiments, lately published, a brood of caterpillars of the tortoise-shell butterfly of Europe was divided into three lots. One third were placed in a photographic room lighted through orange colored glass, one third in a room lighted through blue glass, and the remainder kept in an ordinary cage in natural light. All were fed with their proper food, and the third lot developed into butterflies in the usual time. Those in the blue light were not healthy, a large number dying before changing; those raised in the orange light, however, were nearly as healthy as those first mentioned. The perfect insect reared in the blue light differed from the average form in being much smaller, the orange brown colors lighter, and the yellow and orange running into each other instead of remaining distinct. Those raised in the yellow light were also smaller, but the orange brown was replaced by salmon color; and the blue edges of the wings seen in the ordinary form were of a dull slate. If changes so great as these can be produced in the course of a single experiment, it is probable that a continuance of the same upon a succession of individuals will develop some striking results.

GRAND FAIR OF WESTERN TEXAS.—The Second Grand Fair of Western Texas will be held in October of the present year, commencing on Wednesday the 5th, at the Fair Grounds, near San Antonio, and will continue four days. A large list of premiums is offered, consisting of money and diplomas. Further information can be obtained of the Secretary, Mr. Robert Clark, of San Antonio.

GAS was first used for lighting streets in Birmingham, England, about the year 1816.

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NEW YORK, SATURDAY, JUNE 25, 1870.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

SIX MONTHS OF PROGRESS IN MECHANICAL AND CIVIL ENGINEERING.

The close of the present volume affords a convenient opportunity to review what has been done in the mechanical world during the time of its publication. We shall find little that is new or startling in the way of discovery but that considerable work has been done, and some steady progress has been accomplished.

The department of civil engineering may boast of the active commencement of one of the greatest feats of engineering of modern times, in the building, launching, and placing of the great caisson, at the Brooklyn terminus of the East River Bridge. Descending into this vast structure, if one has sufficient physical strength to withstand the pressure, he may see a large gang of men busy as bees in a hive, laying the foundation for the enormous superstructure. Everything is progressing with that smoothness and absence of unforeseen contingencies which gives assurance of the successful completion of this great work.

The Suez Canal has been greatly improved, so that ships of the deepest draft now find no difficulty in making the passage.

The proposed Darien Canal has been made the subject of careful survey, and its possibilities and probabilities are becoming daily more determined.

A new explosive, dualin, has been added to the list of compounds employed for blasting, but its merits are still not so fully demonstrated as to secure the confidence which it perhaps deserves.

The question of street pavements has received more light from some successes, and by far more numerous failures. A new kind of pavement called Dura Pavement, from its resistance to wear, is now laid in small sections in several places, and seems to promise well. Experiments with the French asphalte, and with artificial imitations have also been made, but we think not with great success.

The preservation of brown sandstone, which has become so popular as a building material, has also been the subject of experiment; and concrete building, as well as the manufacture of artificial stone, has been slowly but surely advancing.

Our readers will recollect some editorial remarks upon the subject of "Improved Building Materials," published not long since in this journal. The subject will bear further attention in connection with recent improvements.

There seems to be a general effort now making to produce cheaper and if possible better building materials than have hitherto been employed. Our exchanges from abroad, more especially those devoted to architectural topics, give us very encouraging accounts of the progress of concrete building. This style of building seems growing in favor, and is furnishing a very good class of dwellings at a very cheap rate.

We find also an account of a new kind of artificial stone, called the Victoria stone, which seems to have endured severe tests and to promise well.

It is the invention of a clergyman, Rev. H. Highton. The process by which it is made consists in mixing broken granite with hydraulic cement, and steeping the whole when set in a solution of silica. The granite used is the refuse of the quarries, and is broken up at the works. It is then mixed with Portland cement, in proportions of four of granite to one of cement, sufficient water being added to give it a pasty consistency. In this state it is placed in molds, when it consolidates in about four days. When taken from the molds it is placed for two days in a solution of silicate of soda, which completes the process.

The silicate solution is prepared in a peculiar manner, and upon it the success of the operation depends. The silicate of soda has the property of hardening any kind of concrete in which lime is a component. This substance has been hitherto too costly for general use in artificial stone manufacture, and it becomes caustic by the absorption of its silica, so that it attacks the hands of the workmen.

Mr. Highton produces his solution in the following manner. He uses a soft kind of stone containing twenty-five per cent of silica, found at Farnham, in Surrey, England. This stone readily dissolves in a cold caustic soda solution.

The solution of soda is placed in the tanks used for steeping the stone, and the Farnham stone is ground and added to the bath. The lime in the artificial blocks removes the silica from the solution, which in its turn takes up more silica from the Farnham stone, and so maintains its supply of silica, thus removing the objections above named. The process is extremely ingenious, and we are informed that flagging, sinks, mantels, coping, cap-stones, sills, etc., are produced by it. Finely cut moldings are not successfully produced, and it seems better adapted to a heavier class of work.

In America also considerable improvement is observable in this field. We recently noticed an excellent stone manufactured in this city. A Brooklyn paper states that porcelain enameled bricks are now produced by a firm in that city, of great beauty, both for outside and inside work, and a cost not exceeding that of Philadelphia pressed bricks.

The adaptability of zinc for certain architectural purposes is also attracting attention, and is growing in favor. It is formed by pressure into ornaments both for outside and inside decoration, which when painted resemble, very closely, cut stone or stucco, as the case may be. These ornaments are both cheap and durable.

The Pneumatic Tunnel under Broadway, New York, has been commenced, and so skillfully conducted as not to disturb surface travel in the least. This tunnel when completed and put in operation will be the largest work of the kind in existence.

Prof. Norton, of New Haven, has been testing the hitherto admitted laws of the deflection of beams, by rigid experiment, with results varying from the hitherto accepted formulæ. His experiments, of which a notice appeared on page 256, current volume, are worthy of the attention of engineers, as the laws in question lie at the very root of scientific construction.

In rock-drilling machines, some improvement has been made, but the progress in this portion of the engineering field has been limited mostly to the more general adoption of machines already invented, than to the invention of new machines. Power is gradually superseding hand labor here, and is probably destined to be ultimately used in all extensive works where such drilling is required.

A submarine blast of unprecedented magnitude was fired in the harbor of San Francisco, on the 23d of April, by which Blossom Rock, a dangerous obstruction to commerce, was entirely removed. The rock known as Hell-gate in the East River still remains an obstruction, but it is stated that a large quantity has been removed by drilling and blasting. Our opinion is that unless some other means than are at present applied to its removal are adopted, it will be a long time ere this obstinate rock will be subdued.

In steam engineering no marked advancement has been made, although many devices tending to increased safety in the use of boilers have made their appearance. The past six months have been extremely fruitful of disasters from explosions, which shows that practice in boiler making, or in boiler tending, or perhaps both, are retrograding rather than advancing.

In miscellaneous inventions there has been considerable activity, and many useful devices have been brought to public notice. It shall be our aim in the coming volume to keep pace with all new improvements, and to render the SCIENTIFIC AMERICAN in the future, as it has been in the past, the best and most reliable record of progress published in this country.

THE CLOSE OF VOLUME XXII.

In closing the present volume we feel a natural pride in the fact that notwithstanding a host of competitors have sprung up in the various cities of the Union directly or indirectly calculated to obtain a share of the patronage of the class of readers for whose interest and instruction we have so long labored, we find our subscription list larger than ever before at this season of the year. The general tone of our correspondence also assures us that never before has the SCIENTIFIC AMERICAN held so high a place in the esteem of the reading public as at this moment.

We feel that we may entertain a just pride also in the very large variety of original matter contained in the present volume. No technical paper published in the English language has touched upon such a wide range of topics, or given information in a more popular and readable form. While then we look upon our extending circulation with satisfaction, we feel that our success is but the reward of earnest endeavor and unremitting labor to perform all that we promised in our prospectus at the beginning of the year.

We feel that our full performance of our promises to our readers also entitles us to confidently solicit their co-operation in further extending our circulation. There can be no investment for which a greater return is sure to be obtained than a subscription to this journal. Nothing comparable to it in size or in fulness of valuable contents is published for anything like its price, and its information is always gathered from reliable sources. We hope, therefore, our readers will feel like giving a good word to their friends and neighbors in our behalf, and that they will feel certain of their reward for this slight trouble in our continual effort to place weekly in their homes the most readable, instructive, and reliable paper published in the world, upon such matters of general, technical, and current interest, as comes within our sphere.

To our numerous exchanges we extend thanks for the many courtesies for which we are indebted to them, and the many favorable notices and compliments by way of copied and accredited articles, we have received at their hands.

Pledging ourselves that we shall in no way slacken our efforts to keep full pace with the advancement of the age, we shall commence Volume XXIII. with the determination that although others may compete with, they shall not excel us.

DANGER OF EXPLOSION AND COLLAPSE IN KITCHEN BOILERS---HOW TO AVOID IT.

Whether from the better construction, and more scientific arrangement of kitchen boilers in this country, or whether because cases of such explosion are not deemed sufficiently sensational to be generally reported on this side of the Atlantic, certain it is that we read of three such accidents in foreign journals, to every one that we find reported in our American exchanges. Yet there is no nation in the world that makes such an extensive use of modern improvements of this class as the American.

Such accidents, however, do happen here, and that they do not happen more frequently is certainly not due to want of facilities afforded by plumbers.

For the most part the pipes and boilers in dwellings are left in charge of servant girls, who know very little about steam or hydraulics, and many of these arrangements are constructed on principles to understand which requires not a small degree of such knowledge.

In his absence one day, notification was given to people at the residence of the writer, that the water was about to be turned off from the street, by a contractor, and directions were left to extinguish the fire, which, it was stated, would prevent any injury to pipes or boiler. Relying upon this instruction, they succeeded admirably in doing two very disagreeable things, namely, substituting a cold lunch for the usual dinner at 6 P. M., and collapsing the kitchen boiler into the shape of a very dilapidated hat just rescued from beneath the foot of an elephant.

Shortly afterwards this boiler, which had been re-rolled and repaired, was collapsed in another way. Too great heat had generated so much steam that the water was forced entirely out of the boiler. The servant, slightly opening the faucet, was alarmed at the volume of steam which escaped, and shut off the flow; this threw a jet of water in from the supply pipe, which suddenly condensed the steam, and before water in sufficient quantity could flow in to supply its place, the boiler was again suddenly flattened out.

