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Improved Bolt Cutter.

Most bolt-cutting machines have but two dies in the cutter head. The work performed by these dies is, without doubt, underrated by most mechanics, increasing in severity with the size of the bolts. The machine herewith illustrated has these dies in the cutter head, between which the work is equally distributed, and also possesses such other points of merit as to secure the award of the first prize, the large medal, at the recent Mechanics' Fair at Buffalo.

The principal points of superiority claimed for this bolt cutter is the clean and perfect manner in which the thread is cut by one passage over the iron, with rapidity and ease of action, uniformity of work, simplicity, and durability.

The arrangement of the dies is such, that as soon as they begin to cut, they will close as far as the stop will allow them, and the bolts will be cut the same size, any length.

As soon as the bolt is cut its required length, the dies are opened by the lever and the bolt taken out *without the necessity of running back off the thread.*

The action of the dies is the same as a lathe tool, taking a clean chip, which leaves the thread firm and strong.

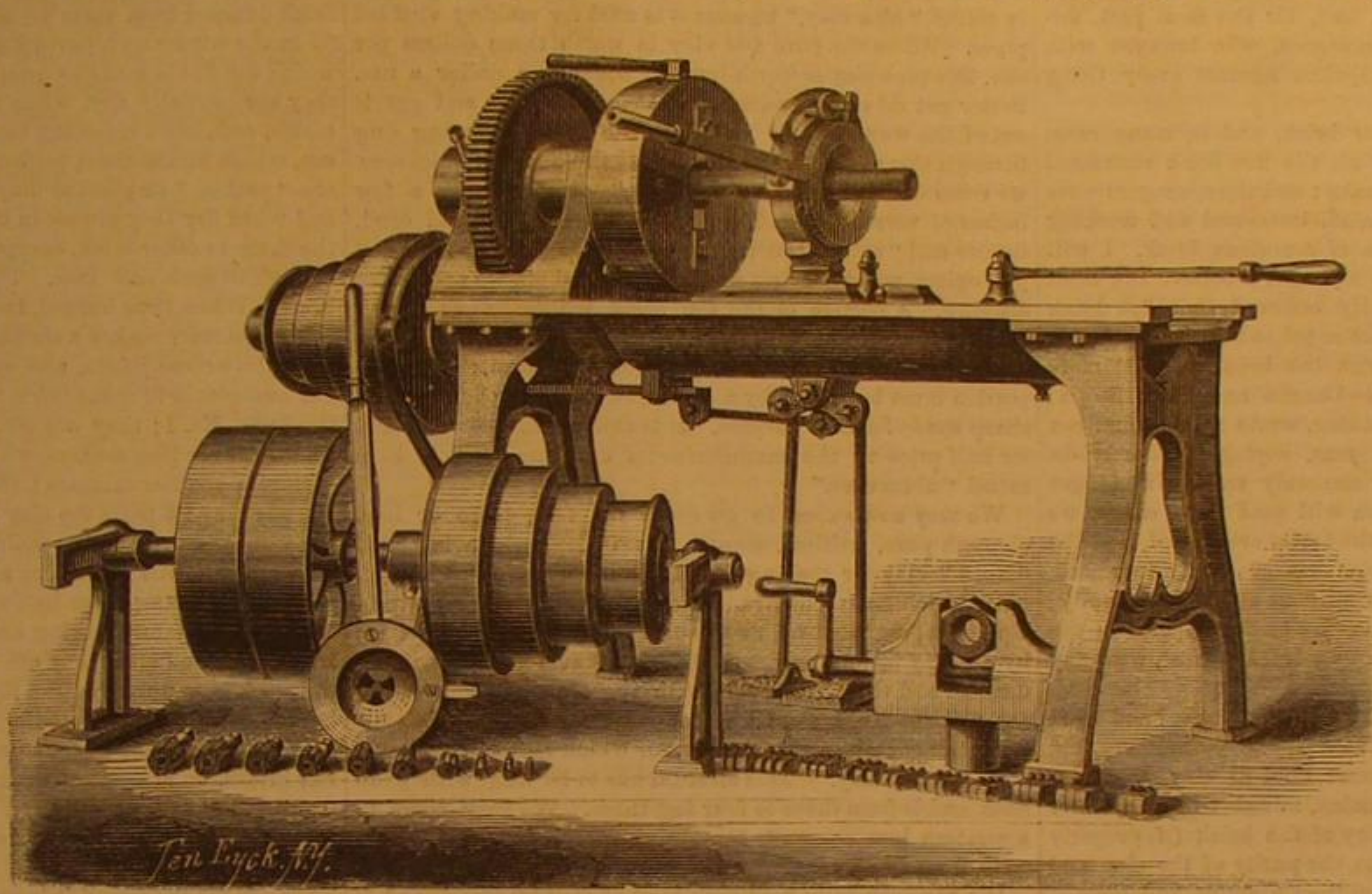
The dies can be sharpened by grinding. When too much worn, they can be taken out of the head, refitted, and re-tempered in a very few minutes. In cutting short bolts, a plug socket is placed in the jaws, which will admit the head of the bolt. In using the socket, it is not necessary to stop the machine to take out or replace the bolt. One socket will answer for all bolts, if it will admit the head and not allow it to turn.

Besides the ordinary V-shaped thread, from $\frac{3}{8}$ to $1\frac{1}{2}$ inches inclusive, by once passing over the bolt, the machine will cut coach screws, and square threads, double and single, such as piano stool, letter press, and cider-mill screws, from $\frac{3}{8}$ to $1\frac{1}{4}$ inches, of not less than four threads to the inch. For sizes, from $\frac{3}{8}$ to $1\frac{1}{4}$ inches, inclusive, square thread, once passing over the bolt with a No. 2 machine, with double center, is sufficient to cut a perfect thread. No. $2\frac{1}{2}$ will cut from $\frac{3}{8}$ to 2 inches, inclusive, V-thread, and to $1\frac{1}{2}$ in. square thread. No. 3 machine will cut from $\frac{3}{4}$ to 3 in., V-shaped, and to $2\frac{1}{2}$ square thread. The machine will also tap nuts of corresponding sizes to bolts cut. With each complete No. 2 machine is furnished a nut holder, and with complete machines, Nos. 2 and 3, are furnished parallel vises for holding nuts, as shown in the engraving, thereby making it a perfect bolt cutter and nut tapper.

Each complete No. 2 single center machine is furnished with six sets of dies, six burrs (master taps), cone, pulleys, counter shaft with hangers, and nut holder. The double-center machines have the same, with eight sets dies and eight master taps. No. $2\frac{1}{2}$, same, with eleven sets dies and eleven master taps. No. 3, single center, same, with eight sets dies and eight master taps. No. 3, double center, same, with twelve set dies and twelve master taps. With cutter heads, dies only are furnished.

The center head may also be employed to advantage on other bolt-cutting machines, or attached to engine lathes, of which those swinging from sixteen to twenty inches are the most convenient for this purpose.

We are informed that many of these tools are now in use, and that they even perform work hitherto reserved for the screw-cutting lathe, such as vise screws, lead screws for lathes, etc. It is stated, and attested by reliable parties, that this machine will cut two 1-inch screws per minute, and nuts with equal rapidity. For further particulars, address R. L. Howard, manufacturer, Chicago street and Erie Canal street, Buffalo, N. Y.

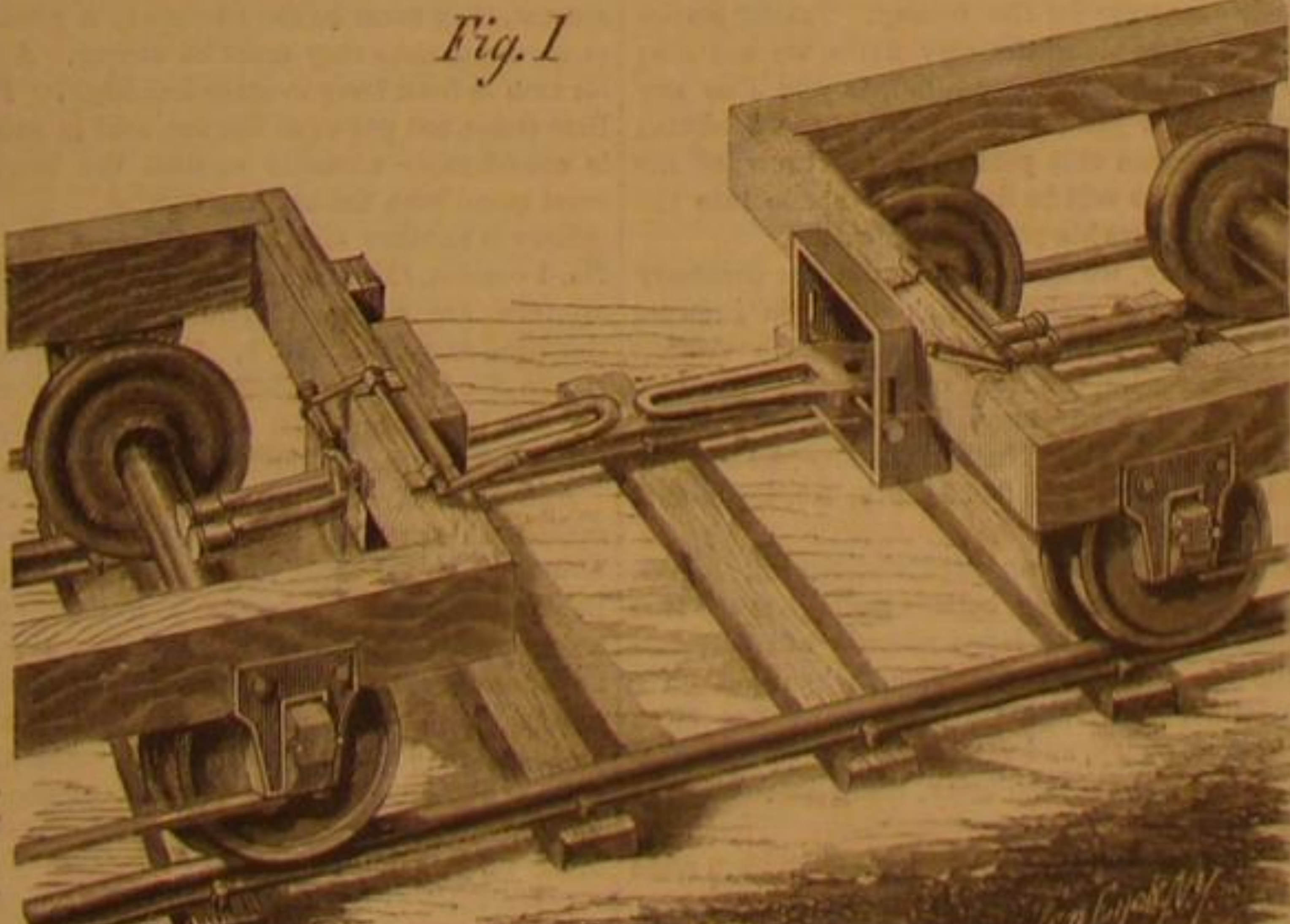


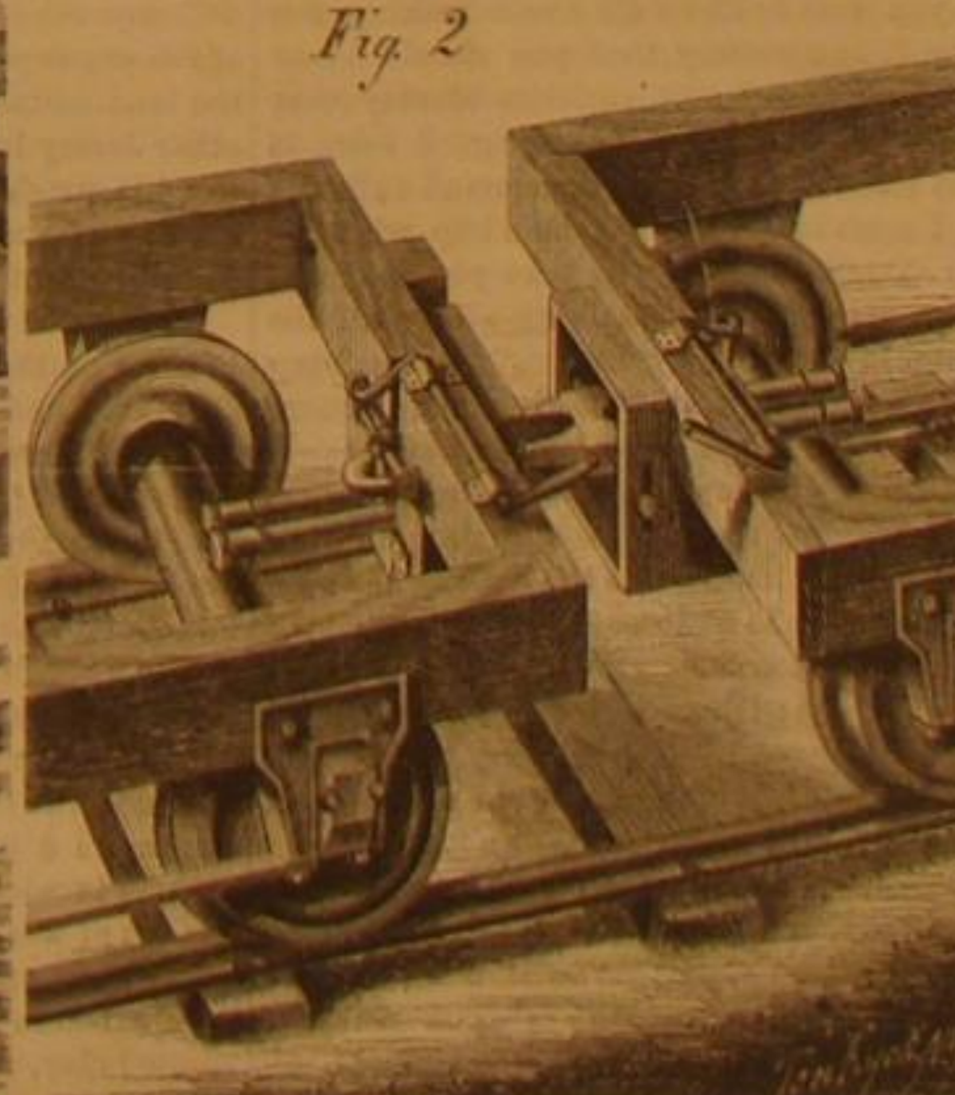
SCHLENKER'S PATENT BOLT CUTTER.

Improved Self-Connecting Car Coupling.

Our reader are well aware that very many attempts have been made to devise a safe and efficient self-connecting car coupling, by which cars will, when run together, couple themselves without the aid of an attendant, whose life is often endangered in coupling cars by the old method.

The one herewith illustrated works well on the model, and we see no reason why it should not also work well in actual practice.





LANDIS' SELF-CONNECTING CAR COUPLING.

Fig. 1 shows two cars with this coupling attached, but uncoupled. Fig. 2 shows the same cars coupled. The uncoupling is very quickly and easily performed without entering between the platforms of the cars, as will be seen upon inspection of the engravings.

The coupling links are pivoted in such a manner as to give both vertical and lateral play, and balanced so that they maintain an approximately horizontal position. The coupling pin has vertical play through the eye of a horizontal bar, which bar has a horizontal rotary motion in suitable bearing. Thus the coupling-pin may swing inward, but can swing outward only to the vertical position where it meets a latch, which holds it from swinging any further until the coupling is raised, as hereinafter described.

To an eye in the upper end of the coupling pin is attached a short link, which connects the coupling pin with a crank lever, by which, when it is desired to uncouple the car, the coupling pin is raised enough to clear the latch, when it swings outward and the coupling link is released.

It makes no difference which coupling link slides on the top of the other. In whatever position they come together they will couple the cars. The device is simple, and, it would seem, might be advantageously applied, to both freight and passenger cars. As it is cheap and certain in its operation we consider it worthy the attention of railroad men.

Patented, Nov. 3, 1868, and assigned to Hiram F. Landis, whom address at Hummelstown, Pa.

Painting in Milk.

In consequence of the injury which has often resulted to sick and weakly persons from the smell of common paint, the following method of painting with milk has been adopted by some workmen, which, for the interior of buildings, besides being as free as distemper from any offensive odor, is said to be nearly equal to oil painting in body and durability. Take half a gallon of skimmed milk, six ounces of lime, newly slaked, four ounces of poppy, linseed, or nut oil, and three pounds of Spanish white. Put the lime into an earthen vessel or clean bucket, and having poured on it a sufficient quantity of milk to make it about the thickness of cream, add the oil in small quantities at a time, stirring the mixture with a wooden spatula. Then put in the rest of the milk, and afterwards the Spanish white.

It is, in general, indifferent which of the oils above-mentioned you use; but, for a pure white, oil of poppy is the best.

The oil in this composition, being dissolved by the lime, wholly disappears; and, uniting with the whole of the other ingredients, forms a kind of calcareous soap.

In putting in the Spanish white, you must be careful that it is finely powdered and strewed gently over the surface of the mixture. It then, by degrees, imbibes the liquid and sinks to the bottom.

Milk skimmed in summer is often found to be curdled; but this is of no consequence in the present preparation, as its combining with the lime soon restores it to its fluid state. But it must, on no account, be sour; because, in that case, it would, by uniting with the lime, form an earthy salt, which could not resist any degree of dampness in the air.

Milk paint may likewise be used for out-door objects by adding to the ingredients before-mentioned two ounces each more of oil and slaked lime, and two ounces of Burgundy pitch. The pitch should be put into oil that is to be added to the milk and lime, and dissolved by a gentle heat. In cold weather, the milk and lime must be warmed, to prevent the pitch from cooling too suddenly, and to enable it to unite more readily with the milk and lime.

Time only can prove how far this mode of painting is to be compared, for durability, with that in oil; for the shrinking to which coatings of paint are subject depends in great measure upon the nature and seasoning of the wood.

The milk paint used for in-door work dries in about an hour; and the oil which is employed in preparing it entirely loses its smell in the soapy state to which it is reduced by its union with the lime. One coating will be sufficient for places that are already covered with any color, unless the latter penetrate through it and produce spots. One coat will likewise suffice, in general, for ceilings and staircases; two will be necessary for new wood.

Milk painting may be colored, like every other, in distemper, by means of the different coloring substances employed in common painting. The quantity I have given in the recipe will be sufficient for one coat to a surface of about twenty-five square yards.—*Painter, Gilder and Varnisher.*

THE MANUFACTURE OF FIRE BRICKS.

Twenty years ago, the manufacture of fire brick in the United States was in its infancy—in an experimental condition. Consumers of fire brick had, for the most part, foreigners, chiefly English, for managers, who brought with them to this country their prejudice against every thing American.

We had to beg them to try our brick, and in many cases pay them for doing so. Nearly all the fire brick consumed at that time, were of English make; and the managers were often agents for English houses, all interested and working together against the production of American brick. I will do them the justice however to say, that I believe the most of them were sincere, and really believed that fire brick could not be produced in America equal to English fire brick. But latterly, American fire brick has been exported more or less to the British dominions—Canada and Nova Scotia; and a British house of high standing, wrote to an American manufacturer within the last year, saying, "Your bricks always give good satisfaction; the only trouble is to get them in small quantities. If you will send us a cargo, we will sell them for you." Thus the tables are turned, and the production of American fire brick has gradually increased, until at this time more than fifty millions are made annually; and I believe the best American fire brick competes in the quality of successfully withstanding intense heat, with any brick produced in the world.

What are they made of? and how are they made? and what is the secret of their production?

Fire brick is made of a peculiar kind of clay, the principal ingredient of which is alumina, mixed with a smaller portion of silex; and the quality of the brick (if properly manufactured) is in exact ratio to the purity of the clay and its freedom from all matters other than alumina and silex.

Fire clay is found in England and west of the Alleghany Mountains in the United States, in the vicinity of coal fields, in a semi-rocky state, resembling soap stone; and in many instances it forms the bed or hearth on which rests the bituminous coal. Like the coal, it contains more or less sulphuret of iron, the worst enemy fire brick makers have to contend with, except it be potash, ½ of 1 per cent of which would ruin any fire clay. The manufacture of fire brick from this kind of clay is the same in all countries, except the difference in machinery to work it, and the process is simple.

But I shall confine myself in this article, mostly to the subject of manufacturing fire brick from the noted fire clay of New Jersey, which is found in the town and vicinity of Woodbridge; and which, so far as I know, is unlike any other fire clay. As you wish to know all about making fire brick out of this clay, it is necessary that you should know all about the stock, or the different varieties of clay that make up the stock; for the secret of making good brick is partly to be found in the stock; and to understand fully its nature and quality, I must invite you to take a trip with me to the clay mines in Woodbridge. I will take you to one of the largest and best worked mines, containing nearly all the varieties of clay found in the fire clay district. On arriving at the mines, we look down into a valley, thirty feet or more below the surface on which we are standing, and behold forty or fifty men, mostly with spades and shovels, a part working into the bank above the clay, and a part digging and throwing clay out from pits, whence the bearing has been removed, on to platforms made of loose boards, from which teams are almost constantly seen loading and carting it away.

The first impression is that it can never pay, the whole bearing and clay to be removed being from forty to fifty feet in depth, and all to be handled with the spade and shovel. Indeed it does seem very much like a mouse endeavoring to eat up a large hay stack. Now we will go down into this valley; if it is a wet time, it will be somewhat difficult to get around on account of the mud that will cling to our boots with great tenacity; but knowledge is often obtained under difficulties. We now find ourselves on a level of the first stratum of clay. Before us rises the bank of earth, thirty, sometimes forty feet high, from the clay to the surface. This is called "the bearing." On the other side of the valley is the "dump ground," rising some twenty-five or thirty feet high, with sewers underneath, which are extended as we proceed, to carry off the water. The bearing is moved across the valley on to the dump ground; and as the bearing recedes, the "dump" moves forward, care being taken to keep room between bearing and dump, to mine and cart away the clay. The best way to move the bearing to the dump, is by means of a portable engine and portable railway. But I shall weary your patience if I go into details too much, and our business is to examine the different varieties of clay that make up the stock for making fire brick.

The workmen have a pit cleared off and all "skived off;" that is, all the rubbish cleaned off down to the clean clay, and to a sufficient distance from the bearing to be out of danger of being filled by a slide from the bearing when half dug out; for the lower part of this bearing is very treacherous. You need have no fear of the bank pitching over upon you; it never pitches over; but the lower part being composed of a black clay mixed up with lignite, quicksand, and sulphuret of iron, and filled with water, sometimes runs out like hot lead, and down comes the bearing with a slide, the top nearly maintaining its level as it descends. Thus you will see that we are always in some danger of having our pit filled with very dirty, impure stuff, against which the superintendant has constantly to guard. Now let us dig the clay. The men clean their boots before they go on or into the pit. The spade is driven in and the "spits" or lumps thrown out. If the clay has a clean, light-colored, bright, silvery look, it is good, "top clay," fit for use in making brick. If there are any impurities, such as colored streaks or small specks of sulphuret of iron, invisible to the naked eye, but known by the gritty feeling on the spades, it must be condemned without mercy and thrown out by itself. Such clay is called "pipe clay," because it is used for making vitrified pipes. While the pure top clay is worth three dollars per tun, this pipe clay is worth but fifty cents or a dollar a tun. Better get rid of it at once for what it will bring and get it out of the way, for we want all the room. Having dug through this strata of top clay, about three feet in thickness, we come to the pure "alum clay," overlaid with a few inches of very dirty stuff, composed of black clay and sand, lignite and "sulphur balls," interesting only to chemists and geologists, which having carefully cleaned off, we commence digging. A portion of the top spits, will be impure, being more or less impregnated with the sulphuret of iron which rested upon it, and when thrown on the platform, the impure portion must be cut off by a careful man placed there with a sharp spade for that purpose. It is thrown one side and sold for half price to the manufacturers of alum, and is here called "alum clay."

We may now expect to go down ten feet, more or less, through pure, gritless, smooth alum clay, which is called "No. 1" clay for making fire brick; but we must continually watch for impurities. The miner may suddenly strike a vein impregnated with sulphuret of iron, which he detects by a gritty feeling on the spade. This must always be condemned and thrown one side with the alum clay. Getting through the No. 1 clay, we come to a much harder clay—pure, but containing more silex, for which reason it is called "No 1 sandy clay." This stratum has to be dug with grub hoes, and is from three to four feet thick. We then come to a stratum less compact, containing more silex, and called "No. 2 sandy clay."

We have carefully kept each kind of clay by itself, and if we have struck a stratum in the fine clay, a portion of which has a red look (which is sometimes the case), we have put that by itself and called it "spotted clay." In some portion of the clay fields, nothing but this "spotted clay" is found; in other portions nothing but "pipe clay," and again in other portions, very little but "top clay."

You will see from the above, that perpetual vigilance is necessary in purchasing stock for the manufacture of fire brick; and this vigilance must be secured *at the mines as the clay is mined.* If the impure is mixed with the pure at the mines, it cannot be separated afterwards; and if we wish to make fire brick that will always give good satisfaction, we must mine our own clay.

But I have kept you a long time at the mines, and we will now take our departure for the factory. Taking a view of the country as we pass along the clay fields, we see that the land under which the clay is deposited, is just like any other Jersey land. It is good farming land; the Irishman has his patch of potatoes this year near the brow of the bank, where next year he will be driving his spade into the clay forty feet below where his potatoes grew.

Arriving at the factory, we find all the buildings necessary to carry on the business of making brick either in summer or winter, and a separate place or shed to store each variety of clay. Here we have, 1st, the No. 1 clay worth $6 per tun, at the mines; 2d, No 1 sandy clay, $5; 3d, spotted clay. $2·50; 4th, top clay, $2·50; 5th, No. 2 sandy clay, $2·50; 6th, kaolin clay, $2; 7th, fire sand, $1·50; 8th, No. 1, cement; 9th, No. 2 cement.

The kaolin clay is not found deposited with the other clays, but in locations not far distant. I believe geologists say it is decomposed rock. It contains a large amount of mica, and will not like the other clays, fly into atoms when put on a hot fire in a plastic state. It is used by many fire brick makers in place of top clay, and very generally by the consumers of fire brick for laying the brick, being mixed into a creamy state for that purpose.

Now before we commence making brick we must burn some spotted clay, and some No. 1 clay, keeping them separate, and giving them a sufficient heat to melt cast iron, so as to take the shrinkage well out of them. They are then crushed in any suitable machine to the size from that of a pin head to that of kernels of corn, and this is misnamed "cement." [A machine for this purpose, the invention of Mr. Hall, was illustrated and described on page 158, current volume.—*Eds.*]

Having thus prepared what we call No. 1 and No. 2 cement, we are ready to compound a mixture for brick; and just here, we must take into consideration the purpose for which we will make brick. What is our line of business? Many large works make brick almost exclusively for gas works. This includes brick, slabs and retorts. Other large works make almost exclusively for iron makers and iron workers, including a great variety of shapes and sizes. Brick may answer for gas works that would not do for iron works, on account of the lighter degree of heat to which they are subjected in the manufacture of gas.

