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THE OLD MOLDER.

Down on his knees in the sand, his grizzly beard and hair soiled with grime, with keen eyes intent upon his work, he does not notice your approach. When he, at last, sees you, and hears your salutation, what a hearty good-morning issues from that crater-like looking breathing hole of his! Full of manly independence is your old molder. Though your clothes be fine, and a solitaire sparkles in your shirt front, he feels himself just as good in his smutted clothes as you do in your finery.

A dry joker—ten to one he asks you to extinguish your cigar, in so bland and natural a way that you do so at once; then wondering what necessity there can possibly be for such a prohibition in a foundery, you catch a sly gleam in his eye, which instantly tells you of the inward laugh he is enjoying at your expense.

Now take a seat on that empty cope and watch him, as in the tractable sand he shapes beautiful, curious, and difficult forms. We promise you that if delicate manipulation, and ever varying ingenuity delight your style of intellect, you shall spend an hour profitably and pleasantly. Queer stuff that sand—is it not? As susceptible to impressions as a child's heart and mind, but not so retentive. That obstinate corner will break down in spite of the dainty skill with which our old molder's practiced hands—steady as a rock, though he is three score years old, if a day—lift out the pattern. Now watch him as he builds it up with a trowel that looks like a child's toy. Here is skill of eye as well as of hand. This man might have been a sculptor—he *is* a sculptor in fact, of a most practical and useful sort.

Now the mold is complete. With what accuracy every line, projection, and depression of the pattern has been traced in the yielding sand. So he goes on from one mold to another, preparing sand wombs for their fiery gestation.

Soon resounds, through the massive building, the steady roar of the blast, and the furnace grows hotter and hotter under its power. The molten iron settles to the bottom of the cupola ready and eager to leap forth, and undergo its regeneration into forms of beauty and usefulness. Could we follow it back through the ages in which it has undergone the transformations which left it a crude unsightly mass in the side of yonder mountain, from whence human brains and hands have wrested it to its present purpose, we should read a history far more grand and vast than any ever achieved by human dynasty.

No time for such reflections at present; the furnace is tapped and the white hot stream is flowing. Now our old molder is in his glory; the high priest of a temple which glows in every corner of its sooty dome. Dusky forms, lit by a lurid glare, swiftly fill the matrices with incandescent metal. From each inclosure rise clouds of steam, which, mingling together in the dome, are lighted by the glowing metal below, like the smoke which hangs over Mount Vesuvius.

Now the molds are all filled, and the flasks are opened, and the iron shapes come forth glowing. The operations are over for the day, and washing off sweat and grime, the old molder starts for his modest home. Let us hope that there peaceful content, and the warm love of wife and children, and the rewards of patient industry, await him; and, that, when the earth shall finally enfold his shape, he will rise again, like the forms he has fashioned, to a better and nobler existence.



THE OLD MOLDER.

Russian Foods.

The tea in Russia is very different from that used in England and in this country. The strong, black, high flavored congou, from the south of China, used here, is almost unknown in Russia; and when by accident they have it (as by present from a friend), they do not know how to use it. What they use is a light, delicate flavored tea from the North of China. Make the infusion as strong as you like, it would be impossible from it to produce a cup of tea as dark and black as ours. At the strongest theirs never seems to get beyond a light amber color. A cup of tea of the color of senna or coffee would revolt them. Hence, when they have English congou, they regulate the strength of the infusion by the color they are accustomed to see in their own, a standard which, to speak mildly, does not produce strong tea. But looking at their tea, not as ours, but as another species of the same genus, and altering our standard accordingly, then it has merits of its own not possessed by ours. Coming from the colder districts and more mountainous regions of northern China, it has not the strong aroma of that from the less elevated and hotter slopes of the south, but it has, in its place, a peculiar delicacy and refinement of flavor.

The breads resolve themselves practically into different modifications of three chief kinds. Tschernoichleb, black bread made of rye; kalatsch, white bread made of wheat, and of this the best kind comes from Moscow; and saika, white bread enriched with raisins or other accesories, equivalent to our buns or the Scotch "cookies."

Ices are made in great perfection in St. Petersburgh. One, a very good kind, made from or flavored by the hazel-nut; and another still better, a water ice made from the juice of the "clucva" or cranberry (gathered after the berry has been touched by frost), sweetened and slightly flavored with vanilla. In Russia this is much used, and it is well deserving of introduction into this country.

The great vegetable staple of the country is the cabbage, which grows in great perfection, fine, large, solid, white, and crisp. It supplies a chief portion of the subsistence of the people all the year round. At the beginning of winter every family lays in a store. At that time the plants are cut down and chopped up or shred into thin slices. These are packed in barrels with vinegar and salt, and a certain amount of fermentation takes place, when the cabbage becomes a kind of sour crout. From these barrels, a portion is taken as required, and made with meat into a cabbage broth called "shtshi."

This shtshi is the most characteristic national dish in Russia. With the mass of the people it is their daily food. Meat is cheap in St. Petersburgh; only about half the price we pay, and consequently it is much more freely used. All northern nations consume a greater quantity of animal food than more meridianal races. Every meal, every dish at every meal, forces this fact upon the visitor's attention, in St. Petersburg.

The Modern Order of Contractors.

The late Mr. Stephenson stated that—"The Britannia bridge—containing an amount of masonry unheard of before, nearly two millions of cubic feet—was built in three years, without concern on my part in regard to the masonry. It was turned over to a contractor—an intelligent and thoroughly practical, though not a scientific man, and he performed the task. Yes! two millions of cubic feet of masonry were worked from the quarry, dressed, squared, set, and reared into a magnificent edifice in three years. More than this had been one at the Montreal Bridge. There was an indefinite amount of ingenuity in the mere tackle of such a work. And yet they must not permit their own skill and success to blind them to the fact, that, so far as work was concerned, things of almost equal note were achieved in other countries. His experience in Egypt surprised him not a little. During the construction of a railway there, he calculated on much difficulty in regard to the making of embankments, ditches, culverts, and so on. But arrangements were made through the agency of dragomen; and the Egyptians, once at work, much surprised him. He was almost in despair at first; but after they had become familiar with the labor, they performed a quantity of work that was really astonishing.

He mentioned this case as one that stood in strong contrast to the Britannia bridge masonry, which might be regarded as a work where the utmost available amount of science was brought to bear, while the Egyptians' work was one in which an indefinite division of labor was employed and exemplified An embankment was made over the delta of the Nile, extending to about 140 miles, eight feet high and twenty-five feet wide; the whole was now completed. One portion of the work struck him as very remarkable. The Pasha of Egypt had, of course, the power of sending to villages and directing the mayor to cause a certain amount of work to be performed in a certain period. A road was required to one of the Pasha's palaces, and the Pasha ordered it to be made. To be ordered there, is to be done. The road was made thirty miles long, forty feet wide, and eight feet high; and in what time would be supposed? why, in six weeks. In that comparatively barbarous country, then, a work had been accomplished which he had not known equaled in any country however highly civilized."

In a recent discussion at the Odontological Society, the notion was thrown out, that the teeth have a higher office than that commonly assigned to them—namely, that of merely crushing or masticating the food. They are to be regarded as endowed with a tactile sense, a discriminating faculty, correspondent to that possessed by the muscles and nerves of the eye and ear. Teeth, it was remarked, have an extreme delicacy of discernment, both as to whether the objects comminuted be suitable as food, or such as will irritate the delicate lining of the œsophagus. How speedily do the teeth detect the smallest particle of cinder that has found its way into a freshly baked biscuit! And yet both are pulverized with much the same force and sound.

SEAL FISHING.

A correspondent of the *Evening Post*, writing from St. John's, N. F., gives the following interesting particulars:

On these shores, 146,000 souls are maintained in existence by catching, curing, and exporting seals and codfish. All our institutions, churches, schools, politicians, lawyers, bishops, clergy are created out of seals and cod. Take these away, and we all vanish quickly as the morning cloud and the early dew.

It is a stirring time here when preparations for the seal fishery commence. For the three weeks that precede the first day of March, the sound of hammers and axes reverberates cheerily. The offices of the merchants are crowded with rough, hardy-looking men, who are eagerly seeking for berths. From the distant "outports" they have arrived, with bundles of spare clothing over their shoulders, slung on the "gaff" or pole seven or eight feet in length, with which the seals are to be struck and dragged over the ice to the side of the vessel. These are the "batmen;" the "gunners," who rank a step higher, carry on their shoulders the long, heavy sealing gun, with which the older seals are to be destroyed. The men are roughly but warmly clad, and wear long, heavy boots, well paved in the soles with "sparables "nd spikes, to enable them to walk securely over the ice.

The men are well fed during the voyage, their diet being chiefly pork, biscuit, tea, and a few vegetables. They also feast on the heart and certain other parts of the young seals, when succesful in capturing a number.

A SEAL HUNT—ITS PERILS AND EXCITEMENTS.

Let us now picture to ourselves sixty or seventy of these stout fellows on board one of these small sealing vessels of 140 or 150 tuns, ready for their hunting excursion on the ocean fields of ice; and let us, in imagination, go with them on their perilous voyage, in order to form some idea of the great "swile hunt," as it is vernacularly called. About the middle of February, the seal casts its young on those huge ice fields that are borne along our shores by the great northern current that sets southward out of the Greenland seas. For three or four weeks after birth, the young remain on the ice, fed by their mother's milk, and growing rapidly. At the end of this period they are very fat and in perfect condition; and the object of the hunter is to reach them at this time, as they are then readily taken, and their oil is purer and finer than that of the old ones. For this purpose they sail from our harbors as nearly as possible to the first day of March. Steering northward, they endeavor to keep the open water, if such can be found; but generally they are not long out till they encounter the ice.

At times the scene is terrific; howling night closes in, and the vessel, caught in a vast ice field, is momentarily threatened with destruction. The huge floes come grinding, crushing down upon her; the wind roars through the shrouds, driving on its wings the arrowy sleet and snow, sharp as myriads of needles, before which only men of iron can stand. Thus beset and locked in the embrace of the floe, the luckless vessel is drifted helplessly hundreds of miles, at times past the harbor from which she took her departure. Then suddenly the scene changes. Soft westerly breezes blow, unfolding a lovely sky studded with bright stars, adorned by the presence of the young moon, and brilliant with the flickering aurora. Calmly the vessel makes its way through numberless islets of glittering ice, with shining pinnacle and fantastic forms, realizing all the youthful dreams of fairyland. The scenery on such a night, amid the ice fields, is said to be enchanting.

BLOODY WORK.

Suddenly, however, the enchantment is dissolved by the welcome whimpering of young seals, resembling much the cry of an infant in distress. The vessel has at last touched the seal meadows, and myriads of the "whitecoats" are all around amid the ice hillocks. Now the bloody work begins; not a moment is to be lost, for the wind may shift and the treasure drift far away. If the ice be firm the men eagerly leap on it, armed with "gaff," "towing line," and "sculping knife." If it is broken, the word is given, "Out with the punts (boats)!" and from "pan" to "pan" they pursue their prey. The "slaughter of the innocents" is terrible. The shouts of the hunters, the blows of the "gaffs" as they dispatch their victims with a stroke on the nose, the blood gouts that cover the hands and arms of the murderers and stain the virgin snow, the carcases denuded of skin and fat, and yet palpitating with warm life as they are flung on the ice; the eager, exultant hunters slaying, "sculping," dragging heavy loads of fat and skins towards the vessel—what a scene of death amid these ice solitudes of the ocean, with the bright sun in the heavens lighting up the glittering pinnacles and far-spreading fields of ice!

"SCULPING" AND HAULING.

Meantime, the vessel keeps moving through the ice; the men follow, clearing off the seals on each side as they pass along. Sometimes a dozen seals are found within a space of twenty yards square. At other times they are more widely scattered, and the men have to disperse over the ice in search of them, to a distance of several miles. In skinning, a cut is made through the fat to the flesh, a thickness generally of about three inches, from the throat to the tail. The legs or "flippers," and also the head, are then drawn out from the inside, and the skin is laid out flat and entire, with the layer of fat or blubber adhering to it.; and in this state the skin is called the "pelt" or "sculp." It is generally about three feet long, and two and a half feet wide, and weighs from thirty to fifty pounds. The hunters nick two holes along the edge of each side of the skin, and then lay them one over the other, passing the rope through the nose of each "pelt," and lacing it through the side holes in such a manner that, when pulled tight, it draws them into a compact bundle. Fastening the gaff in this bundle, they then put a rope over the shoulder and haul it over the ice to the vessel. Six pelts are reckoned a heavy load to drag over rough and broken ice, often leaping from "pan" to "pan." Then what a scene the deck of the vessel presents as the seal skins are piled there, previous to being stowed under deck! The men move about knee deep in fat and blood—the deck, with gore, is slippery as glass. The hunters arrive with their boats, and snatch a hasty moment to drink a bowl of tea or eat a piece of biscuit and butter—their hands and bodies reeking with blood and fat—they then hurry off in search of new victims. The poor mother seals, now cubless, are seen popping their heads up in the small lakes of water and holes among the ice, anxiously looking for their snow-white darlings, and refusing to believe that the bloody carcasses on the ice, stripped of their warm coverings, are all that remain of their tender offspring. With a moan of distress, they plunge into the water, as if anxious to escape from a scene polluted by the ensanguined trail of the hunters.

DANGERS AND DISASTERS.

The seal hunt is full of perils and excitements. Sometimes when the men are a mile or two from their vessel, a blinding snowstorm sets in, or a thick fog envelopes them; and as they stagger along, trying to regain their ship, they fall through a hole in the ice, covered by the treacherous snow, and go down to ocean's depths "unknelled, uncoffined, and unknown." Sometimes, too, the field of ice on which they are at work separates into fragments, and they are floated off to lie down and die on the ice, unless picked up by some passing vessel. Or perhaps a furious nor'easter blows for several days, "rafting" huge blocks of ice, one on the other, all around the imprisoned ship, crushing her at length like a nutshell, and leaving the unhappy sealers shivering and perishing with hunger on a floating ice field. At times their sufferings are very great, and in some seasons there is a serious loss of life. On the whole, however, such are their skill and fortitude in meeting all emergencies, and such their knowledge of the ways and manners of the ice, comparatively few mishaps occur.

SPECIES OF SEALS.

There are four species of seals in our seas. The Bay seal lives on the coast, frequents the mouths of rivers and harbors, and is never found among the ice. The harp seal is so called from having a broad curved line of connected spots proceeding from each shoulder and meeting on the back above the tail, forming a figure like an ancient harp. The old male animal alone has this figuring, and not till his second year. The third variety is the hooded seal, and is much larger than the harp. The male, called the dog-hood, is distinguished from the female by a singular hood or bag of soft flesh on his nose. When attacked or alarmed, he inflates this hood so as to cover the face and eyes, and it resists seal shot. It is impossible to kill one of these creatures, even with a sealing gun, so long as his head or tail is towards you; so that the only way is to aim at the side of the head, so as to strike at the base of the skull. The hoods bring forth their young two or three weeks later than the harps, and keep farther north than the others. The fourth species is the square tipper. It is largest of all, but is rarely taken on the coast. The white coats, the young of the harps, are the most desirable for capture, their oil and skin being the finest.

THE METRIC SYSTEM.

Prof. Chas. E. Davies, of West Point, lately delivered a lecture, in this city, on the metric system, and the probable consequence of its proposed introduction into this country. After explaining the system in detail, he concluded his remarks as follows:

Let us suppose the metric system to be adopted by law, and every other system excluded—for without such exclusion the whole thing would be a perplexity and a farce. What follows? We have blotted out, from the mind of the nation, the foot and all knowledge of every measure into which it enters as a unit. We have expunged the yard, used in connection with the arm more or less in every family; and the pace, the unit and guide of the farmer, for an approximate measure that will not supply the place of either. Every lot of ground 25 feet front by 100 feet deep must be described as follows: 7 meters 6 decimeters and 2 centimeters front, by 30 meters 4 decimeters and 3 centimeters deep. Thus, the description of every such lot will require three different units and six words, instead of one unit and two words. In all conveyances and descriptions of land, the translation from one language to the other would occasion great trouble and difficulty. The old familiar mile of 1,760 paces is also gone, and the distance from Albany to New York, 145 miles, will be known to us, if known at all, as 229,680 meters. Let us see how we shall recognize the earth in its new dimensions. Its diameter, instead of 8,000 miles, in round numbers, will be 12,672,000 meters, and its circumference about 39,810,355 meters and 2 decimeters. The acre is also gone, and with it all its multiples and sub-multiples.

Since the commencement of the present century, the public lands have been surveyed and laid out in townships of 6 miles square, each containing, of course, 36 square miles, or 23,040 acres. The side of each township, by the new system would contain 9,504 meters (instead of 6 miles), and its area 921,600 ares. All the lands from the Ohio river to the Pacific ocean have been surveyed, deeded, and recorded in the units of the square mile and the acre. What will be the labor and the confusion of translating every deed and record into the language of the meter and the are? We should scarcely know our own farms by their new names.

The consequences of these changes to the metric system would be the following:

1. They would strike out from the English language every word and phrase and sentence used in connection with our present units of weights and measures, and would impose the necessity of learning a new language for the one now in use.

2. They would blot out from the knowledge of the nation all apprehensions of distance and area and volume, acquired through the present units, and would render necessary the acquirement of similar knowledge by less convenient units, having different relations to each other, and expressed in a new and unknown language.

3. They would change the records of our entire landed property, requiring them all to be translated into a new and foreign language.

4. We must not forget that prices and currency are dependent upon, and necessarily adjust themselves to, weights and measures; and that all our ideas of cost and value are fixed with reference to our present units. The adoption of the metric system, therefore, would carry with it an entire change in the money values of all articles of commerce and manufactures, and of all agricultural productions; for these values would have to be re-adjusted to the new units, and to be expressed in the new language. Hence, the changes would extinguish all knowledge of money values, now so familiar to the entire population in their daily purchases and sales and barters, for those values are all adjusted with reference to the units of weights and measures.

5. Can we afford to make these changes for the very small gain of changing our present yard from 36 inches to 39 inches and $\frac{3.7}{1.0.0}$ of an inch? Can we accept any system as a substitute for the one now in use, unless it makes some provision for maintaining the unit 1 foot?

All our knowledge of distances, the yard, the rod, the furlong, the mile, the league, come from it. The square rod or perch, the rood, the acre, are also derived from it. Can we change the survey of an entire continent, with the description of every piece of land upon it, from the unit, one acre, to the unit, one are, forty times less? Can we change, without great confusion, the unit of volume, the cubic foot and the cubic yard, so familiar to every schoolboy? and, above all, can we change our unit of weight, the pound avoirdupois, which is equal in weight to sixteen of the 1,000 equal parts of a cubic foot of rain water?

6. Can we abandon, as a mere question of language, these short, sharp Saxon words, for their equivalents expressed in a foreign language? Besides, the foreign language which we introduce has no exact equivalents to these words, which have almost become things, and which now form a part of the mind and knowledge of every people who speak the English tongue, or are connected with American commerce. These are the great questions now discussed and considered by the American people. They affect directly the interests of all classes. They affect our systems of public instruction, our trade, our commerce, and the mechanic arts, in all their development and in all their applications. Let us then approach these questions with a deep sense of their importance. Let no hurried action embarrass us. Let us remember that time is a necessary element in the accomplishment of everything that is truly great, and that these questions can only be rightly and permanently settled by the enlightened and aggregated judgment of mankind. Let the discussion, therefore, be full and complete.

160,000,000 Needles a Month.

Sewing needles are almost wholly of English manufacture, but a few German goods under English brands reach the American market. In England, the manufacture has been systematized and simplified to such a degree that English labor always has a monopoly of the needle trade. A needle passes through 120 operations, and a child can control the machinery and turn the eyes of 4,000 needles per hour.

The introduction of sewing machines restricts the increase in the sale of sewing needles, though they seem to hold to a very steady yearly increase, in the United States, of about three per cent. The statistics published from Commissioner Young's Bureau, in Washington, do not specify the importation of specific items of small wares, all goods going under a general classification of the product they originate in. Hence the actual consumption of needles is something difficult to determine. The agents of the two leading makers in Boston, report the aggregate sold in Boston, New York, and Philadelphia, as about one hundred and sixty million of needles per month, running from 75 cents to $2 dollars per thousand. The sales chiefly are on the numbers from 5 to 10, while seven eights of these orders take the numbers of 7 and 8. Knitting and darning needles, that twenty-five years ago were sold in amount over double the sales of sewing needles, have dwindled to a very insignificant item of stock. They can hardly be said to sell now at one twentieth of their former amounts. Crochet needles have a very large sale, and have taken the place made vacant in stocks by the disuse of the darning and knitting needles.

PROFESSOR GOULD, who has gone to superintend a new observatory, founded by the government of the Argentine Republic, at Cordova, in his remarks about the climate, gives a few particulars which exemplify its extreme dryness. "A bowl of water," he says, "left uncovered in the morning is dry at night; ink vanishes from the inkstand, and becomes thick almost by magic; the bodies of animals, left exposed, dry up instead of decomposing; and neither active exercise, nor exposure to the sun's rays, causes perceptible perspiration."

VINCENT'S PROCESS OF PREPARING LINSEED OIL.

[Condensed from the English Mechanic.]

Various methods have from time to time been adopted to accelerate and increase the natural siccative action and properties of linseed oil.

This is generally accomplished by boiling the oil; but a method of preparing it in a cold state has long been known and practised. It consists in agitating the oil, to which a small quantity of litharge has been added, with a solution of vinegar of lead (tribasic acetate) in soft water. This operation is carried on in a warm place with frequent stirrings, till a whitish precipitate is thrown down, and the oil is of a pale straw color. By a process of filtration and exposure to the sunlight it may be obtained almost as clear as water. This is the vehicle for the pigments used by decorators and painters in the finer descriptions of work, and where the purity of the tints is a matter of importance, although it does not dry quite so rapidly as the boiled oil. [This vehicle has not met with the favor in America which, as we are led to suppose by this paragraph, it receives in England.—EDS. SCI. AM.

The process, by which the ordinary dark-colored vehicle used by painters in common work is produced, consists in boiling the raw linseed oil with a larger or smaller proportion of litharge, which, by some chemical action not thoroughly understood, increases the drying properties of the oil. Magnesia and the oxides of zinc and manganese have also been employed for this purpose, but oxide, or some other salt of lead, is in more general use, with the addition, in some cases, of a small quantity of resin.

According to Liebig, the mucilage and vegetable albumen in the raw oil prevent or impair its natural siccative action, and the boiling with litharge in some way removes these substances, and permits the oil to more readily absorb oxygen from the air. M. Chevreul, however, expressed an opinion some years ago, that it was not necessary to boil the oil at all; that a temperature far below boiling point (about 600° Fah.) had an equally good effect, and that in fact it was possible to boil the oil too much.

Of late years, a method of preparing the raw oil by employing steam has been adopted on the Continent and by some English makers, in which the temperature is rarely raised above 228° Fah. An account of this process, as discovered and worked by himself was recently given before the Society of Arts, by Mr. Vincent. The process destroys the pungent odors and intensely disagreeable smells of the older process. The apparatus used consists of a pan, constructed preferably of copper, with a depth about equal to the diameter, and with an iron jacket, for the lower half, forming a space for the steam, and capable of standing a pressure of 40 pounds to the inch. To the top of the pan a dome provided with a manhole is riveted, and proceeding from this dome is a pipe to convey the vapors into the ash pit, and consequently through the fire. In the center of the dome is a stuffing box, through which two shafts, the one working inside the other, are passed. These shafts bear fans, which, rotating in opposite directions within the pan, by the violent agitation set up, cause a complete mixture of its contents. The oil to be boiled is placed in a large tank, through which passes a coil of pipe conveying the waste steam from the jacket, thus raising the temperature of the oil to about 95° Fah., and facilitating the separation of mucilage and accidental impurities before the boiling operation is commenced. When the previous charge has been run off, about two tuns of oil are pumped into the pan from the tank, the steam turned on, and the fans started. When the pressure of the steam has reached 35 pounds, air is forced into the already agitated and churning liquid through an inch pipe fixed in the bottom of the pan. The dryers, about three quarters of a pound to the cwt. of oil, are added as soon as the oil is heated through, being ground to a fine powder, mixed with oil, and passed through a funnel and stop cock into the pan. After the introduction of the dryers, it is only necessary to keep the fans and the air pump at work; and at the expiration of about four hours the oil is fit for removing into tanks, where it remains till the dryers have settled, and the clear oil is then drawn off into the vessels used for storing. In practice, Mr. Vincent says it is advisable to add about 20 per cent of raw oil to each barrel of the prepared liquid intended for exportation.

No information as to the name of the dryers employed is given in the paper. They part with some of their oxygen to the oil, and, coming in contact with the oxygen of the air forced into the pan, become reoxidized, and again contribute oxygen to the heated oil. The accomplishment of this reoxidization of the dryers necessitated the employment of blowing engines for the boiling oil, when the discovery, that under this treatment the oil rapidly acquired body, gave rise to the method of treating it we have described above, a process by which the absorptive powers of the oil for oxygen are enormously increased and permanently retained.