These are the most common ways in which such boilers are collapsed, where the supply of water flows in directly from the main, as is usually the case in this country. The rarity of bursting is probably due to the fact that the head of the water limits the pressure of the steam, and the boilers are originally made to safely withstand the pressure due to the head.

We know, however, of cases where the lead pipes leading to the boilers have burst by the action of steam forcing hot water back into them and thus weakening their tenacity.

These accidents may be avoided by a proper arrangement of valves. Every boiler of this kind should have a valve opening inward to prevent collapse. It should be made strong enough to withstand considerably greater pressure than it will be subjected to by virtue of the head. Then if a check-valve be employed to keep the water from being forced back into the pipes by the steam pressure, and a safety valve be set to blow off at, say, five pounds above the maximum pressure due to the head, the boiler can neither burst nor collapse under any circumstances, and will need no care to guard it against the ignorance of servants.

THE DAWN OF AN IMPORTANT INDUSTRY.

In the year 1832, Professor Dumas, the eminent French chemist, discovered among the products of the distillation of coal a new body, to which he gave the name of paranaphthaline, but which was afterwards called anthracene. When coal tar is subjected to fractional distillation a heavy oily matter comes over, which, upon exposure to a temperature of 18° Fah., deposits crystals of naphthaline and anthracene. The crude material is treated with alcohol, which dissolves the naphthaline and leaves the anthracene unattacked. The latter body can then be purified by further distillation.

Anthracene boils at 350° Fah., and is soluble in turpentine, but not in alcohol. It does not seem to be formed at low temperatures, but at the heat required to manufacture gas it sometimes comes off in sufficient quantity to make its appearance like snow in the purifiers, and also in clogging the pipes. It is therefore as an incidental product of the gas house that we are to look for this substance side by side with the benzole, carbolic acid, and lubricating oils now so extensively made from tar.

Berthelot and Limpricht have succeeded in making anthracene artificially, but the process is too complicated for practice on a large scale, unless materially modified by further experience. It is not many years since coal tar was thrown away. The gas companies allowed anyone to take it who

could make any use of it—finally they sold it for a trifle, and thus the case stood when the discovery of aniline produced a revolution in the whole business; and other inventions following upon its track have raised the price of coal tar so materially that the time appears to be near at hand when it would pay to make it as a direct product, and to regard the manufacture of gas as incidental.

The anthracene discovered by Dumas forty years ago has been entirely lost to view, and none but scientific men were aware of its existence, but in the light of modern research it appears likely to occupy the front rank of coal tar products, and to lay the foundation of an industry that is destined to work a revolution in the whole business of the manufacture of colors, and to restore vast provinces of the richest lands to the production of corn and grain.

At the meeting of the Lyceum of Natural History on Monday evening, Dr. Walz, a distinguished young chemist of New York, read a paper on the artificial preparation of alizarine from anthracene. He gave a history of the researches that preceded the important discovery, and in a lucid manner explained to the association the transformations that had to be made before success attended the labors of the chemists who had undertaken the research.

It will be remembered that a dispute in the French Academy as to the medical properties of the red oxide of mercury, and of the red precipitate led to an invitation being extended to Priestley to come to Paris to settle the difficulty, and he, in the course of investigation, made the important discovery of oxygen gas. In a perfectly analogous way, said Dr. Walz, have we attained our knowledge of alizarine and its artificial preparation.

Alizarine is the coloring matter of madder, and, since the time of its discovery in 1831, its true chemical composition and the proper formula to express its nature have been matters of controversy among chemists. It was while carrying on researches to settle this vexed question that the discovery was made of its possible preparation from anthracene, and thus a dispute about a chemical formula has lead to one of the grandest and most important discoveries of our time.

Messrs. Graebe and Liebermann are the chemists who have patented the process for the artificial preparation of alizarine. They prepare bibromide and bichloride of anthrachinone, and from this make the alizarine by the action of caustic alkalies. They have since found that sulphuric acid can be substituted for the bromine and chlorine.

Dr. Walz exhibited specimens of the new coloring matter as well of pieces of goods that had been dyed with it. The colors were in no way inferior to the best aniline pigments with the great advantage of being more permanent. The problem of the economical manufacture of alizarine has not been fully solved, but enough difficulties have been overcome to insure ultimate success. Thus one by one the old pigments prepared from vegetable sources have given way to the artificial colors of the synthetical chemist. Madder and indigo were the only two left, and now indigo is in undisputed, solitary possession of the field.

When the discovery of bleaching powders released thousands of acres of rich meadow land to the plow, and the culture of grain, and thus cheapened the price of clothing and of food, a great blessing was conferred upon mankind.

If all the anticipations in reference to the artificial production of alizarine are accomplished we may predict an equal advantage to be derived from this new industry.

According to a large number of experiments 100 tuns of coal tar can furnish 0·63 tun of anthracene, or we can obtain a tun of anthracene by distilling 2,000 tuns of oil—the amount of alizarine that can be made from a tun of anthracene has not been published nor is it easy to ascertain, but these figures will be supplied before the lapse of many months. The annual production of madder is estimated at 47,500 tuns, and the price per tun is £45, which makes the cost, per annum, £2,137,500.

To divert an industry of this magnitude into new channels is one of the most momentous results of modern science, and one that can only be compared in importance to the revolution accomplished by the introduction of aniline colors.

CIVILIZATION VERSUS NATURE.

There are two sets of public teachers who are very fond of referring to nature in their discourse, the one in deprecation, the other in praise. They are the theologians and the quack doctors of medicine, who publish pamphlets for popular rather than professional circulation, the aim of which is to instruct people that some proprietary nostrum which they manufacture and vend is the great panacea for the physical ills of mankind.

The first class of teachers, whose pupils are many, chiefly discourse about the morsl nature of man, which they mostly unite to condemn for its asserted total depravity. The second class, whose pupils we are sorry to say, are also numerous, discourse upon man's physical nature which they unite in praising, denouncing moreover any departures from nature as fatal to physical health, and a mistake, the consequences of which they are however very careful to tell us we may escape if we will only use a few bottles of their "Great Oriental Liver Arouser," or a dozen boxes, more or less, of their "Wonderful Health Preserving Purgative Pills."

The truth about our moral and physical nature probably lies between these extreme doctrines. Our moral nature is not so totally depraved that it not susceptible of some improvement, else the preacher of the gospel would find his occupation gone. Our bodies are probably in better condition for some departures from primitive modes of living, which is what is meant by departure from nature by those who would have us eat bread made of unbolted flour, and stop our tea, coffee, condiments, and cigars. Not that we are the better for these things, but the fact that they are not natural or primitive articles of diet does not *prove* them harmful.

Civilization is a direct departure from nature. In a state of nature the weaker are sacrificed to the stronger. Life and property are at the mercy of whoever has the might to appropriate the one or destroy the other. The primitive food is not as good as the food of civilized races, and the clothing and shelter of barbarous tribes are infinitely inferior to those of enlightened races, notwithstanding the many fashionable follies in dress current among the latter. Tight shoes produce corns, but the sandal of the oriental barbarian, or the buckskin moccasin of the American Indian would result in worse diseases were they to be adopted by us. Corsets are, in our opinion, health-destroying distorters of the human form; but they do less harm than would the entire absence of dress to protect the chest, which is the custom in many savage tribes.

In becoming civilized, man's physical condition has become better, notwithstanding his departures from his earlier habits. The dog which has been taught that not to molest sheep, or disturb the chickens, are virtues which admit him to good society, or that the poodle, twenty times as small as himself, has recognized social rights which he is bound to respect, has become partially civilized. By nature dogs disregard the rights of sheep, chickens, and their fellow dogs. They are better and happier dogs for the rudiments of conscience they have acquired, and for eating their meat cooked instead of raw, as they did in a state of nature.

The fact is that to be natural is to be barbarous in all respects, and to be civilized is to be happier than is the primitive state of mankind. To say then that to eat French rolls or drink coffee, to smoke tobacco or use alcoholic drinks, is deleterious because it is unnatural, is a palpable absurdity. The true scientific mode of investigation applies the test of experiment to these things. It says, this food, or that drink, that corset, and those tight shoes, are hurtful, because experiment has shown them to be so. Experiment has shown that dyspepsia, nervous disorder, consumption, and corns, none of which make people happy, result from these practices, and therefore we denounce them. We know that some things which are not man's natural food, and which he had to teach himself to relish (tomatoes for instance) have proved excellent articles of diet.

The scientific method teaches that man's primitive condition, or what is understood by the phrase "state of nature" is no index of his capabilities, but accurate experiment is. It says whatever is done, is done in accordance with the laws of nature, because it is impossible to defy them. All good, as well as all hurt, is simply a result of such obedience. If a man takes arsenic it is in accordance with nature that he shall suffer poisoning. If he eats wholesome food it nourishes him in accordance with the same laws by which poison kills.

People have been so long accustomed to regard systems of ethics as things settled for them, and to which the true scientific method cannot apply, that to suggest that in these fields there is yet room for experiment, or to go further and assert that nothing like well conducted organized experiment has been applied to determine what is morally good, and what is morally bad, may shock at least the conservative portion of modern society. We will not thus shock them, but will close by asking if there is ever to be such a thing as social *science*, how else is it to be obtained? Surely there cannot be a science without the pursuance of a scientific method, and the difficulty in ever applying such a method is what has led many thinkers to doubt the possibility of a social science.

INSTRUMENTS FOR SOUNDING ALARMS.

From remote times it has been found necessary to employ means whereby signals of warning could be given speedily through a long distance in times of emergency. Sometimes the event of which it was desired to communicate intelligence was war, sometimes fire, sometimes shipwreck; or it was necessary to warn vessels off from a dangerous coast.

Light traveling with inconceivable swiftness, and easily generated by the kindling of bonfires on hill-tops, is the primitive means adopted by savages to signal distant tribes or clans. The bonfire and firebrand gradually gave way to rockets and colored fires, and the modern light-house with French lenses, electric lights, and the various contrivances which characterize the modern system of beacons.

But the use of artificial light is limited by distance and the state of the atmosphere, and it is only seen by those who are awake.

As civilization advanced another sense was resorted to, that of hearing, which is easily aroused to action when people are wrapped in slumber. The principal device known to early civilization for sounding alarms was the bell, which to the present time, is still universally employed by civilized races.