We will take the following mixture: 10 parts spotted clay; 6 parts top clay; 4 parts No. 2 sandy clay; 5 parts No. 2 cement; 2 parts fire sand. The clay being run through the clay crusher, each kind as it is crushed is placed round by the pit, the cement and sand being placed evenly upon it; it is then shoveled into the pit, care being taken to spread it evenly over the whole pit, so that all the kinds shall become thoroughly mixed. The proper quantity of water is then let in, then another section of the same proportions is prepared in the same way, and repeated, till the pit (which is about five feet deep and holds enough for from eight to nine thousand bricks) is filled, water enough being added as we proceed to make the right consistency. If left to soak over night, it may then be shoveled into the "tub mill," which is connected with the pit, and being thoroughly mixed as it passes through, is molded into brick by a molding machine, which receives the "mud" from the bottom of the mill. The molds containing the brick are carried off and the brick dumped from them on a smooth, clean, drying floor, (if in the winter on a paved floor in the "flue house," under which the fire is made to pass through flues), and left till they are partially dry, when they are pressed in metallic molds, each brick receiving twenty-five or thirty tuns pressure, which makes them perfect in shape and uniform. They are "packed" or piled as they are pressed, and left to dry, and when dry they are set in the kiln, heated, and burned in the same as other brick, except that they require more fire—enough to melt cast iron. This heat would melt common brick. When thus burned, they are ready for market.

This mixture makes a smooth, plump, strong, good-looking brick, lays close joints, and stands the poker well; and if our business is to make brick for gas works, we may stamp the brick No. 1; they *are* No. 1 for gas works; but if our customers are iron makers, we must stamp them No. 2.

Here is another mixture: 10 parts No. 1 clay; 4 parts No. 1 sandy clay; 3 parts top clay; 6 parts No. 1 cement; 2 parts fire sand. Crush, mix, mold, press, and burn as before. This mixture will not make as smooth, good-looking bricks as the other, being more liable to warp and requiring much care both in manufacturing and handling, being more tender both before and after they are burned, for the reason that the stock is so pure that the fire will not take hold of and harden them so readily as the others.

Without experience, the purchaser would select the inferior bricks, on account of their being more dense and better looking, but experienced iron masters know better. With them, quality is the great consideration. Every one of these bricks must be stamped No. 1 as they come from the press. They are for the use of iron makers and iron workers, and on no account should we allow an inferior brick however good looking it may be, to bear this stamp. We are obliged to charge ten dollars per thousand more for these bricks than the others, and sometimes lose customers because we will not sell No. 1 brick as cheap as others; but if we value our reputation, we shall resolutely resist all temptation to stamp an inferior brick, No. 1, for the sake of selling them as cheap as others do. In time, it may be three or four years, we will get a letter from a consumer written thus: "Since we had brick of you four years ago, we have been purchasing brick of various parties, and find no brick to stand as well as yours. If you can furnish us the same kind, please send," etc.

The best quality of fire bricks must have *breathing qualities—lungs*; that is, they must be full of air cells. In this respect, they must be the reverse of a good building brick; at the same time they must be strong. A smelting furnace for iron is from forty to sixty feet high. The ore, coal, and lime stone, are put in at the top, and in passing down, there is considerable abrasion against the brick, and the brick must stand both fire and the friction.

Here is another mixture: 10 parts No. 1 clay; 10 parts No. 1 cement. Mix, press, and burn as before. Bricks of this mixture are stamped extra. They cost five dollars per thousand more than No. 1. For some purposes they are superior to No. 1, and for other purposes they are not. They resist flux better, but will not resist abrasion quite as well. Some customers continually order them.

And now, Messrs. Editors, as far as I can do it without making this article too long, I have shown you theoretically, how to make fire brick; perhaps you will understand better how to make the best fire brick, if I show you how to make a poor one out of the best stock. Take the same mixture we have for extra brick (10 parts No. 1 clay and 10 parts No. 1 cement), grind the cement to powder, mix thoroughly and press solid. This will make a very smooth, handsome, solid brick; but when subjected to an intense heat, its density will conduct the heat into and then contract the end of the brick for some distance.

If the brick is in the arch or crown of a heating furnace or forge, and the same is suddenly cooled, the end of the brick for some two inches will fall off, and the brick will be condemned as very poor. Thus I have shown you what fire bricks are made of, how they are made, and what the secrets are.

If you wish to embark in the business, and have one hundred thousand dollars to invest, and have credit for fifty thousand dollars more, and can resist the temptation, with Roman firmness, to mix impure clay with the pure, and the temptation to stamp No. 2 brick with the No. 1 stamp, and if you have the patience to exercise perpetual vigilance fourteen years, by that time you will acquire a reputation for making good fire brick. No slovenly or careless man will ever acquire that reputation.

[For the Scientific American.]

SOMETHING ABOUT SILVER.

BY PROFESSOR CHARLES A. JOY.

Pure silver can be distilled the same as zinc, but requires a very high heat and a special furnace. By using lime as a crucible and applying the heat of the oxyhydrogen flame, it may be distilled in the form of a pure white, very soft metal, having the specific gravity 10·575. Thus prepared, it can be easily hammered into thin foil, which is transparent, with bluish green color; thicker leaves show yellow light. It is an interesting fact that silver will let what are called the actinic or chemical rays of light pass through it so that it is possible to take a photographic print under a very thin silver plate. Silver amalgam has been made artificially at the French mint in Bordeaux in a quantity of mercury which had been used to extract silver from refuse. On filtering through chamois leather some well-defined crystals remained which, on analysis, were found to contain, in 100 parts: Silver, 27·4; quicksilver, 72·6. This would show a relation of one atom of silver to three atoms of mercury, whereas, in the native amalgam, the relation is one to two.

Pure silver if highly heated in oxygen will absorb 6·15 to 7·47 volumes of that gas, and under the same circumstances will take up 0·907 to 0·938 volumes of hydrogen, 0·486 to 0·545 carbonic acid, and 0·15 carbonic oxide—in this property it differs considerably from palladium.

When it is attempted to prepare the pure metal by electrolysis, it is a curious fact that silver, in the form of peroxide, goes to the positive pole, and as a metal to the negative pole, if a plate of silver is used at the positive pole. The explanation of this is made on the ground that the ozone of the decomposition of the water attacks and oxidizes the silver.

Sulphurous acid throws down small crystals of silver from solutions, and this method is employed to recover the metal from photographic wastes; it is also used when a chemically pure metal is sought, for the accurate determination of specific gravity or atomic weight. The question of the atomic weight of silver has been subjected to a rigid examination by several chemists, and on the modern theory of oxygen, equal to sixteen, it has been decided to be 107·93 as the mean of a large number of determinations.

The temperature of fusion of silver is also a question that has occupied the time and attention of chemists for a long period and scarcely any two agree; Becquerel puts it at 916° Cent. (1680° Fah.)

The specific gravity of silver ranges between 10·424 and 10·511, and the mean of 13 determinations was found to be 10·468—generally it is stated at 10·5. It is softer than copper and harder than gold; its absolute resistance per cubic centimeter is, for cast silver, 5760 lbs., for wire, 6310 to 8270 lbs., and for heated wire 3600 to 3900 lbs. The tenacity of silver has been studied by Matthiessen, and can be stated for comparison, as follows: alloy of tin and copper, 1; gold, 3·6 to 4·3; copper, 4·3; silver, 7·2; platinum, 7·2; iron, 13; steel, 30. It is so ductile that a grain of it can be drawn out 400 feet, and it can be hammered into leaves so thin that it would require 100,000 of them to make a pile an inch in hight. Its conductivity for heat is to copper in the ratio of 100 to 73·6; and for electricity as 1000 to 954. Cast silver expands, according to Calvert, between 0° and 100° Cent., 0·001991; and its specific heat is 0·05701. Although silver is a remarkably good conductor of heat, its power of radiation is very small, so that a silver vessel retains the heat of a liquid contained in it longer than any other metal.

According to Elsner, a mass of silver at the heat of a porcelain furnace, was entirely volatilized.

Nearly all of the oxidizable metals precipitate silver from its solution. Green vitriol or sulphate of iron precipitates it readily, and if the liquid be boiled, some of the silver is dissolved, but again falls down when the liquid cools.

Tin and lead act rapidly in a solution of nitrate of silver to precipitate the metal; more slowly act osmium, zinc, copper, bismuth, antimony, and quicksilver. Phosphorus also reduces salts of silver the same as it does solutions of copper. Cadmium is a good metal to substitute for zinc in the reduction of silver.

Peroxide of hydrogen at once attacks silver and converts it into a suboxide. Cane sugar precipitates silver from the nitrate upon the addition of ammonia and boiling, but grape sugar is preferable for this purpose. Silver can be made to take the place of potash in ordinary alum, and the double sulphate of alumina and silver be produced. And this reminds us to state that modern chemists call silver a *monad* and place it in the same family with potassium and sodium. Some years ago Dr. Torrey, of New York, discovered a compound of carbon and hydrogen with copper, which was produced by the passing of ordinary illuminating gas for a long time through copper tubes, and was shown to be highly explosive; it has recently been found that a similar compound with silver can be formed by passing illuminating gas through an ammoniacal solution of nitrate of silver; a brown black flocculent precipitate settles, which, on an anvil, or heated, explodes with great violence, leaving finely-divided carbon and metallic silver as a residue.

The analogous compound of copper can be prepared in the same way by passing the gas through nitrate of copper. It is now known that the explosive powder is a compound of acetylene. It is possible that by passing the gas issuing from oil wells through the nitrates of silver or copper, this interesting substance could be formed.

Some years ago there was a report that all of the copper-bottomed ships brought home silver from the salt water of the ocean, and mathematicians at once went to work to compute the enormous quantity of the precious metal that must be contained in the oceans of the world; but since the original discovery nothing further has been said on the subject. In 1849 silver was also found in the blood of several animals, especially of the ox, but in all of these cases the occurrence is generally considered to be accidental.

The production of silver was stated by Wagner, in 1868, to be in values:

North America	$20,000,000
Mexico and South America	35,000,000
British America	500,000
Australia and New Zealand	1,000,000
Siberia	1,500,000
All other countries	2,000,000
Total	60,000,000

The uses of silver are numerous, and are continually on the increase. It is too soft to be employed pure for coinage, but when alloyed with copper is much harder and better suited to the wear of a circulating medium. The value of silver to gold is as 1 to 15¾, and the specific gravity as 15 to 18, so that for the same sized coin the value of the pure gold has 29⅗ the relative worth of the silver of the same size and weight. Silver wire and silver foil have long been extensively employed, and various methods have been prepared for cleaning the articles made for it. Among the liquids that have been employed for this purpose may be mentioned a solution of permanganate of potash, also cyanide of potassium, hot hydrochloric acid, borax, and potash. The so-called silver beads and pearls for embroidery are made of tombac metal which is rubbed with silver amalgam and freed from mercury by heat. Brass can also be plated with imitation silver by rubbing it with a preparation composed of equal parts of mercury, tin, and bismuth, and one and a half parts prepared chalk—a trifling amount of silver makes the colors and appearance of silver more enduring.

Further uses of silver in photography, in numerous alloys, in the manufacture of mirrors, and for ornamental purposes have been given in the SCIENTIFIC AMERICAN in previous years. The present article presents certain properties of the metal more fully than they are given in our modern works on chemistry, and will serve for reference to all persons interested in the subject.

[For the Scientific American.]

THE GUAVA.

BY JOHN E. GORDON.

The guava is a tree which grows in tropical countries, and it is found principally in the West Indies. It is of the genus termed by botanists, Psidium, and is of two sorts, the P. pomiferum and P. peryferum. The plant does not attain any considerable size, being generally about fifteen feet high; and it is of very delicate formation. The bark is quite thin, and of a light brown color. It peels off in small portions when exposed to the sun; to prevent this, the trees are usually planted beneath others of a larger growth and hardier nature. The leaves are of an elliptic, lanceolate form. They are very distinctly marked by the fibers of which they are composed. They are of a dark green color, and measure about 2½ inches. The flowers resemble those of the orange, and emit a strong perfume. The fruit is about the size of a small lemon. It is almost of the same shape and color. The interior consists of a red, pulpy substance, containing an innumerable quantity of small seeds somewhat larger than those of the fig. The rind of the fruit is of the consistency of that of an apple. Of this fruit the West Indians make several kinds of preserves, the guava jelly, stewed guava, quake pear, and marmalade. The most lucrative is the guava jelly. The fruit is often eaten in its raw condition. The negroes are so fond of it that they are very wary and diligent in guarding the trees from robbery when they are bearing fruit.

The guava jelly is obtained by boiling the guavas with sugar and spices; and, after expressing the juice through a cloth, it is left to cool. Of course it undergoes minor processes, which I omit, they being inappropriate to the object of this paper.

The jelly is frequently bottled, but oftener it is put into small cylindrical boxes made of laminated pine board. A great quantity of this comfit is manufactured in Cuba, where it is termed "Jalea de guayaba," which is exported to the United States and Europe. Notwithstanding that a good deal is made in the smaller islands, they import quite a quantity of the Cuban jelly.

After the juice has been expressed from the guava, there remain the skins and the pulp containing the seeds; the latter is stewed and bottled, and it constitutes the stewed guava. This is generally partaken of with milk.

The skins are converted into the delicacy termed "quake pear," by a process varying slightly from the foregoing.

The guava marmalade is not frequently made. It consists of the guava grated and prepared in a peculiar manner.

Of the forementioned preserves, the marmalade is preferred by most connoisseurs. The small seeds in the stewed guava are very objectionable, the more so if one is subject to toothache, as they get into the cavities of decayed teeth, causing a great deal of suffering.

The natives of the West Indies are great herbalists; they convert almost any plant into medicine of some kind or other, and they have discovered several medicinal properties in the guava tree and its complimentary portions; what they are, I cannot pretend to say.

There is no distinction made between the name of the tree and that of the fruit in English, both being guava; the French term the tree, *goyavier*, and the fruit, *goyave*. Their respective terms in the Creole patois are, *gyan-baum*, and *gyan*.

CHEMICAL NEWS.

EASY PREPARATION OF CHLORATE OF BARYTA.

It is sometimes important to be able to prepare chloric acid for use in the arts, and the most convenient salt for the purpose is chlorate of baryta, as that can be easily decomposed by sulphuric acid and the chloric acid liberated. Moritz Brandau proposes the following simple method of procedure: 49 parts by weight of sulphuric acid, 333 parts of sulphate of alumina, 122½ parts chlorate of potash are mixed to a thin paste in water and gently warmed. The product is a solution of chloric acid with alum, and excess of sulphuric acid and sulphate of alumina. When it is entirely cool it is mixed with about an equal volume of alcohol and then filtered. The alcoholic filtrate is then neutralized with caustic baryta which gives us chlorate of baryta in solution, while sulphate of baryta is precipitated. The chlorate is decanted from the precipitate and evaporated to expel the excess of alcohol, and is then ready for use. It could be employed in the preparation of oxygen gas, but for this purpose would be more expensive than chlorate of potash. The uses of chloric acid are not well understood, and a cheap method like the above for its production may lead to a more general application of this highly interesting compound.

THYMOL AS A DISINFECTANT.

Paquet recommends thymol as a substitute for carbolic acid. It is prepared from the etherial oil (oil of thyme) of *Ptychotis tjowan*, an umbelliferous, officinal plant from the East Indies. In a concentrated form it serves as a cautery for the removal of warts, and also in cases of hollow teeth is very efficacious, without leaving the disagreeable odor of carbolic acid or creosote. In aqueous solution (1000 aq.) it has a cooling effect upon bad sores, and stops decay.

By the injection of a mixture of four grains thymol, two grains aniline, and one hundred grains glycerin into a dead body, all decomposition and decay were arrested for months.

CHEMICAL ANALYSIS OF AIR.

In order to form some idea of the impurities carried into the air near large manufacturing towns. Dr. Smith, of England, took advantage of the property of rain to bring down a certain proportion of them, and resorted to an analysis of rain water. He found in the vicinity of chemical works five grains of sulphuric acid per gallon; near Liverpool two and a half grains, in Newcastle three grains, in Manchester three and a half grains. The acid was probably in a free state, as the rain water turned blue litmus red. Muriatic acid was also present, but in larger amounts near the seashore than inland. A tun of the rain water was found to contain 100 grains of ammonia. In a million cubic feet of air near Manchester was found 4,008 grains sulphuric acid and 59 grains muriatic acid.

TESTS FOR SULPHUR, PHOSPHORUS, AND NITROGEN.

In order to detect small quantities of phosphorus in any compound, mix a small quantity in a glass tube closed at one end with an equal weight of magnesium powder or foil, and gently heat. If any phosphorus be present a red film will form on the cool part of the tube, the mixture will become phosphorescent, and with water it will yield phosphureted hydrogen. As magnesium does not combine with sulphur, the same substance can be taken to test for that element. Heat the contents of the tube with metallic sodium and project it afterwards into acidulated water; if any sulphur be present, an evolution of sulphureted hydrogen gas will at once betray it. If nitrogen be suspected in any compound, heat it in a similar way with metallic sodium, and the formation of cyanide of sodium, indicating nitrogen, can be shown by an iron salt.

These three tests for sulphur, phosphorus, and nitrogen, are probably the best that can be employed for small quantities, and have the additional merit of easy execution.

SEPARATION OF COBALT.

It is sometimes necessary to separate cobalt from iron, manganese and other metals; this is said to be effected if the solution be kept neutral by carbonate of manganese and sulphureted hydrogen gas be passed through it; all of the cobalt will be precipitated.

A REMARKABLE GAS WELL.

At a recent meeting of the Lyceum of Natural History, Professor Wurtz gave an account of an extraordinary gas well at West Bloomfield, Ontario Co., N. Y. Borings five hundred feet in depth were made in search of petroleum, and at this depth the rush of gas was so great as to render further operations impossible. According to rough calculations made on the spot, the flow of gas is at the rate of 18,000 cubic feet per hour, and it comes out with a roar. Its illuminating power is low as there is very little heavy carbureted hydrogen in it, and was found to be equal to six candles. An analysis gave Professor Wurtz the following results:

Marsh gas	82·41	per cent
Carbonic acid	10·11	"
Nitrogen	4·31	"
Oxygen	0·23	"
Illuminating hydrocarbon	2·94	"
	100·00	

It is proposed to use the gas for illuminating and heating purposes.

A NEW OXIDE OF AMMONIUM.

M. Maumene has published a method for the preparati[on] of oxide of ammonium by the action of metallic nitrates. [H]e employs 200 grammes nitrate of ammonia, 2,170 gr[ammes] hydrochloric acid (density 1·12), and 552 grammes tin [which] are gradually mixed to prevent elevation of tem[perature]. The product is crystalline, soluble in alcohol, and [does not] give a precipitate with a platinum salt, and is d[eliquescent]. The crystals are not octahedron but short p[risms]. The composition of the new compound, expressed [by] H_3NO_3,HCl.

Improved Hominy Mill.

The inventor of this mill was one of those killed by the terrible boiler explosion at the State Fair held at Indianapolis, last October, the account of which excited universal sympathy throughout the entire country. Mr. Jackson was at the fair for the purpose of exhibiting this mill, from which his widow is now desirous to realize something to support and educate her children.

She writes us that some parties are endeavoring to take advantage of her comparatively helpless position, to deprive her of her rights, and we sincerely hope that the invention, which we are informed has proved its value in actual service, may find a purchaser, or some manufacturer who will undertake to make the mills, and protect the widow of Mr. Jackson in her rights.

The mill is intended to crack or break corn for hominy, and differs from mills constructed for that purpose heretofore. Hominy mills,with a continuous feeder,have been found inefficient,for the reason that in many cases a large portion of the corn will pass through without being broken, thus causing extra labor to separate it afterward.

In this mill the corn is put in the hopper, A, in charges, and subjected to the action of the crackers or breakers, which consists of screws, B, and knives, C, arranged on a shaft in rows. In the process of breaking the corn, the fine flour or any refuse matter is, to a great extent, separated by the action of fans or blowers, E, and expelled through the slats, F, Fig. 2, into a receptacle placed to receive it. After the corn has been reduced thoroughly,it is dropped into the conveyer, G, which is a quick-pitched screw. This conveyer being set in motion by the gears, H, moves the grain into the screen,I,below,where it is properly bolted and rendered fit for market.

This mill has been thoroughly tested, and pronounced by competent judges to be a perfect success. It may be constructed of any size, from a mammoth mill that will turn out a hundred bushels of hominy a day down to a small hand-power mill for family use. The latter is just what is wanted by every farmer, especially in the West and South.

Patented, June 15th, 1869, by A. P. Jackson. State rights will be sold, and liberal terms given to parties wishing to manufacture and sell on royalty. Address E. J. Jackson, Memphis, Ind.

Fig. 1.

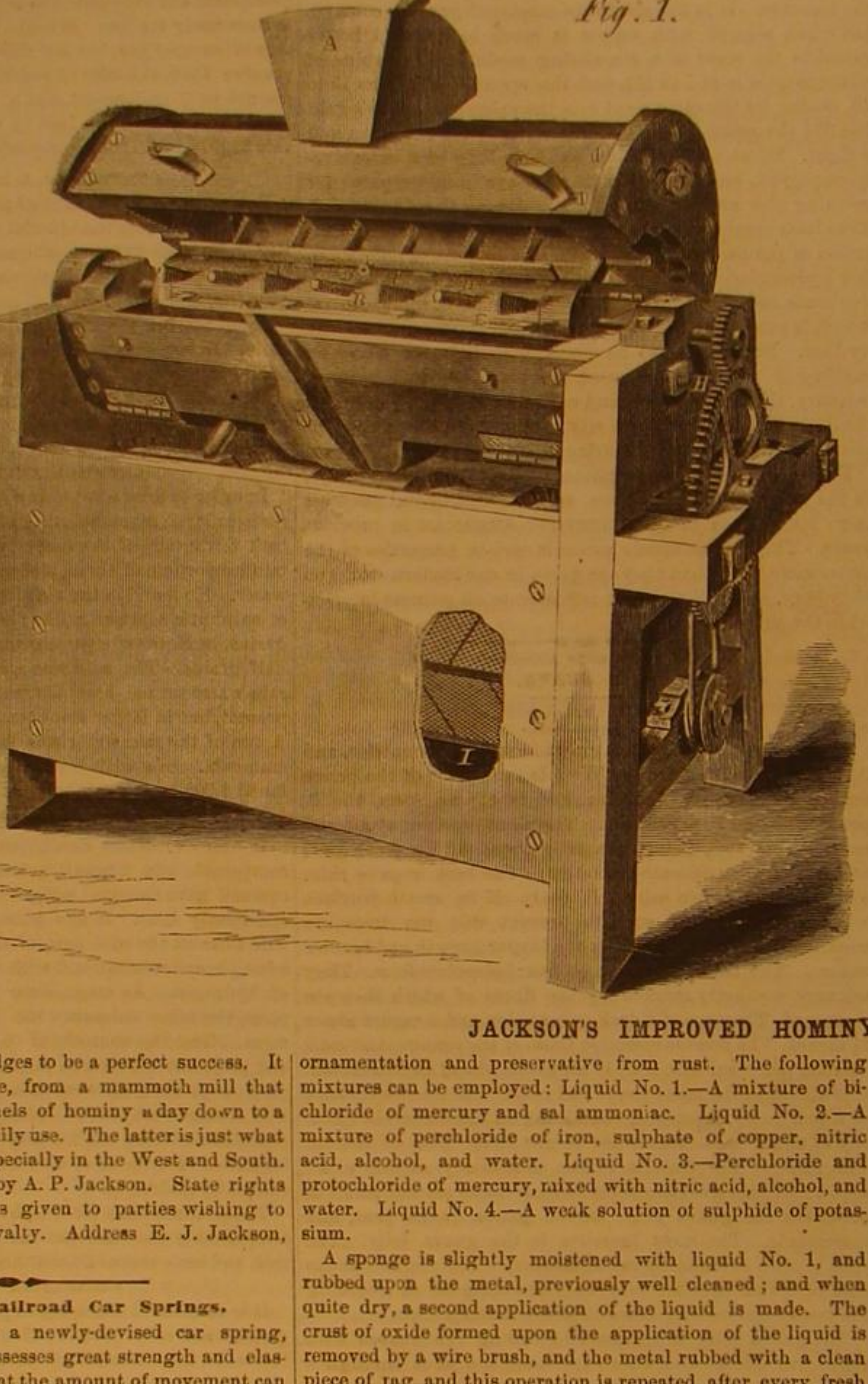
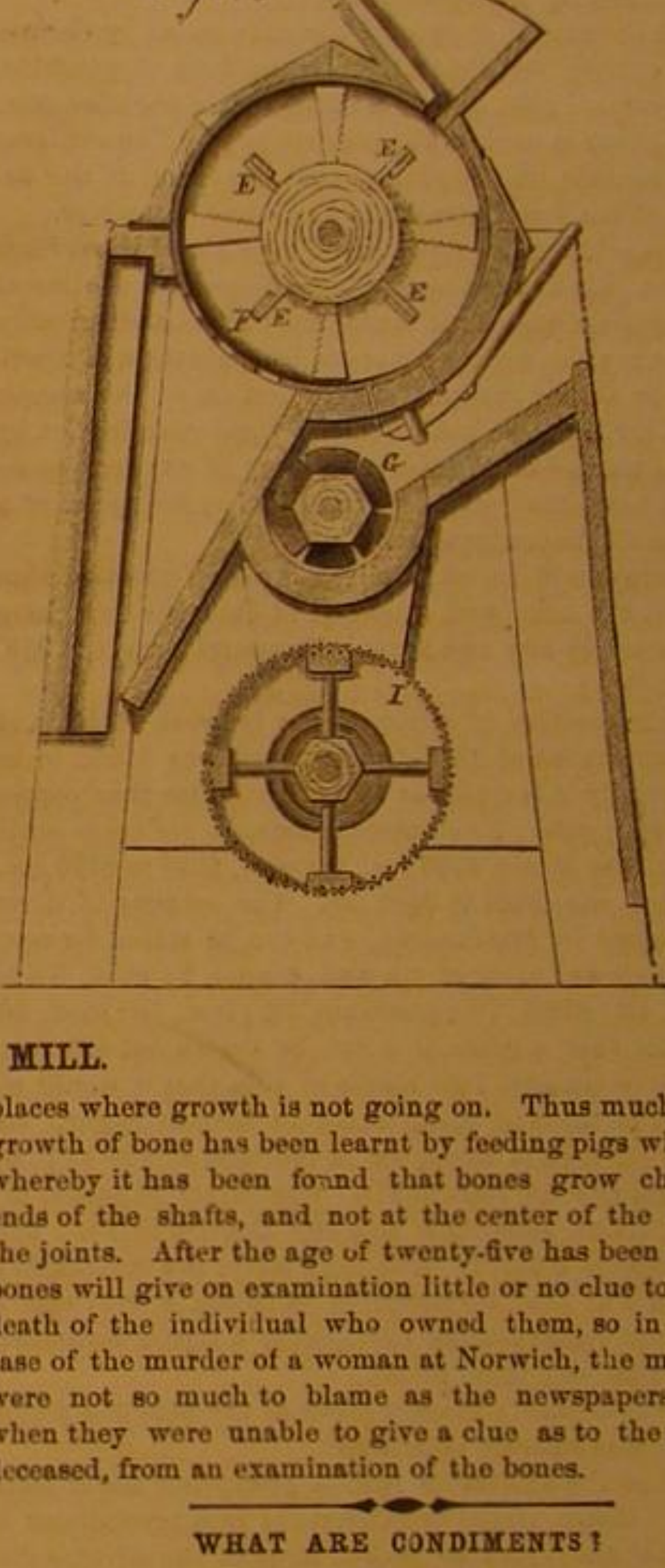


Fig. 2.