What these dryers really are remains a trade secret; but many years ago, Faraday suggested the employment of binoxide of manganese in order to hasten the drying of printing inks, while it has been asserted that a very small quantity of borate of manganese is sufficient to cause any of the drying oils with which it is mixed to rapidly dessicate. Hitherto it has been a common belief among manufacturers that oils would not show their impurities until a temperature of some 500° was reached; but if the article prepared by Mr. Vincent's process be as good as that produced by the old method, there can be no doubt that a great step in the right direction has been taken, and the disagreeable odors, with the unavoidable danger from fire, those usual attendants on oil and varnish works, should rapidly become things of the past.

[This process was patented in America about two years since. There is no secret here about the dryer used; it is simply red lead. The oil produced by the process does not dry well, but remains tacky for a considerable period. Experts inform us that it is an inferior article. There seems to be, however, room for improvement upon the process, and in the hands of those competent to experiment with it, it might develop into something of greater importance than it appears to be at present.—EDS. SCI. AM.

Poison in Bread.

It seems, says the *English Mechanic*, that in some metropolitan districts, our "staff of life" contains a most insidious poison. Our readers are doubtless aware that alum is extensively used by bakers to render flour of a low quality serviceable, and the bread made from it whiter than it otherwise would be. By retarding the transformation of the starch into gum, sugar, and lactic acid, it renders the bread more nutritious and prevents it turning sour. But if alum has its advantages, it also has disadvantages. Dr. Dauglish read a paper before the Society of Arts, some time since, in which he stated that the effect of alum on the system is that of a topical astringent on the surface of the alimentary canal, producing constipation, and deranging the process of absorption; but it also neutralizes in a great measure the action of the digestive solvents. So that while it prevents solution at a time when it is not needed, namely, when the bread is being prepared, it continues its effects when taken into the stomach, and the consequence is that a large portion of the gluten and other valuable constituents of flour are never thoroughly dissolved, but pass through the alimentary canal without affording any nourishment whatever.

Other medical men assert that the amount of alum in bread is not in any way injurious; but, however opinions may differ on this subject, there can be no question of the deleterious influence on the human economy of another "whitener" found in bread.

The *Food Journal* publishes an account of an examination of twenty samples of bread purchased in districts of London south of the Thames, from which we find that an undoubtedly dangerous poison exists in baker's bread to an extent that is far from pleasant. Sulphate of copper, commonly called blue vitriol, is in extensive favor with Belgian bakers; but hitherto its action as a "whitener" was supposed to be unknown to their metropolitan brethren. According to our cotemporary, out of the twenty samples, only three were positively genuine, and while five contained alum in quantities ranging from 22 to 88 grains per 4-pound loaf, no fewer than sixteen contained sulphate of copper, varying in amount from 0·43 to 1·82 grain per 4-pound loaf.

It would be advisable to discover who mixes this dangerous poison with our bread—the miller or the baker—and we shall look anxiously for the promised settlement of the doubt. To all appearances, not even those who make their own "household" are secured against the effects of a most subtle and dangerous poison.

Manufacture of Needles.

Most of the small needles of the German make are of very inferior workmanship; some faults are so palpable that it is obvious that neither manufacturer nor artisan could know the qualities necessary to constitute a good needle; the eyes are not central, nor pressed out clearly, and have a burr or sharp edge left on the inner surface, that would cut the thread; very irregular in temper, with in no instance that elasticity of texture which characterizes the best English needles; in numerous instances the heads are not ground, nor the eyes burnished, and what is worthy of notice is, that all the best Prussian needles have gilt eyes; a process which, although applied to some best English made needles, as a rule is most generally allotted to lower class goods.

There are two methods of producing "steel London" needles in English manufactories: one, to use inferior material, and employ corresponding workmanship; the other, to put up needles intended in the onset for best, but which have proved defective in one or other of the manufacturing stages, and they are sold as "steel London." In the scouring mill alone millions are annually reduced from best goods to "steel London."

The "hardening," too, is another uncertain process, but, judging from results, is better, though slower, than the German system, yet still open to much improvement. It is on the combined success of these two processes ("hardening" and "scouring") that the temper of the needle depends, and which, from a combination of circumstances, too frequently fails. The Germans employ machinery successfully for many processes of which the English know nothing. They use a "pointing" machine, by which all their needles are pointed, and this, too, in a country where labor is cheaper that it is in England. George Printz, one of the German manufacturers, has obtained a gold medal for "scouring" and other machinery now in use in most of their needle mills, with which they claim to scour more needles, by four fifths, in forty hours, than the English system will in seven days; and (as they assert) avoid the danger of overheating, and thereby spoiling the temper of the needles. They have a machine for "cutting," which leaves the wires straight without the aid of fire, so that the rubbing process is altogether dispensed with; and also a "blueing machine, worked by two little girls, doing the work which in the English system would employ five women. "Tempering" and "cheek filing" are also done by means of machinery,

There should be as much certainty in making a "packet" of needles to any required quality as there is in making a watch, or building a house; but there is not. Still, it might be done, if two obstacles could be removed. One of them is the frequent irregularity found in the quality of steel, and the uncertainty of obtaining the better quality at the higher price: the other is, the required temper should always be obtained in the tempering shop, and no after process should, under any circumstances, be allowed to alter that temper. The "hardener," then, would be solely responsible, and would seldom fail.

From late improvements in the art of steel making, even these last few months, there is good reason to hope that the first difficulty is fast being removed. The investigations and discoveries of Bessemer, Richardson, Calvert, and others, who have carried science into the workshops, must, if persevered in, eventually end in the quality of this most important material being no longer a question of guess, but one of certainty. Even now the ingredients of steel are not known; the chemical action of some of the gases on steel, when in a heated state—hydrogen, for instance—is still an open question; and as the steel is, with some little exception, heated for hardening in carbureted hydrogen, if the small size of the needle be considered, it seems of importance that this should be known even by the workmen. It is either from undervaluing the importance of good steel, or not being able to obtain it, or, when obtained, spoiling it in firing, that the German small needles are so inferior in temper.

Bringing down the temper of needles, after leaving the tempering shop, is the rock upon which needle manufacturers of all times have been splitting. The "hardener" or "scourer" both work according to rule, but the rule is defective, involving considerable loss and inconvenience.

There is considerable difficulty in obtaining friction without heat, and needles, after they are tempered, undergo an immense amount of friction, and under this process they are likely to sustain injury. It requires a temperature of 400° to effect in any way the temper of the mildest needle steel, and, consequently, if in "scouring," needles could be kept under, say, 300°, they would leave the scouring mill with the temper exactly as it left the tempering shop.

Earths and Alkalies Used in Pottery, etc.

Terra di Sienna: deep brown or coffee color, fine, compact, very light, very smooth and glossy, does not color the hands; when wetted, marks a fine yellow upon paper; burns to a pale brownish red color, but does not harden; comes from Italy, and an inferior sort from Wycombe.

Burnt *terra di sienna* is used as a paint.

London blue clay: dark blueish; used for luting vessels in distilling acids, but requires another luting over it to keep it moist and to prevent its cracking; it is also used for pottery, for lining ponds, and for modeling.

Devonshire blue clay is fat, tough, makes white solid pottery, but is expensive.

Devonshire black clay makes cream ware.

Devonshire cracking clay is gray, burns to a beautiful white, but is apt to crack in the firing. Common clay, used for artificial stones, as bricks, etc., and common pottery.

Fuller's earth is grayish brown, but varies greatly; hard, very compact, rough, but scraping glossy, does not color, burns hard and yellowish brown, being very fine, and absorbs grease very readily; used to full woolens.

Rotten stone is ash brown, very light, moderately hard, dry, coloring, burns to a deep ash color, but not harder; used as a color, and to give a polishing powder for metals; is to be found in Derbyshire.

Umber is fine, pale brown, close, very light, dry, coloring, burns deep reddish brown, but no harder; used as a color, and to give porcelain the shining ground called *écaille;* comes from Turkey.

Burnt umber is used for paint, makes a good shade for gold; both these umbers are excellent shades or dead colors, having a good body.

Windsor loam, Hedgerly loam, is yellowish brown, very hard, heavy, harsh, coloring slightly, burns very hard, and to a fine deep red; used for setting bricks of wind furnaces, glasshouse furnaces, also for luting, and coating glass and earthen vessels to be exposed to a strong fire.

Bath bricks from Windsor loam made into bricks; used for a coarse polishing powder.

Founder's clay or penny earth is dusky brown, very hard, heavy, harsh, not coloring; found at Woolwich and in Northamptonshire; used for molds in large foundries.

Cheam clay is of light ash color, nearly white and very hard; used for the body of glazed gallypots.

Bohemian tripoli is of light ash color, heavy, moderately hard, open, harsh, dusty, but not coloring, not altered by burning; used for polishing and plate powder.

Terre verte is deep blueish green, very heavy, hard, smooth, glossy, not coloring, but marking a green line, taste coppery, burns very hard and to a dusky brown; found near Rome, also near Woolwich; used as a lasting, but not bright, green paint.

Argile de Saveigne is blue, very tough, sandy; used to make the French pottery *degrès* or stoneware.

Argile des Forges-les-eaux is blue; used to make glasshouse pots and stoneware.

Welsh clay: used to make Welsh fire clumps for building the fire rooms of steam engine furnaces.

French chalk is greenish, semi-transparent, compact, smooth, unctuous, glossy, not coloring, scrapes white, marks an unctuous silvery line, burns very hard and white; used to mark cloth, to take out grease, and cause boots to slip on easily; it is frequently confounded with Spanish chalk.

Myrsen meerschaum is pale grayish green, resembling tallow dropped upon brass, close, heavy, smooth, unctuous, glossy, not coloring, burning extremely hard and pale white; used as soap, and to make the large German tobacco pipes, or rather the bowls of them.—*Professor Dembinsky, in Mechanics' Magazine.*

THE UNITED STATES STORM SIGNAL SERVICE WEATHER CHARTS AND REPORTS.

Many were inclined to regard the establishment of the Storm Signal Service as an unnecessary and useless measure. It was imperfectly comprehended how it could be of any service to the country at large. That telegraphic messages could travel faster than thieves, had been fully demonstrated. That they could also travel faster than storms, was generally believed; but storms were generally supposed to be so erratic in their movements, that people were slow to believe that a report of a storm raging at Leavenworth, Kansas, could be of any practical benefit to New York; or that the knowledge of the state of the weather in Maine could be of any service to the inhabitants of Florida.

The reports are, however, daily demonstrating their value. The usual courses of storms are becoming better and better defined; their average rates of progress are now practically determined; and the predictions based upon the study of the daily weather charts are generally correct. The weather reports now form one of the most interesting and valuable features of the daily newspapers, and are looked for with eagerness by all classes of intelligent readers.

As an instance of the practical value of these reports, which, however, hardly needs any further testimony, we may cite the following from the *Carson* (Nevada) *Register*. That journal says, that "on the 19th of April, a terrific storm originated in the Rocky Mountains, starting southward; but on reaching Corinne, Utah, it turned eastward. Its course, as it varied, was reported by telegraph all over the country. The signal stations on telegraph lines are all furnished with the weather instruments heretofore alluded to, so that when the storm raged north of Corinne, and was reported by telegraph at Omaha, the report was sent no further, as the instrument at that point gave no sign of its approach. The moment it turned east from Utah, the barometer at Omaha told, more surely than the telegraph, that the storm was coming, and it was telegraphed on to the lakes, where the shipping was put in readiness to receive it forty-eight hours before it arrived. Thus did this admirable system save life and property by its timely warning."



STORM MAP.

For the benefit of our readers who are not fully acquainted with the method of constructing the weather charts, we append an engraving of a portion of the chart for April 1, 1871, as made out from the reports, at 7.35 A.M., in the War Department at Washington, and for which we are indebted to Dr. J. Mauran, of this city. These reports are transmitted over the wires of the Franklin and Western Union Telegraph Companies. Around such stations as report "clear," an open circle is printed, upon a map previously printed upon tissue paper. If the station report "fair," a ring with a transverse bar is used to indicate it. "Cloudy" is indicated by a black circle. "Rain" by a white circle, with the letter R within the circumference. "Snow" by a white circle containing the letter S. An arrow crossing the circle indicates the direction of the wind, its head pointing in the direction toward which the wind is blowing, at the time the report is telegraphed to the department.

Figures are also printed at the respective stations, the first group in order showing the temperature of the air in degrees Fah., the second group showing the hight of the barometrical column, in inches and hundredths of an inch, and the third group indicating the velocity of the wind in miles per hour. The absence of the arrow indicates "calm."

The maps are drawn to scale, and by use of transfer paper, a large number of charts may be simultaneously prepared.

We have indicated only a portion of the stations from which daily reports are received, but have given a sufficient number to explain the method.

One of the most important stations from which reports are sent to the Department, is that on Mount Washington. Three reports are sent daily from this station, to the War Department, and three made for the use of the Smithsonian Institute, the latter, however, being transmitted monthly. Only one of these daily reports is published in the public prints.

A correspondent of the Boston *Journal*, who has visited the station, and investigated its workings, speaks of the value of the observations, as follows:

"The general newspaper reader finds, perhaps, the most interest in the figures relating to the temperature and to the velocity of the wind, the state of the elements in this exposed position often producing most remarkable results in those connections, such as are never reached upon a lower plane.

"To the purely scientific mind, however, other observations, more especially those relating to the humidity of the atmosphere, and to the barometrical changes, are of far greater value, although the reports of temperature and wind velocity also possess a certain importance beyond their mere phenomenal nature. The hygrometer is perhaps less understood by the mass of the public than any other meteorological instrument, yet it is destined to be of the greatest general use. By showing the relative amount of moisture in the atmosphere, the probabilities of rain are denoted, and in connection with the hygrometric observations, the barometric variations, which are governed by well ascertained natural laws, become of value in determining the approach of storms. The figures in the daily reports concerning the humidity of the atmosphere, express the ratio which the amount of vapor actually present in the air bears to the amount which the air would contain if it were saturated, the point of saturation, when the atmosphere can no longer sustain the moisture, being taken in all observations as 100. Thus, when a high percentage of moisture is indicated, reference being had to the previous condition of the atmosphere, and to the hight of the barometer, the probabilities of rain or snow are surely estimated.

"The correct result is obtained by noting the difference of temperature between the dry bulb and wet bulb thermometers, which are hung side by side, and applying simple tables of calculation. The hygrometer, when used understandingly, could be made of daily practical benefit to ninety-nine persons out of a hundred—to all, in fact, whose business or pleasure depend in any measure on the state of the weather.

"The Mount Washington observations, during the past winter, have established the fact that periods of cold and storm are indicated, at this altitude, hours in advance of their arrival at the lower plane. They are regarded with great importance by the Signal Service Department, although in the daily predictions through the press direct reference may not be made to them. A series of observations, extending for several years, in connection with other similar observations at other elevated points, may be necessary to establish their true value, but that they have already an important bearing is clearly shown."

Portland Cement.

At a recent meeting of the London Institution of Civil Engineers, Mr. John Grant read a paper on the above subject, in which he observed that concrete made of broken stone or broken pottery was much stronger than that made of gravel, due, no doubt, partly to the greater proportion of cement absorbed in the latter case, in cementing the finer particles of sand, and partly to the want of angularity in the gravel. Compression and an increase in the proportion of cement alike increased strength. In making concrete bricks of moderate size, compression might be applied with advantage; but with large masses of concrete, it would be difficult to do so, without running the risk of interrupting the process of crystallization or setting, which commenced immediately on the application of moisture. The cost of labor so applied would therefore be better employed in a larger admixture of cement.

The different modes of using Portland cement in the construction of sewers were described; in some cases only as a foundation or as a backing for brickwork; in others sewers, 4 feet 6 inches by 3 feet of concrete, were lined with half brickwork; and in other instances sewers were formed entirely of concrete, in the proportions of one of cement to six of sand. The cost of this concrete was less than half that of brickwork, but, if rendered inside with cement, it was about the same as if lined with half brick—perhaps the cheapest form of sewer combining strength with soundness. Sewers and culverts of almost any size might be made on this principle. Sewers made of concrete, and not rendered inside, though somewhat cheaper, had one practical disadvantage in busy thoroughfares, inasmuch as they required a long length of centering, on account of the slow setting of the concrete, and it was therefore necessary that about double the length of trench should be open at one time. The cost of a concrete sewer, 4 feet by 2 feet 8 inches was 10s. per lineal foot, exclusive of excavation. Under the same contract, a brick sewer of the same size 9 inches thick, cost 16s. 6d. Another concrete sewer 7 feet 1 inch in diameter, cost 16s., or, inclusive of earthworks, side entrances, junctions, etc., about 23s. per lineal foot. This sewer was in some respects exceptional, inasmuch as it consisted of little more than an arch over a previously existing invert; the lower half was, however, rendered with cement or sand, in equal proportions, one inch thick. Everything being taken into consideration, the most economical combination was 4½ inches of brickwork in cement and the rest in concrete. Another sewer, 9 feet by 9 feet, of concrete, with a lining of 4½ inches brick in cement was mentioned.

In the construction of the Albert or Southern Thames embankment, it was originally intended to form the wall of brickwork, with a granite facing; but after about a fourth part of the work had been executed, 14,335 cubic yards of Portland cement concrete, made in the proportions of six to one, at 11s. per cubic yard, were substituted for an equal quantity of brickwork, at 30s. per cubic yard.

From the experience already gained in the use of Portland cement concrete, there would seem to be hardly any limit to the purposes to which it might be applied. It was gradually being brought into use in the construction of dwelling houses in different parts of the country, and there was no doubt it would be still more extensively employed in the construction of docks, piers, breakwaters, and other massive engineering works.

Many experiments had been made in the manufacture of bricks of different proportions of Portland cement and sand, and these were equal in strength and appearance to most kinds of clay bricks. Where concrete should be used in a mass, it was cheaper than when used in the form of blocks, and still cheaper than in the form of bricks. In 1867, a number of arches were formed with *bétons agglomérés*, by M. Coignet, under the steps leading from Westminster Bridge to the Albert embankment; also about 40 feet of sewer, 4 feet by 2 feet by 8 inches, in the Camberwell road. Similar arches and sewers were constructed of Portland cement concrete, and the general result was that the Portland cement concrete was both stronger and cheaper than the *béton*.

Roman cement, though, from its quick setting property, very valuable for many purposes, deteriorated by exposure to the air before use; and was about double the cost of Portland cement, if measured by strength. In making cement concrete it would from this seem desirable to spend no more time than was absolutely necessary to effect a thorough admixture of the cement with the sand and gravel.

UNDER the name of palm wool, there is collected in Western Australia, a downy substance, which is used for stuffing mattresses. The plant, erroneously called a palm, is a zamia. From the deep cavity formed by the peculiar growth of the axilla of its leaves, which bears, outwardly, a strong resemblance to the shape of the hot-house pine, wool is got in very great quantities, and of a sort so soft and springy, that the beds which are stuffed with it may vie with French mattresses for their comfortable and somniferous qualities, especially if the French custom be likewise pursued, of yearly unpicking the beds, and restoring the elasticity by turning over and separating the wool where it may have become matted by use

Manufacture and Consumption of Sulphuric Acid in Connecticut.

We had the pleasure of visiting the Bridgeport Copper and Sulphuric Acid Works, near Black Rock, the other day, says the Bridgeport, Conn., *Standard*, and of examining their mode of construction and the process of manufacturing this important article of commerce. The works consist of one large building, containing the furnaces and condensing chamber, another which we will call the refinery, and a third where the steam boiler is located. The first building contains 22 kilns, or furnaces, and an immense lead tank 130 feet long, 30 feet wide, and 23 feet high. The sheet lead of which it is made cost about $13,000.

The materials from which the acid is distilled are sulphuret ores of iron and copper, from Canada. This ore is broken into pieces about the size of stove coal, and thrown into the furnaces, where, with two and a half per cent of the nitrate of soda added, it is roasted, and the sulphur, together with all the volatile substances contained in the ore, is carried through a large pipe into the immense lead tank where dry steam is added, and the vapor is condensed into "chamber acid," having a specific gravity of 44 degrees. From thence it is carried by a pipe, underground, to the refinery, where it is first floated through a series of shallow lead tanks, moderately heated, then passed through a succession of glass retorts, where, by exposure to intense heat, it is brought to the required standard of 66 degrees specific gravity, and is ready for the market.

Not being previously acquainted with the process, we were greatly pleased with its unexpected simplicity. These works are so situated on a side hill that the acid runs down from one building to the other, and clear to the last tank, whence it is run into the carboys, thus dispensing with the necessity of pumping, lifting, or dipping.

Mr. Adams, the President of the Company, informs us that by the use of this ore instead of sulphur, he gains a pecuniary advantage over other manufacturers of the acid. The ore is dug from a mine in Canada, loaded on the cars at the mines, brought down the Connecticut Valley road through Springfield, and, by means of a short side track, into the factory.

It costs $10 a tun, landed here, for tariff and freight, besides the cost of mining, and after being roasted, it is worth about $12 per tun for the copper it contains. The capacity of these works is five tuns of acid per day. Mr. Adams is also the principal owner of three other acid works, one in Boston, one in Quebec, and one in London, Canada, and in those two last named factories nearly all the sulphuric acid used in Canada is manufactured, the whole product of one of them, about four tuns per day, being taken by the kerosene oil makers.

The amount of this acid used in the arts is truly astonishing. One factory in this city consumes from fifteen to eighteen tuns per month, another nearly the same quantity; and if we add what is used by all the iron founderies, the druggists, the manufacturers of phosphates, others, and it is computed that about 1,500 tuns is now used annually in Bridgeport. Waterbury uses about the same quantity. Ansonia about 900 tuns, and 140 tuns daily are used in refining kerosene oil. From these data, some idea may be formed of the immense quantity of sulphuric acid annually required in the whole country.

This company also manufactures that valuable fertilizer known as the superphosphate of lime. It is made of ground bones, phosphate of lime, guano, potash, and soda salts. These articles are thoroughly commingled, and then about one third of their weight of sulphuric acid is added, after which the whole mass is dried, sifted fine, and put into bags for market.

This company was organized in July, 1870, with $85,000 capital. It has ever since, as we are informed, done a lucrative business, and recently increased its capital stock to $125,000, when it commenced the manufacture of superphosphate, as there is said to be a decided advantage in combining the two manufactures.

Kaieteur Waterfall, Demarara.

The great Kaieteur fall, recently discovered by Mr. Brown, has a clear descent, according to barometrical observations taken simultaneously by Mr. Brown at the bottom, and by Mr. Mitchell at the top, of 750 feet. Above, the Potaro glides smoothly, in a slight depression of the table of conglomerate sandstone, and disappears over the edge in a body, which is estimated at eighty yards in width, and of depth uncertain in the center, but shallowing rapidly towards either bank. When the fall was discovered in April last, the rocky channel was completely covered, and the stream must have had a width of at least 100 yards. During the summer it diminishes in volume, and, as the Indians state that it continues to do so till October, only the central and deeper portion, about one third of the whole, then remains. The best time, therefore, for a visit, is in the spring, at the end of what appears to be the rainy season of this elevated tract.

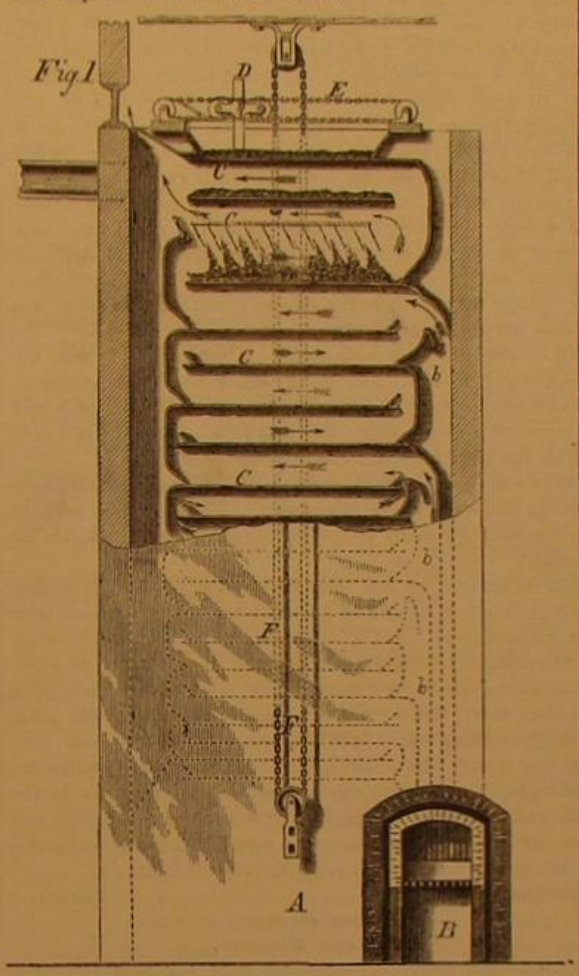
As seen by the exploring party who discovered it, nothing can be imagined more beautiful than the fall. The central portion, which is never dry, forms a small horseshoe or reentering angle, and the water in this part preserves its consistency for a short distance from the edge. But everywhere else, and here, also, at a few feet from the top, all semblance of water disappears; it breaks up, or blossoms, into fine foam or spray, which descends in the well known rocket-like forms of the Staubbach, and similar waterfalls, but multiplied a plied a thousand times, into a small dark pool, over a semicircular curtain.