Next followed the discharge of cannon, the sound of which travels much farther than that of the bell. The employment of steam has given birth to another class of alarm instruments, comprising steam whistles, gongs, and fog-horns, which emit sounds of immense volume and great penetrating power.

Last and most wonderful in its far-reaching, subtile power, is the telegraph wire, which penetrates the darkness even of the ocean deeps, and whose action is so delicate that a pulse-beat in London may be registered in New York.

It might be supposed that in this triumph of science invention in this field had culminated and every possible means attainable by man is reached, whereby he can convey intelligence to remote points.

The telegraph has shown that the senses of sight and hearing are not all we possess by which the knowledge of distant objects and events become possible. A blind and deaf man might easily be taught to read and communicate telegraphic messages through the sense of touch. It is obvious, however, that this sense cannot be made available for purposes of general signaling, or, even if it could, that the senses of sight and hearing are far more available.

The telegraph is necessarily limited in its application so long as a wire is necessitated to convey the electric current, and although from time to time it has been announced that somebody had discovered, or was about to perfect a discovery of a method whereby the metallic conductor might be abandoned for the universal substances, earth, air, and water, these announcements have not borne fruit, and we think the prospects of such a discovery are not encouraging.

In a recent conversation with a gentleman of some inventive genius, he made a suggestion, of a method for transmitting sounds to vessels at sea, something similar to which we seem to have heard or read of before, but which we cannot refer to any particular source. It however seems that some experiment in the direction indicated might lead to good results.

The main feature of the plan is to make the water instead of the air the medium through which the sound is to be conveyed to the vessel. To this end he suggested that each vessel should be provided with a funnel, the bell of which should be inverted in the water at some convenient position upon the ship, forming a very large hearing trumpet to collect the sound transmitted through the water, and concentrate it in the ear of a person stationed to detect the signals.

To generate a sound of great intensity, he suggests that a bell or fog-horn, or perhaps even a cannon, be placed in a submerged apartment, the air in which is submitted to the pressure of the superincumbent water. At a depth of ninety feet the air would be compressed by a weight of nearly four atmospheres, and the intensity of the sound produced would be greatly increased thereby, and would therefore be transmitted with greater velocity and to a greater distance through the water than in air.

Tyndall states in his treatise on sound that its intensity depends upon the density of the air in which it is generated, and not upon the density of the air in which it is heard, therefore the inferior density of the air in the "Dionysian ear" attached to the vessel would not affect the transmission. It is thought that vessels might be signaled at a distance of thirty miles in this way, and we think it not impossible that such a result might be attained.

ST. ANTHONY'S NOSE AND THE MANUFACTURE OF SULPHURIC ACID.

It appears that a portion of the rocks on the Hudson river named in honor of one of the best saints in the calendar, abounds in sulphurous pyrites, and that the manufacturers of oil of vitriol are fast blowing off St. Anthony's nose, so that soon nothing will be left but the name.

The cliff at this point contains large deposits of pyrites, and recently extensive sulphuric acid works have been erected on an island in the river, the sulphur for which is obtained by roasting the ore on the spot.

Hitherto all of the sulphur for acid works was imported from Sicily. In England they have long been in the habit of making sulphur from their own ores, and have thus effected a great saving in various ways; first, in the cost of the sulphur, and, secondly, in the reclamation of copper from ores that would otherwise have been worthless. They also manufacture large quantities of red paint out of the iron pyrites, and sometimes smelt the oxide to iron. The fact that it is found to pay to take the factory to the mines of sulphur, leads us to hope that eventually the auriferous copper and iron ores of Colorado can be advantageously worked in this way, thus furnishing us sulphuric acid for a large number of industries, while the whole of the copper and gold can be obtained. This solution of the difficult question of how best to work these ores would no doubt be the most practical of any, and would do away with the disagreeable and expensive system of amalgamation hitherto practiced.

We need sulphuric acid works all over the country to enable us to manufacture our own soda ash, and for refining petroleum and converting the phosphates of Crown Point and South Carolina into super-phosphates for our land.

EXTENSION OF A SEWING MACHINE PATENT.

On the 8th of May, 1849, a patent was issued to John Bachelder for an improvement in sewing machines. The claim covers an endless cloth holder in combination with a device for discharging the cloth after being sewed. This patent in due course of time became the property of the Sewing Machine combination, and was extended by the Commissioner of Patents for seven years from May 8, 1863, and now by the expiry of the patent, the invention has become the property of the public. We understand that an application is now pending before Congress for another extension of the Bachelder patent, and that strong efforts are making to secure favorable action upon the petition. It does not appear that any protest has been filed against the extension, and it is possible that the Committees on Patents may be persuaded to consider the case as one of great merit; but we can assure the Committees that the public feels a deep interest in the matter, and will not sanction the extension of this or any other patent for the exclusive benefit of a giant monopoly such as now controls the entire sewing machine interest of this country.

M. DIDIERJEAN read a note at a recent meeting of the Academy of Sciences, calling attention to the fact that milk is a preservative from the poisonous effects produced by lead upon the workmen who are engaged in the preparation of its compounds.

Facts for the Ladies.

I have used Wheeler & Wilson's Sewing Machine for the past six years, and it has, in all respects, surpassed my highest expectations. During this time, though I have done all my family sewing upon it, it has not needed the slightest repair, and I am still using the needles I got with the machine, never having either broken or bent one.

MRS. S. W. BURCKETT.

No. 3 Seventh ave., Brooklyn.

Business and Personal.

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

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

For Sale—An engine, 7x11, to be sold to put larger one in its place. Apply at 411 West 50th st.

First-class Locomotive Boiler, twenty flues, 1-2-in. diam., 9-in. long. Price $25. E. P. Watson, Box 4436, New York.

Direct-acting Steam Circular Saw Mill—Mill and engine combined in one machine. The power of the engine applied directly to the saw without belts. They are now in successful operation. Patent applied for. E. H. Bellows, Worcester, Mass.

The "Union Water Meter Co.," Worcester, Mass., Manufacture Steam-pressure Regulators, the best machine in use for reducing and regulating the pressure on paper machines, bleacheries, slushers, and all places where an even temperature is desired.

For foot-power engine lathes address Bradner & Co., Newark, N.J.

Lithograph Press, Stone, etc., for sale, $10. 16 Beach st.

Lubricators and Oil Cups for shafting and machinery. Broughton's are the best. Manufactured only by H. Moore, 41 Center st.

Wanted—A good second-hand molding or sticking machine, medium size. Milton Bradley & Co., Springfield, Mass.

Rawhide Carriage Washers are cheaper than leather, and run with less noise than any other. Darrow Manufacturing Co., Bristol, Conn.

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 61 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Catlin's Patent Self-closing Barrel Filler for filling packages with liquids of any kind. See other advertisement, and address, for circular, S. C. Catlin, Cleveland, Ohio.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

Pictures for the Sitting Room.—Prang's latest Chromos, "Flowers of Hope," and "Flowers of Memory." Sold in all Art and Book Stores throughout the world.

Tempered Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

Shop, Town, County, or State Rights for sale, for Patent Coal Scuttle. For circular, etc., address T. T. Markland, Jr., 1515 South st., Philadelphia, Pa.

L. L. Smith, 6 Howard st., N. Y., Nickel Plater. First Premium awarded at the late Fair of the American Institute. Licenses granted by the United Co., 17 Warren st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-ton propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

An experienced mechanical and railway engineer wishes a position as Master of Machinery, or Manager. Address "Engineer," Station "G," Philadelphia, Pa., Postoffice.

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

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Caldwell's Dryer dries Brick, Fire Brick, Tile, Peat, Whiting, etc., as fast as made. J. K. Caldwell & Co., Philadelphia.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming 12 years in use. Beware of Imitations.

Recent American and Foreign Patents.

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

CLAMPING MACHINE.—James H. Humes, East Saginaw, Mich.—This invention relates to improvements in machines for clamping sash and other like frames of wood, for squaring them up and holding them for fastening, and it consists in an arrangement on a table having a strong frame around the edge and raised above it, of two sliding clamping bars at right angles to each other, on horizontal slides working in slots in the table top, by means of cranked shafts below operated by treadles or hand levers, to which slides the bars are adjustably connected by angle plates, to be changed for larger or smaller frames, and which have set screws for adjusting the clamping bars to the shape of the frames to be clamped.

PROJECTILE FOR RIFLED CANNON.—John G. Butler, Fort Leavenworth, Kansas.—This invention relates to an improvement in lifting studs applied to projectiles for the purpose of centering the front ends of the same, and the invention consists in the combination with a projectile of a band and studs, both expansible and respectively fitted in undercut cavities at the front and rear ends of a projectile.

LEMON SQUEEZER.—James L. Jensen, Brooklyn, N. Y.—This invention relates to improvements in lemon squeezers, and consists in an improved means of attaching the porcelain cups or bowls to the handles.

BEDSTEAD.—James C. Merritt, West Point, N. Y.—This invention consists in so constructing the parts and rails of a bedstead that they may be securely and durably fastened together without screws or metal fastening of any description, and a strong and perfect bedstead formed thereby.

BRIDLE BIT.—M. J. Firey, Mansfield, Ohio.—This invention relates to a new and useful improvement in bridle bits, whereby they are made more effective in securing horses to posts or other fixtures, than bridle bits have heretofore been.

STEAM BOILER BLOW-OFF PIPE.—John C. McLaughlin, Pittsburgh, Pa.—The object of this invention is to provide efficient means for clearing the bottoms, or interior lower surfaces of steam boilers of scale and sediment, thereby preventing such boilers from being damaged by the fire.

PERCOLATOR.—Albert Merrell, Cincinnati, Ohio.—The object of this invention is to furnish an apparatus by means of which percolation can be forced, either by removing the pressure of the atmosphere by vacuum from the bottom of the percolator, or by forcing air into it at the top, or both, and thereby greatly accelerating and more perfectly performing the operation known in pharmacy as percolation.

COMBINED IRON AND STEEL BARS.—Elbridge Wheeler, Hudson, Mass.—This invention relates to improvements in the manufacture of metal bars, having for its object to provide merchantable bars of combined iron and steel, of any size, shape, and length, the two metals being permanently welded and adapted for working by the common methods into any required articles.