JACKSON'S IMPROVED HOMINY MILL.

Improvement in Railroad Car Springs.

Our engravings illustrate a newly-devised car spring, which the inventor claims possesses great strength and elasticity with adjustability, so that the amount of movement can be regulated.

A perspective view of this car spring is shown in Fig. 1, and a vertical and longitudinal section in Fig. 2. The shell or case which incloses the plates is made in two pieces, A and B; A being the upper and B the lower part. The lower part, B, telescopes into the upper part, and is held in place by bolts, C.

The cases inclose an arrangement of elastic plates or bars, D, Fig. 2, the ends of which abut on shoulders formed on the two portions of the case, as shown. These plates are separated by cross-bars, E, shown in section Fig. 2, which cross bars are kept in place by vertical guides.

The cross bars, E, transmit the strain from the upper plates or leaves of the spring, to the lower plates, and each plate or leaf acts independently of every other one in the spring. The cross bars are placed at a point about one third the length of the spring from the end. It is claimed that this arrangement distributes the strain equally on all points of the plates, which gives all the power the steel plates afford, and diminishes the liability of breakage.

Fig. 1

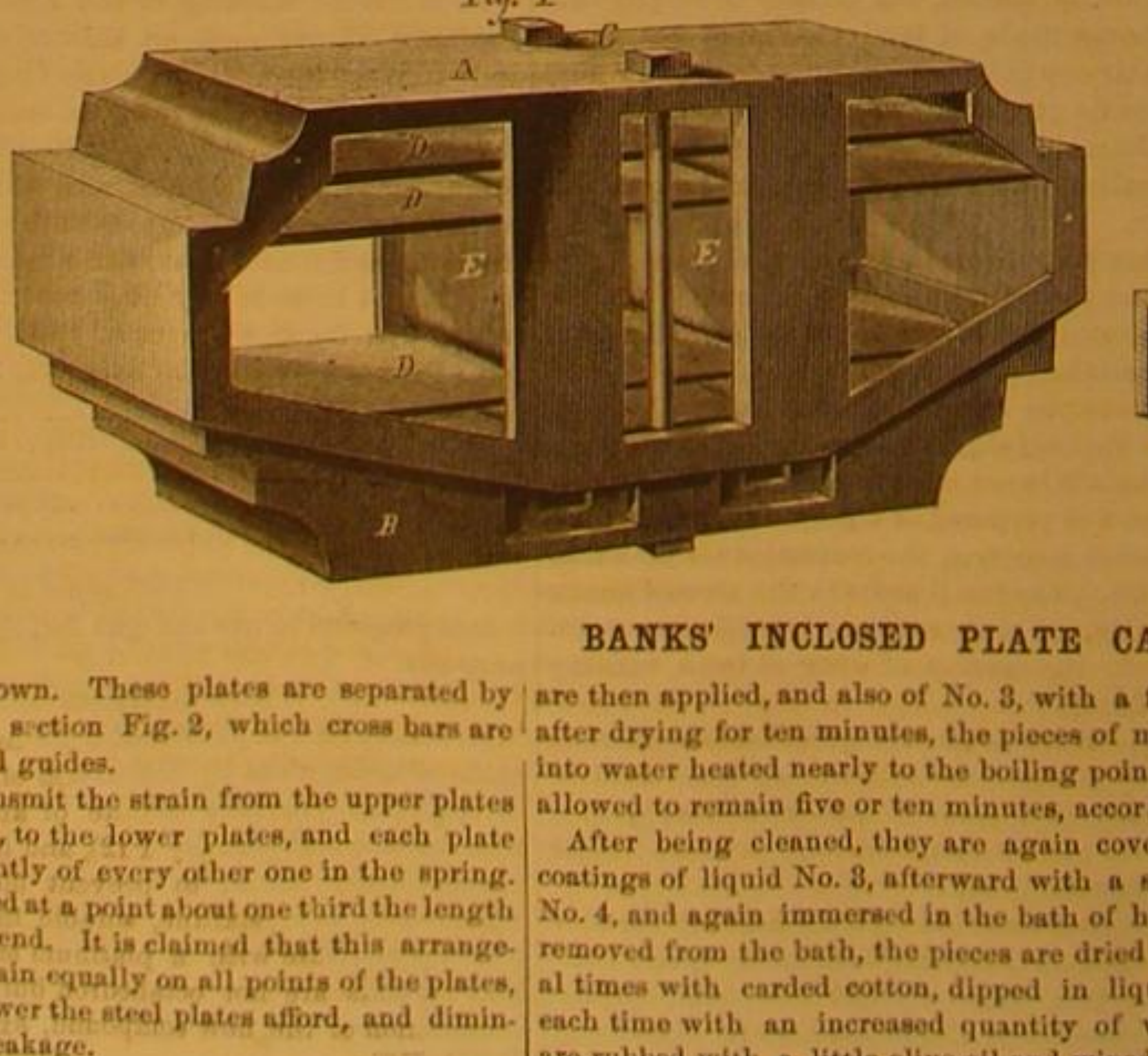
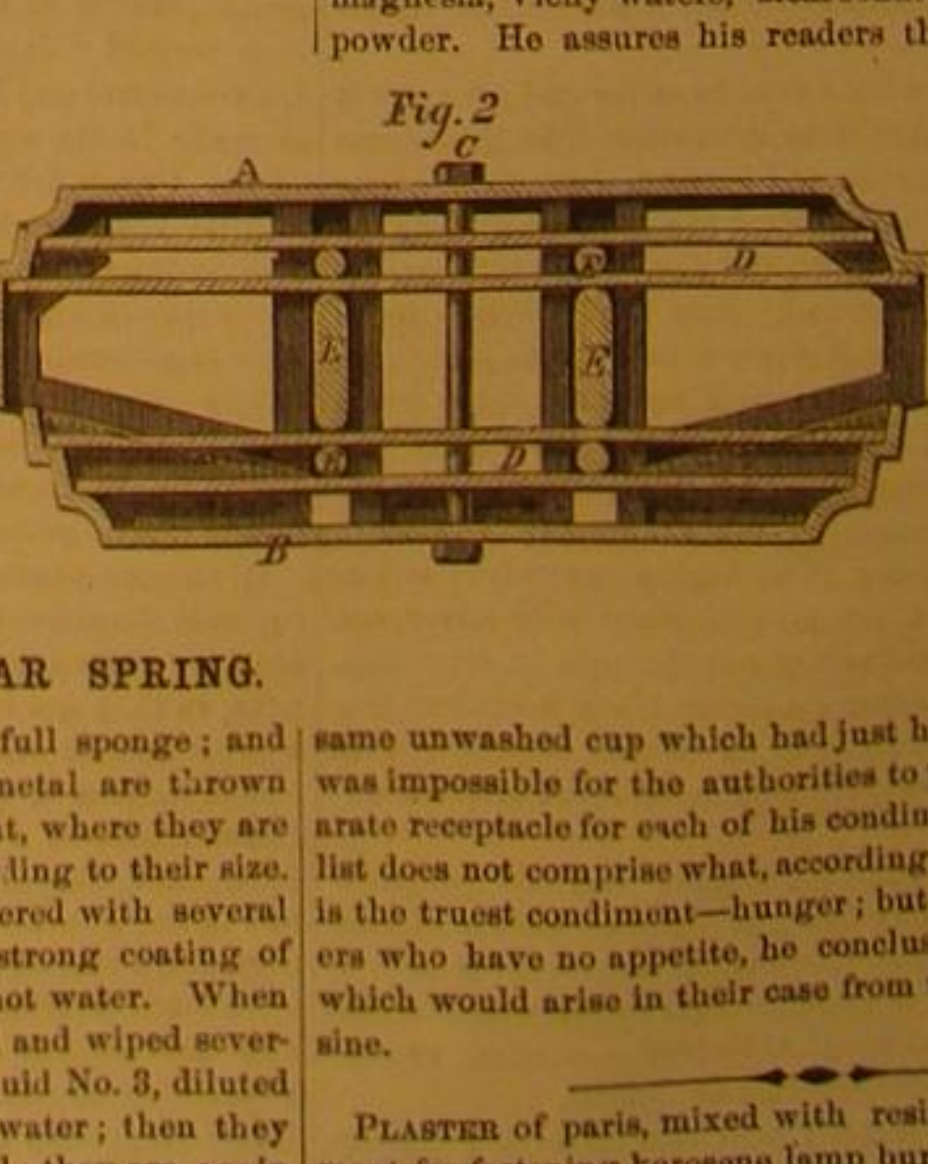


Fig. 2



BANKS' INCLOSED PLATE CAR SPRING.

Of course the strength of the spring and the amount of movement may be regulated and adjusted by the thickness of the plates, their number, and the positions of the cross bars. These springs are equally applicable to any form of passenger or freight car now in use.

The spring has been tested under cars for some time with, we are informed, highly satisfactory results, and we are told the inventor is already in receipt of a large number of orders.

Patented, through the Scientific American Patent Agency, Feb. 15, 1870, by C. M. Banks, Roxborough, Philadelphia, Pa. For further information, address patentee, care J. Jeffries & Sons, rear Girard House, Philadelphia, Pa.

Black-Bronzing Iron and Steel.

This method of coloring iron and steel serves both as an ornamentation and preservative from rust. The following mixtures can be employed: Liquid No. 1.—A mixture of bichloride of mercury and sal ammoniac. Liquid No. 2.—A mixture of perchloride of iron, sulphate of copper, nitric acid, alcohol, and water. Liquid No. 3.—Perchloride and protochloride of mercury, mixed with nitric acid, alcohol, and water. Liquid No. 4.—A weak solution of sulphide of potassium.

A sponge is slightly moistened with liquid No. 1, and rubbed upon the metal, previously well cleaned; and when quite dry, a second application of the liquid is made. The crust of oxide formed upon the application of the liquid is removed by a wire brush, and the metal rubbed with a clean piece of rag, and this operation is repeated after every fresh application of the several liquids. Several coats of No. 2 are then applied, and also of No. 3, with a full sponge; and after drying for ten minutes, the pieces of metal are thrown into water heated nearly to the boiling point, where they are allowed to remain five or ten minutes, according to their size.

After being cleaned, they are again covered with several coatings of liquid No. 3, afterward with a strong coating of No. 4, and again immersed in the bath of hot water. When removed from the bath, the pieces are dried and wiped several times with carded cotton, dipped in liquid No. 3, diluted each time with an increased quantity of water; then they are rubbed with a little olive oil and wiped; they are again immersed in water heated to 140° Fah., and upon being removed from it, they are rubbed briskly with a woolen rag and, lastly, with oil. The pieces thus treated are of a beautiful glossy black, especially if they have been polished.

Iron and cemented steel are well adapted to receive this black polish; cast steel is still better adapted for it, as it assumes a more uniform brilliancy. Cast iron presents more difficulties, because it does not assume the same tint all over equally.

The Architecture of the Human Body.

Professor Humphry, M.D., F.R.S., in a recent lecture upon the architecture of the human body, said that as the tail diminishes in animals, the hinder limbs seem to grow out. Thus the serpent is nearly all tail and no limbs; the whale, with its shortened trunk, has a broad flat tail; also, as the tail of the tadpole disappears, the hind legs of the frog take its place. Man has the bones of a small, incipient tail, with three flat sides; this tail turns inwards, so that the human being is really the only animal in creation who can occupy an arm-chair in comfort. The head of the thigh-joint rests in a socket so very shallow that it is only held in its place by atmospheric pressure and the ligaments surrounding the joint, and the leg swings to and fro below this shallow socket very much like a pendulum. The thigh-bone is by far the longest bone in the human body. Madder, when taken into the living body, is found to have the curious property of coloring growing bone, but it does not color the bone in places where growth is not going on. Thus much about the growth of bone has been learnt by feeding pigs with madder, whereby it has been found that bones grow chiefly at the ends of the shafts, and not at the center of the bone, or at the joints. After the age of twenty-five has been passed, the bones will give on examination little or no clue to the age at death of the individual who owned them, so in the recent case of the murder of a woman at Norwich, the medical men were not so much to blame as the newspapers supposed, when they were unable to give a clue as to the age of the deceased, from an examination of the bones.

WHAT ARE CONDIMENTS?

Professor Fonssagrives, in his new treatise upon dietetics, gives us some curious information upon the use of condiments in France and in England, and includes under that term a somewhat surprising list of things; as, for example, magnesia, Vichy waters, bicarbonate of soda, and Gregory's powder. He assures his readers that this last mixture is habitually used in England as a condiment, and universally enjoys a high reputation. A writer in the *Medical Times*, commenting upon the difficulty of accurately defining a condiment, observes: "We recollect hearing a hospital nurse remark, when a patient complained that he did not like his beef-tea out of the same unwashed cup which had just held his medicine, that it was impossible for the authorities to provide him with a separate receptacle for each of his condiments." The professor's list does not comprise what, according to the medieval adage, is the truest condiment—hunger; but for the comfort of readers who have no appetite, he conclusively proves the benefit which would arise in their case from the habitual use of pepsine.

Plaster of paris, mixed with resin soap forms a good cement for fastening kerosene lamp burners.

NATURAL HISTORY---THE GREAT AUK.

BY PROFESSOR JAMES ORTON, IN THE AMERICAN NATURALIST.

The recent addition of a specimen of this rare bird to the Smithsonian Museum, is an event worthy of record. There are now three specimens in the United States; the one just mentioned, another in the Academy of Natural Sciences, Philadelphia, and a third in the Giraud cabinet in Vassar College. The last is the most perfect specimen, and certainly possesses the greatest historical value, as it is the one from which Audubon made his drawing and description. It was caught on the banks of Newfoundland.

The Great Auk or Gare-fowl, fortunately for itself did not live long enough to receive more than one scientific name—*Alca impennis*. It was about the size of a goose, with a large head, a curved, grooved, and laterally flattened bill; wings rudimental, adapted to swimming only, approaching in this respect the penguins of the southern hemisphere. The toes are fully webbed, the hind one wanting; the plumage is black, excepting the under parts, the tips of the wings, and an oval spot in front of each eye, which are white. It was an arctic bird, dwelling chiefly in the Faroe Islands, Iceland, Greenland, and Newfoundland. "Degraded as it were from the feathered rank (said Nuttall), and almost numbered with the amphibious monsters of the deep, the auk seems condemned to dwell alone in those desolate and forsaken regions of the earth." But it was an unrivaled diver, and swam with great velocity. One chased by Mr. Bullock among the Northern Isles, left a six-oared boat far behind. It was undoubtedly a match for the Oxfords. It was finally shot, however, and is now in the British Museum. "It is observed by seamen," wrote Buffon a hundred years ago, "that it is never seen out of soundings, so that its appearance serves as an infallible direction to the land." It fed on fishes and marine plants, and laid either in the clefts of the rocks or in deep burrows a solitary egg, five inches long, with curious markings, resembling Chinese characters. The only noise it was known to utter was a gurgling sound. Once very abundant on both shores of the North Atlantic, it is now believed to be entirely extinct, none having been seen or heard of alive since 1844, when two were taken near Iceland.

The death of a species is a more remarkable event than the end of an imperial dynasty. In the words of Darwin, "no fact in the long history of the world is so startling as the wide and repeated extermination of its inhabitants." What an epoch will that moment be when the last man shall give up the ghost! The upheaval or subsidence of strata, the encroachments of other animals, and climatal revolutions—by which of these great causes of extinction now slowly but incessantly at work in the organic world, the Great Auk departed this life, we cannot say. We know of no changes on our northern coast sufficient to affect the conditions necessary to the existence of this oceanic bird. It has not been hunted down like the Dodo and Dinornis. The numerous bones on the shores of Greenland, Newfoundland, Iceland and Norway, attest its former abundance; but within the last century it has gradually become more and more scarce, and finally extinct. There is no better physical reason why some species perish than why man does not live forever. We can only say with Buffon, "It died out because time fought against it." From the *Lingula prima* to the Auk, genera have been constantly losing species, and species varieties; types and links are disappearing.

Unhealthfulness of Iron Stoves.

Considerable discussion having arisen as to the permeability of cast iron to gases, and to their morbific effect in ill-ventilated rooms, the conclusions of Gen. Morin, as given in a report to the French Academy, will be read with interest.

The experiments extended over a year, and were performed at the "Conservatoire des Arts et Metiers," in Paris, being terminated in February, 1869.

His conclusions are as follows:

1. In addition to the immediate and grave inconveniences arising from the facility with which stoves of the ordinary metals attain a red heat, cast-iron stoves, at a dull, red heat, cause the development of a determinate but very variable amount of carbonic oxide, a very poisonous gas.

2d. A similar development takes place, but in a less degree, in sheet-iron stoves raised to a red heat.

3. In rooms thus heated, the carbonic acid naturally contained in the air, and that derived from respiration, may be decomposed, and produce carbonic oxide.

4. The carbonic oxide may arise from several different, and, sometimes, concurrent causes, as, the permeability of the iron to this gas, which passes from within outward; the direct action of the oxygen of the air upon the carbon of the iron heated to redness; the decomposition of the carbonic acid in the air by its contact with the heated metal, and the influence of organic dust naturally contained in the air.

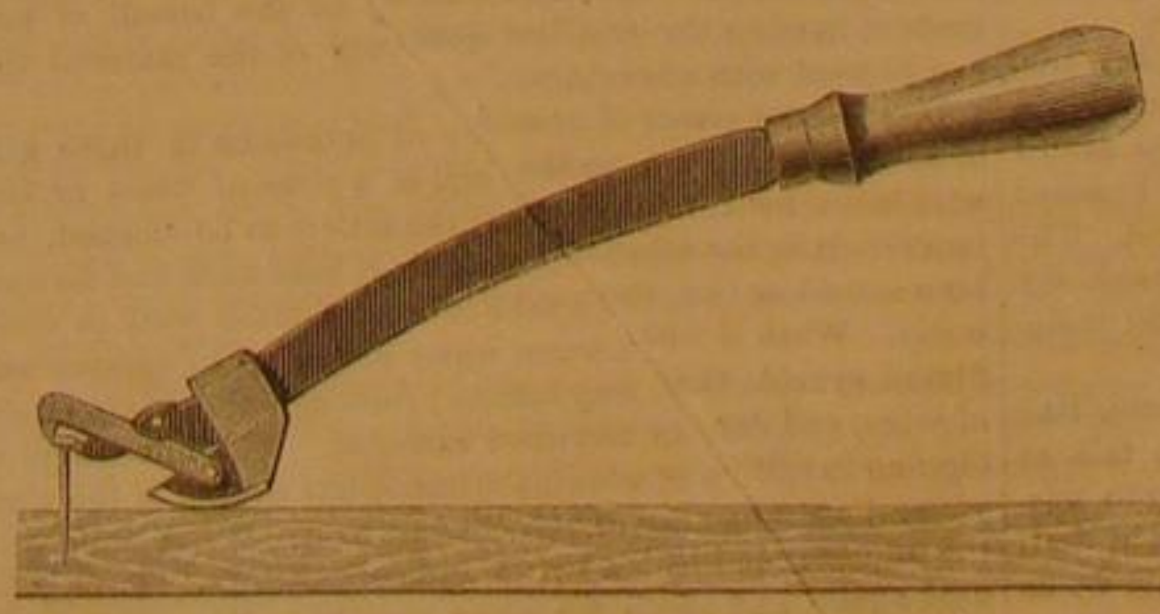
5. The effects observed in a room lighted by four windows, and two doors, one of which is frequently opened, would be made manifest and grave in ordinary rooms, without ventilation, in consequence of the presence and decomposition of various kinds of organic dust therein present.

6. Consequently, stoves and heating apparatus in cast or sheet iron, without interior linings of fire-bricks, or other refractory substances, which will prevent their becoming red-hot, are dangerous to the health.

MM. St. Claire Deville and Troost have shown that the air in contact with the external surface of a cast-iron stove may become charged with a proportion of carbonic oxide equal to ·0007 to ·0018 of its volume. Experiments on rabbits show that carbonic oxide has the property of expelling a part of the oxygen contained in the blood; and that the small amount of ·0004 will cause the expulsion of ·45 of the oxygen of the blood. Though sheet-iron stoves are less dangerous, on this account, they are not so harmless as Dr. Carret supposes, as they are open to the grave objections of the sudden elevation of temperature of their external surface, and of then decomposing the carbonic acid of the air. It has long been admitted as a fact in science, that iron, at a red heat, decomposes carbonic acid, takes a portion of its oxygen, and transforms it into carbonic oxide. The experiments showed that the amount of carbonic oxide formed was notably less in a moist than in a dry air; this justifies the common use of vessels filled with water on stoves and furnaces.—*Annual of Scientific Discovery.*

IMPROVED IMPLEMENT FOR DRAWING NAILS.

We copy from the *English Mechanic* a description of an invention whereby nails, spikes, or brads driven into packing cases, flooring, or other timber or woodwork may be drawn or extracted therefrom in such a manner that they will not



be broken, bent, or twisted, and unfitted for further use, and so that the wood will not be split or otherwise injured by their extraction.

The implement (a side view of which, showing the position of the parts with regard to the nail being extracted, is given) consists mainly of two hooks or claws so arranged together, and in combination with a lever and adjustable curved shoe, which forms the fulcrum of the said lever, that in drawing a nail, they can be first forced into the wood below the head of the nail, and then by a proper movement of the lever made to grip the nail and draw it from the wood, the curved shoe sliding towards the nail as the same leaves the wood, so that the nail is drawn out in a direction parallel or nearly so with its axis, and is thereby extracted without being broken, bent, or twisted.

The Production of Sulphur in California.

According to the *Alta California*, the production of sulphur and manufacture of its compounds in California are rising in importance. The chief supply of the world is obtained from the sides of Mount Etna, in Sicily, and that State used the Sicilian brimstone until lately. Now the sulphur works on the shore of Clear Lake produce four tuns a day, as much as the coast can consume. The freight from the Mediterranean, the increased charge on account of the combustible nature of the material, and the necessity of keeping large stocks on hand, so as to prevent any disturbance of trade in case a cargo should be delayed or lost, give decided advantages to the home manufacture.

The Sicilian brimstone cannot be had in California for less than four cents per pound, and the domestic article is sold for three and a half cents. Clear Lake occupies the crater of an extinct volcano, and the evidences of volcanic action are abundant in the vicinity. The triangle formed by the lake, the Geysers, and St. Helena—each about twenty-five miles from the other two—abounds with volcanic scoria, trap, lava, obsidian, tufa, warm springs, and other remains of eruptions, and signs of subterranean heat at no great distance from the surface.

The sulphur bed of Clear Lake is about eight miles from the southern end, on the eastern shore, only a few hundred yards from the water. There is a bank resembling ashes, in which there are numerous alkaline and sulphur springs, and, also, vent holes from which sulphurous fumes escape. These holes are surrounded by beautiful crystals of pure sulphur deposited from the fumes rising from below. The earth, containing about fifty per cent of sulphur, is placed in an iron retort, which is heated to a high temperature, so that the sulphur is driven off in fumes into a receiver, where it settles in a liquid form, and runs out into pine boxes, two feet long and a foot square. It is as pure as the Sicilian brimstone, but the latter comes in sticks, which are more convenient for handling, when small pieces are wanted.

The lump sulphur is used chiefly for making powder and sulphuric acid, which last is employed in making blue-stone, giant powder, nitric acid, and muriatic acid, and in refining gold and silver. The consumption of sulphuric, nitric, and muriatic acid on the coast, amounts to 2,000,000 lbs., and the entire demand is supplied by home manufacture.

Lately the production of flowers of sulphur has been commenced at Clear Lake. The fumes passing off from the retort instead of being carried into a small hot receiver as for brimstone, are led into a large cool chamber, in which they condense into a flaky, snowlike condition. This form of sulphur will be needed in large quantities next spring and summer, as a cure for the mildew which attacks the vines and did great damage in many of the vineyards last year.

The Lower Lake *Bulletin* says: There are no less than eight new mines of quicksilver and sulphur now being opened up in this vicinity (southern part of Lake County); the three mines of these minerals now in daily operation employ over 300 men. With eight more in practical operation, nearly 900 men and several millions of dollars in property valuation will be added to this part of the country. And these are not possibilities, they are probabilities. The mineral is there; men are employed there now in running tunnels and holding the ground, and time will develop them.

A Strong Cement for Iron.

To four or five parts of clay, thoroughly dried and pulverized, add two parts of iron filings free from oxide, one part of peroxide of manganese, one half of sea salt, and one half of borax. Mingle thoroughly, and render as fine as possible; then reduce to a thick paste with the necessary quantity of water, mixing thoroughly well. It must be used immediately. After application, it should be exposed to warmth, gradually increasing almost to white heat. This cement is very hard, and presents complete resistance alike to a red heat and boiling water.

Another cement is to mix equal parts of sifted peroxide of manganese and well-pulverized zinc white, add a sufficient quantity of commercial soluble glass to form a thin paste. This mixture, when used immediately, forms a cement quite equal in hardness and resistance to that obtained by the first method.