The cavern behind the fall is the home of thousands of swallows, which issue from it in the morning, and may be seen returning in their multitude at night. The fall itself is one vast descending column, of a fine, dry looking, snow white substance, bearing a resemblance in color and consistency to the snow of an avalanche, but surpassing all avalanches in size and in the beauty of the forms taken by the material as it falls. Rainbows of great splendor were observed; one from the front of the fall, in the morning, one from the summit in the afternoon: but this last reverted, from forming a colored loop or ring, into which the whole mass seemed to precipitate itself, and to disappear and dart out underneath, black and foaming, at the gorge and outlet of the pool.—*Nature.*

GECMEN'S IMPROVED MALT KILN.

In the manufacture of malt by the old process, there are three things which it is very desirable to obviate, namely, the danger of fire attending the method, the life-killing labor undergone by the men in stirring the malt, and the large extent of flooring required, which, in cities where buildings are expensive and rents are high, becomes a large item of expense to the manufacturer.

Fig 1



The kiln illustrated herewith not only obviates large floors, danger of fire, and the exhausting labor of malting by the old system, but produces a much better and more uniformly dried article of malt, with a large saving of fuel. The crushing of the malt in handling and stepping about over it is entirely obviated, and it is delivered in the best condition for the subsequent processes of crushing and mashing.

To dry 350 bushels of good malt it requires, with this kiln, one man's labor for one hour and a quarter, while with the old kiln, it require the labor of four men for eleven hours.

Fig 2

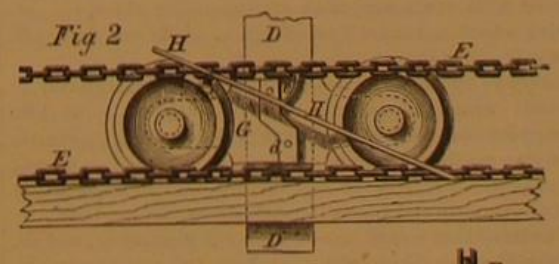
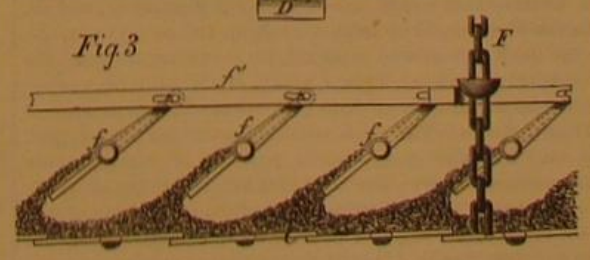


Fig 3



The uniformity in drying, consequent upon the more even distribution of heat through the kiln, is a prominent feature of the invention. Its applicability to the drying of many other kinds of materials, such as fruits, phosphates, etc., will become apparent from the detailed description, of its parts and operation, which follows. As a grain drier, an Illinois grain merchant attests that he has used it for drying many thousand bushels of grain with the most entire satisfaction, and we are informed that it dries perfectly 1,000 bushels of grain per day when working continuously.

An elevation of the kiln is shown in Fig. 1. The grain or malt to be dried is loaded into a car, D, which is moved by an endless chain, E, on suitable ways. The car is provided with a vertical chute, extending down to three inches from the upper one of a series of horizontal floors subsequently to be described. The grain passing through the chute is by this means distributed evenly over the upper floor to a depth of three inches.

The floors, C, are made of iron slats; in fact, the entire kiln contains nothing but iron and brickwork. The slats constituting the respective floors are connected by a bar or rod, like ordinary blind slats, and they mutually overlap enough to make the floor continuous when closed. The entire series of slat floors is worked by an endless chain, F, in such a manner that they are dumped and closed again, one after the other, from bottom to top, and from top to bottom again, the slats of each floor turning in opposite direction to that of the slats of the preceding one, so that whenever one floor is opened, the next below is closed to receive the grain or malt which is dumped upon it. The dumping mechanism is more fully shown in Fig. 2, where *f* is the slat rod, F, the dumping chain, and C, the slats constituting the floors.

The heated gases of combustion (anthracite fuel being used) are led along over and under the floors, as indicated by the arrows; but as they become charged with moisture, additional increments of dry heat direct from the furnace are admitted through flues, *b*, the number of such admissions being adjusted to the number of flues in the kiln, but being generally four or more.

To operate the kiln, the upper floor is charged by the car. The chain, with the dog, on running up, turns each floor from the bottom upward, and, consequently, discharges the upper floor load, and loads the second below. The loaded car distributes the malt over the upper floor as it passes along; and the chain, running up, discharges the contents of the second floor on to the third. The second floor being now empty, the chain discharges the contents of the first floor on to the second, and then passes on, and so on until all but the lower three floors are loaded. The malt then remains undisturbed for three or four hours, to dry, after which the chain runs through once, dumping the malt from one floor to the other, successively, turning it over at the same time. As it reaches the two last floors the malt is allowed to remain undisturbed for three or four hours, when it is finally discharged perfectly dry.

The kilns might be worked continuously, could the grain be grown on the growing floors fast enough to supply them. To facilitate the growing, the manufacturers of the kilns have patented and manufactured an apparatus, working on the same general principle as the kiln with slat floors, dumping in a similar manner, which saves a large area of flooring

In drying grain, all the floors are first filled, and then the kiln is worked continuously, the lower floor being dumped as often as the upper one is filled.

Small sizes of those kilns, for farmers' use, are made, whereby farmers may dry their own grain, thereby preventing mould and growing of damp grain, and often saving much loss.

We are told that grain can be dried upon this kiln for seed as well as for exportation.

A kiln for grain is working in August Schiffer's grain drying establishment at Monee, Ill. One for malt is running at John A. Boppe's Brewery, Newark, N. J. Another has just been erected at J. F. Barklay's Mill, 99 and 100 North Moore street, New York. Those interested may inspect its working at either of the places named. The invention is covered by two patents, March 13, and Nov. 13, 1866. Small portable kilns are made on the same plan, for various drying purposes. Manufactured by the Holske Machine Company, 528 Water street, New York, whom address for further information.

Co-operative Butter Making.

We have investigated and watched the system of co-operative butter making with a great deal of interest, and in every instance, so far as we know, it has proven eminently successful. There are, however, sundry difficulties to be overcome in some districts. As yet no really practicable method of determining the relative value of milk has been hit upon, and in nearly every community there are more or less careless feeders. Both quality and quantity of butter are affected by this circumstance, much more sensibly than is the case with cheese. The profitable disposal of the skimmed milk is a matter of serious import. Near large cities having a large foreign population, a considerable sale of skimmed milk may, by proper effort, be established; but as yet the greater proportion of it has been worked up into skimmed cheese, for which there is but a limited demand; indeed the present supply is believed to be quite sufficient to meet the demand at profitable rates.

The butter factory at Elgin, Illinois, made sales of unpressed curds last season to parties in Chicago, who were experimenting upon their use in the arts, but with what special application, or to what extent successfully, we are not informed. All things considered, there seems but one course to be pursued with the article, and that is to carry it back to the farm, and feed it out to calves or pigs. And to the farmer who is not wedded to the absurd theory that he may carry off his crops indefinitely without making any restitution, this ought not to afford any discouragement, for we know from actual experiment that veal or young beef or pork may be profitably made from skimmed milk and grain, while a very considerable amount of manure may be produced for an increased production of butter, veal, and pork next year, a result even more desirable ultimately than any mere increase of cash income.—*O. H. Bliss, Georgia, Vt.*

It frequently happens that painters splash plate, or other glass windows when they are painting the sills. When this is the case, melt some soda in very hot water and wash them with it, using a soft flannel. It will entirely remove paint.

Correspondence.

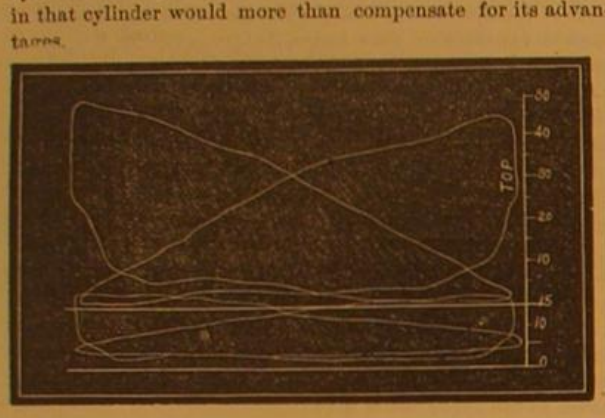
The Editors are not responsible for the opinions expressed by their Correspondents.

Compound Engines.

MESSRS. EDITORS:—So far as I have seen, none of the writers on the subject of compound engines in this country seem to have had opportunities of applying tests of their efficiency when in actual work; and having had some experience with this class of engine, and opportunities of applying the usual tests, I propose to lay before you some of the results thereof.

The steamship *Magellan* runs between Liverpool and Valparaiso, touching at Rio and Montevideo. She is 334 feet long, and 41 feet beam on the water line, with a mean draft of water amidships, of 19 feet. The engine is of Randolph and Elder's patent, and is arranged with the two cylinders standing over the cranks, which are at right angles to each other, the general appearance being that of the ordinary double engine, with inverted overhead cylinders. There are three boilers, having cylindric shells of ¾" iron, 11 feet diameter, with two furnaces at each end, the aggregate grate surface being 275 square feet.

The steam is thoroughly dried or superheated to a small amount, and passes to the first valve chest, and through the small cylinder, which is 60 inches diameter; it then exhausts into a belt surrounding the small cylinder, which, with the second valve chest, makes a reservoir for the second cylinder, 96 inches diameter, to draw from, and also preserves the symmetrical appearance of the engine, as the small cylinder with its belt is of the same external diameter as the large one. Between this belt and the small cylinder is the hot steam jacket, filled with steam of the boiler pressure; the large cylinder is not jacketed, as the loss of heat to the cooler steam in that cylinder would more than compensate for its advantages.



After finishing its work in the large cylinder, the steam passes to the condenser in the usual way. The stroke of the pistons is 3 feet 9 inches; diameter of piston rods, 6 inches; and pitch of screw 25 feet, with a diameter of 17 feet.

The accompanying figure is the diagram taken from the two cylinders, having the atmospheric line marked 15 common to both parts; and is an average for the 24 hours. The boiler pressure is 54 pounds; the vacuum 27 inches; revolutions, 56 per minute; coal burned per hour 33 cwt., or 3,696 pounds; mean unbalanced pressure on piston, 23·8 pounds per square inch; area of piston minus half its rod, 2,813 square inches. Then $\frac{23{\cdot}8 \times 2813 \times 7{\cdot}5 \times 56}{33000} = 852{\cdot}5$ I.H.P. for the small cylinder. Then in the large cylinder we have mean pressure 10·17 pounds per square inch. Area of piston, minus half its rod, 7224: then $\frac{10{\cdot}17 \times 7224 \times 7{\cdot}5 \times 56}{33000} = 935$ I.H. P and 935+852·5=1787·5, total I.H.P. So $\frac{3696}{1787{\cdot}5} = 2{\cdot}07$ poundscoal. per hour per I.H.P. which is a very good result, so far as indicated power is concerned.

It will be seen by examining the steam and expansion lines of the high pressure diagram, that the steam is wire drawn, and is cut off at about half the stroke, which condtions correspond with those in the average of the sea going engines; and if we were to exhaust this small cylinder direct to the condenser, we would expect to get a back pressure line corresponding with that shown for the low pressure cylinder. Considering that as done, and measuring our card, from the steam line of the high pressure to the back pressure line of the low pressure cylinder, we get a mean balanced pressure of 40 pounds per square inch; and $\frac{40 \times 2813 \times 7{\cdot}5 \times 56}{33000} = 1431{\cdot}5$, I.H.P. obtained from the small cylinder alone; and 1787·5—1431·5 = 356 I. H. P., gain by the addition of the large cylinder.

In regard to the gain in actual power as applied to the cranks, there must be made a deduction for the friction of the pistons, rods, and valve gearing; and if we assume 1 pound per square inch to be the pressure required to overcome this, we must deduct 35·8 H. P. for the small cylinder, and 91·9 for the large; total, 127·7 H. P. Thus, 1787·5—127·7 = 1659·8, the H. P. obtained from both cylinders. In case the small cylinder alone is used, we have 1431·5—35·8 = 1395·7 H.P. These results appear to be comparable, as the friction due to the load varies as that load, being a certain percentage of it; and so we have 1659·8—1395·7=264·1 H.P., equal to 19 per cent gain by the addition of the large cylinder. This is not so great a gain as has been often claimed for these engines in this country, and it must be borne in mind that these engines are from one of the best shops in Scotland, where special attention has been given to their production; and when the estimate for economy of coal is considered, that in this case we were using the best Cardiff coal, which is far superior to anything we have in this country that is used at sea.

WM H. HARRISON.

Boston, Mass.

Motive Power for Farmers, etc.

MESSRS. EDITORS:—We have been so much impressed with the truthfulness of the article, "What Women Want," in your issue of May 6, that we cannot help telling "Betsy" how much we have felt the force of her clear, sharp article.

Many times we have noticed that "dumb pathetic patience with which the household workers toil and wear out." Our "better half" does her own housework, but with the assistance of sewing machines, washing machines, and all machines that can aid, and some that do not, that we know of, housework is still a never ending and never completed task; and, as far as we at present see, without a remedy.

Now, if "Betsy" could arrange the details (and we feel sure she could), we think the power hinted at might easily be made forthcoming, from that same restless wind that old dame Nature has furnished so bountifully.

For the last ten years we have been carrying on a manufacturing business, with no other power but those of hand and foot. In building anew, after the Medina conflagration last year, we put into execution a long cherished hobby of ours. A seventeen feet modern windmill (Continental Windmill Co. make) was placed on a tower twenty-five feet above our building, to the great astonishment, alarm, aud, in some cases, bitter remonstrance, of people in this vicinity, that we should waste so much money ($500) on so foolish a project, that was old and exploded and sure to fail. Well, Messrs. Editors, that same windmill runs (almost every day in the week) three rolling mills, two polishing lathes, ten emery machines, three turning lathes, small buzz saw, blower, machine for washing finished work, and drills an artesian well (another hobby of ours); and, in short, does everything we ever gave it a chance to do, and has never cost twenty-five cents for repairs.

Of course, we have occasionally a day when it will not run, but it is seldom: and, on the other hand, the mill is always ready, so much so that we often start it to grind a tool or to polish a single ring. It starts in a second, be it day or night, and costs nothing, unless it be for oil.

Why are they not used more, and what more can farmers want in the way of a motive power? The motion is perhaps too unsteady for many purposes, but answers for our use admirably.

Before closing, we feel that we must give the old SCIENTIFIC AMERICAN its due as follows: we get our power from the perpendicular shaft by a quarter twist belt, and to remedy the difficulty (discussed last winter), we thought of a perpendicular shaft as an "idler pulley" to keep the belt upon the slack side. Then "Young Mechanic" gave us his plan, namely, twisting one side of the belt.

It was nearly nine o'clock, one Saturday night, when we read it, but down went our paper, and up went we to the belt, and in two minutes more it went "one side out and then t'other," and the money we saved in those two minutes we are going to send for the SCIENTIFIC AMERICAN.

Medina, Ohio. NOVICE.

Potato Diggers.

MESSRS. EDITORS:—The articles upon potato digging machines, in late numbers of the SCIENTIFIC AMERICAN, found your humble servant employed in planting several acres of the tubers. Having had considerable experience in the arduous work of both planting and digging, and having given the subject some thought, I wish to give a few hints to the inventors who are experimenting upon machines to accomplish the task.

The successful potato digger must raise the potatoes from the ground, detach them from the vines, weeds, stones, and dirt, and deposit them in a proper receptacle.

The first operation for the machine to perform is to get the potatoes from the ground. Potatoes are generally planted in hills, about two or two and one half feet apart, each way. In commencing to dig a row of potatoes, we have before us a series of hills or clusters, with accompanying vines, etc., occupying about a square foot of space. Between each hill are weeds and stones.

In digging by hand, we devote our strength exclusively to the hill; while the machine is so constructed as to tear through not only the hill, but through the intervening spaces, containing weeds and stones. It must be evident that a great deal of power is wasted by this method, and an unnecessary amount of weeds and stones is taken up by the machine.

A machine that would uproot each hill separately, and detach the vines, could be made very light, and easy to manage. To use such a machine, it would be necessary to plant the hills with precision. This, I think, could also be accomplished by machinery. Potato planters are known at present only as failures. The seed, when prepared for the ground, is a very irregular mass—whole potatoes of various sizes halves, quarters, etc. The machines heretofore invented are intended to get the seed out at the bottom of the receptacle, and it clogs very easily. The seed must be taken from the top of the receptacle, I think; a very simple movement could accomplish this.

Another obstacle to be overcome in potato planting and digging machinery, is the weight of the potato itself. One bushel weighs sixty-five pounds, and but very few bushels can be carried on the machine. If a digger could be constructed which would put about one hundred pounds in a bag and leave it to be taken up by a wagon, it would approach as near perfection as possible.

Harvesting potatoes is now the most laborious operation on the farm, and every intelligent farmer would hail the introduction of a successful potato digger or planter with as much delight as he now does the mowing machine or horse pitchfork. I trust you will excuse me for occupying so much of your time with my crude ideas But the many backaches I have endured while harvesting potatoes, make me very anxious that the potato digger shall not be written down a failure.

J. H. M.

Traction Engine.

MESSRS. EDITORS:—In your article entitled "Traction Engine," in your issue of April 29, 1871, your writer cannot certainly understand the principles of the working of the road steamer, *G. H. Craft*, of our city, or he would not have claimed that surmounting an obstruction, on an inclination of one in four, would give the machine the power to go further up of itself. Such a road steamer would too much resemble that "marvelous duck." I have carefully watched the development of this traction engine, and think it has some merit; but, after close observation, think with you that the power exerted in mounting an obstruction is lost, and cannot be saved in any part after it has been used for that purpose. In the performance of this road steamer there is but little shock, arising from the fact that the propelling power has a lifting influence on the body of the machine. There are, under the machine, eight pushing legs, hanging at an angle of forty degrees, attached two to each of four slides. These slides are moved backwards and forwards. That they can force the machine further forward, without power being used, is incomprehensible to me.

I believe the device would be a success as a canal boat propeller, although the inventor laughs at the idea; it would be a true steam pushing force, adjusting itself to every inequality, and would propel a canal boat with great economy of power.

E. MCKENZIE.

New Albany.

Unsafe Oils Again.

MESSRS. EDITORS:—Can you give any reliable manner of testing kerosene oil, besides the lighting with a match? I have had two explosions in my office of late. I obtained the best oil I could find in the city, but all would light and burn by the application of a match in an open dish. I sent for, and have just received, ten gallons of Pratt's astral oil, which has been highly recommended by you, but I find this oil in the patent can burns just as readily without a wick, and by application of the match, as oils supposed to be far inferior. Now one thing is certain, either the oils are all adulterated, or this is not a sure test.

Please give us light on the subject (without explosion) if possible.

G. W. FORD.

Rockford, Ill.

[There is a great want for a simple and reliable oil-testing apparatus that can be used with care and certainty by consumers. The match test is undoubtedly an indication of an unsafe oil, when the oil ignites as our correspondent describes; but an oil may not ignite in the manner specified and still be unsafe. We have given from time to time methods of testing oils, but most of them are not suited to the wants of consumers. The best is, probably, to place the oil in a small tin vessel, and float this on a bath of water heated to about 115° Fah. If the oil will generate, at 110°, a gas that will flash, we consider it an unsafe oil to use in lamps.—EDS.

Explosion of an Emery Wheel.

MESSRS. EDITORS:—On the 17th of May, 1870, a young man, James Lieke, was killed instantly, at the works of Messrs. Dodge, Kimball & Austin, at Kalamazoo, Mich., by the bursting of a Tanite emery wheel.

The wheel was 16 inches diameter, 1½ inch face, making 2,615 revolutions per minute, which is 1,265 revolutions faster than the circular calls for. The wheel was held in the mandrel by 9-inch cast iron collars, with faces perfectly true, and bearing on the wheel with the whole surface. The wheel was perfectly balanced, being used to grind the edge on steel plows, in a way to form a lever on the wheel.

Mr. G. Dodge, of the firm, claims that if the foreman had put leather between the collars and the wheel, the wheel would not have burst. The foreman answered to his recommendation to reduce the speed to 1,350 revolutions, "we won't do it just now." He told him then, if anything should happen he should not blame him for it, and Mr. G. Dodge answered that he would risk it. Two days after the man was killed. The wheel ran about 15 minutes, and the moment the work was put to it, it burst to pieces.

Please give your opinion whether the leather between the collars would have made the wheel stronger or not?

Kalamazoo, Mich. G. J. BREMER.

[We do not think it would.—EDS.

No Life Without Phosphorus.

Dr. Frankland has been making some experiments upon the development of fungus growth in potable water; and, as a result of his labors, arrives at the following conclusions:

"1. Potable waters mixed with sewage, urine, albumen, and certain other matters, or brought into contact with animal charcoal, subsequently develop fungoid growths, and other organisms, when small quantities of sugar are dissolved in them and they are exposed to a summer temperature.

"2. The germs of these organisms are present in the atmosphere, and every water contains them after momentary contact with the air.

"3. The development of these germs cannot take place without the presence of phosphoric acid, or a phosphate, or phosphorus in some form of combination. Water, however much contaminated, if free from phosphorus, does not produce them. A German philosopher has said, 'without phosphorus, no thought,' which may now be changed to 'without phosphorus, no life.'"

DR. JOHNSON says: "The chains of habit are generally too small to be felt till they are too strong to be broken."

FLYING SPIDERS.

[By J. H. Emerton, in the American Naturalist.]

One of the most curious habits of spiders is that of flying, as it is often called. This has no resemblance to the flight of birds or butterflies, for spiders have no wings nor any organs that could answer the purpose of wings. Their ability to rise in the atmosphere depends entirely upon currents of air acting upon their bodies, or upon threads of cobwebs attached to them. By this means they are blown about like the down of thistles or any light objects, rising sometimes to a great hight, and again, upon a change of weather, falling, often far from the place whence they rose.

In the autumn of 1870 I received a letter from an officer on one of the United States vessels, in which he stated that one day while at anchor near Montevideo, after a strong wind, the rigging was filled with cobwebs, and little spiders dropped down on all parts of the deck.

Mr. Darwin, when in the same region during the voyage of the Beagle, several times noticed the same occurrence.

In Temple's Travels in Peru it is mentioned that, when sailing up the river Plate, "the rigging of the ship, from top to bottom, was literally covered with long, fine cobwebs that had been blown off the shore, having attached to them their insect manufacturers, who dispersed themselves in thousands over the deck."

Such showers of cobwebs are common in Europe, especially in the autumn. They are said to be usually preceded by a great quantity of web on the ground, which afterwards rises, and when the wind changes, or the sun begins to go down, falls again.

Mr. Blackwall, who has devoted many years to the study of English spiders, gives the following interesting account of one of these showers of gossamer:

"A little before noon on the 1st of October, 1826, which was a remarkably calm, sunny day, the thermometer in the shade ranging from 55° to 64°, I observed that the fields and hedges in the neighborhood of Manchester were covered over, by the united labors of a multitude of spiders, with a profusion of fine glossy lines, intersecting one another at every angle, and forming a confused kind of network. So extremely numerous are these slender filaments, that in walking across a small pasture, my feet and ankles were thickly coated with them. It was evident, however, notwithstanding their great abundance, that they must have been produced in a very short space of time, as early in the morning they were not sufficiently conspicuous to attract my notice, and on the 30th of September they could not have existed at all; for, on referring to my meteorological journal, I find that a strong gale from the south prevailed during the greater part of the day. A circumstance so extraordinary could not fail to excite curiosity; but what more particularly arrested my attention was the ascent of an amazing quantity of webs of an irregular, complicated structure, resembling raveled silk of the finest quality and clearest white. They were of various shapes and dimensions, some of the longest measuring upwards of five feet in length and several inches in breadth in the widest part; while others are almost as broad as long, presenting an area of a few square inches only. These webs, it was quickly perceived, were not formed in the air, as is generally believed, but at the earth's surface. The lines of which they were composed, being brought into contact by the mechanical action of gentle airs, adhered together till, by continual additions, they were accumulated into flakes or masses of considerable magnitude, on which the ascending current, occasioned by the rarefaction of the air contiguous to the heated ground, acted with so much force as to separate them from the objects to which they were attached, raising them into the atmosphere to a perpendicular hight of at least several hundred feet. I collected a number of these webs about midday, as they rose, and again in the afternoon, when the upward current had ceased to support them, and they were falling; but scarcely one in twenty contained a spider, though on minute inspection, I found small winged insects, chiefly aphides, entangled in most of them.