ELEVATING APPARATUS.—P. R. Berry, Youngstown, Ohio.—This invention relates to improvements in apparatus for elevating brick, mortar, and other building material in the erection of buildings, and consists in a platform, sectional vertical guides, and a safety holding apparatus for the platform, arranged for hoisting the material either by manual labor or by horse or steam power in a rapid and economical manner.

VEGETABLE CUTTER, SCRAPER, ETC.—A. W. Pagett, Springfield, Ohio.—This invention relates to improvements in machines for washing, cutting, pressing, and scraping vegetables for food, fruit for making cider, wine, etc., and for crushing beefsteak, stuffing sacks for sausages, and other like uses. The invention consists in a peculiar construction and arrangement in one machine, of a washing apparatus, a pressing apparatus for separating the juice from the pomace, also applicable for stuffing, a cutting, and a scraping apparatus, under an arrangement whereby all the operating parts may be worked by one hand lever, and whereby the same may be simply and cheaply constructed.

RAILROAD RAILS.—Elbridge Wheeler, Hudson, Mass.—This invention relates to improvements in railroad rails, and consists in the construction of rails, either of iron and steel, or all iron, so that the whole of the exterior shell, or the whole of the same except the base will be formed of homogeneous steel or iron, and welded to the central iron part with no seams or "lines of filling" extending to the surface, except at the edges of the base, and so that more perfect welds will be formed between the steel and iron.

RATTAN CUTTER FOR UMBRELLA RIBS.—John Murphy, Green Point, N. Y.—This invention has for its object to construct a tool by means of which rattan can be cut on three sides for umbrella ribs, and the outer separated parts split, to be useful for caning chairs. The invention consists in the construction of a cutter, having three cutting sides, and open on the fourth side, and provided with outward projecting splitting ribs.

WASHING MACHINE.—Israel Baker, Tomah, Wis.—This invention has for its object to furnish an improved washing machine, which shall be simple in construction, and effective in operation, and which may be manufactured and sold for a small amount.

WASHING MACHINE.—Gustavus Hamel, De Soto, Mo.—This invention has for its object to furnish an improved washing machine, simple in construction, easily operated, and effective in operation, washing small and large articles with equal facility and thoroughness.

POTATO DIGGER.—Daniel Bibbee, and William Rand, Letart Falls, Ohio.—This invention has for its object to furnish an improved potato digger, which shall be so constructed as to raise the potatoes and soil, and separate the potatoes from the soil and from the weeds and grass that may be raised with them, and deposit the potatoes in a box, and which shall at the same time be simple in construction and operation.

WATCHES.—Henry Stauffer, Ponts Martel, Switzerland.—This invention relates to improvements in watches, and consists in an arrangement of the large second hand, commonly called "dead second," to beat full seconds at one beat, instead of making several beats to a second as they now do. It also consists in arranging it to beat in unison with the quarter second, the same being connected together by gearing arranged in a novel manner.

HORSESHOE.—S. J. Baker, Madison Centre, Me.—This invention relates to improvements in horseshoes, for spreading the heels of horses, that have become too contracted, and it consists in jointing the two parts of the shoe at the front to a plate to which the toe calk is attached by a rivet through each part, and a central rivet at the space between the ends of the two parts, the latter to prevent the two parts from shifting forward or back. It also consists in beveling the rear parts of the shoe from the inside outward and downward, so that the walls of the heel fitted thereon will be gently forced outward; and it also consists in the application to the said rear parts, of a spreading seam, for gradually setting the parts outward from time to time when the shoe is attached to the foot, to spread the heel.

MACHINE FOR MAKING HARROW TEETH.—James Morgan, Pittsburgh, Pa. This invention relates to improvements in machines for making harrow teeth, and consists in an arrangement of a pair of pressing and pointing dies, a fine cutter, and a cutter for cutting off the bar.

SCREENS.—W. C. Chapman, Charleston, S. C.—This invention relates to improvements in the construction of rotary, reciprocating, or other screens or sieves for screening rice and other grains, and consists in making screens with meshes in the form of oblong parallelograms, of round or other oval formed wire, preferably wound (in the case of circular screens) spirally over the transverse ribs, widely separated, and confined to them by small wires wound around each, determining the width of the spaces between the wires; and in the case of flat screens, stretched across the transverse wires and similarly secured, or in some cases stretched from end to end of the rotary screen, the transverse ribs being arranged the other way, but not spirally.

COTTON SEED PLANTER.—Edward J. Hudson, Golconda, Ill.—This invention has for its object to sow two "stands" of cotton seed at one and the same time, one of which shall be covered deeply, and the other shallow, in order that, if the weather be wet the shallow-covered seed may germinate, and if the weather be dry the deeply covered seed may come up, and the farmer thus be reasonably sure of a crop in either alternative.

TOY HOOP.—Philipp Hessemer, Washington, D.C.—This invention consists in the combination of tags painted in different colors with the spokes of a hoop, one tag to each spoke, and in the arrangement of one tag near or next to the hub of the hoop, the second tag at a distance from the hub greater than the length of the first, and the third tag at a distance from the hub greater than twice the length of the first, and so on, in order that, when the hoop is rapidly revolved, it may show as many separate concentric colored rings as there are tags.

RAILWAY GATE.—John B. Rittenhouse and Jos. Collins, Locust Lane, Pa.—This invention has for its object to enable a locomotive engine to automatically open the gates placed across a railway track for the purpose of preventing cattle from straying thereon to places whither they should not wander.

NET WEIGHT SPRING BALANCE.—John Jochum, Brooklyn, N. Y.—This invention relates to improvements in spring balances, whether having circular dials or straight scales over which the index fingers work, and consists in the application of an adjustable pointer or index finger arranged to be set back to zero after the "tare" has been placed on the scale, and indicate the net weight only of the article placed on the vessel for containing it; or in case the dial or scale be arranged to move past a fixed finger, the said dials or scales are to be similarly adjustable.

STRAW CUTTER.—Nelson O'Neil, Purchase Line, Pa.—The object of this invention is to furnish a machine for cutting straw and similar material for feed, which machine shall be cheap, durable, and convenient, and it consists in the arrangement for changing or varying the length of the feed cut.

METALLIC CONNECTIONS FOR MOSQUITO-NET FRAMES.—U. W. Armstrong and Ira Keeney, Evansville, Ind.—This invention has for its object to furnish improved metallic connections for securing the upright and horizontal bars of mosquito-net frames to each other, which said connections shall be simple in construction and effective in operation, enabling the net frames to be readily put up and taken down when required.

BRIDLE BIT.—Milton J. Firey, Mansfield, Ohio.—The object of this invention is to provide suitable and efficient means for securing and controlling horses, more especially designed for vicious and headstrong horses which cannot be controlled by the ordinary bit, or which have a habit of pulling and breaking away when hitched.

PROCESS OF CLEANING AND POLISHING COFFEE BEANS.—Charles C. Warren and James B. Baldy, Toledo, Ohio.—This invention has for its object to simplify the process of cleaning and polishing raw—that is, not roasted—coffee beans, and to prevent the application of foreign substances to the beans during such cleaning process.

CRANK MOTIONS FOR ENGINES.—John Smith and Godfrey Jolthe, Newark, N. J.—This invention relates to certain improvements in that kind of crank motion in which, by the application of two gear wheels the motion of the crank shaft is doubled. The invention consists in mounting the crank upon a sleeve which turns loose on the crank, and which carries a cam for setting the valve. The sleeve, cam, and crank make but one revolution to two of the shaft, and the valve is therefore set to produce one rotation of the crank whose shaft meanwhile turns twice.

STEAM GENERATOR.—T. S. La France, Elmira, N. Y.—This invention relates to a new vertical steam generator, which is so constructed that the heat of the fire is almost entirely utilized, and that steam can be very rapidly produced. The invention consists in a new arrangement of double pipes which lead from the main water chamber into the fire-box, and in which a complete circulation of the water will be obtained to create steam rapidly. The invention also consists in the use of a novel superheater.

ADJUSTABLE SHEDS AND ROOFS.—Francis L. Hall, Oneida, N. Y.—This invention relates to a new manner of hanging the protecting leaves of field and garden sheds, and the roofs of equivalent structures, with a view of allowing their adjustment in every direction for letting the rays of light pass through from either side.

HEATER.—John F. Still, West Farms, N. Y.—This invention relates to improvements in heaters, for heating dwellings and the like, by means of cold air received into a space between the shell of the combustion chamber and an outer shell, to be heated and then conveyed to the room to be heated and it consists in an arrangement, in the said space, of heating plates, draft-regulating heaters, and a water reservoir, whereby the air is heated and mixed with the vapor rising from water contained in the said reservoir, in any efficient manner, the said arrangement being such that the heater may be very cheaply constructed.

PRESS FOR COTTON AND OTHER SUBSTANCES.—W. I. Blackman, Columbus, Miss.—This invention has for its object to furnish an improved press for compressing bales of cotton, and other substances, which shall be strong, durable, simple in construction, effective in operation, and may be built at a trifling expense.

SCREENS, GRATINGS, ETC.—Charles Lockwood, Haverstraw, N. Y.—This invention has for its object to improve the construction of the metallic part of the screen or grating, and the manner of its attachment to the frame, to adapt it for use for sand and coal screens, ash sieves, door and window gratings, wool-washing machine gratings, and similar purposes.

CHURN DASHER.—Philip Edgerton, Rutland, Vt.—This invention has for its object to furnish an improved churn dasher which shall be so constructed and arranged as to throw the milk into various currents and counter currents, thereby violently agitating it, bringing the butter in a very short time, and developing all the butter that may be in the milk.

STOVE FOR HEATING PURPOSES.—Dewitt C. Clark and Henry W. Cady, Sioux City, Iowa.—This invention relates to a new and useful improvement in stoves, for heating purposes, whereby such stoves are rendered more efficient for the purpose intended than stoves of ordinary construction, and it consists in forming chambers between the outer wall or casing of the stove, and in a damper in the lining, and in a dividing partition.

ANIMAL TRAP.—William D. Lindsley, Eudora, Kansas.—This invention relates to a new and useful improvement in traps for catching rats and mice, and other animals, and consists in making the trap in two compartments, and so arranging the mechanism, that the animal springs the trap in one compartment, and is caught, and, in attempting to escape by passing into the other compartment, he resets the trap.