Test for Arsenic.—A new and very delicate test for arsenic has been discovered by Bettendorff. Its sensibility is so great that it is said to be capable of detecting one part of arsenic in a million parts of solution; and the presence of antimony does not affect it. In order to apply this test, the arsenious, or arsenic liquid is mixed with aqueous hydric-chloride (hydrochloric acid), until fumes are apparent; thereupon stannous chloride is added, which produces a basic precipitate, containing the greater part of the arsenic as metal, mixed with stannic oxide.

Correspondence.

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

The Yosemite Valley.

Messrs. Editors :—Will you kindly grant to me, as an act of simple justice, the use of your columns to say a few words in answer to your editorial of the 19th ult. Your authority for some of the so-called facts stated, has sadly misinformed you, and misrepresented them ; and by so doing has left—or endeavored to leave—upon the public mind the impression that Mr. Lamon was the only *bona fide* settler in Yosemite prior to its cession to the State of California. That, I am sorry to say, is as unfair as it is untrue. The same misrepresentation was attempted before the Legislature of California, but after its full examination by committees of both Senate and Assembly, a unanimous report was made by each committee in favor of *both* settlers.

Not satisfied with this, the same parties, influenced by unfair motives, again made a similar statement in the San Francisco *Evening Bulletin* in December last. I met that by the following statement and challenge through the columns of that paper, but which they failed to accept :

"I arrived in Yosemite with my family, to settle there, May 20th, 1864 ; and the act of cession was not passed until June 30th, 1864—appearing for the first time on this (the Pacific) coast, I believe, in the *Bulletin* of August 3d, 1864. As these facts can be abundantly established, my settlement there can be proven to be *before* the passage of the act of cession to the State.

"As the above statements of some of the commissioners have been made before, both here and elsewhere, in order to set that matter at rest, I now challenge them, or any one of them, to meet me before a notary public, where I will swear that my statement is true and theirs is not. Will they do the same for mine? We shall thus have the opportunity afforded of seeing which of the two will be guilty of perjury, and willing to suffer the consequences.

"Respectfully, J. M. Hutchings."

As the same ubiquitous statement, like a certain well-known ghost, has again made its appearance, I again renew the challenge, and we shal see if that will possess the power of laying it or not. I hold that it is dishonorable to discuss any subject unfairly, and as dishonest as it would be to steal to misstate a fact. Let the question be discussed solely and fairly upon its own merit, and I will meet any one, at any time, for that purpose.

Besides, I am prepared to prove that not only was I the first visitor to Yosemite, and the first to make its glories known, by description and illustration, from 1855 down to the present moment ; but that as early as 1861, when health began to fail me, I had goods packed ready for transportation for the express purpose of making Yosemite our future home. Then, however, "Dame Rumor" half filled the valley with snow, by its drifting into it, as into a railroad cut ; and our departure was postponed in order to prove the truth or falsity of such a rumor. For that purpose Mr. Clark, one of the commissioners alluded to in your editorial, and Mr. Lamon, the other person there spoken of, set out with myself to test the question.

When snow had increased to nearly two feet in depth both of those gentlemen declined to go any farther ; and as I could not think of risking my family in such a place, until I had unmistakably demonstrated the safety of such a proceeding, I reluctantly started on without them.

With my provisions, blankets, overcoat, ax, sketching materials, etc., at my back, I wandered on through the cloud-draped, snow-covered, and trailless forest, *alone*. Each night I slept where any friendly rock or tree offered me shelter. Some days the deep snow, at times only up to my middle, at others up to, or above my chin, and frequently dropping me down among bushes, allowed of my traveling half a mile only from daylight till dark. On other days I accomplished from two to three miles. In this way I spent eleven days without seeing a human face or hearing the music of a human voice, and was thus enabled to reach the wonderful valley, and obtain satisfactory proof that the rumors—like the statements of your authorities—were without foundation.

Twice on this perilous trip I came near losing my life. Once when crossing some snow-covered logs that bridges a stream, the bottom dropped out, and, catching by one arm, I saved myself from being swept over a waterfall a hundred yards distant, and over eight hundred feet in hight. The other, on descending a slippery rock, I fell backward, my head striking on my ax, fortunately only inflicting an insignificant wound.

This is but one or two of many instances I could name. Had those men who sit in judgment upon me, and who talk as loosely and glibly about "squatters"—even stooping to misrepresent and defame me—performed and endured but half what I have done for my Yosemite home, they would be as unwilling as I am to surrender it—to be driven from it as though by living upon unclaimed, unappropriated, and entirely unreserved public lands, as a *bona fide settler*, I had committed some crime, and the driving me from it was but a fitting punishment therefor.

It is said that Sheridan, the English statesman, once went out from Cockneydom gunning. At noon he arrived at a farm house, and, seeing a large flock of tame ducks upon a pond, and a countryman standing near, eating his dinner, after looking first at the ducks, and then at the man, he offered him half a sovereign for a shot at the flock. This being promptly accepted, and the money paid over, Sheridan blazed away at the ducks, and killed a large number. Turning to the countryman with a somewhat sarcastic and triumphant smile, he said inquiringly : "You didn't make much by that, my man—did you?" "Oh, I didn't lose anything," was the stolid reply, "they 're not my ducks!"

Now, I opine that if those men who have misrepresented both me and the facts, had a loved home in Yosemite (consecrated by winter solitude, by many difficulties and privations and dangers, by ennobling and enlarging family ties, by many years of domestic happiness and peace); if they had endured for it, struggled for it, as I have done—in other words, if these were "their ducks" instead of mine, would they show quite as much *sang froid* in having them killed?

J. M. Hutchings.

Washington, D. C., March 24, 1870.

Easy Method of Restoring Jewelry to its Original Luster.

Messrs. Editors :—Years ago when electro-plating was first introduced into this country, I perceived while experimenting on the new process, that cyanide of potassium was a valuable article for restoring the luster of tarnished jewelry, but supposing that the fact must already have been revealed to the trade by the electro-platers, who could not be ignorant of it, I paid no further attention to the subject, beyond using the article in my own business.

About fifteen months ago, however, a gentlemanly-looking individual came into my store and offered to sell for five dollars a receipt for cleaning my goods, assuring me that it had been carefully prepared, under his direction, by a celebrated chemist.

Upon my declining to purchase he became anxious for me to witness the effect of his mixture. The result, although not as decided as it should have been, was satisfactory, and the conviction flashed across my mind that I had my old acquaintance, the cyanide, before me. A smell at the mixture verified the fact.

"That is cyanide of potassium," I remarked.

"Cyanide is one of the ingredients," he replied, "the principal one ; but there are four or five others. There is ammonia in it."

I doubted his assertion, but experience has taught me not to reject without a fair investigation even doubtful information because it is opposed to my preconceived opinions, so, although I refused to purchase his receipt, I willingly gave him an article to which he had taken a fancy for two of his vials. From a commercial point of view I was a loser by the transaction, but scientifically considered, a gainer, as it had led me to a series of experiments which confirmed my impression that a solution of cyanide of potassium in water—pure and simple—was equal if not superior to any compound that could be used, its action on the articles submitted to it being thorough and instantaneous. A piece of jewelry, so tarnished and dirty as to be unsalable, immersed in it for a few seconds, then rinsed in clean water and dried, was as clean and bright as when it came from the manufactory. At first I hesitated about submitting costly pearls and coral to its action, but soon found that the luster of the pearls instead of being injured was improved by the thorough cleaning of the settings around them ; the same being the case with the coral, the liquid cleaning all those parts of the work which neither brush, buff, nor thread could reach. Fine filigree and Tuscan work ; French, or fire gilt work ; plated and galvanized goods were equally benefited ; the only articles which could not safely be dipped being those which washing would injure, namely work with imitation pearls and paste gummed in, or with transparent stone mounted in close settings with foil behind. Lockets, and box and glass pins can be done by removing the glasses.

When I kept a manufactory I derived considerable profit from my wholesale and retail customers by cleaning their goods which had become tarnished and dirty by exposure. The work which then occupied a whole day can now be done by the new process in a couple of hours, the rouge and lathe being unnecessary.

Among the thousands of retail dealers scattered over the country, there are many to whom the process is still unknown. To them the knowledge of it will be valuable, as it will enable them to clean their own goods, at a saving of both time and money. I therefore send it for the benefit of your readers, naming the smallest quantity of the material that can be used with advantage.

Dissolve one ounce of cyanide of potassium in three gills of soft water. Turn up the end of a piece of brass or iron wire into a hook. Attach to it the article to be cleaned, and immerse it in the solution, shaking it backwark and forward for a second or two, then take it out and rinse well in clean water. Wash it with warm water and soap to remove any film of cyanide that may remain ; rinse again, dip into spirits of wine, and dry in boxwood sawdust. The advantage of dipping in spirits of wine is the immediate drying of the work without any sticking of the sawdust to it. When done with the solution, put it in a bottle and cork tightly. It may be used again and again for some months. Do not forget to label the bottle—*Poison*.

One caution is necessary ; do not bend over the solution so as to inhale its odor, nor dip the fingers in it ; if one of the articles drops from the hook, better empty the solution into another vessel. The cyanide is a violent poison, and although there is no danger in cautiously using it, carelessly inhaling it is injurious, and its absorption through the pores of the skin even more so.

Alexander Allan.

Improved Stove Legs Wanted.

Messrs. Editors :—In reading lately in the Scientific American, I noticed an article headed "Dangerous Stoves," which accorded so nearly with my experience about one year ago that I feel prompted to write you, partly to relate my experience in the matter, and partly to offer a remedy for what is certainly a most unmitigated nuisance, to say nothing of the danger to which both life and property are often exposed.

I purchased a stove with extension top and water heater ; the latter a covered boiler set loosely upon the top of the stove, and holding about four pails of water.

One morning one of the legs of my stove was discovered to have fallen out ; my little girl, then about ten years old, being the first to discover it, attempted to replace it, when the stove, standing upon two legs as it was, tipped over, throwing the boiler off and scattering its boiling contents all over the room. My child barely escaped a severe if not fatal scalding.

Now I fully agree with your correspondent that the matter is a serious one, and calls loudly for a reform. I suggest, as a remedy, that the legs upon the bottom of the stove, instead of being "dovetailed," be made square or beveled outward, and that the tapering part of the leg be made *solid* instead of *forked* (as they frequently are, for the purpose, I suppose, of saving a pound or two of cast iron), and then at least a three-eighths, or better still, a half-inch screw tapped into the bottom plate of stove, and the whole screwed firmly together. That, I think, is as cheap, simple, and *effective* as any device which can be gotten up, and when public sentiment, as well as public safety, demands it, stove makers will be compelled to adopt it. M.

Ansonia, Conn.

Lockage Waste.

Messrs. Editors :—In reading your article on the "Lockage Waste of Water on our Canals," it occurred to me that a considerable amount of the water now wasted can be economized by the very simple method of using a double lock instead of a single one.

Build two single locks, constructed in the ordinary manner, and parallel to each other ; place a water gate in the pier between the two locks at the lower level, so that when said gate is open communication is made between the two locks. In this case one lock can be used for lowering and the other for elevating boats at the same time. Suppose, for instance, there are a number of boats to pass the lock each way—one lock open to the upper, and the other open to the lower level ; boats are floated in, the lock-gates closed, and the water-gate in pier opened. The result is that the lowering of one boat from upper level has elevated a boat half way from the lower level ; then close water gate in pier, and complete the raising and lowering in the ordinary manner. The next transfer of boats would be done by the same means using opposite locks.

When boats are to be transferred from upper to lower level only, a boat is floated into the lock open to the upper level ; the lock gate is then closed behind it. We will suppose the gates on the other lock are closed with water in the lock at lower level ; then open water gate in pier between locks, when the lowering of the boat half way will raise the water half way in opposite lock, thereby saving nearly one half of the water now wasted.

A similar means to that used for lowering boats from the upper to lower level is applicable to raising boats from lower to upper level, when the passage of boats is entirely from lower to upper level.

Having two locks would also increase the usual means of transferring boats twofold.

Cleveland, Ohio. J. J. Smith.

Liquid for Soft Soldering.

Messrs. Editors :—A better liquid for soldering tin, iron or copper with soft solder, is obtained when the solution of zinc in muriatic acid is gradually heated, and then a proportionate quantity of oxide or carbonate of tin in powder is added, to neutralize the liquid. The same will not corrode the seams, like that made of zinc and acid alone.

For a fine job on tin, "Stearic acid" obtained from the candle factories, is much preferable to resin, etc., and will not run off so easily from the soldering iron.

Cement for stoves, etc.—1 part fine iron-filings, 1 part peroxide of manganese, made to a paste with liquid water-glass. Manganese and liquid water-glass will make a strong cement for glass and china ware, and gets hard quick.

To soften hard putty.—Break the putty in lumps of the size of a hen's egg, add a small portion of linseed oil, and water sufficient to cover the putty, boil this in an iron vessel for about ten minutes, and stir it when hot. The oil will mix with the putty. Then pour the water off and it will be like fresh made.

For removing hard putty from a window-sash, take a square piece of iron, make the same red-hot, and run it along the putty till it gets soft. The putty will peel off without injuring the wood work. Concentrated lye made of lime and alkali will effect the wood and make it rot quicker.

Beardstown, Ill. Th. A. Hoffmann.

Boiler Inspection.

Messrs. Editors :—There is, no doubt, much justice in the strictures made by "Nimrod," in your issue of March 26, respecting the testing of steam boilers in Connecticut.

If he pleases to give me his address, I will show how his desire to have thorough inspection of his boilers may be met.

106 Broadway, New York. Thos. S. Cunningham.

Mending Broken China.—Diamond cement for glass and china is made in the following manner : Take isinglass 1 oz., distilled water 6 ozs., alcohol 1½ ozs., warm in a water bath till dissolved, and strain the solution. Add to the clear solution, while hot, milky emulsion of gum ammoniac ½ oz., alcoholic solution of gum mastic 5 drachms ; this possesses great adhesive qualities.

Effect of Sudden Loads on Cast Iron.

Brittle substances are usually defined by physicists as those in which the force of cohesion is comparatively weak. Their particles or component atoms are therefore held somewhat loosely together, and when exposed to strains of certain descriptions, possess little or no resistance. It will probably here be observed that many brittle substances are endowed with very considerable powers of resistance to a crushing force, although they display but very feeble tensile strength. This is no doubt true. Cast iron, for instance, will stand a direct crushing force ot fifty tuns to the square inch, while its tensile strength is only eight tuns to the square inch. But the real strength of the material is only to be depended upon when the crushing force is applied in a particuler manner. It is not so much a question of the amount of the force, as of the manner in which its action is exerted. When it is stated that cast iron will bear a crushing or compressive strain of fifty tuns per square inch, it is always presumed that the strain is applied to the material in a similar mode to that which prevailed at the experiments which fixed that constant. Whenever the weight of fifty tuns, or other crushing weight, is imposed upon a square inch of cast iron, it is supposed to be by gradual and almost imperceptible increments, commencing with a very small weight, and terminating with that which ultimately determines the fracture of the specimen under experiment. If, on the contrary, the weight be applied suddenly and violently, the material will yield to one very much less in amount. It is this liability to give way under a sudden strain that has rendered engineers so very cautious in employing the material in any situation where it might perhaps inadvertently be exposed to its influence. By an excess of caution, cast iron is frequently, from the same cause, debarred from being applied to numerous useful purposes to which it is perfectly well suited, and in which it might be adopted without the slightest fear of disastrous or unforeseen consequences. It is, no doubt, advisable, especially for young members of the profession, to be "on the safe side," as it is termed, but nevertheless, while adhering to the example of precedence, and the result of experience, one must not be afraid to employ a constructive material simply because its employment has been in some instances attended by failure; however, it should not be forgotten that the majority of these failures occurred in the early days of railways, and were due more to the incompetency and rash judgment of the designers of the structures than to any real defect in the material.

At present it may be safely presumed that our knowledge of the nature, properties, and capabilities of cast iron under strain is more complete than it previously was, and it might therefore be concluded that bridges and other structures of that material were not likely in future to be subject to such contingencies. No doubt such accidents are rare, but that they still happen is demonstrated most absolutely by the occurrence that took place recently at the bridge of Elkantara, in Algeria. A description of this bridge will be *apropos* to our present article, and very instructive to those who may have the designing of works of the same or similar character. In the first place let us briefly relate the accident. A roller of five tuns in weight was traversing the bridge backward and forwards for the purpose of crushing the metalling and bringing it to a smooth surface. On a sudden the roadway gave way. The horses attached to the roller were able to maintain it for a few minutes in a suspended condition, while the driver cut the traces, when it disappeared into the gulf beneath with equal noise and rapidity. The ravine across which the bridge of Elkantara is thrown is nearly 400 feet in depth, so that both driver and horses had a very narrow escape of being dashed to pieces. The span of the bridge, which is wholly of cast iron, is 184 feet, and the clear width between parapets 33 feet. There is not the slightest difficulty in the present instance in arriving at the cause of the accident. It was the breaking of one of the cast-iron plates constituting the roadway, under the heavy rolling load brought upon it. There are altogether five arched ribs composing the framework or main girders of the bridge, two of which are the face or outside ribs, and the others the interior or intermediate ones. These latter are spaced about 9 feet 9 inches apart, and the whole are braced together by cross girders and trussing, also of cast iron. The transverse girders are of a plain T section. Upon the intermediate arched ribs are placed the cast-iron road plates, their span being nearly equal to the distance between the centres of those ribs, which is evidently a long span of cast-iron plates in the situation under description. The plates are slightly cambered, and their average thickness is 0·8in. That of the metalling is about 10½ inches. The framework of the structure was not in any degree affected by the accident.

A glance at the construction of the bridge at once points out that the contingency was, in the main, due to an attempt at false economy. The design clearly was to dispense with the usual transverse road beams, and make the cast-iron plates do the double duty of acting as road plates and girders at one and the same time. The shape and section of material that will answer perfectly for a road plate pure and simple, where the span does not exceed 3 feet or 4 feet, is not by any means adapted to situations where the span becomes nearly 10 feet. It is somewhat extraordinary that the French engineers, who, as a rule, calculate the action and effects of strains upon bridges a great deal more precisely than we do, should not have appreciated the exact nature of the case. At the very first sight, a road plate of cast iron nearly 10 feet in span is a very unusual piece of construction, and it could not fail to strike one that in that position it would be acted upon by other strains than that of compression. Cast iron in the shape of a road plate is not adapted to undergo tensile or transverse strain, and even in the best form, namely, that of Mr. Hodgkinson's girder, it is not altogether reliable under a heavy impactive or concussive load. In addition to these theoretical objections, there are also others of a practical nature. When the ratio of the thickness of the plates to their superficial dimensions is considered, it is not an easy task to insure that the casting should be thoroughly, uniformly, and homogeneously manufactured. Any flaw in it, which might, under less trying circumstances, be of no importance, would be fatal to a plate in the situation it was placed in at the bridge of Elkantara. On the score of weight, both cast-iron plates, and the still older practice of using brick arches to carry the roadway are objectionable. They are now nearly obsolete with us. Wrought iron corrugated or buckled plates are the means usually employed by English engineers for supporting the roadway of public bridges, but even in that case their span does not attain to the dimensions of the cast-iron plates which have been just described. The cross girders of a bridge require depth, the road plates, superficies, and it is impossible to combine the two in one without the chance of danger, or incurring an unwarrantable expense.—*Building News.*

New Photo-Engraving Process.

We have pleasure in announcing a new photo-engraving process, with half-tone, of great promise which has just been patented by Mr. Woodbury. The one example which we have seen strikes us as amongst the most perfect examples of photo-engraving we have hitherto met with. The process is based upon Mr. Woodbury's photo-relief process, part of the operations in which are employed to produce the printing-plate in the new method, which may indeed be regarded as a modification of the old one, although giving different results, printed at a different press, and with a different ink.

In order to make the matter clear to the reader not familiar with the technics of intaglio printing, we must briefly explain one or two details. Most of our readers know that copper-plate printing is effected with a plate having an image in intaglio; that is, the design is cut in or sunken, not in relief. They also know that Mr. Woodbury, in his photo-relief process, prints from a similar plate. It might naturally be asked, therefore, why Mr. Woodbury's intaglio plate might not be used in the ordinary process of copper-plate printing instead of requiring a special gelatinous ink and special presses. There are several reasons; but there is one of an especial and primary character; such a plate from a subject with half-tone has no ink-holding capacity. In a subject with half-tone there are broad spaces of flat or continuous tints out of which the ink would be wiped when used for copper-plate printing. It should be remembered that after inking a copper-plate it is wiped to remove all the ink which does not fill up the sunken design; and, if the plate have no grain or ink-holding spaces, the ink is wiped out of the widest and shallowest spaces, destroying much of the image. If, however, these spaces have a grained or cellular texture the ink is held by the grain or cells, and is not wiped out.

Various methods have been adopted to secure the requisite quality in photo-engraved plates, with greater or less degree of success, which it is not necessary to refer further to here. The method adopted by Mr. Woodbury is analogous to some of them; and, so far as we can judge from what we have seen, more efficient than the majority of them.

Like many other valuable discoveries, Mr. Woodbury's new process owes its origin partly to accident. About twelve months ago Mr. Woodbury gave us one of his gelatin reliefs, which had a singular defect. He was in the habit of adding a little coloring matter to the gelatin from which his reliefs were formed, as an aid to examining their progress in development. On this occasion, from some unexplained cause, the color, instead of diffusing itself as a flat tint or stain, granulated, and communicated to the gelatin relief a surface resembling that of a very fine aquatint plate. When this effect was first produced we discussed with Mr. Woodbury the chances of utilizing it as an aid to producing a photo-engraved plate for copperplate printing. The idea then canvassed, Mr. Woodbury has since worked out to the issue we mention. From a granulated relief an intaglio in lead or type metal is obtained by hydraulic pressure; but as such a plate would be too soft for valuable service in the mode of printing employed with copper-plates, it is desirable to proceed further. This soft metal plate is therefore placed in the battery, and a copper-plate in relief obtained; from this, as a mold, another intaglio plate is obtained in the battery. This last is the printing plate, and to give it enduring qualities it is submitted to the *acierage* process, whereby it acquires a steel face, so that a large number of impressions may be obtained without sensible wear.

How far this new process will bear out, in general practice, all that it now seems to promise, time alone can tell, but, so far as we can judge, a valuable addition is secured to the mechanical printing processes connected with photography.

Since writing the above we have seen specimens of a process in some respects analogous, patented by Mr. Courtenay, and described at the Photographic Society. We shall hope to see further examples before forming a decided opinion of the value of the process, as those we have seen scarcely suggest any great advance on what has already been achieved.—*Photographic News.*

Spare the Centers.

The practice of kocking off the centers of turned work is a mischievous one. It is merely doing work that is not only needless, but that, at some future day, will have to be done over again. When a center is once properly made in a shaft, or any other part, it is unalterable except by chipping or purposely changing its position; and work once turned true on good centers, will always be true, provided no damage occurs to it. It is just in this particular that the true center is useful, for if a shaft is bent, or an arm on one thrown out of line, the old centers are available, and the injured piece can be made as good as new in a short time. Suppose, however, that the journal of a shaft is worn oval, or that the collar is battered and jammed up, how is it possible to find the true center of the shaft? It never can be found; the shaft may be made to run straight, but not by its old centers if they have once been cut off. When shafts are forged too long, in cutting them to the right length great "tits" are left on the ends, which are both ungainly and in the way. This is the blacksmith's fault, and must be remedied by the machinist; cut the shaft to the right length first, knock off the centers if they are too long, and then re-center the job and finish it according to the drawing. In steam-engine work, especially, the centers of shafts are essential to nice adjustment, and they should never be removed.

A foolish notion prevails among some mechanics that centers injure the finished appearance of the work, but it seems to us that this is an erroneous view, which ought not to be tolerated. Drill every center, and drill it deep; countersink it so that it will have a good bearing on the centers of the lathe, and the workman will have the satisfaction of knowing that, all other things being equal, he will have a good job, and one that can at any time be easily repaired if damaged.—*Modern Practice of American Machinists and Engineers.*

Velocity of Shafts.

As the quality of the material employed for the construction of shafts enters largely into the calculation of their strength, so also the velocity at which they revolve becomes an important element in the calculation of the work transmitted by them. In all cases where machinery has to be driven at a high speed, it is advantageous and even essential to run the shafting at a proportionate velocity. If, for example, there are a series of machines running at five hundred revolutions per minute, it will be advisable to run the shafts at half that speed, by which means the following very important advantages will be gained.

There will be a great saving in the weight of the shafts, for with a slow motion of fifty revolutions per minute, fully three times the weight would be necessary to transmit the same power. There would also be a saving in original cost in the power absorbed, and in maintenance.

Shafts running at low velocities are cumbersome, heavy, and expensive to repair. They are costly in the first instance, and they block up the rooms of the mill with large drums and pulleys, obstructing the light, which, in factories, is a consideration of very great importance.

At the commencement of the present century, mills were geared with ponderous shafts, such as those just described. They were generally of cast iron, square, and badly coupled, and the power required to keep them in motion was, in some cases, almost equal to that required by the machinery they had to drive. In the present improved system, with light shafts, accurately fitted and running at high velocities, the work which previously was absored in transmission, is now conveyed to the machinery of the mill.

I may safely ascribe my own success in life, and that of my friend and late partner, Mr. James Lillie, to the saving of power effected by increasing, threefold, the velocity of the shafting in mills more than forty years ago. The introduction of light iron shafting not only enabled the manufacturer to effect a considerable saving in the original cost, but a still greater saving was effected in power, while it relieved the mills from the ponderous wooden drums and heavy shafting then in use, and established an entirely new system of operations in the machinery of transmission.—*Principles of Mechanism.*

The Trade in Masks.

Masks are an important article of trade in Paris. The houses which are engaged in this industry are generally respectable and long-established houses, who make their money out of folly in the soberest way. Paris produces masks, but the foreigner buys them. South America, New Orleans, New York, and especially Buenos Ayres and Brazil, are among the principal customers—the carnival being observed there with great enthusiasm. Parisian makers also receive orders from America for masks representing the types of the human race—negroes, Jews, Englishmen, Germans, etc.

Italy makes her own masks. Russia orders but few, as it pays but little attention to the Carnival; but Protestant England requires a great many masks for the anniversary of the Gunpowder Plot. What with one festival and what with another, this trade is never quite at a stand still. The workmen engaged in it are paid from 5 francs to 6 francs a day; the women from 2 francs to 3 francs. The commonest mask, worth one sou, passes through the hands of eight workpeople.

Just before going to press with our last issue, we received the announcement of the successful launching of the caisson for the Brooklyn tower of the East River Bridge, of which we had only space to make a brief notice. Notwithstanding the giant dimensions of the structure, no difficulty whatever was experienced in making the launch. The caisson will have to support a weight of one hundred and thirty-five millions of pounds. The base of the towers will rest on an area of one hundred and thirty-four feet by fifty-six feet, and it will diminish at the top to an area of one hundred and twenty by forty feet.