"From contemplating this unusual display of gossamer, my thoughts were naturally directed to the animals which produced it; and the countless myriads in which they swarmed created almost as much surprise as the singular occupation that engrossed them. Apparently actuated by the same impulse, all were intent upon traversing the region of air; accordingly, after gaining the summits of various objects, as blades of grass, stubble, rails, gates, etc., by the slow and laborious process of climbing, they raised themselves still higher by straightening their limbs, and, elevating the abdomen by bringing it from the usual horizontal position into one almost perpendicular, they emitted from their spinning apparatus a small quantity of the glutinous secretion with which they fabricate their silken tissues. This viscid substance being drawn out, by the ascending current of rarefied air, into fine lines several feet in length, was carried upwards, until the spiders, feeling themselves acted upon with sufficient force in that direction, quitted their hold of the objects on which they stood, and commenced their journey by mounting aloft. Whenever the lines became inadequate to the purpose for which they were intended, by adhering to any fixed object, they were immediately detached from the spinners by means of the last pair of legs and became converted into terrestrial gossamer, and the proceeding just described was repeated."

I do not know of any published account of similar flights of cobwebs in this country, but on almost any fine morning in summer, the grass and shrubs may be found covered with threads connecting the extremities of the twigs and leaves in every direction, and floating horizontally from them sometimes to a distance of several yards. I have often seen the short grass in the Salem pasture so covered that every leaf seemed to have several threads passing from it. One morning in June, 1868, I noticed some little spiders, about one tenth of an inch long, rambling about on the top of a low fence, partly shaded by horse chestnuts and apple trees. At intervals they would stop, raise the back part of their bodies, and straighten their legs until they stood on tiptoe in the ridiculous position shown in the figure. After a few seconds, they would retake their customary position and travel on. I



went to the same fence and watched them on several successive mornings, and finally saw one, on the edge of the fence cap, raise itself as in the figure, and immediately after a thread extended upward from its spinners. In a few seconds, the thread increased to nearly a yard in length, when spider and all rose slowly upward until the thread became entangled in the branches of an apple tree above, which were already connected together by numerous threads and occupied by several spiders of the same kind. This took place soon after sunrise, on a warm and apparently perfectly calm morning.

At another time, on one of the first warm days in March, I saw a little crab spider running about on the ends of a barberry bush and dropping from twig to twig, until it hung from a projecting branch by a thread of about a foot long. It swung back and forth for some minutes, when a gust of wind blew it away so quickly that I could not follow it with my eyes. It had, however, spun a thread, as it went, which passed from a bush to the juniper about six feet off.

Mr. R. P. Whitfield, of Albany, N. Y., tells me that once when passing through a field of oak stubble on a warm day in autumn, he observed great numbers of threads floating upwards in the air, the lower extremity being attached to the upper ends of the stubble; and on examining some of the stalks, he found numbers of small spiders busily running up and down them. When a suitable place was found, the spider would attach a thread to the upper end of the stalk, and then descend one or two inches and return, allowing the air to carry upward the loose thread. At the same time, it elevated its abdomen, and the current, acting on the loop already formed, drew out the thread from the spinnerets until a sufficient quantity had passed, when it broke off the end attached to the stalk and floated away with the web. In this way, he observed several individuals ascend. At the time there was no perceptible current in the atmosphere except the upward current caused by rarefaction.

Is the Brain the Origin of Thought, Intellect, or Mind?

This is a most interesting question, well worthy the study of the psychologist. There is, indeed, much to prove that it is the origin of the mind, or as some psychologists put it, the brain secretes thought somewhat in the same manner as any gland in the body performs its functions of secretion, regarding the gray cells of the brain in the light of secreting gland cells, their function being to secrete thought. But here a difficulty at once presents itself, namely: whence do they gather or from what element do they eliminate the constituents of thought, so as to produce mind or intellect? For, if the analogy hold good, there must be some element from which these cells gather the constituents of thought. We know, says the London *Medical Press and Circular*, the kidneys eliminate urea from the blood, and the liver, bile; the salivary glands their peculiar secretion, and so of all the glands of the body. But we see that these several secretions and excretions pre-existed in the living blood; it may be in a different form, but, nevertheless, their constituents were there, and were only brought together and eliminated thence by these glands. So, when we say the liver forms bile; the kidneys, urea, etc., we do not mean that they eliminate them from the blood. So, following out the analogy that the brain cells secrete thought, we again put the question: "Whence do they gather the elements of that thought?" Some will at once reply, from the immaterial principle of the mind. This brings us to what we believe is the generally received opinion, namely: that mind is an immaterial principle; but if it be an immaterial principle, how is it that you cannot destroy the brain without destroying the intellect as well? Thus, in apoplexy, or any case where there is an effusion of blood, or other fluid, to any great extent, the individual becomes unconscious. You may object that this is owing to the shock to the animal life, and not specially referable to the brain. Well, we have stronger proofs. Look at a man intoxicated with alcohol. The first effects are to quicken the imagination, and induce a freer flow of thought. As the man takes more he becomes dull and heavy, and if he takes more still he becomes entirely unconscious. He appears to have lost all power of thought and intellect. Does this not show that the alcohol acting on the material brain affects the mind—in the end seeming to destroy it? And that it is the alcohol acting on the brain is proved beyond a doubt, by examining the brain of those poisoned with whisky and brandy, or in the experiments performed on dogs by giving them a couple of drachms of pure alcohol, which kills them instantaneously, and immediately opening the head and examining the brain. The pure alcohol can be distilled therefrom, showing what an affinity it has for the brain, and how quickly it is absorbed by the stomach. We have a still stronger proof of the brain being the originator of thought, in the pathological condition of softening of that organ, and which, at the same time, also proves the exact part of the brain which is the seat of intellect, comfirming other proofs deduced from experiments made on animals, birds, and reptiles, which it would be quite superfluous to go into.

From these experiments it is clearly shown that the cortical or gray structure on the outside of the brain is the seat of thought. We say, is "the seat of thought," assuming the brain to be so for the present. Well, now pursuing this thread of the subject, we find where softening commences in the central white substance of the cerebrum that the intellect is in no way disturbed at first; but we may have, and if the disease progress to any considerable extent, will have, paralysis—hemiplegia most likely. If the softening proceed downward, and attack the cerebellum and medulla oblongata, the patient may die without his intellect being at all affected; but if the disease proceed upward, and extend to the cortical or gray structure, the intellect becomes very soon engaged. On the other hand, if the disease commence in the cortical portion, the intellect becomes affected at once, prior to any symptoms of paralysis.

When we use the word softening, we mean chronic softening, as contradistinguished from acute inflammatory softening, in which these effects are not so distinct and clear, though they can be perceived by close observation. We have a patient just now in care who, we consider, has chronic softening of the brain, involving principally the cortical portion, and he presents symptoms in accordance with the above. He complains of dull, aching pain in his head, loss of memory, an inability to fix the mind vigorously upon any subject, or to pursue any lengthened train of thought, the intellect becoming, as it were, wearied, and seemingly unable to sustain any great mental exertions. Yet he has no paralysis of either sensation or motion, except some symptoms of amaurosis, indicating involvment of the optic disks. Now, does not all this go to prove that the cortical portion of the brain is the origin of intellect? You may still reply, no; it only proves that the brain cells, being disorganized or destroyed, are no longer capable of performing their function of secreting thought from the immaterial mind, which is there as perfect as ever, and unharmed by disease of the material substance.

If the mind be an immaterial principle, then we may look upon the brain as the medium or instrument through which it is rendered manifest to the external world. This is the view Watson and many others take of it. People also generally regard the mind and soul as identical. If they were, then of course that would settle the question as to the brain being the origin of mind. It could not be, for then it must be the origin of the soul. But that is impossible, as the brain is destroyed at death, but the soul lives on forever. That which is mortal could not be the origin of that which is immortal.

Hydrate of Chloral.

Chloral proper is made by passing dry chlorine gas through pure alcohol, heated with sulphuric acid, the crude chloral that is separated being rectified over lime; the chlorine takes the place of the hydrogen in the alcohol and forms, also, hydrochloric acid; this, by a further decomposition, becomes chloral. It is in this state an oily, colorless liquid, having an odor very much like that of a ripe melon. The hydrate which is ordinarily used is formed by the addition of water, in which the chloral crystallizes in snow-white needles. It is in the mode of administration that the difficulty lies, there being no means of determining what constitutes a proper quantity to take at any given time. When taken into the system, either through the mouth or by injection under the skin, the moment that the chloral comes in contact with the alkali in the blood it decomposes, and forms chloroform; this instantly carbonizes the blood, or in other words, changes the fresh arterial, into dead venous blood, which, spreading throughout the body, slowly dulls the senses and creates a more or less complete anæsthesia. But how is this to be regulated? The exact mode by which chloroform or chloral produces death, is as yet unknown, almost every physician having a special theory on the subject. How, then, is it possible to tell what quantity would produce sleep, and what death? Its effects are very different with different individuals. There are examples where the patient had taken only four grains of the drug, yet death ensued. In other cases, 260 grains have been administered without injurious effect.

A reporter of the New York *Times* lately visited several of the prominent physicians of this city to learn their experiences with the drug. They all testify that its use requires the utmost caution, and some of them are of opinion that its employment is only justifiable in cases of *delirium tremens*.

Our Pins.

There are eight pin factories in the United States, whose annual production is 2,000,000 packs, each pack containing 3,360 pins, a total of 6,720,000,000 pins. One manufacturer's agent in Boston, says the *Bulletin*, sells every six months from 700 to 1,000 cases of pins, each case containing 672,000 pins. The factory he represents turns out eight tons of pins per week. Hair pins are jobbed by the cask. There is but one factory that produces them. It turns out fifty tons per month. The machine that cuts and bends the wire makes 360 hair pins per minute, ready for japanning. Yankee pins are salcable in nearly every city of the world, and the production and consumption increases each year about ten per cent. A very large per centage of the hair pins in general use are imported. The tariff does not protect this item of American industry, hence the public pay for them just about one third more than they are worth. Yankee enterprise is now seeking to develop a more rapid manufacture and a more desirable metal or substance, and in this way successfully compete with foreign makes and cut down the cost.

NINE large cotton mills are planned, or in course of construction, at Fall River. There are already seventeen in full work.

RUNK'S BELT TIGHTENER.

Our engraving shows a new belt tightener, invented and patented by Geo. W. Runk, of Franklin, La., and designed to afford a ready means of stretching and tightening belts, without removing them from the pulleys.

It consists of a double clamp and a tightening device, the parts and operation of which will be understood by reference to the accompanying engraving, in which A represents a lever acting through toggles, B, to draw the clamps, C, towards each other. When they are drawn as nearly together as may be requisite, they are held by the bars or link, D, until the belt is laced or riveted.

The clamping is effected by means of an eccentric roller bar, a end view of which is shown in Fig. 2. This, being turned by a winch and held by a ratchet and pawl, E, clamps the belt between the eccentric and the bent bar on the other side of the belt.

The rollers have pivoted bearings at one end, so that, when it is desired to place the clamps upon the belt, they are swung around on the pivots to allow the belt to be inserted be

Fig. 1

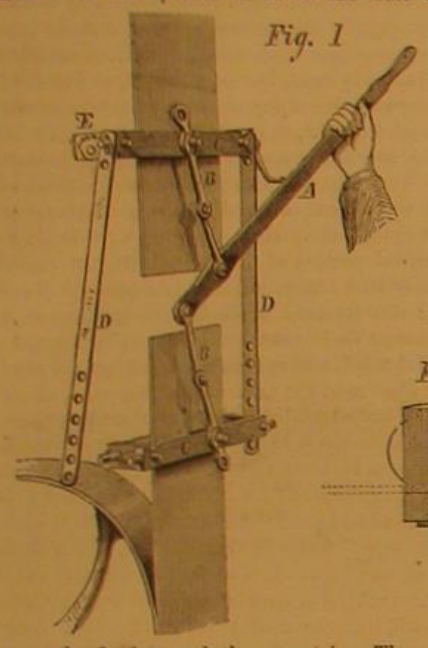
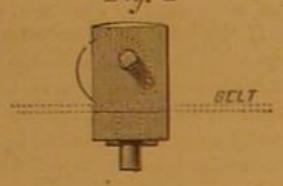


Fig. 2



tween the flat bar and the eccentric. The eccentric then being turned so as to clamp the belt, the turning of the lever, A, draws the belt tight, so that it can be properly cut and riveted.

Patented, through the Scientific American Patent Agency, Jan. 24, 1871, by Geo. W. Runk, whom address for further information, Franklin, La.

Gas Wells in Ohio.

A gas well was recently sunk at Painesville, Ohio, which, according to the *Telegraph* of that place, is quite a marvel. The editor says:

At a depth of 550 feet, a large vein was struck, of such force and power as to stop the work. Indeed there was no occasion for drilling deeper. The volume of gas is so great, it is estimated by good judges, that it would light the entire city of Cleveland. It comes up through the pipe from "the great deep" below with a rush and a roar and a grandeur which one must witness to appreciate. The farm of Mr. Jennings, on which this well is located, is on the east bank of the river, nearly opposite the Geauga furnace, on high ground, and about two miles from the lake shore.

The complete success of this experiment is destined to work an entire revolution in the gas business of Painesville. Citizens in different parts of the town are discussing the project of sinking wells to accommodate several families in the same neighborhood, in all of which cases it is intended to use gas for heating as well as lighting.

For this new "light" in the prosperity of our town and the comfort of our citizens, we are indebted to Gen. Casement. The General had faith that there was as much gas below as above the earth's surface, and the enterprise to bring it to light. All rejoice at his success.

Heating by Water.

"Having to draw up some remarks upon the circulation of water in hot water pipes," says Mr. Alfred Smee, "it occurred to me that the flow and return might be managed by the use of a single pipe, instead of two, as now universally adopted. I directed the experiment to be tried by affixing, to the socket end of a four-inch pipe, an inch supply pipe from an ordinary boiler, and a second pipe communicating with the bottom of the four inch pipe and the bottom of the boiler.

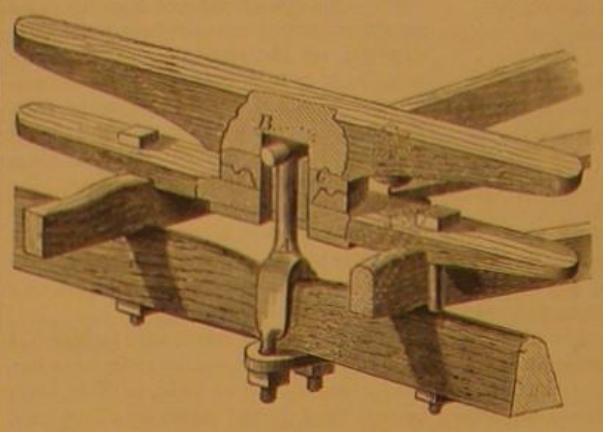
As I expected, the circulation was most perfect and rapid, the hot water flowing along the upper surface of the pipe, and the cold water returning along the lower surface. Two currents in opposite directions were created in the pipe, and the action was so perfect that I ordered, to be fitted up forthwith, a frame, which has been in operation ever since. This mode of heating by a single pipe may be, no doubt, of frequent use, and manifestly, from the simple and portable nature of the apparatus, the arrangement will commend itself to the attention of horticulturists."

THE annual tobacco fair in the State of Virginia will be held this year at Petersburg.

SWARTWOUT'S FRONT RUNNING GEAR FOR WAGONS.

Our engraving is a perspective view of an improved front running gear for wagons, patented through the Scientific American Patent Agency, April 11, 1871, by Lee T. Swartwout, of Locke, N. Y.

The invention is designed to secure greater strength by avoiding perforations, in the axle and bolster, for the passage of the kingbolt.

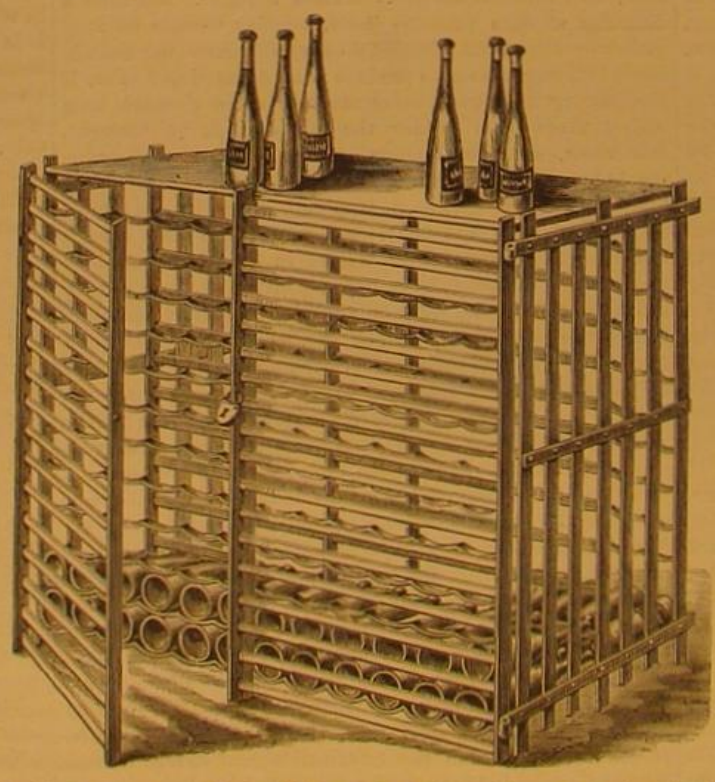


The kingbolt, shown at A, is formed with a clip at its lower end, which embraces the axle. The bolster is recessed at B, as shown, for the reception of the upper end of the kingbolt, which is formed with a T head, as shown. The head is confined in the recess by means of a plate, C, slotted in the direction of the length of the bolster, so that when the bolster is turned across the axle at right angles to it, the head will enter through the slot into the recess; and when the bolster is turned into its proper position, the ends of the T engage the plate. This plate rests upon a suitable plate on the sand board, which forms a seat for it. A boss on its under side enters the lower plate, and forms a long bearing for the kingbolt. The hole in which the boss of the upper plate turns, also admits of putting the plate on the kingbolt over the T head.

The sand board has a slot for the T head to pass through, and on its lower side is attached a plate having a rearward projection for the support of the pivot bolt of the reach. For the support of this bolt at the lower end, the inner end of the clip box, on the bottom of the kingbolt, is extended back, and forms a brace, indicated by dotted lines, which engages the lower end of the pivot bolt. This gives a firm support to the bolt and prevents, to a great extent, vertical oscillation of the axle. Address the patentee for further information.

SUBSTITUTE FOR WINE CELLARS.

Our engraving illustrates an iron wine rack or safe, called by the manufacturers—Hydes & Wigfull, of Sheffield, England—"Peg Wedge Wine Cellar Fittings," on account of the peculiar method of putting them together.



The peg wedges, as they are called, are wedges driven from the inside out through the mortices in the corner posts. They are pegged or riveted to the seats, and the points are bent up on the outside, so that the whole rack is held together in a substantial manner without welding, while, at the same time, it occupies no more space in transportation than is necessary to pack away the straight and bent bars of which it is composed.

The bottles are placed on bent rack bars, as shown, and doors, constructed like the other parts of the safe, give access to the contents, and are fastened by a stout padlock.

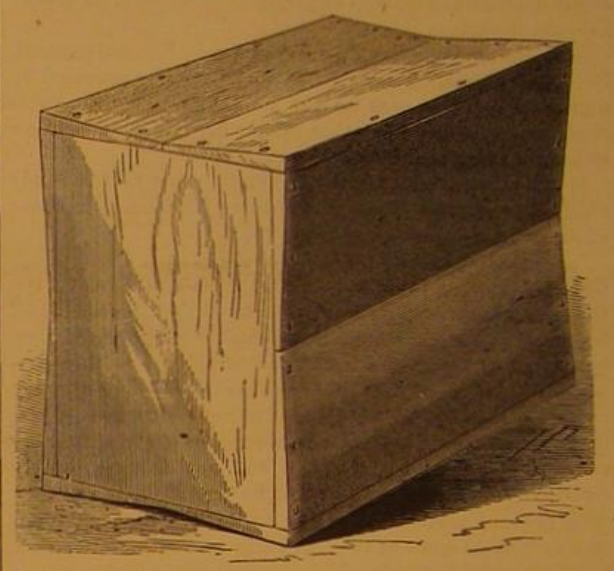
The racks are made of various sizes, to hold from four dozen to fifty dozen, and being constructed of light plates, they are portable, so that they may be readily moved from one part of the cellar to another, or transferred from cellar to attic. Their use entirely dispenses with brick vaults, usual in modern houses for storing wines, and dispenses with wine rooms, which are now necessary adjuncts to our first class hotels.

The English devote a great deal of attention to the manufacture of convenient articles of iron, of which this wine safe is an example. There is no doubt such minor manufactures might be extended in this country with profit. The article illustrated would doubtless, if made light and strong, and put into market here, meet with ready and extensive demand.

PATENT PACKING BOX.

The amount of lumber consumed in the manufacture of packing boxes is enormous; probably more is used for this purpose than almost any other. An improvement by which a large percentage of this can be saved will at once be recognized as important to both box makers and consumers. A large proportion of the boxes used are made from resawn lumber, and in order to get a sufficient thickness of edge to receive the nails without splitting, it has been necessary to use lumber thicker than otherwise required. To obtain half inch or five eighths thickness, one and a quarter and one half inch plank have to be used.

The accompanying illustration shows how the desired



thickness may be had from one inch boards resawn, thus saving from one fourth to one third the lumber.

This style of box is particularly adapted to casing cans of kerosene, sirup, varnishes, etc., not only on account of economy of material (and consequent lightness) but the peculiar outside form of the boxes permits ventilation and free circulation about them when piled up in store, or in shipping. This allows the dampness from imperfectly seasoned lumber to pass off without rusting the cans. These results are obtained by resawing the boards diagonally, making one edge thicker than the other, as required, and placing the thick edges outward to receive the nails. If more than two pieces are required to form the side of a box, the space is to be filled by a third strip, sawn parallel. The illustration shows the method so plainly as to need no further explanation.

When we state that one firm in New York uses over one million cases per annum for two five-gallon cans each, and the saving in lumber in the same is over one million feet, worth $20,000 or more, the importance of this device is apparent.

A patent for this design of packing box was obtained April 11, 1871, through the Scientific American Patent Agency, for A. H. Mershon, East Saginaw, Mich., of whom any further information may be had.

Origin of Vaccination.

It happened that while Jenner was pursuing his professional education with Mr. Ludlow, of Sudbury, a young woman chanced to be in the surgery, and hearing mention made of smallpox, she remarked that she could not take that disease, as she had already had the cow pox. On inquiry, Jenner found it to be a popular notion in the district that those who had once had cow pox were never attacked by smallpox. It appeared that, in Dorsetshire, a pustular eruption, showing itself on the hands of those who milked cows similarly diseased, had already attracted the attention of Sir George Baker; but he, at that time, was in the heat of controversy respecting the endemial colic of Devonshire, and did not pursue the subject.

Jenner, in one of his note books, dated 1799, says that he can find no direct allusion to the cow pox disease in any ancient writer, though the following, Jenner thought, bore some relation to it: "When the Duchess of Cleveland was taunted by her companions, Lady Mary Davis and others, that she might soon have to deplore the loss of that beauty which was then her boast, as virulent smallpox was raging in London, she made reply that she had had a disorder which would prevent her from even catching the smallpox."

IT is recommended by a writer to place the legs of work benches in coppersmith shops on india-rubber cushions. It is said to deaden the sound so that occupants underneath such manufacturers are not annoyed by the hammering. The same idea may be practiced in other works.

ENORMOUS flights of wild pigeons are destroying the crops in Nebraska.

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Importance of Advertising.

The value of advertising is so well understood by old established business firms, that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it: upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the venders of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of from 25,000 to 30,000 copies per week larger than any other paper of its class in the world, and nearly as large as the combined circulation of all the other papers of its kind published.

IMMIGRATION---REPORT OF EDWARD YOUNG, CHIEF OF THE BUREAU OF STATISTICS.

The "Special Report on Immigration," by the Chief of the Bureau of Statistics, has been on our table for some time, but pressure of other matters has, until now, precluded a summary or a review of its contents. The relation which immigration sustains to the future prosperity of the country, and its influence upon the industries of the United States, render the subject of sufficient importance to merit more space than we can assign to it.