STYLUS FOR HAND WRITING.—A. S. Carleton, Providence, R. I.—The object of this invention is to provide a substitute for the ordinary writing pen, whereby a constant supply of ink may be always ready for use, and by which a light or a heavy and uniform ink mark may be made on paper; and it consists in an ink fountain tube, tapered nearly to a point at one end, and discharging the ink therefrom, the flow of ink being regulated by an adjustable needle valve, and by an adjustable air valve, or screen.

PORTABLE WRITING DESKS.—William Bothe, Williamsburgh, N. Y.—This invention has for its object to improve the construction of portable writing desks, so as to make them stronger, more durable, and less liable to get out of order.

WASHING FLUID.—John Rolinder, Brooklyn, N.Y.—This invention has for its object to furnish an improved washing fluid, or soft soap, which will readily and thoroughly remove dirt and grease, will bleach the clothes, and will not injure the fabric.

MUSICAL STAFF.—Horton Wright, Akron, Ohio.—This invention has for its object, and consists in, drawing the lines of the staff to correspond essentially with the key-board of a musical instrument, such as a piano, melodeon, etc. Or, so as to be, in fact, identical with said key-board.

AUTOMATIC LIQUID MEASURE AND FUNNEL.—Theodore W. Ellis, Macon, Ga.—This invention has for its object to furnish an improved liquid measure which shall be so constructed that exactly the desired amount of the liquid will flow out, automatically, from the measure into the receiving vessel the measure acting, at the same time, as a funnel.

SHEET METAL PIPE FORMING AND THREADING MACHINE.—M. K. Pierce, Calahan's Ranch, Cal.—This invention relates to new and useful improvements in machinery for forming sheet metal pipe, and forming screw threads on them. It consists in the combination with a bed plate, having oblique grooves and ribs along each margin, of a forming roller, having spiral grooves and projections at the ends, so corresponding to those on the bed that when placed thereon its projections will fit in the grooves of the bed, and the projections of the latter will fit in the grooves of the former, and operating gear for pressing the roller down upon a sheet placed between it and the bed and attached to one end of the roller, and rolling the latter along the bed, to impart by the said grooves and projections spiral threads to the sheet, which is rolled up at the same time into tubular form, and forced upon punches, which are so arranged in the bed as to punch the lapping edges of the plate to form the rivet holes for connecting them.

ATTACHING SPONGE AND CHALK HOLDER.—Cornelius S. See, New Brunswick, N.J.—This invention relates to improvements in attaching sponge and chalk holders to desks, billiard, and other tables, and consists in providing slotted metal holders for the handles or shanks of the cups, for permanent attachment to the tables, and for connection of the shanks in the slots of the holders, in a way to hold them more permanently, and to prevent the holding screws from getting loose as they now do when screwing the vibrating shanks up against the wood.

GRINDING ATTACHMENT FOR CARDING MACHINES.—Andrew J. Burke, Mansfield, Ct.—This invention relates to the application to carding machines of an attachment for imparting motion to the carding cylinders in the direction opposite to their working motion—as is required for grinding the cards—by means of the main driving belt while working on the loose pulley of the main card shaft, and without the labor and delay involved in the present practice of lengthening and crossing the driving belt.