The direction in which plants twine is not a direct result of the position of the sun in regard to them; the French bean turns from right to left; the hop from left to right, and the common bryony either way.

Improved Vehicle Spring.

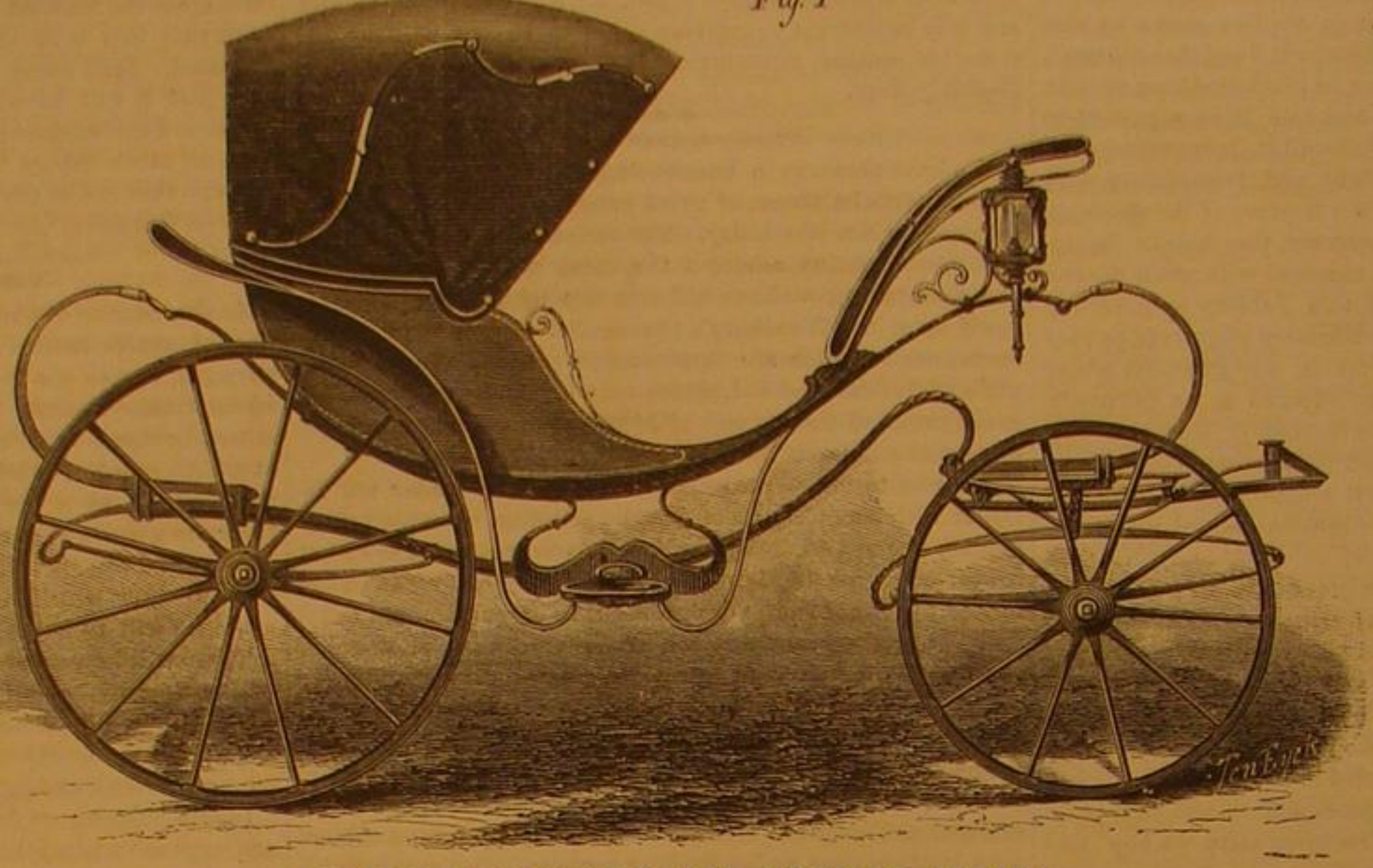
Our engravings illustrate an improved vehicle spring, constructed of wood and steel, which appears to be much superior to those hitherto employed for thorough-brace vehicles.

Fig. 1 represents the spring applied to a "Victoria" carriage to be driven with postillions, and Fig. 2 shows the construction of the spring in side elevation.

A represents the outer leaf which is of steel, and which is made longer and stronger than the other metal leaves.

The lower end, B, is bent perpendicular to the other part, to rest against the other side of the axle or rocker, C, as the case may be; and it may, if preferred, be connected to the strap, D, attached to the under side of the bar, E, of the frame, extending from the hind axle to the front rocker. The upper end is doubled under and laps back on the inner wood leaf, as shown at F.

Fig. 1



GOLLERS' THOROUGH-BRACE VEHICLE SPRING.

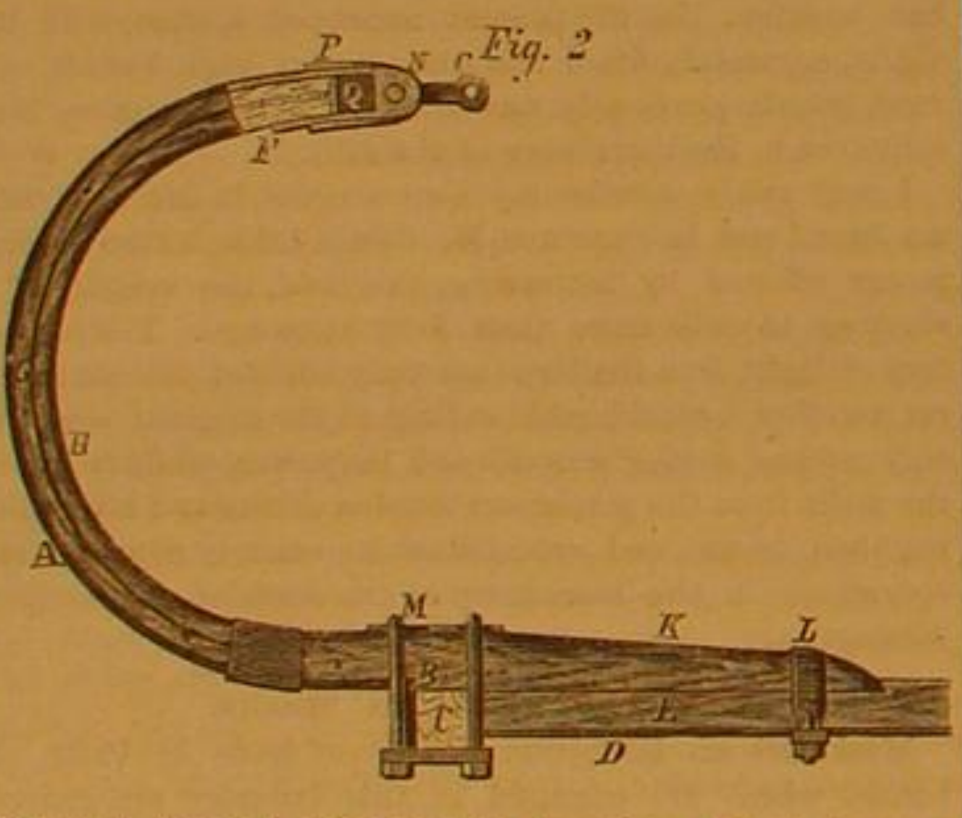
G and H represent the wood leaves of the spring, and I another metal spring between them. These wood leaves terminate in a common shank or stock, K, at the lower end, which is attached to the top of the bolster or axle, C, and the bar, E, by the clips, L and M.

The upper end, F, also laps around the pivot bolt, N, of the shackle, O, and a band, P, is arranged around this double end for straightening it, and for forming the two sides of the socket or recess at the end of the other leaves of the spring, the said leaves being shorter than the leaf, A. This socket is fitted with an india-rubber spring, Q, against which the shorter leaves bear, and which yields to make room for them, when by the springing action they push forward in the socket.

This arrangement is intended to give each leaf of the spring freedom to expand or contract relatively to the others, independently and unconfined by them; and by it each leaf performs its function to better advantage, than when all are confined together, as these springs have heretofore been arranged.

The straps or loops by which the body of the vehicle is supported are connected to the shackle, and may be arranged to extend over the leaf, A, and to be fastened to the plate, B, if preferred

Fig. 2



Patented, through the Scientific American Patent Agency, February 8, 1870, by John Goller, of Los Angeles, California, whom address for further information.

RAPID TELEGRAPHY.

A new telegraph line is now being constructed between New York and Washington, forming a small section of wires that are intended to ramify in all directions through the country, by which cheaper and more rapid telegraphy is expected to be realized. This is the enterprize of the National Telegraph Co., and from the printed report of the Executive Committee to the stockholders, we gather a number of interesting particulars. The capital stock is ten millions of dollars. The instruments used are the recently patented telegraph improvements of George Little, of New Jersey. The messages to be sent are prepared by punching slots and circles through a strip of paper, which, on being drawn through the telegraph instrument, transmits corresponding electric signals. These are received and made visible upon strips of chemically-prepared paper.

Copies of messages may be dropped at all stations upon the line without interfering with the working of the instruments. The machines for preparing the messages are quite simple, and are operated by girls. Mr. D. H. Craig, one of the most experienced telegraph men in the country, states that as much business can be done with the Little instruments, using only one wire, and thirty-two girls to prepare and copy the messages, at a total expense of $48 per diem, as can be accomplished by means of fifteen wires and thirty first-class Morse operators at an expense of $120 per diem.

There is also a difference of fifteen to one in favor of the new system in the prime cost and maintenance of wires.

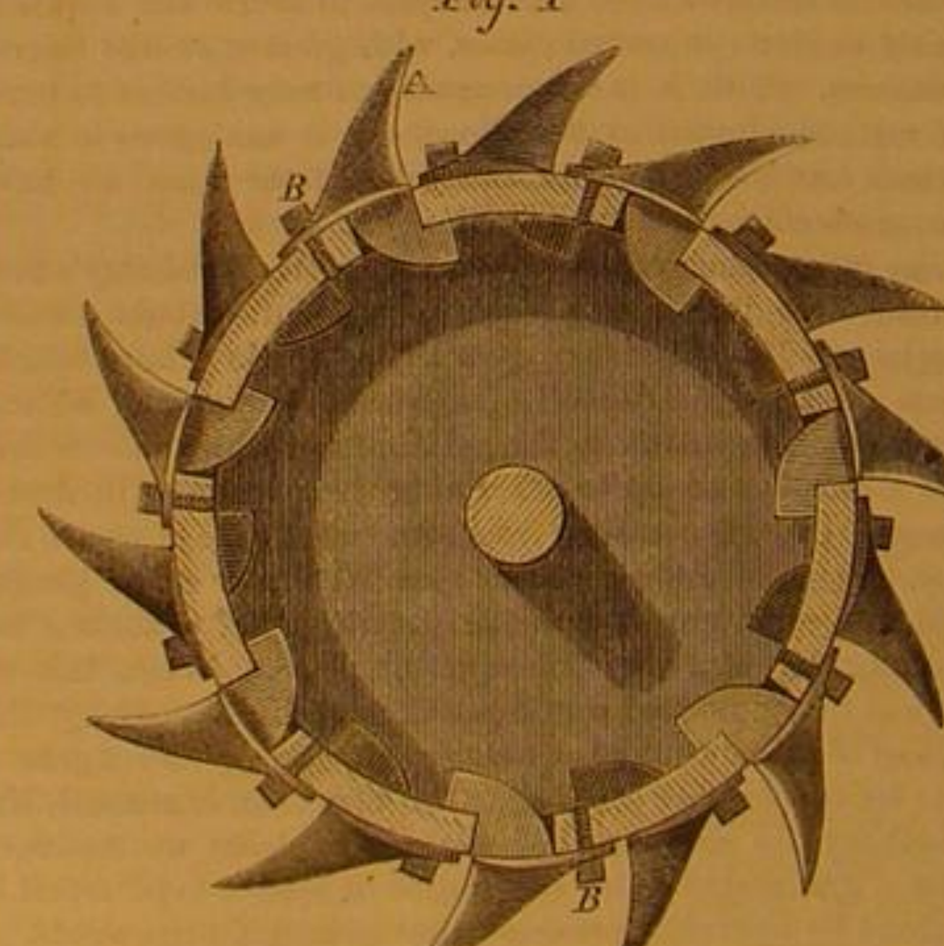
The new company expect that when, by their competition, they have brought down the tariff of the Western Union, and other telegraph companies, to the lowest paying point, the National Company will be able make a reduction below this of 50 per cent, and still have a good margin for profit. If the company can do this or anything like it, their business will be enormous. Next to cheap postage and quick mails the people want cheap telegraphy; and we therefore welcome anything that promises to bring it about. We notice among the active managers the names of Isaiah Blood, Erastus Corning, Jr., and other gentleman of wealth and energy, which is a guarantee that the new company means business. We certainly wish it every success.

IMPROVED COAL-BREAKING MACHINE.

In the ordinary method of breaking coal much of it is crushed into powder, in which condition, it is for ordinary consumption, practically valueless. The object of the present invention is the improvement of the construction of breaker rollers so as to split the coal into fragments, by the substitution of a wedge-like action for the crushing process heretofore employed.

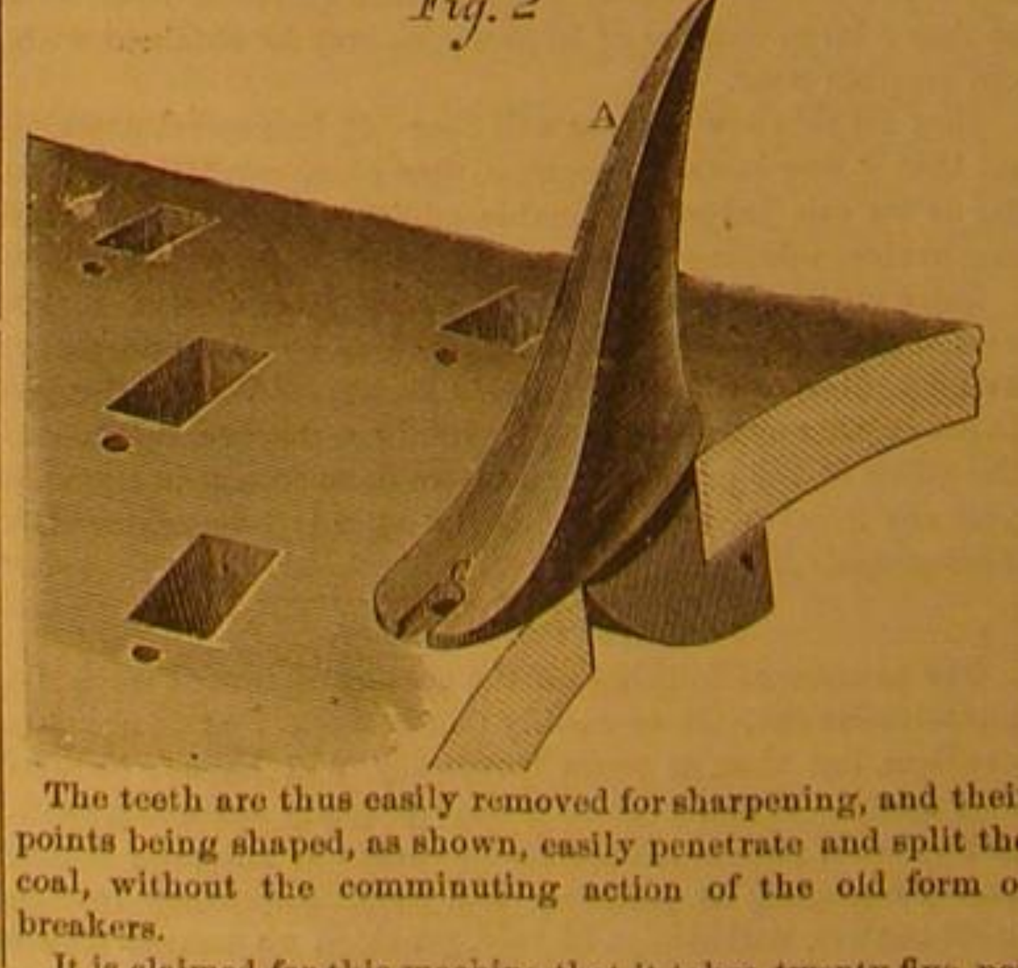
To this end, the rollers are furnished with detachable teeth of steel, of the form shown at A, Figs. 1 and 2. The inner

Fig. 1



ends of these teeth are made to hook on to the interior of the iron cylinder to which they are securely held by the bolts, B, Fig. 1, placed in slots, C, Fig. 2, formed in the bases of the teeth, as shown.

Fig. 2



The teeth are thus easily removed for sharpening, and their points being shaped, as shown, easily penetrate and split the coal, without the comminuting action of the old form of breakers.

It is claimed for this machine that it takes twenty-five per cent less power than any coal breaker heretofore used; that it is very much more durable, and that it at the outset makes twenty-five per cent less waste than machines using the common cast-iron tooth, while it saves a very large proportion of subsequent waste in transportation, because the coal is not so fractured as to break and pulverize in handling.

Patented, through the Scientific American Patent Agency, March 1, 1870, by Edwin Douden, of Lykens, Pa., assignor to himself and Charles Broome, of same place, either of whom may be addressed for a portion or the entire right for the United States.

THE YOSEMITE VALLEY.

In accordance with our general desire to give both sides of every question a candid hearing, we publish in another column a letter from Mr. Hutchings, who claims to have been a *bona fide* settler in the Yosemite valley previous to its cession to the State of California. If his claims are valid he is entitled to compensation, but we maintain that it would be disastrous to allow such a natural wonder to pass from the control of responsible and disinterested hands into the hands of private parties for purposes of speculation. We should as soon think of admitting a private claim to Niagara. If Mr. Hutchings is injured by the action of the government, by all means let him receive ample remuneration, but this great natural wonder should be, as Congress designed, held forever in trust for the people.

The feelings of attachment for his home, which Mr. Hutchings makes so prominent in his plea for the right to remain, ought to yield to considerations of public good; nevertheless, we should not object to their having weight in whatever pecuniary allowance may be made to him upon the full establishment of his claim.

PORTABLE LAUGHING GAS.

Protoxide of nitrogen, commonly called laughing gas, is a remarkable substance. It was discovered by Priestly in 1776, and quickly exhibited curious properties, which chemists thought might be utilized for a variety of purposes, particularly for the alleviation of pain. When inhaled, it produces the most agreeable sensations, being a species of intoxication, but very different from that of alcoholic liquors. The discovery of chloroform has superseded every other agency as an anæsthetic; still laughing gas continues to be used in dentistry to some extent. A great bar to the utilization of it, is that it is not to be had when wanted, except by special manufacture. Professor Doremus has put the gas into a portable shape. He condenses it into the liquid state, which is done by a pressure of about 800 pounds to the square inch. He bottles it up in a stout jar, or vessel, which contains an enormous quantity of the gas, compressed into a small compass. Another important property of the gas is that it vaporizes at something like 125 degrees below zero. Hence it is a powerful agent for the production of cold. The Professor exhibited this recently in a beautiful experiment. He poured some of his liquid gas into a glass tube, then put in some mercury. Vigorous ebullition presently commenced, and in a few seconds the mercury was frozen into a solid lump. It was curious to see the gas boiling furiously while freezing the mercury.

The Proposed International Exposition at Buffalo—A Permanent Building.

A petition, signed by the leading firms and prominent citizens, has been forwarded to Albany, asking the Legislature to grant the City Council of Buffalo authority to lease Terrace Park to the Mechanics' Institute to erect a mammoth fire-proof building for the purpose of holding international industrial expositions and perpetual bazars.

Terrace Park, which is located in the heart of the business portion of the city, is accessible to railroad and steamboat depots, and is surrounded on all sides by broad streets. The main building is to cover an area of over one hundred thousand square feet for the exposition of goods. It is intended to make Buffalo the central point between the East and the West for annual exhibitions and national sales depot.

Solar Spots.—As the period for maximum occurrence of solar spots approaches, increased disturbance is apparent in the photosphere. Those interested in this class of phenomena may almost at any time see such spots, by protecting the eyes with smoked glass. It will be interesting to note whether the connection supposed to exist between solar disturbances and auroral displays, is verified by the observations which will be made during the period alluded to.

Gilding on Glass.—Mix powdered gold with thick gum-arabic and powdered borax. With this trace the design on the glass, and then bake it in a hot oven. Thus the gum is burnt, and the borax is vitrified, at the same time the gold is fixed on the glass. To make powdered gold: Rub down gold leaf with pure honey on a marble slab, wash the mixture, and the "precipitate" is the gold used.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE DARIEN CANAL---WILL IT PAY TO BUILD IT?

After all the surveys and reconnoissances that have been made (19 different routes and more than twice as many surveys) of the narrow strip which divides North and South America, extending between and inclusive of Tehauntepec and Darien, general opinion seems to have settled upon the latter Isthmus as the point for an interoceanic canal.

Admiral Davis in his report to Congress says: "It is evident that to this point we must look for the solution of the great problem of a union of the two oceans. On this Isthmus the two great waters are divided only by a distance of 27 miles, and waters flowing into the Pacific actually come within three miles of the Atlantic Ocean, and tradition says in days gone by that, in some of the great tidal waves which volcanic action heaves up from the quiet Pacific, they have been united. Certain it is that at that point is not only the narrowest part but also the lowest elevation between the two continents. Yet with these facts before the world, there never has been a careful examination of any route on this Isthmus. Expeditions, one after another, have failed, and, we fear, with all its excellent preparation, that another is to be added to the list of failures.

All who have visited the Isthmus agree that it is folly to attempt a passage after the 1st of May. A French party disregarding the warnings given them, attempted to cross early in that month, found themselves caught by a flood, and were scattered over the plains on little hillocks like so many pelicans, whence they were picked off with boats. It is now but a few days to that time when the rainy season commences, and as yet the well-equipped United States Government expedition has hardly effected a landing at Caledonia Bay. But be theirs a success or a failure, it does not alter the fact that a ship canal must at some time be dug, and that Darien is the location. It simply puts off the day; the accomplishment of the great enterprise is inevitable.

Dr. Cullen, an Englishman, claims to have made the most complete reconnoissance of the Isthmus of Darien. He claims to have found a practicable route, with an elevation of not over 190 feet, and he thinks even less may be found. We submit his map.

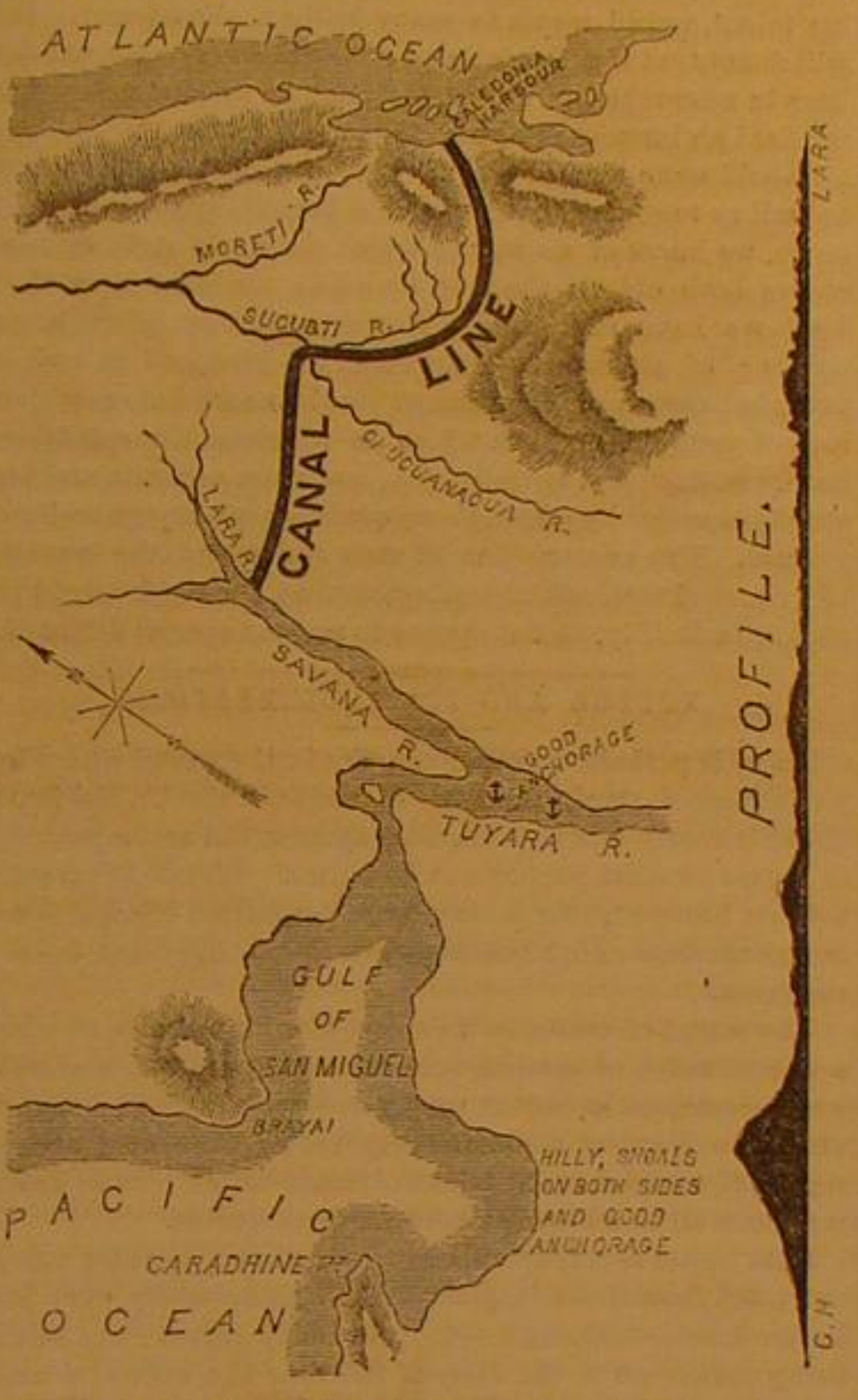
It will be seen that he has a canal of 21 miles, and deepens the Sucubti 12 miles, then navigates the deep streams, Lara, Savana, and Tuyara, 14 miles more, in all 47, with one or two tidal locks—no other. He estimates this to cost about $34,000,000, but his estimates are only for a canal 24 feet deep and 150 feet wide through the mountain or deep cuttings. It would be folly to dig such a small canal at the present day. The harbors at each end will accommodate ships of the largest class now known, and at low tide the depth of water at the mouth of the Lara is 50 feet. The tide rises there 12 to 14 feet.