The total number of aliens that have been added by immigration to the population of this country since its government was formed, has been nearly eight millions; but the indirect increase by subsequent births has probably been greater.

As regards nationalities, the report of Mr. Young states that more than one half of the above total have been British, or have come from some portion of the British Possessions. Next in number, comprising nearly two thirds of the remainder, is the German element. The Scandinavian element is making considerable accessions to its numbers in the Northwest. The Asiatic element has never yet reached 15,000 for a single year, and of these not more than seven per cent are females. From the latter fact, Mr. Young infers the improbability of any large permanent increase of this element in the United States.

In regard to the industrial value of this immigration, Mr. Young remarks:

"Deducting the women and children, who pursue no occupation, about 46 per cent of the whole immigration have been trained to various pursuits. Nearly half of these are skilled laborers and workmen, who have acquired their trades under the rigorous system which prevails in the Old World, and come here to give us the benefit of their training and skill without repayment of the cost of such education. Nor are the farm laborers and servants destitute of the necessary training to fit them for their several duties, while those classed as common or unskilled laborers are well qualified to perform the labor required, especially in the construction of works of internal improvement. Nearly 10 per cent consists of merchants and traders, who doubtless bring with them considerable capital as well as mercantile experience, while the smaller number of professional men and artists, embracing architects, engineers, inventors, men of thorough training and a high order of talent, contribute to our widely extended community not only material, but artistic, æsthetic, intellectual, and moral wealth."

Sixty per cent of the immigrants are of ages ranging from 15 to 40 years, and less than 15 per cent are over 40 years. Of the Irish immigration, over forty-five per cent are females, but in the aggregate the male immigration largely preponderates.

Mr. Young, in discussing the industrial value of this immigration, makes the following remark: "The son of a rich man, whose rearing and education cost $20,000, if not trained to usefulness, is worth far less to the community than the son of a mechanic of small income, whose whole cost has not exceeded $2,000, if the latter be a well-instructed and skilled artisan." This is a text upon which much might be said, but we leave our readers to draw, from its suggestiveness, such logical conclusions as bear directly upon a social system, "where wealth accumulates, and men decay."

The net immigration for the year ending 1870, and which entered the country with the intention of permanently residing here, was 356,303 persons.

In concluding his report, Mr. Young wisely recommends that the "passenger act" of 1855, be amended, or that other more stringent enactments be framed, which shall protect in greater measure steerage passengers from the discomfort, suffering, and immorality to which they are at present exposed.

STEAM TOWAGE FOR THE ERIE CANAL.

Practically, the prize offered by the New York Legislature is for steam towage, as there does not yet exist even the immediate prospect of an electro motor, or a caloric engine, adapted to supply power for this purpose. Let us consider, then, in the present article, the question of steam towage, pure and simple, as limited by the provisions of the enactment.

The rapid transport of freight depends upon speed as well as capacity. With boats of present capacity and model, three miles per hour is as high a speed as can be practically maintained without injury to the banks. We may set it down, then, that any higher rate of speed must involve either a modification of the form of the boats, or an alteration in the construction of the canal, so that side swells may not act injuriously upon the banks. In regard to the latter, it has been suggested that the lining of the banks with hydraulic cement would render them of sufficient resisting power to protect them from damage by swells. But another point must not be overlooked. The increase of swells by higher speed will lessen the depth of water in the middle of the canal, and if this speed is obtained by means of a stern screw, or paddle wheel, the sterns of large boats would drag, if loaded to their full capacity. To use stern screws or paddle wheels, the canal will either require to be deepened, or the boats must carry lighter loads.

There is no question that the largest boats now employed on the Erie canal, carrying as they do 240 tuns, are out of proportion to the depth and width of the channel. The passage afforded by the cross section of channel, namely, 70 × 7, was used on lines of greatest width and depth.

These boats are made just as large as they can be and get through the locks, and they often wedge in entering, absorbing much more time for locking them through than smaller boats, this being a large item in the aggregate of time required to make the passage between Albany and Buffalo. Even if the boat does not wedge, it so nearly fills the lock that it takes a long time to displace the water through the narrow spaces left between the sides of the boat and the sides of the locks. We may, therefore, make a second point, namely, that the size of the boats is out of proportion to the size of the locks, and here is another probable alteration required before the canal can develop its full carrying power, or rather the carrying power desired for it.

The suggestion of rendering the present walls, which line the banks, impermeable by the use of cement, seems to us a good one. If this were done, and the locks enlarged so as to permit the rapid passage of boats through them, the application of steam might result in a rate of 5 or 6 miles per hour, provided the bows of the boats were made sharper, and their lines otherwise altered to adapt them to such a rate of speed, and also such a mode of propulsion adopted, as would not let down the stern and cause the after part of the boats to drag on the bottom.

THE NECESSITIES OF LIFE.

There is, perhaps, no term in general use that conveys a more varied and indefinite meaning than the phrase which heads the present article. To one, it means the simplest food, clothing, and shelter, requisite to keep the vital flame burning; to another, it means unlimited wine, cigars, fast horses, boxes at the opera, etc.; others will fix their standard somewhere between these extremes; but few, very few, form a just estimation of the real material necessities of mankind.

Now, no true comprehension of material wealth can be obtained without first comprehending the real wants of the human family; for material wealth is that which supplies these wants. That which is hurtful to man, or which, being harmless, does not in any way benefit him, is not wealth, in any just sense of the term.

We think that not only those things may be called necessities of life which are required to support existence, but also those which are required to support existence in its highest and best condition, physically, mentally, and morally. Thus not only food and drink are demanded, but the best food and drink—that which enables man to develop and maintain the highest degree of bodily health and vigor for the longest period possible. Books, pictures, statuary, a reasonable amount of ornamentation in dwellings, furniture, and dress, tasteful decoration of public resorts, streets, and private grounds, proper amusements, etc., are also necessities which minister to the well being of body, mind, and morals. And all these are to be good after their kind, for if any are hurtful in their tendency, or incapable of ministering to better living, they cannot be classed among real wants; they are superfluities.

Superfluities are, in most census returns and statistics of wealth, classed as real wealth, and we have only to look at any such document, and check off and foot up such items as in the judgment of any candid mind, will be pronounced superfluous, to see that a very large proportion of the world's work is engaged in the production of things that mankind might not only dispense with, without loss of any kind, but many of which might cease to be used, and all mankind be direct or indirect gainers.

A horse is in general an useful animal, and as such is an element of wealth; but when he has acquired the habit of kicking, so that he endangers the lives of all who approach him, he becomes a source of direct loss to his owner. The sooner he is converted into such articles of commercial value as modern industry is able to extract from the carcass of a dead horse, the better for all. It matters not whether he can be sold for a money valuation or not; so long as he goes on destroying by his heels more than he earns over and above his keep, he is an unprofitable servant, and not an element of wealth. So explosive oils, used for illumination, which endanger and destroy life and property, are not wealth; they are destroyers of wealth. So alcoholic liquors, used as beverages, and tobacco in all its forms, though they represent a large money value in the industry and commerce of the world, are not wealth; they are destroyers of wealth. Shoes that pinch people's feet out of shape, such as are making the rising generation a race of cripples, are not wealth; they are destroyers of wealth. And so we might go on to show that articles wrested from their proper purpose almost invariably cease to be wealth in the true sense of the term, and almost invariably become the destroyers of wealth. For the material wealth of the human race consists in its ability to enjoy, to the greatest extent, its highest possible good; and only those things which, subtracted, would lessen this ability, are proper to be called wealth.

Were this rule strictly applied, how the aggregate of the world's wealth, as estimated by the statisticians, would be diminished! Were those things, which we would all be the richer for discarding, abandoned forever, how much would the real wealth of the world be swelled by industry turned into beneficial channels! It is a fallacy to suppose that the manufacture of superfluities—that is, things which in no way contribute to the welfare or happiness of mankind, or which diminish it—are to be credited with the benefits of paid employment to those engaged in their production. Who would think of benefiting the paupers of this city by employing them to teach horses to kick? or by paying them wages to dip up water from, and pour it back into, the East river? Money paid for the first labor would be worse than thrown away, and in the last instance they might be fed and clothed more cheaply when doing nothing, than when expending energy in work that benefits nobody. Those who can produce nothing of real value, had better be supported unemployed; and any system of political economy that does not embrace the regulation of industry so as to confine it to the production of real wealth, is radically imperfect.

GRAPE SUGAR.

The manufacture of grape sugar has become one of the most important industries of the country, and it is well to consider some of the improvements that have recently been introduced.

It has been found that the addition of a small quantity of nitric acid greatly facilitates the transformation of the starch into sugar. If, for example, 3,300 pounds of fresh and wet starch are to be converted into sirup, as soon as the sulphuric acid is weighed, add two ounces of concentrated nitric acid for every pound of the sulphuric. For sirup, one pound of sulphuric acid is usually taken for every 110 pounds of starch. We require for 3,300 pounds of starch, 30 pounds sulphuric acid and 4 pounds of nitric acid. The nitric acid is mixed at once with the sulphuric, and the mixture poured into the reducing kettles. After boiling for three quarters of an hour, the iodine test is applied, to see if all the starch is decomposed; and this test is repeated every five minutes, until the entire contents of the boiler are changed to grape sugar. Great importance is attached to making the iodine test. The boiling must be continued until the tincture of iodine is no longer violet or red, but shows the true iodine color. If the boiling be superseded too soon, the sirup has a tendency to ferment; and if it be continued ten or fifteen minutes too long, the sirup crystallizes; and in both cases, the sirup obtained is not easily sold. In order to give the sirup a clear color, after filtering through bone black, it is well to bleach with sulphurous acid, and this acid also prevents fermentation, in case the sirup was not boiled sufficiently long. The sulphurous acid is introduced as follows: After the acids have been neutralized by chalk, and the requisite quantity of bone black has been added, for 3,300 pounds original starch mixture, 15 pounds of an aqueous solution of sulphurous acid is poured in, and the whole well agitated; to assist the escape of the acid fumes, an ounce of crystallized soda, dissolved in a pint of water, is added for every pound of acid.

Where it is desired to make sugar instead of sirup, the proportions of acid to be employed are different, 45 pounds of sulphuric acid and 6 pounds of nitric acid being taken to reduce the 3,300 pounds of starch. Before the use of nitric acid was discovered, the boiling required four hours; it can now be accom-

plished in less than two hours. After boiling three quarters of an hour, it is well to begin the iodine tests, and after it is ripe for sirup, to continue the operation some time longer, until, on cooling, sugar will readily crystallize. It is one thing to make sirup, and another to produce sugar, the proportions of acid and the time being different in each case.

After shutting off the steam and suspending the boiling, 15 pounds of bone black must be strewn in, and the liquid set to boil for five minutes. It is then ready to run into the neutralizing vats.

After neutralization, 30 pounds of bone black must be added, under constant agitation, and 15 pounds sulphurous acid and one pound crystallized soda, as before, and the whole left 6 to 8 hours to settle. The clear sweet liquid can be introduced into the vacuum apparatus for concentration. It can be boiled down in open vessels by steam, but is not so white and pure as when the vacuum pan is employed. As soon as the sirup shows 36°, it is filtered, and run into suitable crystallizing vessels. On the filter will be collected the gypsum produced by the neutralization; and as it contains considerable sugar, it must be pressed out and washed. In Germany, the filter consists of strong cloth placed inside of a conical basket, fitted to a suitable barrel. The liquid runs through perfectly clear, and requires three or four days for its crystallization; to hasten the crystallization, some farina sugar can be stirred in. When nearly dry, it is poured into boxes of a suitable size for transportation. The solid grape sugar is extensively employed in breweries, in the manufacture of wines, for distillation, and in candy. The price of the sugar is higher than for sirup, and it is not liable to deteriorate, if it be properly prepared.

The form of the boiler has been considerably modified. Instead of performing the reduction by steam under pressure, a coil of copper pipe, in the bottom of the wooden vessels, serves to convey the heat for boiling the mixture. The dilution of the liquid by the condensation of the steam in the vat, and the necessity of boilers that could resist several atmospheres of pressure, are avoided. There is also less liability to explosion. The employment of nitric acid is a new feature, and the use of sulphurous acid, for the double purpose of bleaching the sirup and preventing fermentation, ought not to be overlooked.

Pure starch sirup resembles honey so closely that few could detect any difference. It is fast becoming a substitute for molasses and sirup from cane, and as the syrup resulting from the beet root sugar is only suited to fermentation and the recovery of potash, the starch sirup must fast grow in favor.

Grape sugar can also be made from shavings, rags, saw dust, and any kind of cellulose, but the cheapest material is the starch from corn and grain. To insure a good quality, attention must be paid to removing all traces of the lime and soda used in neutralizing, and to a proper bleaching by bone black and sulphurous acid. With these precautions, and by aid of improved machinery, there is no reason why the industry should not be made a profitable one to all who are disposed to invest in it.

SULPHUR IN LOUISIANA.

Sulphur beds of great extent, remarkable purity, and apparently of immense value, were discovered accidentally, some three years ago, in the parish of Calcasieu, southeastern corner of Louisiana, near the Calcasieu river, a navigable steam emptying into the lake of the same name, which communicates with the gulf; the mines are not far distant from the line of the Chattanooga railroad. The discovery was made during the boring of a well for petroleum. Oil in paying quantities was not found, but something better, in the shape of this sulphur bed. From a recent pamphlet issued by the American Sulphur Mining Company, of New Orleans, we gather the interesting particulars which follow.

This company (having a capital stock of $600,000) and the Calcasieu Sulphur Mining Company are at work in the development of the sulphurous treasures, and the indications are that this country will ere long cease to be an importer and become an exporter of this valuable commodity.

The Louisiana bed, or layer of sulphur, commences at a depth of 428 feet from the surface of the ground, and terminates at 540 feet, the bed having thus a thickness of 112 feet. The proportion of sulphur is 60 per cent at the top of the bed, the proportion increasing rapidly as we descend, being 90 per cent at a depth of 486 feet. The proportion then gradually diminishes.

The sulphur appears in compact and amorphous masses, of a pale color, interspersed, here and there, with yellow crystals. It is surrounded by a calcareous, crystalline matrix, of whitish color, and rather considerable hardness, but which, nevertheless, is easily reduced to powder under the stroke of the hammer. The general analysis of the deposit yields 77 per cent of pure sulphur.

As for the working of the sulphur bed itself, it will not present the slightest difficulty; for the rock, without being too hard to disintegrate, is yet sufficiently compact and resisting to sustain, without any wooden scaffolding or coating, all the galleries to be constructed.

HOW SULPHUR IS MINED IN SICILY.

In Sicily, pre-eminently a sulphur producing country, the art of working mines is yet in its infancy.

The sulphur strata are met at average depths of 120 to 150 feet below the surface, and are reached by means of sloping galleries, supplied with steps dug in the soil itself.

All the mineral extracted by the miners is brought up to light by children from twelve to sixteen years of age. They take upon their shoulders one or two stones, which they bring up with much trouble to the surface, after overcoming untold obstacles in ascending the steps, always roughly made and partly crumbling. Having reached daylight, they lay down their load, and at once descend again to the bottom of the mine to repeat the same operation.

The proportion of sulphur in the mineral is from 20 to 30 per cent, or an average of 25 per cent. Of this 25 per cent, the Sicilians scarcely extract from 10 to 14 per cent of sulphur; for, owing to the lack of fuel, they are compelled to use the sulphur itself to operate the melting; in other words to burn one half in order to melt the other half, obtaining thereby a very impure product, which has to be manipulated again and refined before being delivered for consumption.

Last year, we published in the SCIENTIFIC AMERICAN an account of the sulphur mines of California, at Clear Lake, which are being worked to great advantage, and are capable of more than supplying all the sulphur needed on the Pacific Coast. The Clear Lake mineral contains fifty per cent of pure sulphur. It is, therefore, not so rich as the Louisiana deposits.

COAL TAR PRODUCTS.

Mr. Anthon Pubetz, director of extensive dye works in Bohemia, has published a short review of the preparation and properties of the principal coal tar products, from which we gather some important facts. Among the thirty-five bodies, partly solid, partly liquid, which are found in the tar, only five, namely: benzine, tuluene, naphthalin, carbolic acid, and cresylic acid are of much importance in the arts.

BENZINE.

Benzine is a light, mobile, colorless liquid, very volatile, and possessing, when pure, an agreeable odor. Its specific gravity is 0·85. It freezes at 0° C, and boils at 80° C.; is insoluble in water but soluble in wood spirit, alcohol, ether, or acetone. It dissolves small quantities of sulphur, phosphorus, iodine, shellac, and copal; and dissolves readily the fats, etherial oils, camphor, wax, india-rubber, gutta-percha, quinine, morphine, strychnine, but not cinchonine. From benzine are prepared a large number of acids, and nitrogen, chlorine, and bromine compounds.

TULUEN, OR TOLUOL.

By the fractional distillation of coal tar we obtain an oily, mobile, volatile liquid, specific gravity, 0·87, and boiling at 110° to 111° C. It odor resembles benzine, it is insoluble in water, slightly soluble in alcohol, but easily soluble in ether. There are numerous products of its decomposition, as of benzine.

NAPHTHALIN.

Naphthalin is one of the principal constituents of coal tar. It is solid at ordinary temperature, fuses at 79° C., boils at 220° C.; and its specific gravity is 1·048. It can be easily sublimed into thin, white, rhombic scales of tarry odor and aromatic taste. Impure naphthalin turns brown in the air. It crystallizes, from its solution in ether, in large prisms, which remain unaltered in the air. It can be ignited with difficulty, and burns with a smoky flame, even in pure oxygen. Water does not dissolve it, but it is very soluble in alcohol, ether, in the fat and essential oils. It is used as a substitute for camphor in the destruction of moths, and also in the preparation of colors.

CARBOLIC ACID.

Carbolic acid crystallizes in long, colorless needles, possessing a penetrating odor resembling creosote. Chemically pure carbolic acid, entirely free from cresylic acid, fuses at 41° C., and boils at 182° C. Its specific gravity is 1·065. It does not turn blue litmus red, and, when ignited, burns with a smoky flame. Water only dissolves two per cent of carbolic acid. Alcohol and ether dissolve it in all proportions. It is also soluble in acetic acid, in the carbonate and caustic alkalies, and does not enter into combination with ammonia. Solutions of carbolic acid coagulate albumen and destroy insects. It is used for the preservation of animal matter, and as a disinfectant. A pine shaving, previously moistened with hydrochloric acid, is changed by carbolic acid to a beautiful blue color on exposure to the sunlight. A numerous class of bodies has been prepared from it by chemists, and it is now extensively employed in the arts.

CRESYLIC ACID.

Cresylic acid is constantly associated with carbolic acid, and it is very difficult to separate them. It is a transparent oil, possessing a smoky odor, with a bitter, burning, caustic taste. Its specific gravity is 1·037 to 1·04; it boils at 203° C., remains liquid at 27° C., and in other respects closely resembles carbolic acid.

NITRO-BENZINE.

Nitro-benzine, called also nitro-benzole and essence of mirbane, is a yellow liquid, possessing a sweet taste, and the odor of bitter almonds. It is used in perfumery instead of bitter almonds, but its chief consumption is in the preparation of aniline. It is insoluble in water, but can be mixed in all proportions with alcohol and ether. It freezes at —3° C., in crystalline needles, boils at 213° C., and can be sublimed unchanged. It is easily manufactured by the action of nitric acid upon benzine. A similar compound is made by the action of nitric acid on toluol, from which aniline can be prepared.

ANILINE.

Aniline was discovered in 1826, in the distillation of indigo. It is now almost universally prepared by the deoxidation of nitro-benzole, by means of nascent hydrogen evolved by iron filings and acetic acid. Aniline is a colorless, oily liquid, which turns brown in the light, possessing a vinous aromatic odor, and a bitter, burning taste. Its specific gravity is 1·028. It is slightly soluble in water, but is dissolved in all proportions in alcohol, ether, or fatty oils. It remains liquid at 20° C., boils at 182° C., and combines with acids to form crystallizable salts, which are soluble in water and alcohol. The faintest trace of aniline can be detected by the deep purple violet color which it imparts to a solution of bleaching powders.

Aniline and the solutions of its salts color oak wood an intense yellow. Aniline is said to be the only poison the salts of which are not also poisons. Aniline salts are innocuous; they stain the skin, nails, and mouth violet, but the color soon disappears. Aniline itself is a violent poison, and must be handled with care. The principal salts of aniline are the chloride, sulphate, nitrate, phosphate, and oxalate, some of which are used in the preparation of colors.

ROSANILINE.

In 1862, Professor Hofmann isolated the base rosaniline in the form of small white crystals, which rapidly turn red in the air by the absorption of carbonic acid. Heated to 130° C. it is decomposed into aniline and carbon. Rosaniline is prepared by the action of chloride of zinc, also arsenious acid on aniline containing toluidine. Combined with acids, it yields salts which have a metallic luster, and are extensively employed in dyeing under various trade names, such as fuchsin, azalein, magenta, solferino, imperial ruby, rosein, anilein, rouge, and neuroth.

HOFMANN'S VIOLET.

Hofmann's violet differs from rosaniline in containing more carbon and hydrogen. It is prepared by heating together equal parts of iodide of ethyl, rosaniline, and caustic soda, and dissolving the product in ten or fifteen parts of alcohol. The special value of this color is that it is a pure violet, without a red or blue tinge. It is one of the most highly prized of the aniline products. There are other colors which have been added from time to time, a detailed account of which can be sought in recent works on dyeing. They are Perkins' violet, geranosine, cyanine, picric acid, corallin, and azulin. The order of discovery of the aniline colors is said to be as follows:

Aniline purple	discovered	in	1856
" magenta	"	"	1859
" blue	"	"	1861
Hofmann's violet	"	"	1863
Britannia violet	"	"	1865

It is estimated that 10,000 pounds of aniline oil are manufactured daily in Europe, to be converted into the various dyes mentioned above. Such is the unprecedented growth of an industry that had no existence fifteen years ago.

MANUFACTURE OF SILK.---SILK WORM EGGS.

Although, for many years, the manufacture of sewing silk has been one of the recognized industries of this country, still it is only within the past five years that the silk manufacture has assumed any very important proportions. It is now rapidly extending, and ere long the United States will occupy a leading place in the supply of every description of silk goods.

In Paterson, N. J., there are some thirty establishments for manufacturing silk, employing about six hundred persons, and making nearly all kinds of goods. Of ribbon factories, the largest in the United States are there, two of them employing from three to four hundred hands, though the leading specialty is silk dress goods, chiefly blacks. A large business is also done in pongee silks, or handkerchiefs, which are sold plain to New York merchants, by whom they are sent to various print works on Staten Island for a finish.

Most noticeable of all, is the large establishment of the Dale Manufacturing Company, engaged in serges, braids, cords, dress trimmings, etc., in great variety. This concern, like others, does a heavy business in manufacturing trams and organzines (warp and filling) for silk establishments throughout the country. Another factory employs numerous hands exclusively on ladies' trimmings, gimps, and fringes. Several others are making sewing silk, hat bands, etc.

To show the importance acquired by some of these minor items, we may state that a single small concern in New York city consumes weekly hundreds of pounds of silk in making the tiny tassels for umbrellas.

Mention might be made of the large works of the Cheney Manufacturing Company, near Hartford, Conn., which is said to turn out stuff to the amount of two or three million dollars per annum.

At Hoboken is another factory, for weaving, and in Massachusetts and Connecticut there are various concerns which have been making silks and twists for the last twenty years.

Enough has been said to show that the silk manufacturing interest is having a rapid development. This appears from the simple statement that five years ago, within a radius of fifty miles of New York, there were not fifty looms running on broad silk. Today, there are not less than 1,000 in New Jersey alone, and in Connecticut and other places, 2,000 or 3,000 more—among these one at Green Point, L. I., should be included. The direct importation of raw silk overland from China and Japan, brings the crop quickly into market, which is a decided advantage.

The importation of silk worm eggs from Japan appears to have already reached a considerable magnitude. A shipment of 100 boxes of eggs, valued at half a million of dollars, lately arrived at San Francisco. They were to go by rail to New York, thence to France, Italy, and Turkey.

OFFICIAL reports from India, state that the coal fields in the district of Berar are much more extensive than had been supposed, and are at a moderate depth below the surface. In one place, a bed of coal, more than thirty feet thick, was struck at a depth of not more than seventy-seven feet. The Damuda field has an area of 149 miles, with an average thickness of forty feet. And in other districts, beds of iron ore from nine feet to seventeen feet thick have been discovered.

THE BATHOMETER, AND OTHER INSTRUMENTS FOR EXPLORING, MEASURING, AND UTILIZING THE SEA.

At a recent meeting of the New York Association for the Advancement of Science and Art, the above subject was presented, accompanied by some novel and interesting experiments, by Mr. G. Livingston Morse.