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104,095.—HANDLE FOR CROSSCUT SAW.—Emanuel Andrews, Williamsport, Pa.
104,096.—WASHING MACHINE.—Israel Baker, Tomah, Wis.
104,097.—HORSESHOE.—Sanford J. Baker, Madison Center, Me.
104,098.—CAR COUPLING.—William Rondeau Baker, Trempealeau, Wis.
104,099.—SPARK ARRESTER.—William Ballard, Caroline, N. Y.
104,100.—BREECH-LOADING FIRE-ARM.—K. V. Barnekov, Cornwall, N. Y.
104,101.—HAWSE-PIPE STOPPER.—Orin B. Bearse, Hyannis, Mass.
104,102.—ELEVATING APPARATUS.—P. R. Berry, Youngstown, Ohio.
104,103.—PRESSES FOR COTTON, ETC.—W. I. Blackman, Columbus, Miss.
104,104.—SOFT SOAP OR WASHING FLUID.—John Bolinder, Brooklyn, N. Y.
104,105.—APPARATUS FOR FEEDING CATTLE ON RAILWAY TRUCKS.—W. J. Bonser, London, England.
104,106.—HAME-TUG FOR HAMES.—Nathan Botsford, Somerset, N. Y.
104,107.—MILLSTONE DRESS.—Daniel Bowman, Johnson City, Tenn.
104,108.—PROJECTILE FOR ORDNANCE.—J. G. Butler, Fort Leavenworth, Kansas.
104,109.—FOUNTAIN PEN.—Albert S. Carleton, Providence, R. I.
104,110.—TRUSS BRIDGE.—M. S. Cartter and H. B. Cartter, St. Louis, Mo.
104,111.—APPARATUS FOR MAKING TUBING.—James Cassidy (assignor to himself and H. K. Flagler), East Boston, Mass.
104,112.—RICE SCREENS.—William C. Chapman, Charlestown, S. C.
104,113.—SNOW PLOW.—Thomas C. Churchman, Sacramento, Cal.
104,114.—MACHINE FOR FORMING ELLIPTIC SPRINGS.—J. B. Cleveland and H. C. Guildersleive, Newark, N. J.
104,115.—OIL CUPS AND BEARINGS FOR SPINDLES.—Eugene Convers, Oswego, N. Y.
104,116.—FOLDING SCHOOL DESK.—Eugene Convers, Oswego, N. Y.
104,117.—SELF-PROTECTOR.—Daniel P. Cook, Hartford, Conn.
104,118.—BROOM AND WHISK.—E. P. Cooley, New York city. Antedated June 6, 1870.
104,119.—PULLEY.—G. B. Cowles, Bridgeport, Conn.
104,120.—BUTTER EXTRACTOR.—Thomas Curtis, Holly, Mich.
104,121.—MACHINE FOR FINISHING STAVES.—Amos Cutter, Boston, Mass. Antedated May 17, 1870.
104,122.—PAPER FILE.—Augustus Day, Detroit, Mich. Antedated May 27, 1870.
104,123.—VEGETABLE WASHER.—Richard Derham, Bermondsey, England.
104,124.—HORSE HAY FORK.—W. E. Derrick (assignor to himself and G. B. Gravison), Jordan, N. Y.
104,125.—HAIR BRUSH OR COMB.—Thomas Divine, Charleston, S. C.
104,126.—HYDROCARBON VAPOR MACHINE FOR ILLUMINATING PURPOSES.—B. B. Douglas, Newark, N. J.
104,127.—CHURN DASHER.—Philip Edgerton, Rutland, Vt.
104,128.—FAUCET.—Asa Eggleston, Fall River, Mass.
104,129.—LIQUID MEASURE.—Theodore W. Ellis, Macon, Ga.
104,130.—SEPARATING AND REFINING METALS.—C. S. Eyster, Denver, Colorado Territory.
104,131.—HORSE HAY RAKE.—William H. Fay, Camden, N. J.
104,132.—WOODBOX.—Frank Ficht, Dyckesville, Wis.
104,133.—BRIDLE BIT.—M. J. Firey, Mansfield, Ohio.
104,134.—BRIDLE BIT.—M. J. Firey, Mansfield, Ohio.
104,135.—CARRIAGE SPRING.—J. S. Foster, Salem, Mass.
104,136.—COMBINED GRATE FRONT AND OVEN.—J. W. Gillespie and Wm. Hughes, Alliance, Ohio.
104,137.—LOOM TEMPLE.—Albert H. Gilman, Boston, Mass.
104,138.—TREATING GRAIN TO OBTAIN EXTRACTIVE MATTER FOR COLORING AND FLAVORING SPIRITS.—Samuel H. Gilman, Galveston, Texas.
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104,141.—PORTABLE SELF-ELEVATOR.—H. L. Hall, Buffalo, N. Y.
104,142.—ADJUSTABLE SHED.—F. L. Hall, Oneida, N. Y.
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104,145.—FIRE KINDLING.—J. L. Hannum and S. H. Stebbins, Berea, Ohio.
104,146.—LINIMENT.—O. P. Hare, Petersburg, Va.
104,147.—DOVETAILING MACHINE.—Elander Heath, San Francisco, Cal.
104,148.—STAMP CANCELER.—Eli E. Hendrick, Carbondale, Pa.
104,149.—CENTRIFUGAL MACHINE.—S. S. Hepworth, Cold Spring, N. Y.
104,150.—TOY HOOP.—Philipp Hessemer, Washington, D. C.
104,151.—METHOD OF MOUNTING CROQUET BOARDS.—H. R. Heyl, Philadelphia, Pa. Antedated May 30, 1870.
104,152.—PAPER-RULING MACHINE.—Wm. O. Hickok, Harrisburgh, Pa.
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104,155.—STANDARD FOR DROP LIGHT.—John Horton, New York city.
104,156.—RAILWAY SWITCH.—J. R. Howell, Atlanta, Ga.
104,157.—COTTON-SEED PLANTER.—Edward J. Hudson, Golconda, Ill.
104,158.—STOVE ILLUMINATOR.—G. G. Hunt, Bristol, Ill.
104,159.—LEMON SQUEEZER.—James L. Jensen, Brooklyn, N. Y.
104,160.—SPRING SCALE.—John Jochum, Brooklyn, N. Y.
104,161.—SCHOOL FURNITURE.—J. M. Johnson, Chillicothe, Ohio.
104,162.—ROAD SCRAPER.—D. B. Jones, Wood Station, Ohio. Antedated June 3, 1870.
104,163.—NAIL FOR PICTURES, ETC.—Hubert J. Judd, Brooklyn, N. Y.
104,164.—TASSEL HOOK.—H. L. Judd, Brooklyn, N. Y.
104,165.—DIE FOR FORGING VISE BOXES.—Christian Konold, Pittsburgh, Pa.
104,166.—PLOW.—Matthew Laflin and Enos Slosson, Chicago, assignors to Matthew Laflin.
104,167.—STEAM GENERATOR.—T. S. La France, Elmira, N. Y.
104,168.—OIL PUMP.—L. S. Lapham (assignor to M. S. Brown), Providence, R. I.
104,169.—PAPER-BAG MACHINE.—Hervey Law, Chatham, N. J.
104,170.—HOBBY HORSE.—John Liming, Philadelphia, Pa.
104,171.—CARPET CLEANING MACHINE.—H. H. Lindhorst, St. Louis, Mo.
104,172.—ANIMAL TRAP.—William D. Lindsley, Eudora, Kansas.
104,173.—SCREEN.—Chas. Lockwood, Haverstraw, N. Y.
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104,177.—"FOUR-HIGH ROLLS" FOR ROLLING METAL.—G. F. McCleane, Pittsburgh, Pa.
104,178.—STEAM BOILER BLOW-OFF PIPE.—J. C. McLaughlin, Pittsburgh, Pa.
104,179.—CRUCIBLE STAND FOR FUSING METALS.—J. C. McManus, Providence, R. I.
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104,181.—PERCOLATOR FOR DRUGGISTS AND OTHERS.—Albert Merrell, Cincinnati, Ohio.
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104,184.—MACHINE FOR MAKING DOUBLE-POINTED TACKS.—Purchase Miles, New York city.
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104,186.—MACHINE FOR MAKING HARROW TEETH.—James Morgan, Pittsburgh, Pa.
104,187.—FEED-WATER HEATING APPARATUS.—J. F. Morse, Oshkosh, Wis.
104,188.—STEAM GENERATOR.—Joseph Nason and David Saunders, New York, assignors to Joseph Nason and H. R. Worthington, Irvington, N. Y.
104,189.—CHURN DASHER.—Lewis T. Newell, Geneva, Ohio. Antedated May 20, 1870.
104,190.—MANUFACTURE OF PASTE.—G. G. Noah, Boston, Mass.
104,191.—CHURN.—J. H. Ormsby and R. S. Harton, Holden, Mo.
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104,193.—METALLIC CAP FOR TIN CANS.—Geo. H. Perkins, Brooklyn, N. Y.
104,194.—MANUFACTURING CARRIAGE SPRING HEADS.—W. R. Petrie, Westville, Conn.
104,195.—ALARM ATTACHMENT FOR LOCKS AND BOLTS.—C. E. Pierce, New York city.
104,196.—SHEET-METAL PIPE FORMING AND THREADING MACHINE.—M. K. Pierce, Calahan's Ranch, Cal.
104,197.—DEVICE FOR RAISING AND LOWERING GAS FIXTURES.—J. F. Pond, Cleveland, Ohio. Antedated June 1, 1870.
104,198.—VESSEL FOR PACKING BUTTER AND OTHER ARTICLES.—William Pratt, New York city.
104,199.—TURBINE WHEEL.—Matthias Rapp, Rapp's Mill, Va.
104,200.—HEELS FOR BOOTS AND SHOES.—Joseph Read, Philadelphia, Pa.
104,201.—CASTER FOR BILLIARD TABLES AND FURNITURE.—William Reagan, New York city.
104,202.—COMB.—J. C. Reed, New York city.
104,203.—INKING APPARATUS FOR PRINTING PRESSES.—I. L. G. Rice, Cambridge, Mass.
104,204.—APPARATUS FOR CURE OF SPERMATORRHOEA.—I. L. G. Rice, Cambridge, Mass. Antedated June 2, 1870.
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104,209.—REFRIGERATOR.—Beneditt Sauter, Danbury, Conn.
104,210.—GATE.—E. B. Scattergood (assignor to W. H. Watts), St. Johns, Mich.
104,211.—BREECH-LOADING FIREARM.—Geo. W. Schofield, U. S. Army.
104,212.—GRATE AND FIRE POT FOR HEATING STOVE.—P. J. Schopp, Louisville, Ky.
104,213.—DRAIN TILE.—F. E. Scott, Centreville, Ind.
104,214.—ATTACHING SPONGE HOLDER TO TABLES, ETC.—C. S. See, New Brunswick, N. J.
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104,225.—HEATING STOVE.—John F. Still, West Farms, N. Y.
104,226.—CATARACT MECHANISM FOR STEAM ENGINES.—J. Storer, New York city. Antedated June 3, 1870.
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104,228.—WINDOW GUARD.—Wm. K. Thomas (assignor to himself and W. E. Hill), Brooklyn, N. Y.
104,229.—TAG FOR SHOE STRING.—Jas. Twamley, New York city.
104,230.—SAW BUCK.—Peter Tyler, Ypsilanti, Mich.
104,231.—EMERY POLISHING WHEELS, ETC.—W. P. Van Kleeck, Charlestown, Mass.
104,232.—CARPET FABRIC.—William Wallace (assignor to himself and Charles McAllister), Philadelphia, Pa.
104,233.—HAY GATHERER.—Charles Waste, Galesburg, Ill.
104,234.—DIE FOR CUTTING SCREW THREADS ON BOLTS.—James E. Weaver, Temperanceville, Pa.
104,235.—DISH WASHER.—Glory Ann Wells, Luzerne, N. Y.
104,236.—TYPE DISTRIBUTING MACHINE.—Chas. S. Wescott, Elizabeth, N. J., and Alex. K. Rider, New York city. Antedated May 9, 1870.
104,237.—COMBINED IRON AND STEEL BAR.—Ellridge Wheeler, Hudson, Mass.
104,238.—MANUFACTURE OF RAILS FOR RAILROADS.—Ellridge Wheeler, Hudson, Mass.
104,239.—CARRIAGE SPRING GUARD.—O. H. Wheeler, Hamlin, Mich.
104,240.—HORSE POWER.—Seth Wheeler, Albany, N. Y.
104,241.—COLORING PHOTOGRAPHS.—Robert Winter, San Francisco, Cal.
104,242.—STOVE GRATE.—Andrew Winterburn, Albany, N. Y.
104,243.—CHAIR SEAT.—Benjamin F. Wright, Charlestown, Mass.
104,244.—BUNG.—Joseph F. Applegate, New Albany, Ind.
104,245.—METALLIC CONNECTIONS FOR MOSQUITO NET FRAME.—Uel W. Armstrong and Ira Keeney, of Evansville, Ind., assignors to U. W. Armstrong.
104,246.—STEAM RADIATOR.—A. C. Baker (assignor to himself and G. F. Laflin), Westfield, Mass.
104,247.—SEWING MACHINE.—Walker B. Bartram, Danbury, Conn.
104,248.—SHIFTING CARRIAGE OR BUGGY SEAT.—Sylvester W. Beach, South Bend, Ind.
104,249.—MACHINE FOR GRADUATING SQUARES, ETC.—C. S. Bement, Southington, Conn.
104,250.—CIGAR PUNCH.—S. J. Bestor (assignor to H. W. Conklin), Hartford, Conn.
104,251.—POTATO DIGGER.—Daniel Bibbee and Wm. Rand, Letart Falls, Ohio.
104,252.—SPRING HINGE.—James Bidwell (assignor to himself and James McMeehan), San Francisco, Cal.
104,253.—GAS MACHINE.—William W. Binny, Auburn, N. Y., assignor to S. N. Bierce, New York city.
104,254.—DUMPING CAR.—Theo. Bootsmann, Tompkinsville, N. Y.
104,255.—PORTABLE WRITING DESK.—Wm. Bothe, Williamsburgh, N. Y., assignor to Culbert & Co., New York city.
104,256.—PIANOFORTE.—William Bourne (assignor to himself and Nathaniel Cummings), Boston, Mass.
104,257.—MACHINE FOR SETTING BUTTON OR LACING HOOK.—Horace C. Bradford, Providence, R. I.
104,258.—STOVE GRATE.—Lewis Bridge (assignor to David Stuart and Richard Peterson), Philadelphia, Pa.
104,259.—PREPARATION OF COLORING MATTER FROM MADDER FOR DYEING.—Thomas Bristow (assignor to Amasa Sprague), Cranston, R. I.
104,260.—NEEDLE SETTER AND THREADER.—R. W. Brown, Providence, R. I.
104,261.—EGG CARRIER.—Abner H. Bryant, Chicago, Ill.
104,262.—GRINDING ATTACHMENT FOR CARDING MACHINE.—A. J. Burke (assignor to himself and J. B. Merrow), Mansfield, Conn.
104,263.—SAFE DEPOSIT BOX.—Wm. H. Butler (assignor to Valentine & Butler Safe and Lock Company), New York city.
104,264.—BOLT HOLDER.—S. R. Butterfield (assignor to himself and S. J. Taylor), Rome, N. Y.
104,265.—HIGH AND LOW WATER INDICATOR.—Wm. Butterfield (assignor to himself and Wm. H. Worden), Madison, Wis.
104,266.—WASHING AND COOKING BOILER.—Nathan T. Case and Emma J. Case, Des Moines, Iowa.
104,267.—CHURN.—Henry Caslow, York, assignor to Jacob G. Myers, Siddonstown, Pa.
104,268.—BRICK MACHINE.—J. L. Chapman (assignor to himself and J. B. Stuart), Philadelphia, Pa.
104,269.—COAL STOVE.—De Witt C. Clark and H. W. Cady, Sioux City, Iowa.
104,270.—EARTH CLOSET.—Lewis G. Clock, Manchester, N. H.
104,271.—GAS BURNER.—Theodore Clough, Dobb's Ferry, N. Y.
104,272.—STOVE COVER, DISH, AND KETTLE LIFTER.—Cyrus Cole, Havana, N. Y.
104,273.—COMBINED STOVE LID AND COVER.—Thomas J. Coulston, Royer's Ford, assignor to E. S. Shantz and Oliver B. Keely, Springville, Pa.
104,274.—HEATING STOVE.—Thomas J. Coulston, Royer's Ford, assignor to E. S. Shantz and O. B. Keely, Springville, Pa.
104,275.—REVERSIBLE CAP AND SPOUT FOR OIL CAN.—E. T. Covell, Brooklyn, N. Y. Antedated June 6, 1870.
104,276.—COMPOSITION FOR TANNING.—G. W. Crabtree and John G. Stoakes, Chocoville, Arkansas.
104,277.—SPRING FOR VEHICLES.—Benjamin Crandall, Jr., Williamsburgh, N. Y.
104,278.—MACHINE FOR MAKING NEEDLES.—C. O. Crosby, New Haven, Conn.
104,279.—LUBRICATOR.—Daniel Currie, St. Louis, Mo., assignor to himself, H. K. Hazlett, and Samuel L. Fisher.
104,280.—CORN PLANTER.—N. C. Davis (assignor to I. N. Hobill), Worthington, Ohio.
104,281.—MANUFACTURE OF PAPER.—Levi Dodge, Waterford, N. Y.
104,282.—MANUFACTURE OF PAPER.—Levi Dodge, Waterford, N. Y.
104,283.—MILLSTONE BALANCE AND COOLER.—William B. Dolsen, Waterloo, Iowa.
104,284.—CONVEYING LIQUID.—Thomas Donnelly, Pittsburgh, and J. H. Anchors and Allen Anchors, Bear Creek Station, Pa.
104,285.—COMPOUND FOR POLISHING AND CLEANING MARBLE.—Peter Doyle and F. P. Colton, Hartford, Conn.
104,286.—VENTILATING ATTACHMENT FOR STOVES.—W. M. Eames, Ashtabula, Ohio.
104,287.—GATE LATCH.—E. E. Earll, Brooklyn, and J. B. Hunter, New York city.
104,288.—CRIB AND CRADLE.—Wm. H. Earnest (assignor for one half his right to Jacob Fromer), Parkersburg, West Va.
104,289.—PUMP.—Edmund Edwards, Westminster, England. Patented in England, August 6, 1868.
104,290.—HARVESTER.—John H. Elward, Polo, Ill.
104,291.—LIME KILN.—Thomas Eunett, Rockford, Ill.
104,292.—DIE FOR FORGING EARS FOR CARRIAGE SPRING HEAD.—John Evans, New Haven, Conn.
104,293.—ANIMAL TRAP.—Edwin B. Everitt, West Meriden, Conn.
104,294.—HINGE.—G. F. Fischer and Alexander Whelan (assignors to themselves and Joseph Kelly), Washington, D. C.
104,295.—TRUSS FRAME BRIDGE.—John Foreman, Pottstown, Pa.
104,296.—EARTH CLOSET.—J. A. French (assignor to himself and R. P. Elmore), Milwaukee, Wis.
104,297.—BAG FILLER FOR FANNING MILL.—J. G. Gephart, Dowagiac, Mich.
104,298.—PLATE LIFTER.—Edwin Gibbs, Richland Centre, Wis.
104,299.—WINDOW.—Erastus W. Giddings, Johnstown, Pa.
104,300.—INKSTAND.—Franklin T. Grimes, Liberty, Mo.
104,301.—PNEUMATIC LIQUID ELEVATOR.—John P. Gruber, New York city.
104,302.—SEED SOWER.—Wm. D. Guseman, J. A. Davis, and H. D. McGeorge, Morgantown, West Va.
104,303.—CORN PLANTER.—Emery E. Hardy and Napoleon Dubrul, Joliet, Ill.
104,304.—CHURN.—Francis M. Harris, Winnamac, Ind.
104,305.—RAILWAY SWITCH.—N. F. Hawkins, Chicot county, Arkansas. Antedated June 3, 1870.
104,306.—RAILWAY CAR COUPLING.—Alexis Hebert, Malone, N. Y.
104,307.—MEDICATED STEAM BATH APPARATUS.—Louis Heine and Charles Scholfield, Philadelphia, Pa.
104,308.—REIN HOLDER.—Jacob Herkimer, San Francisco, Cal.
104,309.—METAL SLEIGH RUNNER.—Daniel Holdman, Waterloo, Iowa.
104,310.—BED BOTTOM.—Enoch Hopkins, Newaygo, Mich.
104,311.—MANUFACTURE OF BEVERAGES FOR MEDICINAL AND OTHER PURPOSES.—E. N. Horsford, Cambridge, Mass.
104,312.—MACHINE FOR MAKING PAPER TUBES.—Conrad Hotz, Zurich, Switzerland, assignor to Paul Corbet and Lesieux.
104,313.—HAY SHELF OR RACK FOR WAGONS.—J. A. Hughes, Tindall, Mo.
104,314.—SASH HOLDER.—Robert B. Hugunin, Cleveland, O.
104,315.—CLAMPING MACHINE.—J. H. Humes (assignor to himself, R. M. Thompson, and L. H. Griffin), East Saginaw, Mich.
104,316.—HINGE.—G. S. Hurford, Canton, Ohio, assignor to himself and Wm. H. Hart.
104,317.—RATCHET DRILL.—Simon Ingersoll, Brooklyn, N. Y., assignor to S. C. Ingersoll, Stamford, Conn.
104,318.—LANTERN.—John H. Irwin, New York city.
104,319.—EARTH CLOSET.—George B. Jewett, Salem, Mass.
104,320.—GATE LATCH.—Job Johnson and Simon Ingersoll, Brooklyn, N. Y., assignors to Job Johnson.
104,321.—DOOR SILL.—Joseph Johnston and E. O. Marlow, Brodhead, Wis.
104,322.—OILER FOR LOOSE PULLEYS.—Charles A. King, Springfield, Mass.
104,323.—FURNACE AND CONDENSER FOR REDUCING CINNABAR AND OTHER VOLATILE ORES.—R. F. Knox and Joseph Osborn, San Francisco, Cal.
104,324.—VIOLIN.—Thomas P. Knox, Boston, Mass.
104,325.—CONCRETE PAVEMENT.—Gabriel Leverich and A. H. Emery, New York city.
104,326.—STEAM AND GAS PIPE HOOK.—C. B. Long (assignor to himself and Jonathan Luther), Worcester, Mass.
104,327.—MANUFACTURE OF FERTILIZERS FROM FISH, ETC.—Orazio Lugo, Baltimore, Md.