What should the Darien Canal be? what should it cost? and can it be built?

The canal to meet the requirements of modern commerce of all characters should be 50 feet deep its entire distance, and 500 feet wide at top, throughout the earth or valley cutting, and at least 150 feet through the mountain section. Without the most wasteful extravagance such a canal would not cost near $100,000,000. The actual mountain section is not over three miles long, the rock is soft dolomite, and coralline, limestone, and gravel. The climate, unlike that of Panama, is comparatively healthy, and there need be no such mortality as was witnessed in the construction of the railroad. We estimate that 10,000 Chinese laborers would in five years add another to the great works of modern engineering skill.

There are remains of greater works in Mexico, built by a people we know nothing of. Ancient Rome had aqueducts almost rivaling this project, and it does not equal those monuments of regal pride and folly the pyramids. The Grand Canal of China, said, by the lowest estimate, to be 863 miles long, is claimed to have taken 43 years to build. It has no locks, and the Morris Canal Company borrowed the idea of drawing boats over inclined planes from that nation. The Holstein Canal is 50 miles long, 100 feet wide at top, 54 feet at bottom, 10 feet deep, cost $30,000 per mile, and was nine years in being built. The Caledonian Canal has 23 miles of cutting, is 122 feet wide, 20 feet deep, and took six years to finish. The Welland Canal has a main trunk of 28 miles, and 22 miles of feeders. It cost £1,800,000, and is navigable for vessels of 800 tuns.

These are some of the great works of engineering skill in effecting inland navigation from which we may draw inferences; but it is with our own Erie Canal that we especially desire to make an analogy. Its main line is 363 miles long, was originally cut 4 feet deep, 40 feet wide at top, and 28 feet at the bottom, was 8 years in building, and cost, in total, $9,474,373, though only $7,143,789 is stated to have been the cost of the canal proper.



Now if we condense the Erie Canal one tenth we have a canal 36·3 miles long, 40 feet deep, 400 feet wide at top, and 280 feet at the bottom. Thus putting the work of 363 miles into 36·3. Taking into consideration the greater lift of dirt, etc., from a depth of 40 feet instead of 4, and the greater length of haul, such a canal should not cost more than five times the amount of the Erie. Then, too, we must remember that labor-saving appliances are more frequent, that the steam dredge now digs, and the steam drill now bores, where once slow hands toiled, and nitro-glycerin does ten times the work of old style gunpowder. The Erie Canal was, in its day, a greater work for the State of New York and the United States than the Darien Canal is to-day for New York city alone. The same spirit of enterprise which animated the one should, and must, build the other.

We have not yet alluded to the cost of the Suez Canal.

Apparently it was much less work to cut through the soft sands of the desert than the rocks and mud and gravel of Darien; but we must remember the manufacture of a harbor at Port Said, and, too, the fact that in the item of "operating expenses, repairs," the rocky sides of Darien will tell vastly in its favor. While, too, the Suez Canal is a great work of universal importance yet it can never be what that of Darien will be if properly constructed.

Mr. F. M. Kelly, of New York, has for years been investigating the various routes for a ship canal between the two oceans, and has done more than any American to bring to light its advantages and the most advantageous route. In 1859, he had a table prepared from the public records of France, England, and the United States of the trade of each of those countries likely to pass through the Darien Canal, namely

	Value.	Tuns.
France	$ 59,073,859	162,735
United States	100,291,687	1,857,485
England	139,184,834	1,029,295

	Value of tunnage.	Estimated saving.
France	$ 8,136,750	$ 2,183,930
United States	93,874,250	85,995,930
England	51,464,750	9,950,348

English vessels would use the canal only on their outward passage to China, etc. Statistics from commercial relations, for 1868, put our foreign Pacific trade at only $44,400,000, gold. England, on the other hand, has greatly increased hers, as she has all her commerce. A new commercial power has also arisen in the Confederated German States, or Prussia. The Suez Canal, too, will take some of this trade, especially if it be permanently and properly kept up

Mr. Kelly publishes a list of distances as follows:

New York to	Via Cape Good Hope.	Via Cape Horn.	Via Darien Canal.
Calcutta	17,500	23,000	13,400
Shanghai	20,000	22,000	10,400
Valparaiso		12,900	4 800
Melbourne	13,230	12,720	9,890
Canton	20,000	22,000	10,400

Hence we see that to leave out other countries, the saving to the United States alone makes the canal a necessity. In all these estimates, too, but little if any notice is taken of our California trade, which has become so large, and the trade of that country with Europe direct.

We gather from various sources the following tables:

London to	Via Cape Good Hope.	Via Darien Canal.
Canton	13,650	11,200
Nagasaki	14,675	10,400
San Francisco via Cape Horn	13,000	8,000

New York to	Via Cape Horn.	Via Darien Canal.
San Francisco	13,140	5,140
Nagasaki	14,925	8,000

The advantage of this route is apparent, and all know the present great and increasing commerce of San Francisco. The trips via Cape Horn from New York to San Francisco range from 90 to 130 days. By the Darien Canal the same could be made in 45 days. Any commercial man can estimate the difference in favor of the canal.

1st. The difference of amount of wages to be paid.
2d. Shorter time and less rate of insurance.
3d. Wear and tear.
4th. Less insurance on cargo.
5th. Less damage to cargo.

The Suez Canal has cost over $80,000,000, and it is estimated to cost $20,000,000 more to make it what was originally intended—that is, 100 yards wide at top and 26 feet deep. We are told that, with its present imperfection, they have taken nearly $100,000 of tolls. Our Darien Canal costing, say $75,000,000, if the estimates we have given are correct, and we have used every effort to be accurate, would at least pay ten per cent profit, and Dr. Cullen estimates the actual saving to the commerce of the world in 1857 would have been $48,130,208, nearly enough to have built it.

AN INVISIBLE CHAIN AND A SILENT CONFLICT.

Of all the forces of nature there is, perhaps, no one more peculiar in its manifestations than that called the attraction of cohesion. This force is the invisible chain which binds molecules into masses, against which another unseen force is constantly tugging.

When particles of matter, of the same kind are brought into so close proximity that the spaces between them are no longer sensible, this force seizes upon them and binds them into a mass, provided heat, the great antagonist of cohesion, does not act with sufficient force to prevent the union. This is illustrated in many ways. A machinist can file two pieces of iron to such a perfect plane surface that, when placed together, thin particles come within the range of this force and cohere. Two clean surfaces of lead may be pressed together till they cohere. Two plane surfaces of ground glass placed together will cohere very strongly.

The ordinary process of welding is an example of simple cohesion. In this process, two pieces of iron are heated, placed together, and hammered so as to bring the molecules within the range of cohesion. Here we see one of the anomalies of this force. We have said that heat is the antagonist of cohesion—how is it, then, that, in welding iron, these forces assist each other?

When we look a little more closely into the philosophy of welding, we find that heat does not assist the cohesive force at all. In the case of filing two pieces of metal so that they cohere, the union is weak, because only a few of the particles are brought within the range of this force. A plane surface has only been approximated, however perfect it may appear. It is, in reality, a series of mountains and valleys, only the summits of which are brought sufficiently near to each other to be linked together by this invisible chain. If, when this is done, we render the molecules sufficiently mobile by heat, so that the force of blows with a hammer, or the compression of rollers would force them within the range of cohesion, the bond would be complete. The object of heating, in making a weld, is to render the particles movable without entirely overcoming their cohesive attraction, so that they will cohere under the hammer, with such diminished energy as remains. As the iron subsequently cools, cohesive attraction acts more and more, until it reaches its maximum intensity.

In considering the various manifestations of this force, it is important to avoid confounding it with adhesion, a force which acts only between particles of matter of different kinds. Thus, two lumps of soft clay may be made to cohere, and become one mass, but, when the clay sticks to a body composed of different material, it is the force of adhesion which holds it there.

Regnault has called cohesion the "force of aggregation," a very appropriate and significant term. It is upon the degree of antagonism between this force and heat that the solid, liquid, and gaseous states of bodies depend. When the antagonism is small, we have a solid. When cohesion is nearly balanced by the disruptive force of heat, bodies exist in the liquid condition. When the force of cohesion is entirely overcome by heat, the gaseous state is produced, in which the particles seek to remove themselves as far as possible from each other, and are only retained within ordinary limits by the action of external forces.

When, however, we come to examine these states of matter, we shall find in the solid and liquid states, where the force of cohesion is not entirely overcome, some striking peculiarities. In the case of liquids, we can ascribe these peculiarities to the degree of approximation of the action of heat to that of the attraction of cohesion. Thus, water is very fluid; molasses, tar, and some oils are viscid, they move sluggishly, and draw out into threads when poured from vessels, etc. This is, probably, the result of a diminished action of heat in proportion to the force of aggregation.

It will be well to state here, that the heat opposed to cohesion need not be sensible heat, or that which the thermometer indicates. Latent heat is, in many cases, far greater in amount than sensible heat, and there is no difference in the essential qualities of latent and sensible heat; both alike oppose cohesion.

In solids, where the force of aggregation acts with the greatest vigor, we find still more numerous peculiarities. The most obvious of its manifestations is the quality of hardness, or the quality by which bodies resist the displacement of their particles. It is quite difficult to give a definition of the term hardness without either including more or less than is really implied. We think so long as scratching is the means employed to determine relative hardness, it would be well to limit the meaning of the term when used in scientific works to simple resistance to abrasion.

How this quality can exist simultaneously with the quality of brittleness, is a puzzle which has never been satisfactorily solved. Equally puzzling is the fact, that a body less hard than another may resist a total rupture of its particles, or possess the quality of toughness to a much greater degree. Thus one may easily scratch a rod of hickory or cut it with a knife. A rod of glass is not easily scratched, and a knife will not cut it; yet the hickory rod will withstand an astonishingly greater pressure than a glass rod of equal size without breaking.

Another peculiarity of the action of this force, is its susceptibility to external influences. This is shown in the hardening and tempering of steel; in the crystallization of iron exposed to continual vibration; and in the brittleness which has been observed in copper wires long exposed to the action of the galvanic current.

Another peculiarity, which gives rise to some of the most beautiful natural phenomena, is the tendency of the particles of bodies, when drawn together by cohesion, to assume definite and regular geometrical forms, which, in the case of solids, are called crystals. The variety and beauty of these forms are indescribable, within the limits of anything less than an extensive treatise on crystallography. These forms, combined with all degrees of translucence, from opacity to perfect transparency, and with the most beautiful colors, produce some of the most delightful and pleasing objects known to man. Whether the regularity of form in crystals depends solely upon the force of cohesion, or upon it in connection with some other force, is not yet determined; but it is certain that, among all the seeming vagaries in the action of natural forces, nothing can compare with some of the mysteries of crystallization.

An example of one of these vagaries is the fact that many substances remain fluid, when allowed to cool slowly, until acted upon by an external influence, when they suddenly assume the crystalline form. A common lecture experiment is performed with Glauber's salt, to illustrate this point. If a hot saturated solution of this salt is allowed to cool down slowly, and entirely undisturbed by any motion, it will remain perfectly fluid and limpid, until a tremor be imparted to the mass by any means whatever, when it instantly strikes into a solid mass of crystals. Even the slight ruffle upon its surface, caused by setting the air in motion with the breath will produce this result.

But we might go on, filling column after column with matter pertaining to this ever-acting invisible chain, and its silent, unceasing conflict with heat. We might show, also, that the condensing steam engine depends for its action upon the alternate operation of heat and cohesion, the operation of generating steam being simply the overcoming of cohesion by heat, and that of condensation, being merely the resumption of the cohesion by the loss of heat. But we forbear to dwell longer upon this fertile subject. At some future time we may return to it, and take another glance at some interesting facts not alluded to in the present article.

THE STUDY OF ALLOYS.

No field of modern investigation offers greater promise of reward to the patient and systematic investigator than the subject of alloys. That so few have devoted themselves exclusively to their study, may be accounted for, perhaps, by the great extent of the subject, the expensive nature of the experiments, and the cost of appliances to properly conduct them.

All the alloys known do not, probably, equal those possible between a pair of the common metals which might be selected. When we speak of an alloy of tin and lead, or of iron and zinc, etc., it is common to regard the term indefinitely as any alloy possible to these metals. But different alloys of the same metals often present very striking differences in character, according to the proportions in which their elements are present; and as the variation in properties may be extended indefinitely, and as, when alloyed in new proportions, no prediction can be made of the properties which will result, it follows that the number of possible alloys, having distinct physical characteristics, of which any two metals are capable, is yet undetermined.

It may be said that, theoretically, this number is undeterminable. But within practical limits, it is determinable. Combinations might be sought in all integral ratios, from 1 to 1000, for all the known metals; for binary, ternary, and quaternary alloys; the physical properties of each alloy, tabulated for reference, and a combination of specimens, consisting of small ingots preserved.

This will, however, hardly be accomplished by a single individual. We should like to see a laboratory fitted up and liberally endowed to fee a corps of able metallurgists, and to furnish all needful appliances and materials for experiments; the results obtained to be published in annual reports for distribution to public libraries, and for sale to private individuals.

This suggestion has in it, we believe, nothing impracticable. Money has been donated freely for the establishment of Astronomical Observatories, calling for an expenditure much larger than that necessary to establish a metallurgic laboratory, and the prospective benefits of the latter would be, in our opinion, much greater than that of an observatory.

In such a laboratory the subject of alloys might receive systematic treatment, and the investigation would be pursued in that consecutive manner which is so important to success.

There can be little doubt that such a course of investigation, conducted by men of scientific attainments and great inventive talent, would result in many brilliant discoveries. Who will doubt, that if a Tyndall and a Matthiessen had spent their lives in researches on alloys, metallurgic science would have received an immense impulse from their labors?

Should some man of wealth wish to secure a lasting fame, as well as to confer an inestimable benefit upon mankind at large, we know of no way in which he could more certainly secure both objects than by founding an institution of the kind we have suggested. The examination of so large a number of substances as would be produced in such an extended course of experiment would necessitate new standards of comparison from which to tabulate the qualities of hardness, ductility, tenacity, etc., and more accurate and philosophical scales by which these qualities can be generally expressed. The construction of such scales, and the invention of improved methods of testing, so that the work might proceed with facility, do not appear to present special difficulties.

BUTTER AND ITS ADULTERATIONS.

There is perhaps no other country in the world where butter is made so staple an article of food as in the United States. Bread is rarely eaten by Yankees without the accompaniment of butter or what purports to be butter. There is reason to believe, however, that a very large proportion of what is sold in our markets under this name, is, to say the least, open to suspicion.

The pound of butter to the quart of milk swindle, in which a vile mixture of caseine, semi-saponified butter, and water was represented as butter, seems to have subsided; but there are more ways of sophisticating butter than one, and, as rogues always learn the tricks of trade before honest men, it may be well to let consumers into their secrets.

Pure butter is a fatty substance of rather a complex nature, extracted from the milk globules. In this country, very little butter is sold without being previously salted; the salting being performed in the dairy at the time the butter is made. Salt, therefore, can hardly be considered as an adulteration, unless it is present in excess. Most butter also contains more or less buttermilk retained mechanically. This can generally be seen without the microscope; but the use of a magnifying glass will show that no specimen of butter in market is wholly free from it. When present in an undue degree it greatly impairs the keeping quality of the butter.

Butter is adulterated by water, silicate of soda, or "water glass," tallow, lard, and starch, and various coloring matters, as anotta, pulp of carrots, etc.

Water is held in it, suspended by the addition of mucilaginous substances, as starch, etc. It may be detected by placing a given weight of butter in a flask, and suspending the flask in boiling water. The water surrounding the flask should be kept boiling for eight or ten hours, at the end of which time the water contained in the butter will have evaporated, and the loss in weight will be that due to its admixture.

To determine the presence of silicate of soda, an ounce of butter must be burned in a crucible, a little at a time. When the ash has assumed a white color, it must be removed from the fire. As soon as the crucible is cool a drachm of hydrochloric (muriatic) acid must be poured upon the ash. Evaporate to dryness, scrape out the mass into a glass beaker, and add a gill of boiling water. If silica is present an undissolved residue will remain in the bottom of the glass. To prove that this is silica will require further tests, but the probabilities that the substance undissolved is silica are so great that further tests will be in general unnecessary.

Tallow and lard may be detected by the microscope, and by chemical tests, but they may ordinarily be detected by the smell when the butter is burned.

Starch may also be detected by the microscope, and excess of salt by the taste. The amount of salt and of water that ought to be present may be estimated by performing the above assays with butter of standard good quality.

The most common adulterations of butter in American markets are lard and tallow. Out of several specimens of low priced butter purchased at random, we have found lard in four and tallow in one; the others seemed to have been butter of ordinary purity deteriorated by long keeping.

HOW FIRE BRICKS ARE MADE.

We desire to call attention to an article entitled, "The Manufacture of Fire Bricks," published in another column. In response to our request, Mr. Alfred Hall, Ex-Mayor of Perth Amboy, N. J., and the head of the firm of A. Hall & Sons, Perth Amboy, and Hall & Sons, Buffalo, N. Y., extensive fire brick manufacturers, has furnished us with the practical details of the art. Books have been written which deal with this subject theoretically, and to some extent practically; but it is well known that all the book knowledge attainable has not availed to save from utter failure many who have entered upon the business in this country. The description of the process will be found of great interest, both from the facts given and its graphic character.

THE WIND MONTH.

The month of March, the most windy, disagreeable, and trying to health of all the months in the year, has been this year more than ordinarily prolific of raw and unpleasant weather. Few people have been so fortunate as to avoid taking cold. Pocket handkerchiefs are in demand, and cough remedies are having a large sale.

The colds acquired in March are, however, generally carried through the month of April, and are very liable to receive additions during the subsequent fickle weather of spring. But the fickle weather is not all to blame; personal carelessness increases the peril. Untimely neglect to wear the accustomed overcoat or overshoes, overheating of apartments, and opening of windows to cool down overheated rooms, will all combine to aid the weather in disseminating colds, coughs, and catarrh, with their attendant category of discomforts and dangers.

In our latitude, March nearly always over-laps April, and even May is not entirely free from bitter blasts, and raw, damp air, extremely favorable to the development of influenza.

The prevention of these unwelcome affections cannot be accomplished by attention to dress, and temperature of apartments alone. Whatever may be the ultimate cause of colds, it is quite certain that the state of the skin has much to do with exemption from them. If the skin be healthy, and the performance of its functions be consequently perfect, a cold can scarcely be possible. On the contrary, if the skin be relaxed, and incapable of reacting from the influence of a chill, a cold is almost an absolute certainty, even in the mildest weather.

A healthy state of the skin can only be maintained under the avoidance of all excesses of whatever nature they may be; but the particular excess most common and most likely to produce derangement in this respect, is over-eating, and indulgence in too rich and hearty food, with copious drink, whereby the excretory function of the skin becomes overtaxed, and congestion of the mucous membrane results.

Then commences a series of ails, which together consitute what is known as the symptoms of a cold. The nose becomes stopped by the thickening of its lining membranes. The throat becomes inflamed and often ulcerates. Decayed teeth begin to remind the sufferer of the dentist. The eyes sympathize with the other organs involved, and weep anything but tears of joy. Congestion of the lungs often accompanies the other symptoms, and is in itself often very dangerous, especially with old people.

While a too rich and copious diet ought to be avoided during spring weather, the tone of the skin may be increased by a cold sponge bath taken every morning. This bath should not occupy more than a minute and a half, and should be followed by brisk rubbing with a towel until the skin assumes a roseate hue, and a genial warmth pervades the whole body. By this process the skin becomes accustomed to changes of temperature, and gradually gains power to react against them.

Another practice which we know from long practice and experience to be an admirable prophylactic against colds, is wetting the head and the back of the neck on rising in the morning with cold water. Those unaccustomed to practice this must begin it sparingly at first; but the dose may be prolonged after a while, and will be found to be agreeable and refreshing rather than otherwise. As a prevention of what is popularly called "cold in the head," we believe it to be the best in use, and it has the sanction of high medical authority.

There is, perhaps, no climate on the face of the earth more subject to sudden and perverse changes than that of central New York and the New England States. In all this region diseases having their origin in colds are prevalent. But if people would realize the full force of the proverb "an ounce of prevention is worth a pound of cure," death and the doctors might have something less to do, while the superior advantages of our temperate climate in other respects would go far to compensate for the little time and trouble necessary to purchase almost total immunity from its greatest discomfort.

ECONOMY IN THE USE OF TIME.

The importance of economizing time is an exceedingly trite subject, yet it may well be doubted whether those who moralize most upon it, really know what they mean by it. The expression has become one of those cant phrases, with which the ears of youth and age are perfectly familiar, yet which has attached to it only the vague idea, that not to be engaged in something which will be recognized by all as a useful occupation, is a sinful waste of time.

But all do not recognize recreation as needful; while there are some, among whom we count, who see that even a useful occupation may involve a grievous and sinful waste of time. Perhaps in no other particular are people so penny wise and pound foolish, as in the employment of time.

One individual engaged in business, gets worn out, dyspeptic, and nervous; a month's relaxation would restore his health; yet rather than give himself the needful rest, he takes the risk of years of suffering and inability.

Another in the mistaken idea that he is economical, blacks his own boots, and occupies time in other comparatively profitless occupations, when his time may be worth twenty times as much in his regular calling.

Another, the one whom moralists unite in condemning—the standard type of the idle man—squanders all his time on frivolous things; yet he is the only consistent man of the lot. He makes no pretense of economy, he makes idleness a profession. True economy in the use of time consists in getting as large a return as possible for its expenditure. The man who ruins his eyes by reading in railroad cars, under the mistaken idea that he is economizing time, is not getting the largest return possible for the use of that time. Good vision in advancing age, is worth more than all the information thus obtained.

The student who spends a couple of hours a day with his skates, or oars, or football, is probably earning more in his recreation, than in any similar period of time spent in study. The man who by a hearty frolic with his children in the morning before he starts to his work, gets good humor for the day, earns as much in his play as he does in his work.

The man who does any kind of work, when he might do other work which would pay better, wastes time. One of the most economical men in the employment of time, we know, is Captain Ericsson. He fully recognizes the truth we have just enunciated. All work which he can avoid is performed by subordinates, and yet he wastes not a minute of his own time. It is thus that he has accomplished so much.

The point we would wish to make is, that men may waste time as well in work as in play, and economize it as well in play as in work, provided the latter is not indulged in inordinately and unreasonably.

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 February, 1870:

During the month, 385 visits of inspection have been made; 698 boilers examined, 650 externally and 123 internally; while 63 have been tested by hydraulic pressure. The number of defects in all discovered, 190; of which 35 were dangerous. These defects in detail are as follows:

Furnaces out of shape, 9; fractures in all, 13—3 dangerous; burned plates, 17—3 dangerous; blistered plates, 30—1 dangerous; cases of incrustation and scale, 36—8 dangerous; cases of external corrosion, 26—2 dangerous; cases of internal grooving, 4; water gages out of order, 5; blow-out apparatus out of order, 7—3 dangerous; safety valves overloaded 10—3 dangerous; pressure gages out of order, 36—4 dangerous. These gages varied from—10 to + 30. Broken braces and rivets, 4—1 dangerous; corrosion of tubes, 2—1 dangerous; stop valves between boiler and safety valves, 2—2 dangerous; fire line of furnace above water line, 4—4 dangerous. And one inspector reports: "Engineer dead drunk while on duty, 1—1 dangerous."

To show how careless some are who call themselves engineers, can be, we mention the two following cases of inoperative safety valves. The inspector for the district writes: "In the first case I found a joist used to support a large tank, resting on the end of the safety valve, leaving the valve entirely inoperative." In the second case: "I found the engineer (?) had placed a piece of board between the end of the safety valve lever and beams overhead to prevent the disagreeable (and to him annoying) hissing the valve made when steam raised to blowing-off point."

This boiler is situated under, and in the center of a manufactory where a large number of persons are employed; and we will say further, that both of these boilers had been under the supervision of an inspector appointed by law. Two instances have been found where there were stop valves between the safety valve and boiler. This pernicious practice is altogether too common. We are unable to understand how a boiler maker of reputation can be guilty of it. A disastrous explosion occurred a few weeks since, where a boiler was provided with this dangerous appliance.

Both the boilers mentioned above had been supervised by an inspector appointed by law. Neglect to remove deposit from fire surfaces and water legs, has necessitated the renewing of plates. This expense might have been saved by timely care and attention. Dangerous points in boilers can only be found by the most careful and rigid examination. The hydraulic test, merely, will not discover the defects enumerated above.

Glass Cutting.

There has, says *Morgan's British Trade Journal*, been a very laudable desire of late, by many glass manufacturers, to make glass so beautiful in its finish when it leaves the hands of the glass blower, as not to require any ornamentation afterwards. But the great demand is for cut glass, especially for table use. This cutting, or, if the term may be allowed, sculptured glass, is effected as an after process, and is a separate and distinct business from glass-blowing. In the glass-cutting room there are, in most manufactories, from forty to seventy workmen. Each man has in front of him a revolving wheel, first of iron, then of stone, then of wood. The iron wheel is for the first process, in which the forming of patterns or figures upon the plain surface of the glass is effected. The stone is for cutting off the rough surface left by the iron, and the wood for polishing to a brilliant luster. Supposing a certain pattern is designed, the workman etches it on the body of the article which is to be cut. He then holds his glass to the edge of the iron wheel, changes his hands to all the positions required for the form he wants, until the whole surface is covered, and the pattern is indented in the article. To prevent fracture from friction, as well as to accelerate the process, sand and water is allowed slowly to drop on the wheel from a wooden vessel hanging over it. Thus is the glass kept at a proper temperature. Sometimes the wheel will of necessity have to be changed to suit the character of the work, many sizes being used for the purpose. The edge of the wheel is that part by which the cutting is effected, and different shapes and thicknesses are given to the edges, in order to produce different results. The stone wheel then passes over these indentations, with water dropping upon it, giving it a semi or half polish. Run the wooden wheel with pumice stone emery continually used on its surface, until the pattern is thoroughly brilliant. The object to be attained in cutting glass is to present such a surface to the rays of light that instead of their passing directly through the glass, they may be broken or refracted, so that there may be a "play of light," as it may be termed, upon its surface. To effect this, it is necessary that the lines forming the figure or pattern upon the exterior of the glass be the reverse of the line of the interior, and that the indentations upon the surface, as well as the projections left by them, be such as to form angles. In the cutting called diamond or prism cutting, this object is at once attained. The same effect is also produced by fluting or flat cutting; because whenever two flat cuttings meet at the edge, they form an angle, forming with the line of the interior an imperfect prism. The broader the flat cuts are, the more acute the angle, and consequently the greater the refraction of light. As these flat cuts are always made with the cutter's wheel upon a circular surface, the broader the flats the more expensive they will be.