The lecturer first explained the unreliability of deep sea soundings by the common lead weight and some other instruments. He stated that it was well known that, when a common lead weight with line was used in a depth of three miles or more, the weight would not reach the bottom, but would remain suspended in the water by the friction of the water on the line, which friction would counterbalance the weight.

The problem in deep sea sounding consisted: first, in constructing an instrument which will accurately record any depth, and be of sufficient strength to resist the pressure of the water at any great depth; and second, in arranging the instrument so that it will bring up a sample of the bottom, in order that its character may be determined.

Among the most recent devices invented for this purpose was one consisting of a small tube or quill, attached to the end of a line; a lead weight was attached to the tube, in such a manner that the moment the lower extremity of the tube struck bottom, it would bury itself in the ooze, while the lead weight would be at once detached, thus leaving the line with the tube free to be raised to the surface, with a sample of the bottom.

While the lecturer regarded this as an ingenious device, he said: In practice, the weight sometimes failed to become detached, thereby diminishing the certainty of its action; and when the weight was detached in depths of from one to two miles, from five to six hours were required to raise the line and tube, on account of the friction of the water against the line.

Another instrument was explained, consisting of a weight within which the line was coiled, so that the line would unwind in descending, and be left behind in the form of a trail, thus avoiding the friction of the water against a moving line; but the chief obstacle of its success was in determining the proper amount of line to be coiled in the machine.

It was estimated that the pressure upon a body at a depth of seven miles below the surface of the ocean amounted to two tuns on the square inch; and in order to construct an instrument to indicate such a depth, it should be able to resist that pressure.

The discovery that a thin hollow glass sphere, about three inches in diameter, would resist a greater pressure than two tuns on the square inch, when tested in a hydraulic press, led the lecturer to invent an instrument, which would record accurately and quickly, any depth. A brass sphere was exhibited, similar in size to the glass spheres; the brass sphere, which had been subjected to the pressure above mentioned, was crushed in at several places.

The lecturer's device consisted in arranging several glass spheres, one above the other, within a casing of hemp or leather, the case tapered at both extremities, and containing at its lower portion a small flexible mercurial reservoir, so constructed that, on receiving pressure, the mercury will be forced from the reservoir into another vessel.

When the instrument descends in the water, the quantity of mercury forced by the pressure from the reservoir into the receiving vessel determines the precise pressure, and indicates the exact depth of the water. A freezing mixture is intended to surround the mercury, and keep it at an even temperature.

A weight is fastened to the instrument, which weight is detached when it strikes bottom, and then the instrument immediately rises to the surface. No line is used with this instrument.

The lecturer then proceeded to show by experiment the operation of the instrument, a model of which he immersed in an upright tank of water six feet high; it sank to the bottom, the weight detached itself, and the instrument instantly ascended to the surface of the water.

Other interesting experiments were made, illustrating the various uses to which the device could be adapted.

Soundings had been made with this instrument in Lake Seneca, N. Y., to a depth of 500 feet with perfect success, the instrument always working with uniform accuracy and certainty; but as yet it had not been tested in the deep sea. The time consumed in taking the above soundings was only from ten to fifteen minutes.

This instrument was considered superior to others, in that it gave an accurate record of any depth to which it might be sunk, and also performed the work more expeditiously and with less labor.

The lecturer concluded by expressing the hope that the arts in the future might be able to make a hollow glass sphere large enough for a man to step into and descend with an electric light, so that he could explore for himself the bottom of the great ocean.

The lecturer believed cylinders could be constructed, so as to ascend through the water at the rate of sixty miles per hour.

He further thought it possible to construct machines that could be sunk to the bottom of the ocean, and raise to the surface quantities of the ooze—a tun at a time—which might be valuable for fertilizing purposes.

The lecture was exceedingly interesting, and at its conclusion the lecturer received many compliments.

A CORRESPONDENT recommends three thicknesses of Canton flannel, cut to required width and overcast at the edges, and states that they are better than lamp wicks obtained at the shops. The idea is old, but easily tried.

Louis Bonard.

A few weeks ago, deceased in this city an old man named Louis Bonard, whom the papers seem to take pleasure in denouncing as a miser, apparently because he adopted a very economical style of living. His diet was frugal and his apartment bare; but how very far he was from being a miser, in the ordinary acceptation of that word, is shown by the fact that he bequeathed the whole of his property, amounting to nearly two hundred thousand dollars, to one of the noblest charities in the city, the Society for the Prevention of Cruelty to Animals. If this man were a miser, it is a great pity that there are not more like him in the world.

In addition to being a "miser," it appears that Bonard was also a student, had scientific and mechanical tastes, and other qualities that more pretentious people might cultivate with advantage. A *Times* reporter, who lately visited the shop or laboratory of the deceased, thus describes its appearance and contents:

It is reached by a very narrow flight of stone steps, and was formerly used as a cellar. A stout door, secured with a strong lock and a patent spring, gives admittance. The shop is about eighteen feet long by twelve wide, and is fitted up with racks and shelves in a thorough workmanlike manner. Under a grating, through which daylight is obtained, is fitted a solid wooden bench, with iron vise, etc., complete. On the shelves are brushes, paint pots, and plumbers', glaziers' and carpenters' tools in endless variety. Half-finished window sashes with patent iron partitions, invented by Bonard himself, barrels of various cements, etc., and bricklayers' and plasterers' tools also form part of the collection. A wooden stool stood by the bench, and an unfinished piece of woodwork lay on the bench just where the dead man had left it. The place was very dark and quite underground, the ceiling being level with the paved yard. Here this extraordinary man would perform all the work and odd jobs necessary for his different houses.

He did everything himself, from putting in a pane of glass to the repairing of a brick wall. He sometimes employed a laborer to assist him in his work. In this shop Bonard made the models of the hat machine, the brick-making machine, and the machine for casting iron, all of which he patented.

D. Clifford, the agent, said that Bonard was of a kind and generous disposition, and especially towards his poor tenants. He would frequently forgive a poor man or woman his or her rent, if they were pressed or out of work, and never turned out a good tenant for a month's rent. Clifford had known him for six years, during which time he had collected the rents and acted as his agent for the houses in Mulberry street. He denies that Bonard was a miser, and says he merely lived in a very humble manner, and saved his money in order to carry out his desire to benefit the dumb creation, as shown by his will. He always evinced a great fondness for animals, and any act of cruelty to any dumb creature always aroused his indignation.

Death of Sir John F. W. Herschel.

We regret to find, in our European exchanges, the news of the death of this eminent astronomer. The name of Herschel has been famous for over a century, the father of the subject of this memoir being the British Astronomer Royal, famed for his learning and diligence in research, and for his discovery of the planet Uranus, often called Herschel. John Frederick William Herschel was born at Slough, Buckinghamshire, England, in the year 1792, and was educated at St. John's, Cambridge, a college which has the highest reputation of any in England for the attainments of its mathematicians. Many years of Herschel's life were devoted to the investigation of the nebulæ and the double and triple stars, and he has given the world catalogues and measurements of at least a thousand, whose positions and distances had never before been fixed.

Four years of his life were spent at the Cape of Good Hope, and astronomers are thereby indebted to him for a vast amount of knowledge of the phenomena of the southern heavens. He refused to receive the amount of his expenses on this expedition, although Lord Melbourne, the then prime minister, offered it to him, and his services to science were recognized by the conferring a baronetcy on him by the Queen. He afterwards became Astronomer Royal and Master of the Mint. His works are numerous and profound, and his social reputation was as great as his scientific renown. He was in his eightieth year.

Infringement Trial.—Holcomb's Patent Fruit Jar.

Judge McKennan, in the United States Circuit Court, at Pittsburg, Pa., recently delivered an opinion in the case of McCully & Co., *vs.* Cunningham & Ihmsen and Lorenz & Wightman. It was a proceeding in equity, in which the complainants asked an injunction, restraining respondents from infringing upon a patent issued for a fruit can, and also to get an account. The complainants are the exclusive assignees of D. Irving Holcomb, to whom letters patent, dated March 14, 1869, for an improvement in fruit jars, was granted. Respondents admitted that from about the 1st of August, 1868, they manufactured fruit jars, in all essential features of construction and combination like the fruit jar patented to Holcomb. They denied, however, that Holcomb originated the jar.

Judge McKennan, in his opinion, decides in favor of the complainants, as follows: "It is scarcely necessary to support the conclusion arrived at, by a restatement of the familiar principle that a combination, all the elements of which are old, is patentable if a new or improved result is thereby obtained, or that a combination, all the elements of which, except a single one, have been before used together, is also the subject of a patent. The whole combination is to be regarded as an unit, and if all its essential elements have not before been embodied and employed together, it is to be taken as an original invention.

"While, therefore, it is apparent that fruit-preserving jars were made, and in use before, with a shoulder bed in which an India rubber gasket rested, and with a metal cap which was pressed upon the gasket and held down by a wire yoke, yet it does not appear that the patentee's device to secure more effective sealing—the vital function of the whole mechanism—by the exclusive circumferential pressure was employed in any one of them. His claim is therefore a combination, of which this device constitutes an essential and valuable part, embodies a new and original invention, and is entitled to protection against infringement. A decree will accordingly be entered for an injunction and an account."

Tunnel at Nusquehoning, Pennsylvania.

The engineers of the Lehigh Coal and Navigation Company are now engaged in tunneling a hill near Summit, Pa., and the work is being prosecuted with great vigor and skill. The labor is commenced at both ends, and is now progressing, through a hard conglomerate into the red shale, at the rate of thirty-five feet per week. The blowing engines are ready to work at the north end, and, when in operation, sixty feet progress per week may be calculated on; and this speed will finish the tunnel in about four months from this time. It is a continuance of a disused mining tunnel, driven 1,500 feet into the Mammoth vein; and recently, the work of hand drilling being too slow in execution, the Burleigh drill has been used. This was in March last, and the engineers hope to have the road laid and ready for train-running next January.

AMERICAN NEWSPAPERS.—Colonel John W. Forney said, at a dinner given in his honor: "In 1870 we count fifty-five hundred news periodicals of all degrees, with a probable annual circulation of not less than seven hundred and twenty-five millions. Of these, four hundred and seventy-five are dailies, circulating nearly two millions of copies every twenty-four hours, one hundred and sixty are agricultural journals, circulating over half a million; and about three hundred religious periodicals, circulating over two and a half millions of copies of each edition—an aggregate, without counting our monthly literature, larger than the rest of the civilized world. In fifty years, when our population shall have attained, on the present ratio of increase, to one hundred and fifty millions, the boy of seventeen to-day will have a far different story to tell."

TO CLEAN PAINT.—We have published the following recipe before; but, this being house cleaning season, some good housewife will thank us for giving it again. To clean paint, provide a plate with some of the best whiting to be had; have ready some clean warm water and a piece of flannel, which dip into the water and squeeze nearly dry; then take as much whiting as will adhere to it, and apply it to the painted surface, when a little rubbing will instantly remove any dirt or grease. After which, wash the part well with clean water, rubbing it dry with a soft chamois. Paint thus cleaned looks as well as when first laid on, without any injury to the most delicate colors. It is far better than using soap, and does not require more than half the time and labor.

IN IOWA, the planting and cultivation of forest trees is encouraged by the offer of handsome premiums, and the result is that the good work is progressing with vigor. One gentleman of Sioux city, it is stated, will plant two hundred thousand trees on his farm this year; another has commenced planting two hundred and fifty thousand trees in Lyon county, and still another is planting thirty thousand trees—chestnut, larch, maple, and cottonwood—in Ida county. At this rate, Iowa will soon become a timber State. We wish that a similar movement could be inaugurated in some of the Eastern States. In New England, the soil has been rendered more arid, and the streams reduced in volume, by the cutting down of the forests.

DETECTION OF SUBSTANCES BY THE FORMATION OF MICROSCOPIC CRYSTALS WITH THE BLOWPIPE.—Dr. Wunden, of the Polytechnic School of Chemistry, has published a set of photographs of the crystals that can be produced by means of the blowpipe and the use of borax beads, with the salts of magnesia, lime, baryta, strontia, alumina, glucina, zirconia, ceria, and tungstic acid. A magnifying power of from eighty to one hundred diameters is necessary to the examination of the crystals, and a little skill and practice will soon enable the chemist to make a qualitative examination, by this method, with the blowpipe.

TREES OUT OF PLACE.—Trees are out of place (says a writer in the *Farmer*) when they overshadow the roof of a house, or darken its windows, or shut out a fine prospect. It is the testimony of eminent physicians that no small part of the sickness of families is attributable to the shading of dwellings by overhanging trees and thick clustering vines. Our bodies need light, pure sunlight, and a great deal of it, and our spirits need it none the less; and he who shuts out this genial dispenser of health makes a great mistake, and does a great wrong.

AN undergraduate at Cambridge, who found among the questions on his examination paper this: "Why will not a pin stand upon its point?" elaborately explained the point thus: 1. A pin will not stand on its head, much less is it possible that it should stand on its point. 2. A point, according to Euclid, is that which has no parts and no magnitude. A pin cannot stand on that which has no parts and no magnitude, and therefore a pin cannot stand on its point. 3. It will if you stick it in.

Supposed Ancient Chemical Works.

A correspondent of the Boston *Advertiser*, writing from Rome, describes the following remains, found near that city, and supposed to have been chemical works:

There is a round, shallow cistern; from it, a pipe hole leads into a row of five shallow basins, about the size of hand basins. At the fifth basin is a groove leading to a parallel row of similar basins, a little lower in the level than the first row. At the last of these is another pipe groove leading to a third row of basins, also lower than the second. Thus the liquid flowed from the cistern down the first row, back through the second, and then into the third; from thence by a large pipe hole somewhere into a place which is not yet excavated.

This curious place has been hidden for centuries, only covered with a light layer of soil, with cattle grazing and horsemen dashing over it; and here, by some chance turning of the spade, made to go a trifle deeper by the indolent Campagna laborer, it has come to light, and will furnish a fresh subject of speculation to archæologists. The basins have a slight crust of reddish brown on their surface. At each end of the whole machine are blocks of stone with small square cavities cut in them; these may have been the places for the furnaces.

Rather Late in the Day.

Abbé Moigno's journal, *Les Mondes*, for September 8, 1870, has just arrived. It was too heavy to be sent by balloon, and had to come from Paris during the lucid interval that obtained after the evacuation by the Germans, and before the unfortunate civil war. It is to be hoped that the abbé has not shared the fate of many of the clergy, and that his valuable scientific journal has not been suppressed. The present number contains considerable interesting matter; among other items, it is pleasant to read a kindly notice of the recovery of Baron Liebig: "It is with the greatest pleasure that we announce that one of our English friends has just received an autograph letter from Liebig, in which he says that although still very feeble, he is able to pass a few minutes every day in his garden; and if his health continues to improve, he proposes to go in three weeks to the Engadine, where he hopes for speedy recovery."

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SCIENTIFIC AMERICAN.—Back Numbers and Volumes for sale at low prices. Theo. Tusch, Scientific Book Agency, 37 Park Row, New York.

For the best, purest, and most economical Machinery Oils, of all kinds, send to Oil House of Chard & Howe, 134 Maiden Lane, N. Y.

Wanted.—A situation by a competent Mechanical Draftsman of 12 years' experience. Can design from a sketch. Address I. C. Russell, Hartford, Ct.

Improved mode of Graining Wood, pat. July 5, '70, by J. J. Callow, Cleveland, O. See illustrated S. A., Dec. 17, '70. Send stamp for circular.

Cleaning Brass.—To F. M. G.—The very best article for all metallic bright work is A. H. Downer's Polishing Oil (129 Maiden Lane, N. Y.), highly recommended by Fire Departments and Railroads.

Railroad Machinery and Rolling Stock illustrated in the RAILROAD GAZETTE.

The Philadelphia Scientific Mechanics' Circle will answer any mechanical question for 25 cts. Address as above, 125 N. 7th st., Philadelphia.

$25,000 will furnish an energetic party with the exclusive control and right to manufacture a staple article, supplying a want long experienced by ladies throughout the whole country. Apply to Mrs. A. H. Graton, Lawrence, Kansas.

Wanted.—The address of Manufacturers of Fine Foot Punching Presses. W. S. Hammond, Lewisberry, York Co., Pa.

We want descriptive circulars and price lists of the best Machine for Sawing Laths for plastering. Stewart & Co., Union Springs, Ala.

For Sale.—A first class Stereopticon, complete. 125 Views. Address B. Adriance, 45 Ann st., New York city.

Electrical Instruments, Models, etc., made to order, and Gear Wheels and Pinions cut, by W. Hockhausen, 113 Nassau st., Room 10, N. Y.

The Kansas Brick Molder and Off-bearer is like a cart, with a mold drum under it, which molds and leaves the brick on the yard. It will make 4,000 brick per day. For Rights or Agency apply to John Whiteford, Kansas City, Mo., Lock box 2165.

Wanted.—New or secondhand Cartwheel Borer, Axle Lathe, double head preferred; Wheel Press and Centering Lathe. Address, with description, maker's name, and price, Michigan Car Co., Detroit.

Diamond Carbon, of all sizes and shapes furnished for drilling rock, sawing and turning stone, conglomerates, or other hard substances, also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Experimental Machinery and Models, all sizes of Turned Shafting, Paper Box, Paper Collar, and Bosom Plaiting Machines, Self-operating Spinning Jack Attachments. W. H. Tolhurst, Machine Shop, Troy, N. Y.

Wanted.—A Mechanic competent to build and adjust the Wheeler & Wilson Sewing Machine, to take charge of a shop. Address Sewing Machine Works, St. Catharines, Ontario, Box 169.

$1,500 for a valuable Patent, or will be sold in State Rights. Can be cast. J. F. Ronan, at Chickering's Factory, Boston, Mass.

Best Scales.—Fair Prices. Jones, Binghamton, N. Y.

Steam Watch Case Manufactory, J. C. Dueber, Cincinnati, Ohio. Every style of case on hand, and made to special order.

Agents Wanted—on a new plan—to sell a patent Collar Stud. Send for Circular. S. E. Williams, Hartford, Conn.

L. & J. W. Feuchtwanger, Chemists, 55 Cedar st., New York, manufacturers of Silicates of Soda and Potash, and Soluble Glass.

For Hydraulic Jacks, Punches, or Presses, write for circular to E. Lyon, 470 Grand st., New York.

Wanted.—A responsible dealer in every town in the United States, to sell "The Tanite Co.'s" Emery Wheels and Emery Grinders. Extra inducements from May 1st. Send for terms to "The Tanite Co.," Stroudsburg, Pa.

"American Manufacturer's Review," Pittsburgh, goes over the whole country. Subscription, $4. Advertisements, 15c. per line. Try it 1 year.

The new Stem Winding (and Stem Setting) Movements of E. Howard & Co., Boston, are acknowledged to be, in all respects, the most desirable Stem Winding Watch yet offered, either of European or American manufacture. Office, 15 Maiden Lane, New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Ashcroft's Low Water Detector, $15; thousands in use; can be applied for less than $1. Names of corporations having thirty in use can be given. Send for circular. E. H. Ashcroft, Boston, Mass.

To Cotton Pressers, Storage Men, and Freighters.—35-horse, Engine and Boiler, with two Hydraulic Cotton Presses, capable of pressing 75 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Tin Presses & Hardware Drills. Ferracute Works, Bridgton, N. J.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N. Y.

American Boiler Powder Co., P. O. Box 315, Pittsburgh, Pa.

Carpenters wanted—$10 per day—to sell the Burglar Proof Sash Lock. Address G. S. Lacey, 27 Park Row, New York.

Manufacturers' and Patentees' Agencies, for the sale of manufactured goods on the Pacific coast, wanted by Nathan Joseph & Co., 619 Washington street, San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

All parties wanting a water wheel will learn something of interest by addressing P. H. Wait, Sandy Hill, N. Y., for a free circular of his Hudson River Champion Turbine.

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

A. G. Bissell & Co. manufacture packing boxes in shooks at East Saginaw, Mich.

Twelve-horse Engine and Boiler, Paint Grinding Machinery Feed Pumps, two Martin Boilers, suitable for Fish Factory. Wm. D. Andrews & Bro., 414 Water st., New York.

Improved Foot Lathes. Many a reader of this paper has one of them. Selling in all parts of the country, Canada Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

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

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., 25 Whitney ave., New Haven, Conn.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for catalogue.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

English and American Cotton Machinery and Yarns, Beam Warps and Machine Tools. Thos. Pray, Jr., 57 Weybosset st. Providence, R. I

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N. Y. (Send for Circular.)

Winans' Boiler Powder.—15 years' practical use proves this a cheap, efficient, safe prevention of Incrustations. 11 Wall 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.

Nearly Every Advertiser,

Who makes advertising pay, contracts through a responsible Agency, experience having taught them to avail themselves of the services of those who have made the business a study. The Agency of Geo. P. Rowell & Co., No. 40 Park Row, New York, is the most competent in the country, and many o the largest advertisers make all their contracts through them.

Answers to Correspondents.

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

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

BRITTLENESS IN WIRE.—To the 3d querist in No. 18, SCIENTIFIC AMERICAN, I may be able to give some light, by stating that:—It was in the summer of 1864, at about noon, a heavy thunder storm passed over our city, the lightning striking (so to say) at my house, of which all my family, five in number, felt the shock very heavily. It seemed to pass without doing any other damage, but when the first visitor tried to ring the bell, of which the wire runs nearly from south to north, about 60 feet in length, the bell did not answer, and on examining the cause, it was found that the wire was broken into a number of pieces, from 4 inches to 1¼ foot in length, and scattered all along, on the ground, some ends of such pieces having the appearance of being burnt. Others again broken shorter still. On examining the wire, I found it was perfectly good steel. Whether this wire was steel originally, or became converted from iron into steel by the electric current, is more than I am able to assert. [The electric current cannot convert iron into steel—EDS.] There is no lightning rod on my house. It seems to me that the same cause that broke my iron or steel wire, may have partly melted J. H.'s brass wire. Either the electric current was not strong enough to break it, or else the brass offered a greater resistance than iron or steel wire to the destructive force of the current.—I. I. H.

J. P. C., of Ohio.—To tin iron, clean the surface with dilute sulphuric acid—scratch-brushing if necessary—until the entire surface is bright. Take it from the acid, and dip in a bath of hot lime water, and rub dry with bran or sawdust. Then dip it in melted tin, having upon its surface a stratum of melted tallow. To copper iron without a battery, clean in a similar manner, and dip in a solution of sulphate of copper. This method of coppering does not give a good permanent coating, and it is much better to use a battery.

H. S. S.—Small rubber-insulated copper wire will perhaps answer your purpose. Rubber springs are quite durable, if properly made. For the books, consult our advertising pages.

TURBINES.—Your correspondents, L. P. and B., ask if turbine wheels with draft tubes are as good as the same wheel immersed in back water. I answer, No. The draft tube is theoretically right, but practically wrong. If the draft tube were made of iron, and as large as the penstock (the horizontal area of which ought to be 100 times the discharge opening in the wheel) and perfectly air tight, with an air pump to extract the air before starting, it might be about as good as immersion. But as they are generally made too small in diameter (thus increasing the friction) and entirely too temporary to make or maintain anything like a vacuum, the consequence is that when the wheel is stopped, the water drops down the wheel and gets in; and if it stands any length of time, will rust and soon wear out. The best wheel makers are now making their wheels in such a way as to require a hole, 5 inches longer than the wheel proper, to be cut through the planking. The frame timbers are set back from the edge of this hole 3 inches, and the wheel immersed so as to insure the bucket being always full of back water. This will prevent all squirting of the water with fractional gates, and give a true reaction. Reduce friction to its minimum, give the whole power of the fall, and preserv your wheel. See that the pit below the wheel be large enough, and if there be a piece of draft tube cast on the wheel, get it cut off before putting your wheel down.—J. W. H., of Del.

ELECTRO COPPERING.—Your correspondent, F. R. A., wishes a receipt for a solution for electro-coppering. He can easily copper in this way: Make a strong solution of sulphate of copper (boiling water will dissolve the most) and strain it. Connect to the wire from the zinc pole of the battery, a clean plate of copper, and place it in the solution. Suspend from a rod across the top of the bath, by means of wire, the articles to be coppered, care being taken that they do not touch each other, and connect this rod with the other pole of the battery. Smee's battery and the electropoion battery are the best for this kind of work. I have used a battery of 14 one gallon cups (electropoion battery, 15 pound zincs and find it will deposit a large amount of copper in a short time.—E. C., of N. J.

TURNBULL'S BLUE.—Your correspondent, "J. B.," wishes a receipt for making "Turnbull's Prussian blue" (sesquiferrocyanide of iron). Ferrocyanide of potassium, 10 ounces; solution tersulphate of iron, 1 pint; water, 3 pints. Dissolve the ferrocyanide of potassium in two parts of water, and add the solution, gradually, to the solution of tersulphate of iron previously diluted with the remainder of the water, stirring the mixture during the addition. Then filter the liquid, and wash the precipitate on the filter with boiling water until the washings pass nearly tasteless. Lastly, dry it, and rub it into fine powder.—E. C., of N. J.