104,328.—LET-OFF MECHANISM FOR LOOM.—James Magee (assignor to himself and S. A. Applin), Usquepaugh, and E. C. Clark, Kingston, R. I.
104,329.—WARPING MACHINE.—Colin Mather and William Rossetter, Salford, England.
104,330.—BRICK MACHINE.—Henry Mauthe (assignor to Julien Larru, New York city.
104,331.—HARVESTER.—L. J. McCormick, Wm. R. Baker, and Lambert Erpelding (assignors to C. H. McCormick & Brother), Chicago, Ill.
104,332.—COAL CAR.—Thomas McCrory, Fayette City, Pa.
104,333.—DRYER.—Peter Mickel, Milford, N. Y.
104,334.—CULTIVATOR.—Samuel H. Mitchell, El Paso, Ill.
104,335.—AUGUR.—Christian Monson, Moscow, Wis.
104,336.—FIRE KINDLER.—A. S. Morse and E. A. Jefferies, Fort Wayne, Ind.
104,337.—BORING MACHINE.—William Morstatt, New York city.
104,338.—RATTAN CUTTER.—John Murphy, Green Point, N. Y. assignor to himself and J. F. Tobin, New York city.
104,339.—BAGGAGE CHECK.—Geo. F. Newcomb, New Haven, Conn.
104,340.—EXTENSION-TABLE SLIDE.—Henry Olds, Syracuse, N. Y.
104,341.—PIANO.—C. F. Oliver, Lynn, assignor to Nathaniel Cummings, Boston, Mass.
104,342.—STRAW CUTTER.—Nelson O'Neil, Purchase Line, assignor to himself and Edward O'Neil, Jr., Mitchell's Landing, Pa.
104,343.—PURIFYING ALCOHOL AND SPIRITS.—C. C. Parsons, New York city.
104,344.—SASH FASTENER.—Howard Perkins (assignor to himself and T. E. Grover, Mansfield), and John B. Hartwell, Walpole, Mass.
104,345.—PRINTING-TELEGRAPH INSTRUMENTS.—William P. Phelphs, Brooklyn, N. Y., and W. J. Philips, Philadelphia, Pa.
104,346.—KNITTING MACHINE.—D. C. Philip, Philmont, and Clark Tompkins and Ira Tompkins (assignors to Clark Tompkins), Troy, N. Y.
104,347.—MALT DRYER.—William L. Philips, Normal, Ill.
104,348.—JOINT FOR CEMENT PIPES.—D. G. Phipps (assignor to himself, M. M. Camp, and E. I. Foote) New Haven, Conn.
104,349.—HAY-BINDER POLE FOR WAGON.—Daniel Potter, Peoria, Ill.
104,350.—TREADLE MOVEMENT.—Orlando B. Potter, New York city.
104,351.—EVAPORATOR AND STILL.—M. H. Powers, Pike County, Ind.
104,352.—WATER VESSEL FOR STEAM FIRE-PROOF SAFES. G. W. Putnam, Billerica, Mass.
104,353.—CLOD CRUSHER AND PULVERIZER.—C. T. Ramsey, Farmer Center, Ohio.
104,354.—BRICK MACHINE.—Seth Rigby, 3d, Newcastle, Pa.
104,355.—RAILWAY GATES.—J. B. Rittenhouse, and Joseph Collins, Locust Lane, Pa.
104,356.—COMPOUND TO INCREASE THE FRICTION BETWEEN BELTS AND PULLEYS.—Louis F. Robertson, New York city.
104,357.—FIRE-ALARM TELEGRAPH APPARATUS.—Edwin Rogers, Boston, Mass.
104,358.—SOFA BED.—J. J. Russ, Worcester, Mass.
104,359.—HINGE FOR BLINDS.—Dewitt C. Sage, Middletown, Conn.
104,360.—WALL AND FLOOR FOR BUILDINGS.—John J. Schillinger, New York city.
104,361.—BLACKING BRUSH AND CASE.—John Schwab, Bridgeport, Conn., assignor to himself and Phillip Roller, New Haven, Conn.
104,362.—HYDRAULIC AIR-COMPRESSING APPARATUS.—Wm. D. Seal (assignor to himself and Edmund Sayre), Washington, D. C.
104,363.—MEAT CUTTER.—Henry Seib, New York city.
104,364.—CUTTING APPARATUS FOR MOWING MACHINE.—H. F. Shaw, West Roxbury, assignor to James A. Woodbury, Boston, Mass.
104,365.—HORSE HAY FORK.—Amos Shellenberger (assignor to himself and J. Z. Ligler), Versailles, Ohio.
104,366.—LAMP BURNER.—G. L. Smith (assignor to Bridgeport Brass Company), Bridgeport, Conn.
104,367.—CRANK MOTION FOR ENGINE.—John Smith and Godfrey Jolthe, Newark, N. J.
104,368.—LOG-MEASURING SCALE.—Luther Smith (assignor to himself and James A. Pevey), Lowell, Mass.
104,369.—INTERFERING PAD FOR HORSES.—William Somerville, Buffalo, N. Y.
104,370.—LATCH FOR CUPBOARD.—W. E. Sparks (assignor to Sargent & Co.), New Haven, Conn.
104,371.—WATCH.—Henry Stauffer, Ponts Martel, Switzerland, assignor to Nordmann Brothers, New York city.
104,372.—LAMP.—Leonard Sterling and T. W. Willson, New York city.
104,373.—HAY RACK FOR WAGON.—J. W. Stevens and John P. Bacome, Westville, Ohio.
104,374.—PUMPING APPARATUS.—David Stoner, Canton, Ohio.
104,375.—RAILWAY TRACK CLEARER.—R. B. Taylor, Reading, Pa., assignor to himself, J. H. Boone, Jonathan M. Heller, and C. B. Bertolette.
104,376.—FIRE-PLACE HEATER.—John M. Thatcher, Bergen, N. J.
104,377.—CHECK-REIN ATTACHMENT.—Albert Thayer and W. A. Hastings, Thorndike, Mass.
104,378.—SEWING MACHINE COVER.—W. P. Uhlinger and Justus Doering, Philadelphia, Pa.
104,379.—GAME.—Nicholas J. Vander Weyde, New York city. Antedated June 3, 1870.
104,380.—MACHINE FOR MAKING ROOFING FELTING.—Edward Van Orden, New York city.
104,381.—MACHINE FOR MAKING NETTING.—Aloha Vivarttas, New York city, assignor to himself and John W. Keene, Newark, N. J.
104,382.—PAPER OR PAPER-AND-CLOTH NECKTIE.—Rudolph L. Walter, Washington, D. C. Antedated June 4, 1870.
104,383.—PROCESS FOR CLEANING AND POLISHING COFFEE. C. C. Warren and J. B. Baldy, Toledo, Ohio.
104,384.—GRIST MILL.—C. T. Weston, Sidney Broadbent, and Willard B. Culver, Scranton, Pa.
104,385.—IRONING TABLE AND BUREAU.—Margaret White, Saratoga Springs, N. Y.
104,386.—HARVESTER.—William N. Whiteley, Springfield, Ohio.
104,387.—BREECH-LOADING FIRE-ARM.—J. M. Whittemore, Augusta, Me.
104,388.—CAST IRON TURN-TABLE FOR RAILWAY.—A. J. Wight and W. L. Meeker, Newark, N. J.
104,389.—OIL CABINET.—M. H. Wiley, East Boston, Mass., assignor to himself, Thomas Miller, and J. H. B. Lang, Boston, Mass.
104,390.—TOOL FOR MAKING BOTTLES.—James Wilson (assignor to Elizabeth Matthews, John Matthews, Jr., and Geo. Matthews), New York city.
104,391.—CARD CABINET.—Arthur T. Woodward, New York city.
104,392.—MILK COOLER.—David F. Woodward, Jasper, N. Y.
104,393.—MUSICAL STAFF.—Horton Wright, Akron, Ohio, assignor to himself and O. D. Childs.
104,394.—LOCK FOR FIRE-ARMS.—Alfred Young, Philadelphia, Pa.
104,395.—SASH HOLDER.—John F. Zacharias, Leesburg, Va.
104,396.—COTTON SCRAPER.—James Lytch, Laurinburg, N. C.
104,397.—CORE-BAR FOR CASTING PIPE.—John Enright (assignor to himself, William Wall, and Thomas Enright), Louisville, Ky.