The same theory holds good of all lapidary or flat cutting upon solid glass; that is, when the cutting is all over the surface. To produce the requisite effect, it is essential that whatever the patterns, flats must be opposite angles. It is by due attention to this that the refraction so necessary to luster and chandelier work is obtained.

When two or more colors are seen in the same article, it is because the glass cutter cuts off the skin of ruby or blue which has been put on by the glass blower; these edges of ruby produce a most beautiful effect by contrast with the flint glass beneath it.

In addition to the cut surfaces of glass vessels whereby such a lustrous play of colors is produced, there are others engraved, which is a more delicate process of cutting than that we have described. The glass engraver, seated at a bench, has before him a lathe; he has at hand a series of small metallic disks or wheels, generally made of copper, and varying from an eighth of an inch to two inches in diameter. He attaches one of those to his lathe, and keeps it in constant rotation, as in the case of glass cutting, either by steam power or by the action of the foot. He touches the edge of the rotating wheel constantly with a little emery moistened with oil, and then holds the glass against the edge of his wheel, by which the desired effect is produced. By dexterous changes in the position of the glass and in the different forms and sizes of his wheels employed, he combines the delicate indentations so as to produce beautiful intaglios or sunken pictures; our opinion of this delicate process is that it is strictly a branch of the "Fine Arts," and places the glass engraver on a different level to the other workmen. Taste, both natural and cultivated, and a knowledge of the external forms of natural objects, and great delicacy both of eye and hand, are all required in this operation, and it says much for the artisans of this beautiful calling, that they were quite equal to all foreign competitors in the Paris Exhibition. Such operations as glass cutting and engraving afford an ample field for the display of art knowledge and design. The reader may, perhaps, form some conception of the high artistic finish of engraving upon glass, when we inform him that one shallow dish in the English department of the Paris Exhibition, only 7 in. across, was valued at 300 guineas.

Another kind of ornamental manufacture is what is termed the crystallo-ceramic, or glass incrustation. It consists of an opaque substance, embedded in a mass of colorless glass. A medallion or bas-relief, representing any device whatever, is molded in a peculiar kind of clay capable of resisting the heat of melted glass. The medallion is inclosed between the two pieces of soft glass in their melted state; the main difficulty of this process consists in so placing the medallion that all the air bubbles shall be excluded. The glass in its molten state is dropped upon the surface of the medallion with such skill and cleverness, that when annealed and polished by the glass cutter, its appearance is singularly chaste and beautiful, for the white clay seen within the clean and highly-refractive glass presents an appearance nearly resembling that of unburnished silver. This process of art, *i. e.*, incrustation of clay devices, was invented about seventy-three years ago by a Bohemian. At a later period some French manufacturers invented medallions of Napoleon in this way, which sold at enormous prices; but since the introduction into England under an improved form, a wide extension has been given to its applicability. This incrustation may be painted in metallic colors which will remain uninjured by the heat required in the process.

PROTECTION OF LEAD WATER PIPES.—Dr. Schwarz, of Breslau, notes a simple method of protecting lead pipes from the action of water, by forming on the inside surface of the pipes an insoluble sulphide of lead. The operation, which is a very simple one, consists in filling the pipes with a warm and concentrated solution of sulphide of potassium or sodium; the solution is left in contact with the lead for about fifteen minutes.

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.

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 Sale.—One Stave Planer, at a bargain. Apply to Hartmann, Laist & Co., Cincinnati, Ohio.

The Tennessee Manufacturing Co., Nashville, Tenn., wish to contract for water, gas, and steam piping for a large cotton mill. Address S. D. Morgan, Pres't T. M. Co.

The Pew Hat Rack.—E. S. Blake, Pittsburgh, Pa.

The Pedespeed, patented May 4, 1869, is adapted to Ladies' use by an elastic band at top of stirrup, conforming, without a buckle, to its place. Send stamp for price list. Thos. L. Luders, Olney, Ill.

For description of the best lath and blind slat sawing machine in use, address W. B. Noyes, Gen'l Ag't, P. O. Box 558, Manchester, N. H.

Belting.—See advertisement of Page Brothers on page 230.

Wanted.—Address of parties making Grain Dryers, prices, etc., by Wm. Benjes, Memphis, Tenn.

Lumbermen and Manufacturers. See adv't of Pat. Metallic Elevator Belting for conveying sawdust, etc., in No. 10 Scientific American, March 5. It is just what you want. Send for circulars to W. P. Powers, North La Crosse, Wis.

Thomas & Robinson, manufacturers of presses and dies for fruit cans, etc., No. 222 West 2d st., Cincinnati, Ohio.

Machines for manufacturing Screw Bolts and Nuts of all kinds. Makers will please send price lists and other information to C. G. Berryman, Saint John, N. B.

Henry Clark, Pawtucket, R.I. Instruction in spelling by mail.

J. Carter, Warsaw, Ind., wants to know where the Requa concave lamp chimneys are manufactured.

Builders of Water Wheels address Berry & Place, San Francisco, Cal.

Eagle Carpet Stretcher.—Manufacturers desiring to engage in a new article destined to supersede all others in its line, are referred to an advertisement on another page, of a new carpet stretcher. It weighs but 2½ lbs., is cheaply made, and is the most effective stretcher out.

Get your models and experimental machinery made, and your patent articles manufactured at the New York Model and Experimental Machine Works, 125 Eldridge st., New York.

H. Franke's Pat. Gravel Heater.—Address Pioneer Iron Works, Conover st., Brooklyn, N. Y.

Important advance on the draft and easement of carriage. See Jackson's Patent Oscillating Wagon, with tests of draft, models, etc., No. 149 High st., Newark, Essex Co., N.J. See Scientific American, Sept. 25, 1869.

The "Anti-Friction" Lever Horse Power, for from one to eight horses, is the best for driving every kind of farm or factory machinery. Send stamp for circular to R. H. Allen & Co., Postoffice Box 376, N. Y.

Our Catalogue of Agricultural and Horticultural Implements, Machines, and Tools (300 pages, 600 illustrations) is sent, postpaid, for $1. This is refunded on receipt of first order. Every manufacturer or dealer should have a copy. R. H. Allen & Co., Postoffice Box 376, New York.

Photographs.—Rockwood & Co., 839 Broadway, for five dollars, make 8x10 photographs of machinery or views within the city.

Machinery Wanted.—Good Calender Mills, suitable for working India-rubber. Address (stating description and prices), Postoffice Box 2213, Boston, Mass.

A "Wood & Light" Patent Shafting Lathe, 28-in. swing, 25ft. bed, used 3 mos., at a sacrifice. E. P. Hampson, 38 Courtlandt st., N. Y.

An experienced master mechanic and draftsman desires an engagement. References unquestionable. Address Postoffice drawer 370 Watertown, N. Y.

1250 lbs. portable platform scales, $25; hay scales, 4-tun, $75. Send for free price list, No. 373. Edward F. Jones, Binghamton, N. Y.

American Boiler Powder.—A safe, sure, and cheap remedy for scale. Send for circular to Am. B. P. Co., P. O. Box 315, Pittsburgh, Pa.

Right For Sale.—Action and Reversion Water Wheel (self-governing). Will vent large or small volumes of water. Will retain its power under back water. Address William E. Hill, Erie, Pa.

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

Needles for all sewing machines at Bartlett's, 569 Broadway, N Y.

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

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

For first-quality new 14, 17, and 20-in. screw lathes, milling machines, and one-spindle drills, at small advance from cost, apply to Geo. S. Lincoln & Co., Hartford, Conn.

Hackle, Gill Pins, etc., at Bartlett's, 569 Broadway, New York.

Perforated Zinc and Sheet Iron for separators, smut machines grain dryers, tubular wells, malt kilns, etc. R. Aitchison & Co., Chicago

T. F. Randolph, Steam Model Works, Cincinnati, Ohio.

Portable Pumping or Hoisting Machinery to Hire for Coffer Dams, Wells, Sewers, etc. Wm. D. Andrews & Bro., 414 Water st., N. Y.

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.

Two 60-Horse Locomotive Boilers, used 5 mos., $1,300 each. The machinery of two 500-tun iron propellers, in good order, for sale by Wm. D. Andrews & Bro., 414 Water st., 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.

S. S., of N. J., asks our advice about his plan to burn the stumps off his land. He proposes to build a concave mirror 4 feet in diameter, of plaster and wood, faced with tin foil, the focus to be 10 feet or more. He asks if this plan of the great Archimedes for firing the enemy's ships, would be patentable if applied to burning stumps. We think it doubtful as to a patent on the application of the reflector to the stump; but probably the construction of the reflector might be claimed. When the sun shines probably the machine could produce the fire. But we will tell our correspondent a better plan. Bore a hole into the stump, fill it with coal oil, plug, and leave standing for 3 days. The oil will penetrate the wood, and when set on fire will burn until the stump is consumed—so we are told. We have not tried it.

B. A. R., of Tenn.—Undue weight in proportion to power obtained is one principal defect in the application of caloric engines to the propulsion of vessels. A one half inch wire cable, made of good material, may be relied upon to withstand a tensile force of at least 12,800 pounds. The buoyancy of all substances, whether solid, fluid, or gaseous, is reduced by compression. Your fifth query cannot be answered without the performance of experiments which, so far as we know, have never been performed. Alcohol expands much more for the same temperature than spirits of turpentine.

P. J., of Mass.—The molten iron enters the Bessemer converters at 2 800° to 3,000° Fah., and the heat to which it rises on the admission of the blast, has been estimated to be as high as 5,000°. It is probably as high a degree of heat as ever attained by artificial means, except that obtained by the oxyhydrogen blow-pipe, and the electric light. The latter is probably an example of the greatest artificial heat. You will find the subject of pyrometers fully treated in recent works on physics. We cannot now enter upon the discussion of that subject.

B. F. D., of N. Y.—"*Lap*" is an addition to either the outer or inner edge of the valve, for purposes of cut off, and exhaust closure. "*Lead*" is a motion of the valve, in advance of the crank, obtained by setting the eccentric at an angular advance from the position in which it would open the valve at the end of the full stroke of the piston. Lead opens the valve a little before the end of the stroke, admitting steam against the advancing piston, and taking up the momentum of the parts.

S. H. K., of Minn.—A body placed in the interior of a hollow sphere, and uninfluenced by any attraction other than that of the shell, will remain at rest in any part of the void. A body freely moving in a fluid sphere, and with a specific gravity greater than that of the fluid, will move to the center of gravity of that sphere. If of the same specific gravity, a body will remain in any portion of the fluid sphere.

C. J. P., of Ky.—The brass alluded to in the recipe for silver solder is the most common variety—2 parts copper and 1 of zinc. This correspondent states that an application of benzine is quite as effective as acid in restoring old files, and does less injury. The action of benzine can, however, be only to clean the file from dirt. The action of acid is claimed to sharpen the teeth, and deepen the cuts.

W. S., of N. Y.—To remove zinc and iron from plumbers' solder, digest the fragments in dilute sulphuric acid. The acid will dissolve the particles of zinc first, the iron, next, and all traces of these metals will be removed by subsequent washing. The solder will not be materially affected by the acid, if the vessel be kept cool. Organic matter, will be burned out in melting the solder.

R. B., of Mass.—You can color castings of lead, tin, and antimony blue, by shellac varnish colored with prussian blue. You should use the best and purest shellac, and should mix thoroughly. By putting on a sufficient number of coats, you can polish the surface, and make a very handsome finish. Common lacquer will give such castings the appearance of copper or brass.

J. M. F., of N. Y.—Our opinion is that hemlock knots are harder than lignum vitæ. We have also seen specimens of locust wood as hard as any lignum vitæ we ever saw. We know of no way by which an inexperienced person can distinguish the hard lignum vitæ from the soft, except by trial, until he becomes familiar with the appearance of the different qualities.

A. G., of N. Y.—A bar of inch and a quarter steel nine feet in length, bent into a triangle in the usual way, will sound sufficiently loud to be heard ¼ of a mile in the absence of other sounds which would obscure it. It should, however, be struck with either a bar of copper, or some very hard wood, as it is liable to break if struck with harder substances.

A. M. C., of Ohio.—The attractions of the positive and negative poles of magnets of equal power, exactly neutralize each other. At any point between each pair of positive poles on the wheel you propose, the repulsion of similar poles would exactly equal the attraction of the dissimilar poles, and no motion would therefore be produced.

R. S., of Mich.—To coat glass with gold, add to a solution of chloride of gold an equal quantity of sulphuric ether. The gold will leave the acid and be taken up by the spirit. Separate and flood the glass with ether, which will evaporate and leave a fine deposit of the metal; rinse in clean water, and either burnish or varnish.

J. D., of Vt.—You will find your query answered in the one to W. S., of N. Y., above, and a rule for the computation of dimensions of safety valve for bridge walls of boilers on page 146 current volume of the Scientific American.

J. R., of La.—Pulleys take their names from the planes in which they revolve. If they revolve in vertical planes, they are vertical pulleys, if in horizontal planes, they are horizontal pulleys.

G. D., of N. Y.—There is no difficulty in melting and casting brass on a small scale. The "Brass and Iron Founder's Guide," published by Henry Carey Baird, Philadelphia, contains practical details.

T. J. H., of Ohio, and others.—We do not know of any electric machinery that we can recommend to you for the purpose of driving small machinery. The number you want has been sent.

J. A., of N. J.—Glue will remain hard and insoluble under naphtha. Should you state the purpose for which you wish the cement, we could answer more definitely.

J. H. P., of N. Y., wishes to know what is the rule for estimating the weight of hay in the mow.

J. R., of Pa.—The stone you send appears to be a conglomerate, showing some iron ores.

Recent American and Foreign Patents.

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

Roofing Compound.—Thomas E. Wood, Waseca, Minn.—This invention has for its object to furnish an improved compound to be used upon or in connection with the inventor's elastic roofing (patented September 29, 1868, and numbered 82,507), upon roofs and walks, to preserve it from being injured by the heat or frost, and keep it permanently elastic by preventing the evaporation of its gases.

Churn Dash Crank Fixtures.—C. Blust and M. Harbster, Lucas, Ohio.—This invention has for its object to improve the construction of the crank and other fixtures by means of which a horizontal churn dasher is operated, so as to simplify their construction, and at the same time to enable the dasher to be easily operated, and conveniently removed from the churn body when required.

Vegetable Grater.—John Maxson and Warren Kinyon, Scott, N. Y.—This invention has for its object to furnish an improved machine designed especially for grating carrots for coloring butter, but which may be used with equal advantage for grating other kinds of vegetables.

Electro-Plating Apparatus.—Howell W. Wright, Taunton, Mass.—This invention has for its object to furnish an improved apparatus for use in electro-plating tacks, nails, screws, and other small articles with copper, or other metal, which will enable the said articles to be quickly, conveniently, and thoroughly plated in any desired quantity.

Steam Generator and Water Heater.—Orlando Clarke, Rockford, Ill.—This invention relates to a new and useful improvement in a boiler for generating steam or heating water, to be used for all the purposes to which it is adapted, wherein the maximum of steam generating or fire surface, is combined with the minimum of space and metal.

Rubber Connections for Mosquito Net Frames.—U. W. Armstrong and Ira Keeney, Evansville, Ind.—This invention has for its object to furnish improved means for connecting the upright and horizontal bars of a mosquito net frame to each other, which shall be simple in construction, and will enable the frame to be easily put up and taken down when required.

Beehive.—John M. Price, Buffalo Grove, Iowa.—This invention relates to improvements in beehives, and consists in a hive made of sections consisting of four slats or bars, attached at the corners in rectangular form, two of which are wider than the others, and provided at the inside with slots for the comb bars, the said sections being confined in a rack, or casket, and laid on a platform having a deep angular groove, in which the hive is laid on one corner, and may be turned from time to time, as may be required. The hive so constructed is designed to be wrapped in cold weather with canvas, and the whole is inclosed in an exterior case.

Forge.—George Campbell, North Buffalo, N. Y.—This invention relates to improvements in blacksmiths' forges, having for its object to provide an improved arrangement of means whereby the supporting frame of a portable forge may be readily transferred from the wheels on which it is moved to the ground, and *vice versa*; also, certain improvements in the tweers, irons, and valves for varying the position and form of the fire.

Footstool for Churches, Lecture Rooms, etc.—William G. Brown, Monmouth, Me.—The object of this invention is to construct a footstool, which may be applied to the seats and pews of lecture rooms, churches, etc., and which cannot be upset, and can be brought forward or moved out of the way without noise and difficulty.

Churn.—N. A. Prentiss, Talleyrand, Iowa.—This invention has for its object to furnish an improved churn, simple in construction and effective in operation, doing its work quickly and well.

Gun Slide and Carriage.—John Ericsson, New York city.—This invention was described, and illustrated in No. 8 of the Scientific American, current volume.

Device for Applying and Retaining Sash Pulleys.—Melvin R. Green, Warwick, N. Y.—This invention has for its object to facilitate the attachment of sash pulleys to the window frames and to simplify the construction of the device by which such pulleys are held in place.

Skate.—Jacob Friedrich Schneider, Brooklyn, N. Y.—This invention has for its object to so construct a skate that it may be used by beginners, also by experts, like an ordinary skate. The invention consists in making the back part of the runner of two pivoted pieces, which may be swung apart on their pivots to form a V-shaped broad support, and which, when brought together, will form a simple ordinary runner.

Tinners' and Sheet-iron Workers' Rolls.—A. W. Whitney, P. A Whitney, and F. A. Whitney, Woodstock, Vt.—This invention relates to a new and useful improvement in the construction of rollers for tinners machines for working tin and sheet iron, or other sheet metal, whereby such rolls are rendered more durable than they have hitherto been, while the cost of manufacturing them is greatly reduced.

Machine for Pressing and Graining Powder.—Paul A. Oliver, New York city.—This invention relates to a new and useful machine for facilitating the manfacture of gun and blasting powder, and consists in a new and improved method of pressing the material into sheets and in cutting the sheets into grains.

Ash Sifter.—Robert Jacob Schaffer Thompson, Washington, Pa.—This invention relates to a new manner of constructing the perforated bottom of a shovel which is used for sifting ashes; and consists in the application of rods, which are fitted between two sets of corrugated plates.

Stove for Burning Shavings and Fine Fuel.—Orlando Clarke, Rockford, Ill.—This invention relates to a new and useful improvement in stoves for heating purposes, more especially designed for shops where shavings, sawdust, and other light and fine fuel are used.

Steam Protection for Safes, Vaults, etc.—John A. Robertson, Boston, Mass.—This invention relates to the employment of steam as a means of protecting safes, bank vaults, etc., and for giving alarm when they are attacked by burglars, and it consists in covering the safes, vaults, and the like, with coils of pipe or jackets of any kind, to be kept full of steam by connection in any suitable way with steam boilers, at all times when burglars might work upon them, and so arranged that access cannot be had to the safe or vault at any part without cutting away the steam pipe or through the jacket, and allowing the steam to escape, which will prevent further operation by filling the room with an atmosphere of steam in which it would be impossible to work.

Loom.—Alphonse Goullioud, Barcelona, Spain.—This invention relates to looms for weaving stays and similar unevenly-woven articles, and consists 1st, in a system of pulling temples; 2d, in a system of separate yarn beams and let-off apparatus for varying the delivery as required for weaving articles with gussets and other irregular forms.

Railroad Rail Joint.—John Freeland and Daniel Ward, New York city—This invention relates to improvements in joining the ends of railroad rails, and consists in an improved combination of chair and fish plates, whereby a cheap arrangement of devices, capable of forming a strong and reliable joint, is produced.

Harvester.—J. B. McCormick, Dayton, Ohio.—This invention has for its object to improve the construction of that class of harvesters in which the binders ride upon the machine, so as to make them of lighter draft and more convenient in use.

Table-leaf Support.—Aaron Anderson, South Bend, Ind.—This invention has for its object to furnish an improved table-leaf support, which shall be simple in construction, effective in operation, and conveniently operated, and which may be attached to any style of table having a falling leaf or leaves.

Horse Hoe.—H. W. Hasslock, Nashville, Tenn.—This invention has for its object to furnish an improved horse hoe for cutting up the grass and weeds about cotton, corn, and other plants planted in hills or drills, and which shall, at the same time, be simple in construction, and effective in operation leaving the soil thoroughly loosened.

PLOW.—D. T. Singleton, Eatonton, Ga.—This invention has for its object to improve the construction of plows so as to make them simpler in construction and more convenient in use.

GANG PLOWS.—Jacob Price, San Leandro, Cal.—This invention has for its object to furnish an improved gang plow which shall be so constructed and arranged that the driver can raise the plows from the ground without having to raise himself at the same time, and so that the "near" wheel may be adjusted at a higher or lower level, according to the depth of the furrows.

PORTABLE HEAD REST.—Elbert P. Cook, Cartersville, Ga.—This invention has for its object to furnish an improved portable extension head rest for travelers, which shall be so constructed that it may be conveniently connected with the back of a seat or chair in any conveyance, and adjusted to support the head so that the traveler can rest and sleep comfortably in his seat while traveling.

COMBINED CORN AND COTTON SEED PLANTER, GUANO DISTRIBUTER, AND HARROW.—Samuel L. Donnell, Humboldt, Tenn.—This invention has for its object to furnish an improved machine for planting corn and cotton seed, and for distributing guano and other fine fertilizers, and which shall at the same time harrow the ridge, open the furrow for the seed, and cover the seed, crushing the clods, and smoothing off the ridge.

APPARATUS FOR PITCHING BARRELS.—Richard Rosochacki, Cleveland, Ohio.—This invention has for its object to remove from beer barrels the pitch lining which is usually added to them for purposes of lightness, when such lining becomes inoperative through age, in order to replacing it with a fresh lining.

SADDLE.—George Horter, New Orleans, La.—This improvement in the construction of side saddles combines three important considerations, viz: durability, cheapness, and beauty of form and finish. The seat of this patent saddle is constructed in the usual manner, the only difference being in the materials of which the skirts are made. The foundation of these is "trunk board," specially prepared, which is covered in a neat and most substantial manner, with either hog skin, enameled leather, or enameled muslin, according to the quality or price. This is protected on the edges by a fore-and-aft "safe" of leather, either patent or plain. Hog skins and patent leather have been used, for years, in the construction of saddles, from the costly English shaftoe to the commoner kinds. The cheapest of these patent saddles, which are covered with enameled muslin, and protected on the edges, as before described, will be very durable, far more so than a buggy top thus covered, as they will not be subject to the same exposure to the sun and rain. Patented March 15th, 1870.

CAST IRON COPING FOR WALLS.—John Grindrod, Albany, N. Y.—This invention relates to improvements in coping for fire and other walls for buildings, and consists in providing coping made of cast iron, the same being arranged in sections, for joining together, and to fit on the walls, to protect the same.

CASTING METAL.—Robert Ross, Middlebury, Vt.—This invention relates to improvements in casting molten metal, whereby it is designed to provide sounder castings than can be made by the present mode. The invention consists in providing traps in the passages through which the molten metal flows when running into the molds, to take out the dirt and all impurities in the metal, which rise to the surface after the molten metal has settled.

APPARATUS FOR PRODUCING DISSOLVED SULPHUROUS ACID.—Moritz Hatschek, Pesth, Hungary.—This invention has for its object to provide an apparatus by which a solution of sulphurous acid may be readily produced, such acid being used for distilling and brewing, and for other useful purposes. The invention consists in the arrangement and construction of a furnace, in which the sulphur is burnt, and a current of air brought to it, and of a detaining chamber and combining column, the latter receiving the water at the upper end, and spreading it into a fine spray, in which state it is most apt to take up the sulphur and the oxygen of the air, while the nitrogen passes off.

TAIL HOLDER FOR HORSES AND OTHER ANIMALS.—F. A. Roberts, North Vassalboro', Me.—This invention has for its object to construct a device by means of which the folds of horses tails can be held together without injuring the hair, and which can be rapidly and conveniently applied. The invention consists in the use of a partly flexible, partly rigid buckle which is strapped around the folds of the tail, and which has teeth or prongs projecting through the tail, to hold the device in place.

CORSET FASTENING.—M. P. Bray, Ansonia, Conn.—This invention relates to a new and useful improvement in the mode of fastening corsets, whereby they are made more elastic and more durable than such fastenings have hitherto been; and it consists in the method of fastening the double spring together, and also in the method of confining the smaller spring to the larger one, and the clasps to the large spring.

TRANSPARENT SIGN.—P. A. La France and J. D. Densmore, Elmira, N. Y—This invention relates to a new method of constructing openwork signs, with an object of making them more simple, stronger, and more readily adjustable than those now in use.

MOP HEAD.—W. S. Crinklaw, Lanark, Ill.—The object of this invention is to furnish a cheap and durable head for mops, one that is not likely to break or get out of order.

BOILER FURNACES AND FLUES.—W. H. Burns, Unionville, Mo.—The object of this invention is to provide certain improvements in setting and adjusting boilers for generating steam for power in the furnaces, and arranging the flues to promote the draft to the best advantage; also to adapt the furnaces for burning saw dust and other similar waste matter.

GAGE AND STOP COCKS.—J. B. Christoffel, Williamsburgh, N. Y.—This invention has for its object to furnish an improved cock designed for use as a gage cock for steam boilers, and for a stop cock for reservoirs, in which water, oil, or any volatile liquid is contained, and which shall be so constructed as to allow the valve or piston to be repacked without removing the cock or allowing any of the steam or liquid to escape.

NEW BOOKS AND PUBLICATIONS.

THE BOWDOIN SCIENTIFIC REVIEW. Edited by Professors Brackett and Goodale, Bowdoin College, Brunswick, Maine.

We are in receipt of the first two numbers of this periodical, containing digests, translations, and summaries of valuable scientific essays and memoirs. The introduction of diagrams would however materially aid the comprehension of the text. This review will probably be well received, and it encroaches upon none of the departments of physics or natural history now well occupied in this country by other scientific journals.

THE CANADIAN ENTOMOLOGIST. Edited by the Rev. C. J. S. Bethune, M. A., Secretary to the Entomological Society of Canada. Toronto: Copp, Clark & Co., King street East.

This illustrated serial appears to be carefully edited, and it will be found a welcome visitor by students of the delightful branch of natural history to which it is specially devoted. The practical aspect of entomology has also considerable attention bestowed upon it.