TURNBULL'S BLUE.—Turnbull's blue is prepared by adding a solution of potassium ferricyanide (red prussiate of potash) to a solution of any ferrous salt. Perhaps green vitriol is the most convenient.—C. T. R. S., D. C.

PERMANENT INK FOR USE WITH STAMPS OR TYPE.—No. 1. Equal parts of black oxide of manganese and hydrate of potash are mixed, heated to redness, rubbed, with an equal quantity of smooth white clay, into a paste, water being added for the purpose. No. 2. Sulphate of manganese, 2 drams; lampblack, 1 dram; powdered loaf sugar, 4 drams; rubbed into paste with water. After stamping, dry the linen, etc., and wash well in water.—D. B., of N. Y.

GRAFTING WAX.—I use a grafting wax which I think is better than one, the recipe of which was given a short time since in this column. This is the recipe: 1 pound tallow, 2 pounds beeswax, 4 pounds rosin. Melt the rosin first, and be sure it is well melted before adding the wax and tallow. If this be not done, the grafting wax will be full of lumps. When melted, pour it into cold water, and work it by hand into rolls of convenient size. In cold weather, soften the wax by putting it into warm water before using.—E. C. P., of Vt.

C. H. G., of M.—Experience has shown that for pipes or tanks designed to supply water for domestic use, zinc coatings are apt to contaminate the water. We do not advise their employment for this purpose.

G. M. D. asks in your number, of December 3, 1870, for a carriage that might be propelled by hand. Such a carriage, made to hold one or two persons, has lately been patented here by a man of Montreal, named Noel Bigavuette, a French Canadian. I cannot say whether his invention is a success or a failure, having only seen the model.—T. G. C. Ottawa.

R. X. T. asks in your number of March 25, 1871, what is the best cement for China ware? According to my own experience, I find that the best and neatest way to mend crockery or China ware, or glass ware, is to tie the pieces together, when the fracture is still fresh, and to boil the article in sweet milk, for ten or fifteen minutes. The crack will not be seen and the cementing is durable.—T. G. C., of Ottawa.

J. C. M., of Ga.—The corrosion of your boiler is evidently due to the presence of some substance in the water which oxidizes it very rapidly. What this is we cannot undertake to say without an examination of a specimen of the water. The specimen sent is red oxide of iron.

J. M. M., of Pa.—We do not know of any authorities on the subject of narrow gage railways. The question of narrow or wide gages is only one of policy, in our opinion, and must be individually considered by each company for itself. There has been much controversy on the question in the leading engineering papers at home and abroad, but little that is of much value has been said or written.

W. E. H., of Conn.—You cannot communicate permanent magnetism to anything except steel. The armature is composed of soft iron, and that is the reason it does not retain the magnetism.

W. H. C., of Pa.—The specimen sent is mica, in the usual laminated form in which it is found, and in which it is used for stove doors.

W. M. M., of Mich.—The mere weight of valve and lever is not enough to deduct from the counterpoise, in calculating the distance from fulcrum to weight, etc., on safety valves. There is the leverage to be taken into account.

E. C. P., of Vt.—The plan suggested by you for canal boat propulsion has been, in its essential features, already tried. It may be, however, that you have modified its details, so as to remove some of its practical difficulties.

H. B. of Ontario.—The article referred to does not state that carrots have not been a long time used for coloring butter. It describes a method of extracting the coloring matter by a chemical process, so that it can be made an article of commerce.

NEW BOOKS AND PUBLICATIONS.

LITHOGRAPHIC PLANS AND STEREOSCOPIC VIEWS OF A MODEL HOUSE. Descriptive Circular and Price List, sent free by George L. Colby, Architect, Waterbury, Vt.

These plans and views give a complete representation of a house symmetrical in form, economical in construction, convenient in arrangement, and beautiful in appearance, embracing the latest modern improvements. It will be of service to any contemplating the erection of a dwelling house.

WE are in receipt, from the Department of State, of a set of six volumes of the Reports of the United States Commissioners to the Paris Universal Exposition, 1867. For these most valuable and interesting documents, the Department will please accept our acknowledgments.

A. J. BICKNELL & CO., architectural book publishers, formerly at Troy N. Y., and Springfield, Ill., have removed to 27 Warren street New York.

Recent American and Foreign Patents.

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

FIFTH WHEEL FOR CARRIAGES.—This improvement is designed to avoid the weakening of parts by the cutting away of the same, when the ordinary kingbolt connection is used. To a top pivot plate, a ball is attached, which is inserted into a socket formed in the bottom plate. The ball is held in its socket by slides, which are inserted in dovetailed grooves in the bottom plate, the slides being secured by bolts. The arrangement allows a socket movement of forty-five degrees in cramping the vehicle. In the attachment to wagons, where very little rock is required, the ball is flattened on its vertical axis, and notched upon its sides, similar notches being made in the edge of the socket, so that by turning the plate a quarter of the way around, the ball will enter the socket, and *vice versa*. Invented by Peter S. Eastman, of Washington Mills, New York.

CLOTHES DRYER AND TOWEL RACK.—Thomas H. Chubb and William G. Marston, of Post Mills, Vt.—This consists of a large and small drying frame, pivoted together in such a way, that when extended they, in connection with another supporting frame from a dryer that gives large extent of holding capacity, may be placed upon the floor, or suspended from the walls of a room, to be used for the purpose specified.

POTATO DIGGER.—Clark Cooney, of Columbus, Nebraska, has invented a potato digger, in which a vine scraper, made of sheet metal in the form of a V-shaped plow, is attached to the front of a frame. The frame is carried on two forward truck wheels and two caster wheels at the rear. It carries a scraper for scooping up the potatoes and earth. From the scraper the earth and potatoes pass on to inclined sifting bars, and thence on to an inclined way having an open bed of wire for the further separation of the earth. From this way the potatoes pass to an elevator, which delivers them into a conveyer or screw in a trough, which forces them in a horizontal direction, and delivers them into the body of a cart or wagon, which is drawn along with the machine to receive them. The elevator and conveyor receive motion through gearing actuated by the truck wheels.

HORSE POWER.—Theophilus Harrison and William C. Buchanan, of Belleville, Illinois.—The object of this invention is to construct a mounted horse power, which has its power-conveying shaft low enough to connect directly with the tumbling rod, without requiring inclined or other inconvenient connections, and in which the said conveying shaft and appendages can be elevated sufficiently high from the ground to clear stumps and stones, while the machine is being moved to and from the place of operation. This is an excellent invention, and will prove of great service where horse powers are required for sawing on rough land.

FRINGE TWISTER.—Hiland Howard, of Leeds, N. Y., assignor to himself, James Fowks, and George Howard, of the same place. This invention consists of a novel combination of apparatus for separating the threads and twisting fingers, whereby, the shawl or other article being stretched between the cloth beams or rollers, the threads will be separated uniformly for forming the strands, and the strands will be twisted separately, then doubled and twisted together simultaneously throughout the whole breadth of the shawl.

COMBINED RECTIFIER AND FILTER.—In this invention, patented by John C. Schnell, of Cincinnati, Ohio, assignor to himself and Eberhard Cammerer, of the same place, the fluid to be filtered, or filtered and rectified, flows from a superposed reservoir down into a cylinder containing two concentric annular chambers, and a central cylindrical chamber. The fluid enters the central chamber first, which chamber contains wool, cotton, or other filtering material. The liquor passes out through perforations near the bottom of the central chamber, and then passes up through the annular chamber which surrounds the inner one. This cylinder is filled with pulverized charcoal. When the liquor reaches the top of the latter chamber, it flows through perforations into the outer annular chamber, which is also filled with charcoal. Thence the fluid passes downward, and escapes through a perforated false bottom into a chamber, whence it is drawn as required.

MEDICAL COMPOUND FOR CURE OF RHEUMATISM.—Harvey Sawyer, of Wilson, in the county of Wilson and State of North Carolina, has invented a medical compound for the cure of rheumatism, neuralgia, and other complaints, which he specifies as follows: To one quart of molasses I add, of nitric acid, six ounces; muriatic acid, six ounces; and let the composition stand and ferment for the space of three days. I then add half a gallon of strong solution of Castile soap, and half a gallon of spirits of camphor, and one and a half ounces of oil of cubebs. The above-mentioned ingredients, when combined as specified, form a liniment.

MACHINE FOR TENONING SPOKES.—This invention consists chiefly in the arrangement of vertically adjustable supports of the spokes, the same being set by means of sliding wedges, and also in the use of a peculiar elastic clamp, provided with a longitudinally adjustable fulcrum block. It is the invention of Arthur Sherman, of Poughkeepsie, N. Y.

JOINER'S PLANE.—In this plane, the plane iron is set to take the proper cut by means of a set screw, and is held to its place by means of clamping plates which engage the iron on the front edges, the clamping plates being attached to the prongs of a bifurcated rod, which passes from the plates rearward through the wood, and is tightened by means of a thumb nut. This improvement is the invention of James K. P. Smith, of Jeffersonville, Ind., assignor to himself and L. S. Shuler, of the same place.

SECURING COLLARS TO LAMPS, ETC.—E. S. Kennedy, of Birmingham, Pa.—In the outer sides of the neck of the glass lamp, molasses cup, or other article, two or more recesses or notches are formed which receive spring pawls or catches, attached to the inner side of the collar or cap. A rubber band or other suitable packing ring being placed upon the top of the lamp, the cap is pressed on, and the pawls engaging with the upper shoulders of the recesses, hold it firmly to its place, thus obviating the use of cement and its attendant inconveniences.

SNOW PLOW.—Alexander Stutzman, of Somerset, Pa.—This plough consists mainly of an upper and under plate, wedge-shaped at the front end, and joined at the point by a V-shaped plate, while between the plates are laterally moving wings, which thrust the snow from the center outward, being actuated by a lazy-tongs movement, and a pitman impelled by a gear and pinion, the main driving gear being keyed to one of the axles of a truck which carries the plow. The plow is designed for cleaning snow from railways.

PLANING, MOLDING, AND TENONING MACHINE.—Joseph Albright, Midway Tenn.—This invention relates to a machine for planing, molding, and tenoning lumber, by means of cutters, which are all placed at different times upon the same shaft; the carriage that supports the stuff being provided with a peculiar clamping apparatus for holding the lumber while under the action of the cutter, the cutter-shaft being arranged to be raised or lowered to suit the thicknesses of the stuff; and the carriage, that sustains the pieces while the tenons are sawing on them, being arranged to be raised and lowered for the discharge of the sawing function.

LAMP.—Charles B. and Stephen S. Munn, Baltimore, Md.—This invention relates to a connecting drum interposed between the burner and lamp, and having an opening with an inner slide, through which the lamp reservoir may be replenished without removing the burner or chimney, or extinguishing the light, and to a wick chamber or tube made of brass, or other suitable metal, and extending downward into the reservoir or fount; and to outlets in said drum, or in the burner, for the purpose of preventing explosions.

PUDDLING FURNACE.—Simeon Burn, of Belleville, Ill.—This consists in the application of a cooling device to the under side of the bottom plate of puddling furnaces, and in improvements in the arrangement of the chills, placed above the bottom plates for the protection of the latter, and to make them more efficient and durable. To effect this, air is admitted under the bottom plate, and distributed over the surface by means of curved ribs attached to the bottom plate, and the chill for the upper side is effected by means of a forked or branched hollow casting, through which air is also admitted, both air-ways being connected with the chimney, so as to secure a regular and uniform draft to cool the plate.

GRINDING MILL.—Henry Hensley, of Elysianfield, Texas.—The stones both revolve, instead of one being fixed and the other revolving, as has hitherto been the case. To effect this, the upper stone is hung on a spindle, running in bearings attached to the upper part of the frame, and the lower one runs on another spindle, having its bearings and step in the lower part of the frame. Both are driven by an endless belt, which, passing over a drum running on a horizontal shaft, passes around the pulley on the upper spindle, thence back to the drum, thence to the pulley in the lower spindle, and thence back to the drum, causing the stones to move in opposite directions, as required.

HORSE DETACHING APPARATUS.—This consists in a sliding bar attached to the whiffletree, or to a secondary whiffletree, to which the one having the horse hitched to it is connected by cock eyes, or rings, in the ends of short traces hooked into studs projecting from the end of the whiffletree, said bar being provided with a holding and tripping spring and ears, through which one of the studs, holding a trace, passes. By the sudden jerk of a cord, one of the short traces is released, and a guard which holds the trace in the other stud is then released, which frees the traces, and thus detaches the horse. Invented by John Linton Hamilton, of St. Joseph, Mo.

COMBINED TOOL.—John W. Currier, Newbury, Vt.—This invention consists of the combination in one instrument of the following tools, namely: a hammer, nail puller, pliers, wrench, screw driver, nest of wrenches awl, and eyelet maker.

PIANO VIOLIN.—Elisha D. Blakeman, of Mount Lebanon, N. Y., has invented an instrument which combines the peculiarities of the piano and violin. It consists of a sound box, upon which a string is tuned to a proper pitch. The string being agitated by a bow, is made to give a succession of musical tones by means of keys, which, played by the fingers of the hand unoccupied by the bow, press upon the string, making higher or lower sounds, as the vibrating portion of the string is shortened or lengthened.

COTTON PLANTER AND GUANO DISTRIBUTOR.—This is a new combination of devices, whereby cotton may be planted, or guano distributed, uniformly and rapidly, and so adjusted that more or less of the seed, or fertilizer, may be distributed, as may be desired. A plow tooth opens the furrow for the reception of seed or fertilizer. The plow is followed by a double-bevel edged wheel, which presses out the side of the furrow, so that it shall not close before the seed is dropped. Back of this wheel is a dropping drum, divided in the middle at right angles with its shaft, the two parts being adjustable to or from each other, to regulate the flow of seed from the space left between the two parts. Behind the dropping drum is placed a covering block, in line with the furrow. The dropping drum is rotated by a belt from a pulley on the double-bevel edged wheel above described, the latter having at its outer edge teeth, which engage with the ground and compel it to rotate, as the machine is drawn along by a horse or mule. Invented by James Ratter, of Winona, Miss.

ATTACHMENT FOR SASH WEIGHTS.—In each edge of the sash is placed a slotted plate, sunk in so that its face is flush with the edge of the sash. The slot extends from the upper end of the plate nearly to the lower end. A cord holder, made in the form of a rod or plate, and of such shape that its upper part will fit the slot, while its lower part rests behind the slotted plate, having a shoulder which rests upon the slotted plate at the lower end of the slot, is perforated by a conical hole to receive the cord, the knot on the latter entering partially into the hole. The cord holder is grooved on its face to receive the cord. When the sash is put in the frame, the cord holder will be held in its place. As soon, however, as the sash is removed from the frame, the cord holder is released. Invented by Freeman Brady, of Washington, Pa.

FLOCK CUTTING MACHINE.—This is the invention of Monroe Morse and Charles H. Morse, of Franklin, Mass. To construct a machine that will cut flock to any required degree of fineness, is the purpose of this invention. In order to accomplish this desirable result, the inventors adjust the cutting and feeding mechanism to different degrees and materials, by a mechanism which cannot be described in such a notice as the present. The machine is extremely compact, and, we judge, well calculated to secure the end desired. The materials are put into a hopper, from which they feed down into openings in the centers of circular cutter heads, whence they are fed outward between the cutter heads by centrifugal force. The lower cutter head is made vertically adjustable, to regulate the fineness of the cutting. All the parts are strong, and apparently durable, and we think the machine will be likely to meet with the approval of manufacturers.

LUNCH BOX.—This is a rectangular box, formed in halves, hinged together, containing interior vessels, lids, etc., and having exterior handles and support. Invented by Daniel Tuxell, of Newark, N. J. The arrangement of the details of this box renders it a very convenient one.

Queries.

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

1.—I wish a fluid that I can write with, and have it luminous in the dark, but which contains no phosphorus?—W. H. C.

2.—CLOTH ROLLERS.—I wish to know what is the best substance to use, to put on a cloth roller to weave brown sheetings. Whatever article is named, please give number and mode of putting it on.—R. A. D.

3.—TEMPERING SPIRAL SPRINGS.—Will some one give me some information as to the manner of tempering spiral springs, and some of the preparations used?—S. B. C.

4.—UPRIGHT TUBULAR BOILER.—Will some steam fire engine or other builder inform me, what horse power an upright tubular boiler will probably develop, say 42 inches diameter, 48 inches high to the shoulder or dome base, dome 12 inches high, say total hight 60 inches (to include fire box and ash pit) to drive four cylinders, each 5 inches diameter and 10 inch stroke? Fuel, coal or wood, according to circumstances.—P.

5.—DISSOLVING MICA.—Is there any way to dissolve and hold in solution mica, or, as it is sometimes called, isinglass?—M.

6.—DEEPENING COLOR OF INK.—What acid added to ink, or such dark substance, will make it of a deeper black color?—M.

7.—CRYSTALLIZING TIN PLATE.—I have been using nitro-muriatic acids for crystallizing tin plate for water coolers, but it makes them too dark, and does not bring out the spangles. Please inform me what I must do to obviate the trouble.—C. R.

8.—NEEDLE TELEGRAPH.—Can any one give a remedy for the irregular working of the needle telegraph in tropical climates? During the warm, sultry days it is hardly possible to get a signal through from station to station, on account of the magnetized needles becoming demagnetized, even when there is no actual lightning.—S. F.

9.—LIQUID GLUE.—Can any of your numerous correspondents give me a recipe for preparing a mucilage from glue that will always remain in a liquid state, and still retain its adhesive qualities? I use very fine glue.—S.

10.—WOOL CARDING MACHINES.—How can I prevent the electricity in the rubbers of finisher points of wool carding machines, and also on the railroad head of cotton machines, as the cotton will stick to the plunger and the tin can? Keeping the floor wet helps the matter some, but it is a disagreeable practice. I have often remedied the electricity of the rubber points of woolen machines by putting lamps on the floors under the ends, but there seems so much electricity in our mountain air that it does not seem to do much good here. Steam pipes with jet holes would answer, but it is inconvenient for me to use steam.—X.

11.—A WOMAN'S WANT.—The best thing to kill bed bugs.—HOUSEKEEPER.

12.—LACKER FOR BRASS AND IRON.—What is the best lacker for iron or brass, that can be changed to any color without injuring its adhesive quality, and that will harden by exposure to the air or sun, without putting in the oven? I need something of the kind to finish up lamp bases, etc., and to coat small articles made of tin and brass.

13.—VISE JAWS.—What is the best material to stick leathers to vise jaws, for holding gibs and keys, and other fine work, while finishing? I have tried copal varnish, but it is not satisfactory.—C. A. W.

APPLICATIONS FOR EXTENSION OF PATENTS.

INSTRUMENT FOR INDICATING THE DEPTH OF WATER IN SHIPS.—Gideon B. Massey, New York city, has petitioned for an extension of the above patent. Day of hearing, July 26, 1871.

CUPOLA AND OTHER FURNACES.—Philip W. Mackenzie, Blauveltville, N. Y., has petitioned for an extension of the above patent. Day of hearing, Aug. 9, 1871.

RAKING APPARATUS FOR HARVESTERS.—Joseph W. Budd, Midland City Mich., has petitioned for an extension of the above patent. Day of hearing August 2, 1871.

VIBRATING SHEARS.—John Toulmin, Worcester, Mass., has petitioned for an extension of the above patent. Day of hearing, August 9, 1871.

Value of Extended Patents.

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

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LAMP.—J. N. Aronson, New York city.
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MOLD.—J. Demarest and J. L. Mott, Mott Haven, N. Y.
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ORE PROCESS.—W. Hooper, Ticonderoga, N. Y.
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114,751.—CARRIAGE TOP.—W. Bauder, Circleville, Ohio.
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114,753.—SCREEN.—E. G. Belknap, Philadelphia, Pa.
114,754.—DRILL.—A. Blatchly, San Francisco, Cal.
114,755.—CAR COUPLING.—E. Bolman, G. Clarke, Halifax, N.S.
114,756.—LOOM.—S. Boorn, Lowell, Mass.
114,757.—TICKET BOX.—N.C. Burson, J. Robertson, Onargo, Ill.
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114,761.—CEMENT.—Isaac Charles, Allegheny City, Pa.
114,762.—GRATE.—J. Churchman, Burlington, N. J.
114,763.—GAS RETORT.—D. W. Clark, Chicago, Ill.
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114,768.—SCROLL SAW.—G. Cooke, Napier, Canada.
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114,770.—TOOL.—J. W. Currier, Newbury, Vt.

114,771.—TELEGRAPH.—L. C. D'Arlingcourt, Paris, France.
114,772.—TAPER.—S. and G. Dare, New York city.
114,773.—ELASTIC TYPE.—H. J. Davies, New York city.
114,774.—FURNACE.—J. Davis, Pittsburgh, Pa.
114,775.—FIRE EXTINGUISHER.—J. C. Davison, Chicago, Ill.
114,776.—PURIFIER.—G.C.L.Degenhardt,Williamsburgh,N.Y.
114,777.—CHAIR.—E. Dietz, Philadelphia, Pa.
114,778.—SCROLL SAW.—W. H. Dobson, Rochester, N. Y.
114,779.—PLANE.—J. E. Donaldsno, Montezuma, Ind.
114,780.—KILN.—E. P. Eastwick, Baltimore, Md.
114,781.—SPINNING TOP.—P. Ely, New York city.
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114,783.—VELOCIPEDE.—W. Erd, New Ulm, Minn.
114,784.—COMPOUND.—W. P. Fennell, Louisville, Ky.
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114,786.—STEREOTYPE BLOCK.—J. Fish, Chicago, Ill.
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114,791.—TELEGRAPH.—T.M.Foote,C.A.Randall,Brooklyn,N.Y.
114,792.—TELEGRAPH.—T.M.Foote,C.A.Randall,Brooklyn,N.Y.
114,793.—TELEGRAPH.—T.M.Foote,C.A.Randall,Brooklyn,N.Y.
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114,797.—COUPLING.—E. M. George, Three Rivers, Mich.
114,798.—COMPOUND.—L. C. Gifford, Monticello, Ill.
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114,800.—CLAMP.—W. H. Goodchild, Centreville, N. J.
114,801.—CLAMP.—W. H. Goodchild, Centreville, N. J.
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114,803.—STILL FOR OIL.—John Gracie, Pittsburgh, Pa.
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114,963.—BANK CHECK, ETC.—A. C. Paquet, Philadelphia,Pa.
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114,965.—DRAFT REGULATOR.—W. E. Pearson, E. Boston,Ms.
114,966.—FLOUR BOLT.—D.N.M.Peregoy, Elizabethtown,Ten.
114,967.—MILLSTONE.—D. N.M.Peregoy,Elizabethtown,Tenn.
114,968.—COPYING DRAWINGS, ETC.—I.Rehn,Washington,D.C.
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114,970.—BOOT JACK.—M. A. Richardson, Sherman, N. Y.
114,971.—LARD PACKAGE.—John Ring, St. Louis, Mo.
114,972.—PRESERVING MEAT.—A. Robertson, Seymour, Ind.
114,973.—WAGON BRAKE.—John J. Rose, Elmwood, Ill.
114,974.—SEPARATOR.—L. C. Royer, Royerton, Ind.
114,975.—KNIFE.—Morgan Rufe, Doylestown, Pa.
114,976.—BRAKE.—J. W. Scott, Broad Top City, Pa.
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114,978.—BLACKING.—J. C. Sellars, Birkenhead, England.
114,979.—CAR WHEEL.—G. Sewell, Brooklyn, N. Y.
114,980.—BOLTING ROLL.—D. Shamp, Perry, N. Y.
104,981.—FAUCET.—E. D. Shoenberger, Philadelphia, Pa.
114,982.—HITCHING POST.—E.F.Shoenberger,Germantown,Pa.
114,983.—BRAKE.—C. A. Smith, Jersey City, N. J.
114,984.—SEPARATOR.—John Smith, Burlington, Wis.
114,985.—COOLING MILK.—D. E. Somes and F. C. Somes, Washington, D. C.
114,986.—SQUARE.—Knud Steen, Rochester, N. Y.
114,987.—RULE JOINT.—D. H. Stephens, Riverton.
114,988.—DRAFT EQUALIZER.—W. Stevenson, Neponset, Ill.
114,989.—PUMP.—Z. T. Sweet, Tiskilwa, Ill.
114,990.—WASHING MACHINE.J. Taber, S. Wolfborough, N. H.
114,991.—NUT LOCK.—S. I. Thompson, New Waterford, Ohio.
114,992.—KEY FASTENER.—L. Tobey, Naples, N. Y.
114,993.—DOUGH KNEADER.—W. Tyler, Georgetown, D. C.
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114,995.—BRAKE.—Henry Walmer, Lebanon, Pa.
114,996.—HYDRANT.—James Walsh, Philadelphia, Pa.
114,997.—TOBACCO PIPE.—W. F. Warburton, Philadelphia,Pa.
114,998.—ICE CREEPER.—M. Warne, Philadelphia, Pa.
114,999.—PITCHING CASKS.—Albin Warth, Stapleton, N. Y.
115,000.—LATHE.—Hervey Waters, Boston, Mass.
115,001.—BOLT.—Jacob Weimar, New York city.
115,002.—CIGARS.—John Wettstein, Baltimore, Md.
115,003.—ALARM.—F. E. Whiteside, Oxford, Pa.
115,004.—HARVESTER.—J. B. Whiting, Ripon, Wis.
115,005.—PAPER.—J. M. Willcox, Glen Mills, Pa.
115,006.—SHUTTLE.—Daniel Wright, Waltham, Mass.
115,007.—SCREW BOLT.—C. O. Yale, New York city.
115,008.—HAMMER.—G. M. Young, El Paso, Ill.
115,009.—BOLT.—O. P. Briggs and L. W. Briggs, Chicago, Ill.