REISSUES.

4,025.—VEGETABLE AND FRUIT PEELER.—E. D. Averell and Joseph Malan, Brooklyn, N. Y.—Patent No. 100,583, dated March 8, 1870.
4,026.—OVEN.—Hosea Ball, New York city.—Patent No. 15,753, dated September 23, 1856; reissue No. 3,666, dated October 12, 1869.
4,027.—STEAM GAGE COCK.—O. T. Earle, Norwalk, Conn., assignee of Albert Bisbee.—Patent No. 13,563, dated September 18, 1855; extended seven years.
4,028.—BEDSTEAD FASTENING.—J. L. Haven & Co., Cincinnati, Ohio, assignees of John Lemman.—Patent No. 58,437, dated October 2, 1866.
4,029.—TOOL FOR MANUFACTURING PAPER BAGS.—E. J. Howlett, Philadelphia, Pa., assignee of himself and Susan Kirk.—Patent No. 63,242, dated Feb. 26, 1867; reissue No 3,718, dated November 9, 1869.
4,030.—RECOVERING GOLD AND SILVER FROM WASTE SOLUTIONS.—Jehyleman Shaw, Bridgeport, Conn.—Patent No. 35,842, dated July 8, 1862; reissue No. 1,651, dated April 5, 1864; reissue No. 3,506 dated June 15, 1869.
4,031.—IMITATION HAIR FOR LADIES' HEAD DRESS.—L. F. Shaw, New York city.—Patent No. 93, 275, dated October 26, 1869.
4,032.—METALLIC CAN BOTTOM.—H. W. Shepard, Mannsville, N. Y., and Robert Seaman, New York city, assignees of H. W. Shepard.—Patent No. 98,526, dated January 4, 1870.
4,033.—FASTENING FOR NECK-TIE.—D. H. Tierney, Forrestville, Conn.—Patent No. 84,974, dated December 15, 1868.
4,034.—STATIONERY FURNITURE.—C. H. Wight, Baltimore, Md.—Patent No. 98,453, dated December 28, 1869.
4,035.—OIL CABINET.—Moses H. Wiley, Thomas Miller, and J. H. B. Lang, East Boston, Mass., assignees of M. H. Wiley.—Patent No. 101,070, dated March 22, 1870.

DESIGNS.

4,148.—LAMP BURNER.—Joseph Bell Alexander, Washington, D. C.
4,149.—SPOOL STAND.—R. G. Clemons, Nashua, N. H.
4,150.—CARRIAGE STEP.—J. W. Curtis, F. A. Briggs, and M. O. Cox, Coldwater, Mich.
4,151.—BOX FOR THE TOP OF BUREAUS.—Cheney Kilburn (assignor to Kilburn & Gates), Philadelphia, Pa.
4,152.—PRINTING TYPE.—Andrew Little, New York city.
4,153.—TRANSPARENT SHIELD.—Israel C. Mayo, Gloucester, Mass.
4,154.—TRADE MARK.—S. P. M. Tasker (assignor to Morris, Tasker & Co), Philadelphia, Pa.
4,155.—SPOON HANDLE.—Robert Wallace, Wallingford, Conn.

Answers to Correspondents.

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

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

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

T. G., of Tenn.—To join two pieces of lead pipe, spread the end of one piece with a conical piece of wood, and scrape down the end of the other piece to a taper. Insert the tapered end into the enlarged end, and rub a little tallow on the parts to be joined. Hold under the joint two or three thicknesses of greased bed ticking, and cover the joint with a ball of melted lead, smoothing the surface with a plumbers' iron. This is easier described than done on the first trial, and you must not be surprised if the job is one that would make an old plumber grin.

J. E. M., of Colorado, states that he was born in Canada, came here before he was 21, has lived here 13 years, served in the Union army, was honorably discharged, and has exercised the right of suffrage here, but has never been formally naturalized. Under these circumstances he asks whether he can take a patent out on the same terms as citizens of the United States; or must he pay $500 like inhabitants of Canada.—We reply that you can take patents here on the same terms as citizens. You are not an inhabitant of Canada.

D. L. P., of Miss.—To find the circumference of an ellipse add together the transverse and conjugate diameters, and multiply the half sum by 3·1416. The product will be the circumference. To find its area, multiply these diameters together, and multiply the product by the decimal ·7854. These rules are incorrect for ellipses in which one diameter is very long in proportion to the other, but they are sufficiently accurate for most practical purposes.

L. D. C., of Mich.—The true reason why the wheels on the trucks of cars and locomotives do not slip is the conical form of the tread of the wheels. The reply sent us is entirely erroneous. Our answer of course supposes proper relation of curves to the conical form of the tread of the wheels, which is not always uniform. Hence there is more or less slip in some cases.

J. K. C., of Mich.—The bronze used for statuary is said to be composed of copper, 91·4 parts; zinc, 5·5; lead, 1·7; tin, 1·4. In preparing this alloy the copper should be first melted. Powdered charcoal should be sprinkled over it to prevent oxidation, and a covered crucible should be used. When the copper is melted the other metals may be added.

D. D. V., of R. I.—The distinction between vapor and steam made by Main, in his treatise on the marine steam engine is this: Vapor is only formed at the surface. Steam is formed from the body of the fluid. Steam is not formed until the liquid has arrived at a certain temperature. The [illegible] of steam is a violent process, while that of vapor is a quiet [illegible].

W. B. W., of [illegible] you are correct. The pressure upon a tight fitting slide valve is equal to the pressure per square inch in the steam chest multiplied into its area in inches. Whatever back pressure is obtained through the parts must be deducted in estimating the effective pressure from which friction arises.

A. B. J., of Me.—To prepare a solution of indigo or sulphindigotic acid, dissolve one part of pulverized indigo in seven parts of fuming oil of vitriol (Nordhausen Sulphuric Acid), and filter. For chemical laboratory use it is generally diluted with pure water until it assumes a pale transparent blue color.

T. L., of N. Y.—The velocity of sound through different kinds of wood varies very considerably. It also travels faster in the direction of the fiber than across it. The velocity of sound through pine lengthwise of the grain is 10,900 feet per second. Across the grain it is only 4,611 feet.

G. Y., of Pa., wants a better cement for rubber and rubber cloth than that sold by the dealers in rubber goods. We know of none. He is mistaken in supposing that rubber goods are joined at the factories by a kind of solvent cement. No solvents are used in their manufacture.

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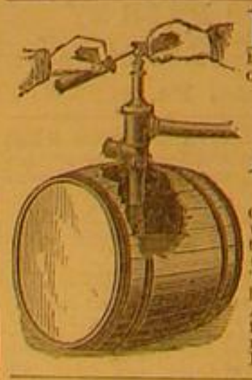
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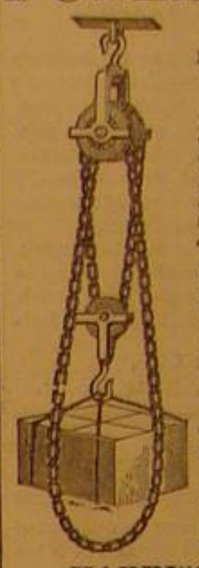
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