SOUTHERN NEWSPAPER ENTERPRISE.—Messrs. Hoe & Co. have just built for the *Mobile Register* one of their fast double-cylinder presses. This journal, the oldest Democratic paper, and, with one exception, the oldest newspaper in the entire South, and well known as John Forsyth's paper, was purchased since the war by Col. W. D. Mann, a live Yankee, who consolidated with it the *Daily Times*, *Advertiser*, and *Evening News*, three contemporary dailies, and by his energy and skillful management has given it a circulation never reached by a Southern newspaper before. The *Weekly Register* has, in addition to an almost universal circulation in the States tributary to Mobile, a large and rapidly increasing list of subscribers throughout the North and West, where many desire to read some reliable representative Southern journal. It is a very large sheet—twelve pages N. Y. *Herald* size—and is published at the low price of $3·00 per annum. It employs the best talent in the South in its various departments. Col. Forsyth fills the position of Editor-in-Chief. We can commend the *Register* to all who want a first-class Southern newspaper. As an advertising medium, we claim it unequaled in the South.

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Issued by the United States Patent Office

FOR THE WEEK ENDING March 22, 1870.

Reported Officially for the Scientific American.

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100,961.—ELECTRO DEPOSITION OF METALS.—Isaac Adams, Jr., Boston, Mass.
100,962.—PHOTOGRAPHIC SHOW CASE.—J. F. Adams, Buffalo, N. Y.
100,963.—BUCKLE.—Moses Adams, Chilmrak, Mass.
100,964.—WATER METER.—A. W. Almqvist, and F. W. Ofeldt, New York city.
100,965.—TABLE-LEAF SUPPORT.—Aaron Anderson, South Bend, Ind.
100,966.—RUBBER CONNECTION FOR MOSQUITO-NET FRAMES.—U. W. Armstrong and Ira Keeney, Evansville, Ind., assignors to U. W. Armstrong.
100,967.—INSTRUMENT FOR DOSING ANIMALS.—Osborne Barker, Brooklyn, N. Y.
100,968.—BOOT AND SHOE HEELS.—Ferdinand Bliesenick, New York city.
100,969.—CHURN DASHER CRANK FIXTURE.—C. Blust, Lucas, Ohio, and Matthau Harbster, Reading, Pa., assignors to C. Blust.
100,970.—FASTENING FOR CORSETS.—M. P. Bray, Ansonia, Conn.
100,971.—FOOTSTOOL FOR CHURCHES, ETC.—Wm. G. Brown, Monmouth, Me.
100,972.—HAY TEDDER.—J. M. Burdick, Ilion, N. Y.
100,973.—CARRIAGE-WHEEL HUB.—Bradley Burr, Batavia, Ill.
100,974.—CORN-PLANTING ATTACHMENT FOR PLOWS.—J. F. Byland, Walton, Ky.
100,975.—FORGE.—George Campbell, North Buffalo, N. Y. Antedated March 11, 1870.
100,976.—DEADEYE FOR WIRE RIGGING.—D. H. Chamberlain, West Roxbury, Mass.
100,977.—FRICTIONAL GEARING.—D. H. Chamberlain, West Roxbury, Mass.
100,978.—WRENCH.—Luke Chapman, Collinsville, Conn.
100,979.—HOT-AIR FURNACE.—Thomas W. Chatfield, Utica, N. Y.
100,980.—TOILET MIRROR.—George H. Chinnock, New York city.
100,981.—GAGE COCK.—John B. Christoffel, Williamsburgh, N. Y.
100,982.—BASE-BURNING STOVE FOR SHAVINGS AND OTHER LIGHT FUEL.—Orlando Clarke, Rockford, Ill.
100,983.—STEAM GENERATOR.—Orlando Clarke, Rockford, Ill.
100,984.—DIRT GAGE FOR PLOWS.—Joseph Cluckner, Arcadia, Ind.
100,985.—CUFF SUPPORTER.—Thomas Cogswell, Boston, Mass.
100,986.—LOCKING DEVICE FOR TRAPS.—Jasper E. Corning, Rye, N. Y.
100,987.—MOP HEAD.—W. S. Crinklaw, Lanark, Ill.
100,988.—FASTENING FOR STUDS OR BUTTONS.—E. M. Deey, New York city.
100,989.—FLUTING MACHINE.—Edward M. Deey, New York city.
100,990.—COMBINED CORN AND COTTON SEED PLANTER AND GUANO DISTRIBUTER.—S. L. Donnell, Humboldt, Tenn.
100,991.—WASHING MACHINE.—J. T. Dorton and S. G. Eubank, Wellington, Mo.
100,992.—BASE-BURNING PARLOR COOKING STOVE.—W. Doyle, Albany, N. Y.
100,993.—BEDSTEAD FASTENING.—C. H. Fessenden, Candor, N. Y.
100,994.—LEDGER INDEX.—C. A. Fitch, San Francisco, and W. O. St. John, Oakland, Cal.
100,995.—SPOOL CASE.—W. F. Foster, Chicago, Ill.
100,996.—RAILWAY RAIL JOINT.—John Freeland and Daniel Ward, New York city.
100,997.—REMOVING COLORS FROM LEATHER.—E. S. Frye, Salem, Mass.
100,998.—GRAIN DRILL.—J. P. Fulghum, Dublin, Ind., assignor to himself and Davis Lawrence & Co.
100,999.—RAILWAY CAR COUPLING.—Adolph Geiss, Buffalo, N. Y.
101,000.—BASE-BURNING STOVE.—Henry G. Giles, Troy, N. Y.
101,001.—BASE-BURNING STOVE.—Henry G. Giles, Troy, N. Y.
101,002.—STOP VALVE.—L. D. Gilman, Lansingburg, N. Y.
101,003.—RESTORING WASTE ALKALI USED IN OIL REFINERIES.—Wm. Goodaire and Geo. Stead (assignors to O. J. Benham), Cleveland, Ohio.
101,004.—PROPELLING CANAL BOATS.—W. F. Goodwin, Metuchen, N. J.
101,005.—WASHING MACHINE.—William F. Goodwin, Metuchen, N. J.
101,006.—LOOM FOR WEAVING IRREGULAR FABRICS.—Alphonse Goullioud, Barcelona, Spain.
101,007.—SASH BALANCE.—Mellvin R. Green (assignor to himself, Benjamin T. Clemence, and Grinnell Burt), Warwick, N. Y.
101,008.—BED PLATE FOR RAG OR PAPER ENGINES.—Anthony Hankey (assignor to himself and George A. Corser), Leicester, Mass.
101,009.—EXTRACTING COPPER FROM ITS ORES.—Nathaniel Haskell (assignor to himself and J. F. Steen), San Francisco, Cal.
101,010.—HORSE HOE.—Hermann W. Hasslock, Nashville, Tenn.
101,011.—APPARATUS FOR PRODUCING SULPHUROUS ACID.—Moritz Hatschek, Pesth, Hungary.
101,012.—PROCESS AND APPARATUS FOR TREATING WOOD.—Ira Hayford, Boston, Mass.
101,013.—BOLSTER AND AXLE BED PLATE FOR VEHICLES.—John Henry, Suisun, Cal. Antedated March 1, 1870.
101,014.—WAGON STANDARD.—John Henry, Suisun, Cal. Antedated March 1, 1870.
101,015.—METALLIC BEAM.—Laurence Holms, Paterson, N. J. Antedated March 5, 1870.
101,016.—METHOD OF PRODUCING SELVAGES ON MACHINE-KNIT STOCKINGS, ETC.—Henry A. House, Bridgeport, Conn., assignor to himself and Frank Armstrong, Hamburg, Germany. Antedated March 17, 1870.
101,017.—HEATING AND OTHER FURNACES.—Thos. Hydes and Joseph Bennet, Sheffield, England.
101,018.—CAR COUPLING.—Wm. M. Ingstrum, Hornellsville, N. Y.
101,019.—APPARATUS FOR COOLING AND SAVING CHARCOAL.—G. A. Jasper, Charlestown, Mass.
101,020.—MANUFACTURE OF REVENUE AND OTHER STAMPS.—G. T. Jones, Cincinnati, Ohio.
101,021.—MACHINE FOR CUTTING BASKET STUFF.—Chas. Jordan, Wrentham, Mass.
101,022.—TOILET MIRROR.—W. H. King, Newark, N. J.
101,023.—GRATER.—Warren Kinyon and John Maxson, Scott, N. Y.
101,024.—FRUIT CAN.—Isaac Kling, Seymour, Ind.
101,025.—SIGN.—Peter A. Le France and J. D. Densmore, Elmira, N. Y.
101,026.—WOVEN TRIMMING.—Catholina Lambert (assignor to Dexter, Lambert & Co.), Paterson, N. J.
101,027.—MEDICINAL BEVERAGE.—Luigi F. Lastreto, San Francisco, Cal.
101,028.—COTTON PLANT PROTECTOR.—Auguste Le Blanc Louisiana, La.
101,029.—SPRING BED BOTTOM.—George W. Loomis, Hartford, Conn.
101,030.—DUMPING WAGON.—Virgil H. Lyon, Plainfield, assignor to himself and J. L. Snipes, Indianapolis, Ind.
101,031.—HARVESTER.—John B. McCormick, Dayton, Ohio.
101,032.—MACHINE FOR PRESSING AND GRAINING POWDER.—P. A. Oliver, New York city.
101,033.—MACHINE FOR FORMING MOLDS.—Samuel Joseph Peet and Daniel Sawyer, Boston, Mass., assignor to Samuel Joseph Peet.
101,034.—SAW MILL.—A. Perin, Paris, France.
100,035.—APPARATUS FOR PURIFYING WATER FOR THE MANUFACTURE OF ICE.—T. F. Peterson, New Orleans, La.
101,036.—WATER WHEEL.—Thomas H. Powers (assignor to himself, George E. Burnham, and Daniel G. Rogers), Milwaukee Wis.
101,037.—TICKET HOLDER.—Onsville E. Pray, Portsmouth, N. H.
101,038.—GANG PLOW.—Jacob Price, San Leandro, Cal.
101,039.—BEEHIVE.—J. M. Price, Buffalo Grove, Iowa.
101,040.—MACHINE FOR PICKING CRANBERRIES.—Joshua P Prickett (assignor to himself and J. C. Hinchman), Medford, N. J.
101,041.—KNIFE FOR SPLITTING WOOD.—Saxon J. Raymond, Brooklyn, N. Y.
101,042.—STOMACH BITTERS.—David Rinkle, Indianapolis, Ind., assignor to himself and C. C. Hunt.
101,043.—TAIL HOLDER FOR HORSES.—F. A. Roberts, North Vassalborough, Me.
101,044.—STEAM PROTECTION FOR SAFES, VAULTS, ETC.—John A. Robertson, Boston, Mass.
101,045.—HORSE POWER.—Francis W. Robinson, Richmond, Ind.
101,046.—CASTING METAL.—Robert Ross, Middlebury, assignor to himself, Wyatt W. Pierce, and George Ross, Vergennes, Vt.
101,047.—SHAFT COUPLING.—Theodore Rowell, Beaver Dam, Wis.
101,048.—TREATING COAL PRODUCTS TO OBTAIN BENZOLE, ETC.—John Rowley, No. 77 Wells street, Camberwell, assignor to the "India Dye Company" (limited), London, Eng. Patented in England July 22, 1869.
101,049.—SKATE.—J. F. Schneider, Brooklyn, N. Y.
101,050.—WATER WHEEL.—W. L. Selleck, Milwaukee, Wis.
101,051.—BOLT FOR SAFES.—Wm. Sharts, Athens, N. Y.
101,052.—ADJUSTABLE GARMENT PATTERN.—Samuel Shawcross, Freeport, Ill.
101,053.—HAND SCREW AND CLIP FOR SPLICING BROKEN CARRIAGE TIRES.—A. B. Sheaffer (assignor to himself and J. Walter) Ephrata, Pa.
101,054.—MILK RACK AND COOLER.—L. Shipman, Barker, N. Y.
101,055.—LATCH FOR GATES.—Warren Shumard, Richmond, Ind.
101,056.—PLOW.—D. T. Singleton, Eatonton, Ga.
101,057.—DUMPING CAR.—O. L. Smith, Providence, R. I.
101,058.—EMERY WHEEL CLAMP.—Edward A. Suwerkrop Washington, D. C.
101,059.—WATER METER.—Thomas Sweeney, Boston, Mass.
101,060.—COMBINED MOWER AND HEDGE TRIMMER.—J. O. Taber, Salem, Ohio. Antedated March 16, 1870.
101,061.—SHARPENING HARVESTER KNIFE.—A. P. Taylor, Darien, assignor to himself and G. R. Clark, Buffalo, N. Y.
101,062.—CLAMP FOR HOLDING BROOMS, BRUSHES ETC.—A. B. Thompson (assignor to himself and Albert Cleveland), Owego, N. Y. Antedated March 7, 1870.
101,063.—STAIR ROD.—H. Uhry (assignor to the American Stair Rod Co.), New York city.
101,064.—STAIR ROD.—H. Uhry (assignor to W. C. Gould), New York city.
101,065.—SHEET METAL SEAMING MACHINE.—J. M. Veasey, Denver, Colorado Territory.
101,066.—ATTACHMENT FOR LAMP BURNERS.—Wm. Westlake, Chicago, Ill.
101,067.—MANUFACTURE OF IRON AND APPARATUS THEREFOR.—James Davenport Whelpley and Jacob Jones Storer, Boston, Mass.
101,068.—TINNERS' AND SHEET-IRON WORKERS' ROLL.—A. W. Whitney, P. A. Whitney, and F. A. Whitney, Woodstock, Vt.
101,069.—APPARATUS FOR MEASURING LIQUIDS.—Eli F. Wilder, Lowell, Mass. Antedated Sept. 22, 1869.
101,070.—OIL CABINET.—M. H. Wiley (assignor to himself, Thomas Miller, and J. H. B. Lang), East Boston, Mass.
101,071.—COMPOUND TO BE APPLIED TO ROOFING.—Thos. E. Wood, Waseca, Minn.
101,072.—PLANING MACHINE.—G. E. Woodbury, Cambridge, Mass.
101,073.—LAMP BURNER.—D. P. Wright and Cephas Butler, Birmingham, Eng.
101,074.—CAP FOR FRUIT JARS.—Homer Wright (assignor to himself, Henry H., and Benjamin F. Collins), Pittsburgh, Pa.
101,075.—ELECTROPLATING APPARATUS.—H. W. Wright, Taunton, Mass.
101,076.—TOY ROLLING CAGE.—Arthur M. Allen, New York city.
101,077.—COTTON CULTIVATOR.—W. J. Andrews, Columbia, Tenn.
101,078.—BUNG.—J. F. Applegate and Casper Feiock, New Albany, Ind.
101,079.—VAPOR BURNER.—William Aurich, Chicago, Ill.
101,080.—SPRING FOR RAILROAD CAR.—J. F. Babcock, Boston, Mass.
101,081.—MACHINE FOR SCRAPING LEATHER.—Jas. T. Barnstead, Peabody, Mass.
101,082.—HEATING FURNACE.—Wm. D. Bartlett, Amesbury, Mass.
101,083.—ADJUSTABLE BEARINGS FOR WATER WHEEL SHAFTS.—Wm. Bayley, Baltimore, Md.
101,084.—TURBINE WATER WHEEL.—Wm. Bailey and A. B. Crowell, Baltimore, Md.
101,085.—VEGETABLE ROASTER.—Charles G. Baylor, Quincy, Mass.
101,086.—CREAM HEATER.—J. C. Reddoe and John S. Coon, Brackport, N. Y.
101,087.—WASHING MACHINE.—Alva Belcher, Delhi, N. Y.
101,088.—LOOM.—Erastus Brigham Bigelow, Boston, Mass.
101,089.—MACHINE FOR CRUSHING RAMIE AND OTHER FIBROUS STALKS.—E. B. Bigelow, Boston, Mass.
101,090.—CHAIR SEAT.—O. A. Bingham, Cavendish, Vt., assignor to G. C. Winchester, Ashburnham, Mass.
101,091.—CHURN.—G. C. Brown, Atlanta, Ga.
101,092.—EGG CARRIER.—A. H. Bryant, Chicago, Ill.
101,093.—EGG CARRIER.—A. H. Bryant, Chicago, Ill.
101,094.—MEDICAL COMPOUND.—Edgar D. Burrill, Providence, R. I.
101,095.—DRILL GUIDE.—G. F. Case (assignor to Windsor Manufacturing Co.), Windsor, Vt.
101,096.—MEDICINE OR COUGH SIRUP.—Geo. W. Chatfield, New Haven, Conn.
101,097.—CARRIAGE AXLE.—William A. Clark, Woodbridge, Conn.
101,098.—EARTH CLOSET.—W. R. C. Clark, New Orleans, La.
101,099.—SAW SWAGE.—Wm. Clemson, Middletown, N. Y.
101,100.—STREET PAVEMENT.—D. C. Colby, Washington, D. C.
101,101.—COMPOSITION FOR THE MANUFACTURE OF TOBACCO PIPES, STEMS, AND CIGAR HOLDERS.—J. R. Cole, Demopolis, Ala.
101,102.—END GATE FOR GRAIN WAGON.—C. H. Comstock, Chebanse, Ill.
101,103.—WASHING MACHINE.—H. W. Connor, Richmond, Ind

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101,126.—Clamp.—E. B. Hays, Vergennes, Vt.

101,127.—Cooking Stove.—Philip W. Hertick, Louisville, Ky.

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101,151.—Lasting Machine.—H. N. Moyon and Jacques E. Lemercier, Paris, France.

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101,158.—Mode of Attaching Cornice to Windows.—Anthony Peple, East Billerica, Mass.

101,159.—Cooking Stove.—G. H. Phillips, Troy, N. Y. Antedated Feb. 14, 1870.

101,160.—Earth Auger.—Sampson Pope, Covington county, Miss.

101,161.—Spring for Bed Bottoms.—J. H. Potts (assignor to Mary F. Potts), Ottumwa, Iowa.

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101,163.—India-rubber Billiard Cushion.—C. L. Richards, New York city.

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101,172.—Metallic Corner Support for Carriage Boxes and Seats.—O. H. Smith and Willet Fisher, Marathon, N. Y.

101,173.—Lime Kiln.—R. A. Smith, Atchison, Kansas.

101,174.—Submarine Tunnel.—Charles Spear, New York city.

101,175.—Manufacture of Xyliodine and its Compound.—Daniel Spill, Paradise Terrace, Hackney, England.

101,176.—Corn Planter.—Philip S. Starnes, Majority Point, Ill.

101,177.—Cooking Stove.—W. S. Stevenson, Philadelphia, Pa. Antedated Janua1y 5, 1870.

101,178.—Seeder and Cultivator Combined.—Wm. D. Stroud, Oskosh, Wis.

101,179. — Mode of Connecting Architectural Toy Blocks.—A. B. Swift, Brooklyn, N. Y.

101,180.—Coffee-Cleaner.—Samuel G. Taylor, Baltimore, Md.

101,181.—Coffin.—T. M. Taylor, New York city.

101,182.—Machine for Making Pump-Buckets.—J. F. Temple, Chicago, Ill. Antedated March, 16, 1870.

101,183.—Hay Gatherer and Shocker.—C. M. Terrill, Oskaloosa, Iowa.

101,184.—Adjustable Cheese Hoop.—Wm. P. Thompson, Watertown, N. Y.

101,185.—Folding Card Globe.—Dennis Townsend, Felchville, Vt.

101,186.—Folding Chair.—Joseph H. Travis, Charlestown, Mass.

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101,188.—Automatic Fan.—S. J. Tucker and J. H. Rose, Richmond, Va.

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101,191.—Fire-Proof Buildings.—Anthony Wanner, New York city.

101,192.—Fluid Lamp.—Thomas Ward, Columbus, Ohio.

101,193.—Manufacture of Soap. — Alexander Warfield, Alexandria, Va.

101,194.—Sliding Door.—Wm. R. Waterhouse, Liverpool, N. Y.

101,195.—Hoop Skirt.—Julius Waterman (assignor to Waterman & Mayer), New York city.

101,196.—Horse Hay Rake.—Godfried Wieland, Dayton, Ohio. Antedated December 14, 1869.

101,197.—Leather-Rolling Machine.—Henry J. Weston, Buffalo, N. Y.

101,198.—Ice Machine. — Franz Windhausen, Brunswick, Germany.

101,199.—Water Wheel.—A. N. Wolf, Sheridan, and Joel Haug, Bernville, Pa.

101,200.—Combined Plow and Cultivator. — John Wolpret, Louisville, Ky.

101,201.—Knife Handle.—W. D. Woods, Bennington, N. H.

101,202.—Vapor Burner. — Albert F. Ziegler, Columbus, Ohio.

101,203.—Dress Protector.—Frederick Wittram, San Francisco, Cal.

REISSUES.

3,881.—Fire and Water-Proof Paint and Cement. — Theodore Brinkmann, Greenville, Tenn. Patent No. 98,022, dated December 21, 1869.

3,882.—Settee.—Wesley Chase, Buffalo, N. Y. Patent No. 90,078, dated May 18, 1869.

3,883.—Vise.—Edwin Crawley and Thomas L. Baylies, Richmond, Ind. Patent No. 89,469, dated April 27, 1869.

3,884.—Manufacture of Glue.—George Guenther, Chicago, Ill., and E. H Neymann, New York city, assignees to George Guenther. Patent No. 97,771, dated December 14, 1869.

3,885.—Operating Slide Valves in Direct-Acting Engines.—W. H. Guild and W. F. Garrison, Brooklyn, E. D., N. Y., assignees of G. W. Hubbard and W. E. Conant. Patent No. 12,293, dated January 9, 1855; reissue 2,359, dated September 18, 1866; extended seven years.

3,886.—Projectile.—John D. Richards, Muscatine, Iowa.—Patent No. 96,647, dated September 7, 1869.

3,887.—Safe.—T. J. Sullivan, Albany, N. Y. Patent No. 97,-929, dated December 14, 1869.

3,888.—Pump.—The Forrester Manufacturing Co., Bridgeport, Conn., assignee by mesne assignments, of I. N. Forrester and J. H. Luddington. Patent No. 85,577, dated January 5, 1869.

3,889.—Sheep Shears.—R. M. Wilder, Coldwater, Mich., for himself and Hiram B. Robinson, assignee of R. M. Wilder. Patent No. 14,840, dated May 6, 1856.

3,890.—Chair Seat.—G. C. Winchester, Ashburnham, Mass., assignee of Osmore A. Bingham. Patent No. 94,553, dated September 7, 1869.

3,891.—Teachers' Toy.—E. F. Anderson, Mansfield, Conn. Patent No. 92,244, dated July 6, 1869.

3,892.—Apparatus for Carbureting Air and Gas.—Arthur Barbarin, New Orleans, La. Patent No. 95,412, dated October 5, 1869.

3,893.—Printing Press.—R. Hoe & Co., New York city, assignees of Richard M. Hoe. Patent No. 15,501, dated August 5, 1856.

3,894.—Portable Forging Apparatus.—A. Thomas, Franklin, Tenn., assignee of John M. Cayce. Patent No. 67,845, dated August 20, 1870.

3,895.—Step Ladder.—C. G. Udell, Chicago, Ill. Patent No. 90,973, dated June 8, 1869.

3,896.—Inking Apparatus for Printing Presses.—Valentine Wood, Richmond, Ind., and J. E. Snitterlin, Chicago, Ill., for themselves, and Valentine Wood, administrator of the estate of George W. Wood, deceased, all assignees of John K. Lowe. Patent No. 63,540, dated April 2, 1867.

DESIGNS.

3,913.—Burial Casket. — Charles Dahlinger, Allegheny, Pa.

3,814.—Ornamenting Glassware.—W. T. Gillinder, Philadelphia, Pa.

3,915.—Drawer Pull.—William Gorman (assignor to Russell & Erwin Manufacturing Company), New Britain), Conn.

3,916.—Escutcheon for Doors. — William Gorman (assignor to Russell & Erwin Manufacturing Company), New Britain, Conn.

3,917.—Handle for Spoons.—E. C. Moore, Yonkers, N. Y., assignor to Tiffany & Company.

3,918.—Key for Locks.—W. T. Munger (assignor to P. & F. Corbin, New Britain, Conn.

3,918.—Paper Box.—George K. Snow, Watertown, Mass.

3,920.—Set of Turret and Rings for Harness Saddle.—Henry Whitehouse, Newark, N. J.

3,921.—Cooking Stove.—Joseph B. Wiggenhorn, St. Louis, Mo.

3,922.—Spoon and Fork.—George Wilkinson (assignor to Gorham Manufacturing Company), Providence, R. I.

3,923.—Fancy Spoon and Fork Work.—George Wilkinson, (assignor to Gorham Manufacturing Company), Providence, R. I.

3,924.—Spoon and Fork.—George Wilkinson (assignor to Gorham Manufacturing Company), Providence, R. I.

3,925.—Umbrella Stand.—Christopher Blake, Boston, Mass.

3,926.—Bottle.—J. H. Gamhart, St. Louis, Mo.

3,927 and 3,928.—Carpet Pattern.—Levi G. Malkin, New York city, assignor to the Hartford Carpet Company, Hartford, Conn. Two patents.

3,929.—Machinery for Making Ice.—Theodore Scheffler, Patterson, N. J.

3,930 and 3,731.—Carpet Pattern.—John Smith, Enfield, assignor to Hartford Carpet Company, Hartford, Conn. Two patents.

3,932 to 3,940.—Carpet Pattern.—Henry G. Thompson, New York city, assignor to Hartford Carpet Company, Hartford, Conn. Nine Patents.

EXTENSIONS.

Wrench.—William Baxter, Newark, N. J.—Letters Patent No. 14,221, dated February 12, 1856.

Grain Separator.—Cyrus Roberts, of Three Rivers, Mich., and John Cox, of New Hope, Pa.—Letters Patent No. 14,517, dated March 25, 1856; reissue 3,502, dated June 15, 1869.

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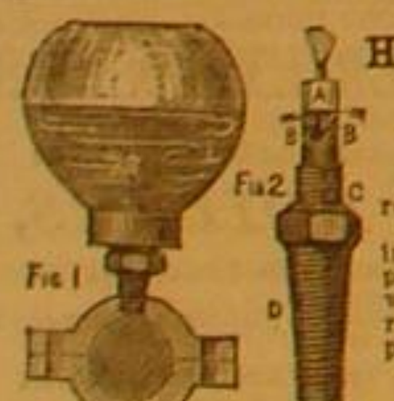

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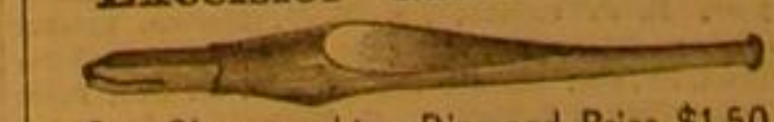

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