REISSUES.

4,379.—HORSE POWER.—H. Aldridge, Elizabethtown, N. M.—Patent No. 68,829, dated September 17, 1867.
4,380.—GRINDING ORE.—Thomas Bates, Central City, Colorado.—Patent No. 102,476, dated May 3, 1870.
4,381.—HEAD COVERING.—C. F. Bosworth, Milton, Conn.—Patent No. 38,506, dated June 9, 1863.
4,382.—PULLEY.—G. W. Gregory, New York city.—Patent No. 57,135, dated August 14, 1866; antedated February 14,1866; reissue No. 2,784, dated October 22, 1867; reissue No. 2,939, dated May 19, 1868.
4,383.—CULTIVATOR.—T. McQuiston, Morning Sun, Ohio.—Patent No. 25,543, dated October 18, 1859.
4,384.—SEASONING LUMBER.—H. H. Beach, Rome, N. Y.—Patent No. 107,854, dated October 4, 1870.
4,385.—FEEDER.—G. Cade, Long Branch, N. J.—Patent No. 109,427, dated April 5, 1870.
4,386.—STOVE.—W. J. Keep, Troy, N. Y.—Patent No. 101, 368, dated March 29, 1870.
4,387.—HEATER.—David Stuart and Lewis Bridge, Philadelphia, Pa.—Patent No. 79,275, dated June 23, 1868; reissue No. 3,608, dated August 17, 1869.

DESIGNS.

4,903.—SASH HOLDER. E. C. Heister, G. O. Heister, Reading, Pa.
4,904.—ERASER.—S. D. Hovey, Brooklyn, N. Y.
4,905.—CARPET PATTERN.—A. McCallum, Halifax, England.
4,906.—FOUNTAIN.—J. Moore, W. Wilkinson, Brooklyn, N. Y.
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4,908.—CARPET PATTERN.—E. Perrin, Kidderminster, Eng.
4,909.—CARPET PATTERN.—E. Perrin, Kidderminster, Eng.
4,910.—STOVE.—J. R. Rose and E. L. Calely, Philadelphia, Pa.
4,911.—BRACELET.—D. H. Smith, Attleborough, Mass.
4,912.—CLOCK CASE.—W. L. Tyler, Bristol, Conn.
4,913.—BEDSTEAD.—N. C. Whiscomb, Oak Hill, N. Y.
4,914.—CARPET PATTERN.—G. C. Wright, New York city.
4,915.—JELLY GLASS.—J. S. Atterbury and T. B. Atterbury, Pittsburgh, Pa.

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EXTENSIONS.

BINDING BOOKS.—A. H. Rowand, of Allegheny City, Pa.—Letters Patent No. 17,299, dated May 12, 1857.
BEDSTEAD FASTENING.—A. M. Rodefer, of Springfield, Ohio.—Letters Patent No. 12,693, dated April 10, 1855.

DISCLAIMERS.

LANTERN.—W. Westlake, J. F. Dane, and J. P. Covert.—Letters Patent No. 42,520, dated April 26, 1864; reissue No. 3,747, dated Nov. 23, 1869.
COMPOSITION FOR ROOFING.—Plastic Slate Roofing Joint Stock Company, of New York city.—Letters Patent No. 46,495, dated Feb. 21, 1865; reissue No. 2,681, dated July 16, 1867.

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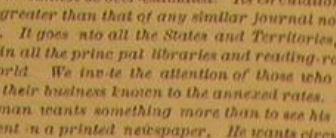
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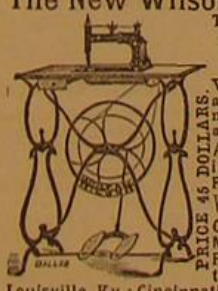
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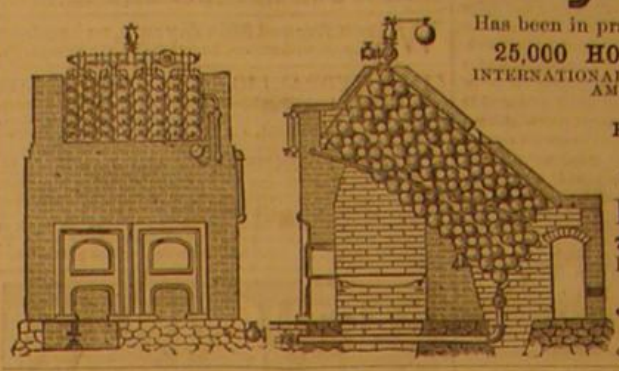
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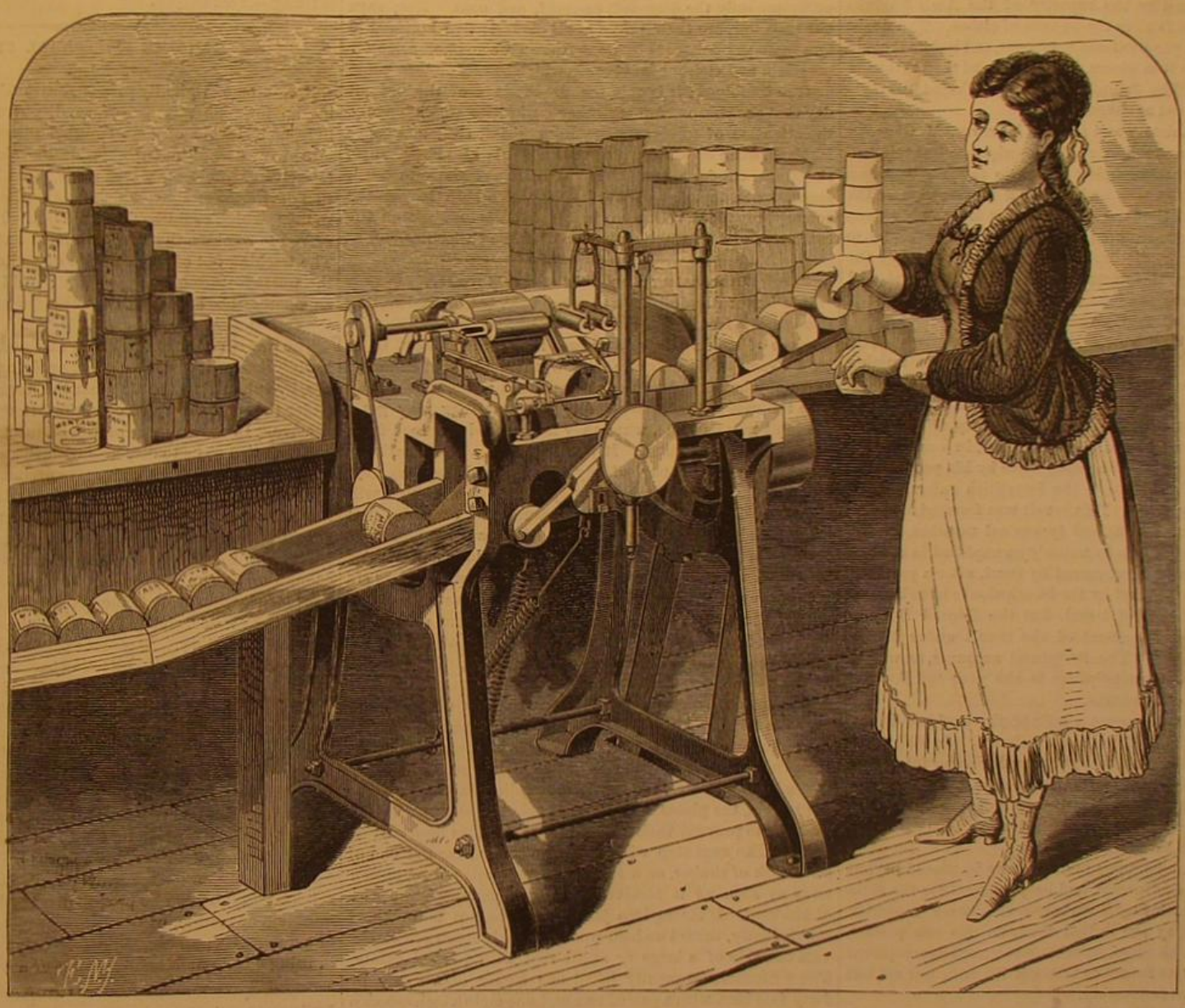
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Vol. XXIV.--No. 23. [NEW SERIES.] NEW YORK, JUNE 3, 1871. $3 per Annum. [IN ADVANCE.]

Machine for Labeling Fruit and other Cans.

Within the past ten years the manufacture of cans for the preservation of fruit and vegetables, and the packing of oysters, for those sections where the delicious bivalves cannot be enjoyed in their native freshness, has increased to such an extent as to be one of the great staple industries of the country. Thousands who, amid the snows of winter, eat the succulent corn or the aromatic tomato, with a sort of matter-of-course feeling, have no idea what a blessing this system has been to the weary traveler on the ocean's bosom, to him who crosses the vast and almost sterile plains of the heart of our continent, to the miner in the wilds of Idaho, or the Arctic explorer.

But few of us in our daily walk to or from the great center of bustle and money getting have not paused to admire the gay display with which the tasty grocer adorns his window. The rich, many colored labels contrast prettily with the bright silvery tin, and with a dainty background of viands brought from all parts of the earth to satiate the cravings of appetite or gratify luxurious taste. It would be beyond our space as well as our intention to enumerate the vast establishments of East, West, or South, or of our own city, to give statistics of the immense business they do, the ground they cover, and the hands they employ to supply the demand for fruits and vegetables out of their natural season. So great has this demand become, that in a commercial and sanitary point of view, every improvement in their preparation for market which cheapens their production is a public benefit, even to the teeming thousands who crowd the tenement houses of our city.



TYRRELL'S MACHINE FOR LABELING FRUIT AND OTHER CANS.

The machine, of which we present an engraving this week, is designed to save the labor of labeling cans by hand, as heretofore performed. In all manufactures where cans or bottles are used, custom and a species of advertising has necessitated the use of labels. No sane business man looking to a sure sale for his goods, would now-a-days think of sending them out without labels. We need not argue the necessity of these bits of paper; whether ornamental or simply useful, they must be affixed to the cans, and the most rapid means of accomplishing that end of course tends to cheapen the cost of production. An active, vigorous hand cannot paste on bottles an average of more than 800 labels per day. If we reckon this hand to cost $5 per week, we shall have a cost of about one cent for every ten cans, or 14·4 cents per gross.

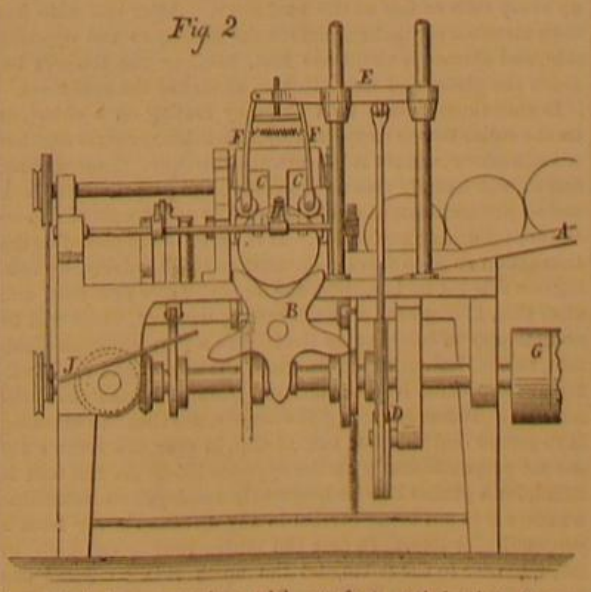
The machine to which we call attention will, it is claimed, do ten times as much with two girls to attend it. Thus two girls, with the machine, will label 8,000 cans or bottles per day of ten hours; or 48,000 per week, at a cost of $10, while the best that ten girls can average in this same time is 48,000 at a cost of $50; a clear saving to the canner, by the use of the machine, of $40 per week. This saving enables him to sell his product at least 10 cents per gross cheaper. To the general reader this would seem a small matter, but when it is recollected that Baltimore alone, last year, put up 40,000,000 cans of oysters, the sum total of saving becomes immense. Then add to this the large number of cans of fruits, vegetables, meats, coffee, spices, and condensed milk, and the large saving effected is easily to be perceived. Then view the great competition in the market, the increasing demand, and the absolute necessity of production at decreased rates, and it is evident that this machine is one of great value to manufacturers and of approximate benefit to the general public.

But it is not only in things edible that this machine becomes of use. Paints, oils, varnishes, tobacco, and, in short, every kind of round tin or glassware that has to be labeled comes within the scope of its operation.

The inventor has had a long experience in one of the largest paint factories in this country. In times of busy trade he saw the value and need of such a machine, and after careful effort, brought it to perfection.

The machine from which our illustration is taken has, it

Fig 2



is stated, been running with perfect satisfaction for over four months in the paint factory of Messrs. C. T. Raynolds & Co. It takes in four sizes of cans, and has labeled 9,000 in 10 hours.

Of course a machine can be made adjustable to the largest size cans. The power, required to run it, is hardly a tenth of a horse power, and it might be so arranged as to run by hand if desired.

Fig. 1 is a perspective view of the machine when at work Fig. 2 is a sectional detail from which the operation of the machine can be understood.

The can is fed in at the chute, A, Fig. 2, and is taken up by the revolving star, B; it is there retained in place long enough to receive the label from the gumming wings, C. The cam, D, gives downward motion to the cross-head, E, and thence to the arms, F F, with the smoothing rollers attached thereto. The can is then discharged by a partial revolution of the star, B, on to the chute, J, as shown in Fig. 1. Power is applied at G. The finger, H, holds the label in place while the gumming wings return for another label.

The patent for this machine has been granted to Edward Tyrrell, assignor to himself and L. Richardson. Rights to use or manufacture this machine, in States or counties, will be sold. For further particulars, address the patentee at 281 and 295 Plymouth St., Brooklyn, N. Y.

Kalsomining.

The rough unfinished appearance of a white or yellow washed wall is not its most disagreeable peculiarity. It perpetually gives off its dirt, and its own fabric in powder, to any one who brushes it with his garments, or who hangs his clothes against it. The superior smoothness and glaze of a good kalsomined wall is a great improvement to the style of the interior of a house; and if well made, such a surface is suitable to the best rooms of a good house, and is so cheap as to be within the means of the poorest. It requires care and judgment in the selection of the not expensive materials, and above all, capability and skill in applying it to the wall.

The plaster is made of Paris white, a fine powder produced by the pulverization and elutriation of common chalk, mixed with fine, clear white glue, dissolved in water. The Paris white costs about three cents a pound, but the wandering operatives who apply for jobs ask a much higher price for it.

The process should be commenced by soaking four ounces of glue in a quart of warm water for twenty or twenty-four hours; then a pint of water should be added; and the vessel (of tin or other thin metal) should be placed in a kettle of hot water over a fire, the glue being agitated till it is thoroughly dissolved and the solution quite clear. Put five or six pounds of powdered Paris white into a large bucket, and add hot water sufficient for the mixture to be of the consistency of cream. Then mix the glue water with it, stir it well, and paint the walls with the mixture with the usual whitewash brush.

It is of the utmost importance that the kalsomining mixture be spread very smoothly, and to secure this, a little hot water must be added, if the stuff be too thick for easy and level application. The quantities given above are sufficient for two coats on a large room, say one eighteen feet square; and for good work two coats should always be applied. A little care in manipulation will produce by kalsomining a neat and handsome effect, even in the hands of the most inexperienced operator.

The Moabite Stone.

In the dreary and almost inaccessible region that lies between the mountains of Moab and Mount Pisgah, on the eastern shore of the Dead Sea, and extending to the Arabian Desert, there was, up to about three years since, a curious relic of a people long past away. A column of stone, forty-one inches in hight, and rather more than twenty in each of its other two dimensions, covered with an inscription of thirty-four lines, containing over a thousand letters and figures, in the ancient Hebrew tongue; such was the Moabite Stone. This inscription is stated by some scholars to be the oldest writing extant, and if we consider the hieroglyphics of Egypt to be drawings, and not writings, the opinion may be a just one; although the inscribed monuments of Egypt give most distinct and intelligible accounts of the lives and manners of their times, by means of pictorial representations.

The stone was discovered by the Rev. F. A. Klein, a member of the German community at Jerusalem, on August 19, 1868. The existence of the stone became known at about the same time, to M. Ganneau, the French Consul at Jerusalem, and to Captain Warren, who is travelling over all parts of the Holy Land, for the Palestine Exploration Association, of England. Each of these three gentlemen was anxious to obtain the stone to be forwarded to Berlin, Paris, or London; but the delay caused by the rapacity of the Arab Sheikhs who owned it, was fatal to the success of either. The Arabs regarded it with a superstitious reverence, and before it could be removed, broke it in pieces, by heating and then throwing cold water on it. The fragments were distributed throughout the neighborhood as charms.

Fortunately for histo.y and science, however, M. Ganneau obtained a paper impression, of the inscription, but this suffered partial destruction, being torn into seven pieces in a scuffle, by the natives who had watched M. Ganneau at the work. The cast of the inscription was not irreparably damaged, and it has been restored sufficiently to allow copies to be taken. Moreover, attempts to collate the pieces of the stone itself, are now being made; and it is to be hoped that this can be done, and the invaluable contribution to history, philology, and archæology given to the world.

The inscription on the stone shows that twenty-two letters were in use in the ancient Hebrew tongue, and this number coincides with the Hebrew alphabet used in the time of David, as will be seen on reference to Psalm CXIX. The message, travelling over such a tract of history, tells that the stone was erected by Mesha, king of Moab, in commemoration of the achievement of independence by his people, they having thrown off the yoke of the Israelitish rulers, a'ter a subjection of forty years. This revolt was fostered, and perhaps created, by injudicious and tyrannical taxation, a cause of revolution which has been notably exemplified in modern times. The land was reconquered by Omri, after a period of four years. Omri is stated by the inscription to have been an usurper to the throne of Israel, but the Second Book of Kings, which gives an account of the revolt under Mesha, does not mention him. The Scriptural accounts, as well as the inscription, concur in pointing to the year 892 B. C., as the probable date of the stone.

Thus is laid before our eyes a relic of the world as it was just after the deaths of Ahab and Jezebel, before Elijah the Tishbite was translated, before the carrying away into Babylon, and before the war with Pharaoh-Necho. It was carved and set up three hundred years before Rome was a settled territory, and was a thousand years old when Jerusalem was destroyed by Titus Vespasian.

By modern arts, its strange message may be placed beyond the possibility of destruction, and be preserved for the satisfaction of the curious for twenty-seven other centuries. What changes it may see in that time, no one can predict. That the cause of progress, enlightenment, and development may go on during its future as through its past, our readers will concur with us in trusting.

In connection with this subject, we may mention that it is proposed to send to the Holy Land, an exploring expedition from this country. Much has been already done by Dr. Robinson and others of our countrymen, as well as by Captain Warren, before mentioned; and any search that may be prosecuted in this most interesting of all historical lands will certainly be rewarded by valuable discoveries. A meeting was held last week at Dr. Crosby's church, on Fourth Avenue, New York, which was largely attended, and at which a subscription was commenced. A copy of the inscription on the Moabite stone was exhibited at the meeting, and was studied with much interest. For the sake of all ancient and modern science, we wish the movement every success.

A Gas Well at Buffalo, N. Y.

The fact that a large and steady flow of gas had been obtained by boring into the earth, at various points on the lake Erie shore, led the Buffalo Gas Company to put down a well in that city in the expectation of reaching gas. The work was begun on the first of February, and is now completed. The first vein of gas was struck at the depth of 318 feet, and the gas fissures gave out their contents at nearly regular distances of twenty feet thereafter. At the depth of 630 feet, the salt water was thrown out of the well with such violence as to show there was a strong impelling force beneath it. The water was then pumped out and the well was tubed, when the gas began to flow freely. The tube, a two inch one, was lately put in, and the flow has been regular from that time, in quantity sufficient to furnish fuel for a large manufacturing establishment. At the gas house, the natural gas did the work of the ordinary fuel for the furnaces, small quantities of coke being supplied in addition now and then. In the retort house, its illuminating powers were tested through about twenty pipes. It did not work well through the ordinary burners; but these being removed and full vent allowed to it, it gave all the light necessary, as a clear, steady light is not essential for the work to be done there. The light is not bright and clear like that from coal gas, and it showed a liability to disturbance by the action of the atmosphere. The company intend to have the value of the gas thoroughly tested, and have engaged the services of Prof. Hadley to make a scientific investigation of the matter. The subterranean gas is found all the way from Buffalo to Cleveland. At Painesville, Ohio, between Erie and Cleveland, a well 550 feet deep is yielding an enormous volume of gas. This well is located about two miles from the lake.

Chinese Ornaments or Curiosities.

The patient and often ingenious workmen of China produce many articles of ornament which have a deservedly high commercial value. Our countryman, Mr. Pumpelly, states that one of the most fertile sources of amusement to the stranger in Pekin, is the walk through the streets in which are collected the curiosity stores and lapidary shops. The show cases are filled with ornaments; piles of porcelain vases of every shape; objects in bronze; étagères of heavily carved vermilion lacker ware, loaded with vases; ornaments which all the precious stones known to us are represented, excepting only the diamond, emerald, and opal. Nor, says our traveller, are their prices at all modest; five hundred to two thousand dollars is by no means an uncommon price for porcelain and cloisonnées vases in which beauty and moderate age are combined; it is only the productions of the present day that are cheap. Among other curiosities which engage the attention of foreigners are horn, glass, silk, and paper lanterns, some of which are very beautiful; also bowls, cups, rings, etc., cut from gems and stones; carved work in horn, stone, roots, metal, and wood. Hardly a ship leaves the country, says Mr. Williams, in his admirable work on the commerce of China, without some of these curiosities.

Increasing the Hight of Rooms.

It is frequently desirable to raise the roof of a dwelling house a few feet higher than it was originally built, for the purpose of making sleeping rooms in the attic story, or to render rooms that are quite too low, more pleasant and airy. But many builders dare not attempt such a job, unless they take the roof entirely down, for fear that they may get a dead-fall trap on stilts, when they have lifted the roof from its original foundation. It will be found a comparatively easy job to raise the roof of any ordinary building one foot, or six feet, with perfect safety, provided a workman will operate understandingly. Let us assume, for example, that it is desired to raise the entire roof of a dwelling house, or the roof of one wing, which is thirty feet long and twenty feet wide. If the lower ends of the rafters rest on plates six inches square, or larger, it will be better to elevate the plates with the roof, by cutting openings through the side walls about six feet from each end, to receive sticks of timber extending across the building beneath the plates. If the building has been erected with a balloon frame, there should be three sticks of square timber, one near each end, and one near the middle. Let these timbers be blocked up close to the under side of the plates. The ends of these sticks need not extend beyond the outside of the plates, so as to interfere with the cornice. If there are no collar leaves secured to the rafters, the plates must be fastened, temporarily, to the timbers, to prevent their spreading as soon as the roof is lifted. The next step will be to set a screw near the end of each stick of timber, on a foundation that will not topple nor sway as soon as it receives the superincumbent pressure of the roof. If strong iron jack screws cannot be obtained conveniently, three two-inch wooden bench screws will elevate one side of a large or small roof with perfect safety. The writer has frequently lifted one corner of a thirty by forty foot barn with a pair of two and one eighth inch wooden screws. As soon as the timbers are secured in their proper places, and the screws are set to lift one side, remove a board just below the cornice, and saw off all the studs on both sides of the building. Let all the studs at the gable end be sawn in two at a point nearly in a horizontal line with the plates, and let the gable end walls and window rise bodily with the roof. Now, let the screws be all worked together, blocking up every inch as fast as the roof rises. After one side has been elevated six inches, remove the screws to the opposite side, and elevate it about one foot, keeping the timbers beneath the plates and well blocked, as fast as the roof rises.

In case there should be a chimney resting on a closet, or on the collar beams supported by a partition, procure another wooden screw, and set it beneath the chimney. Four wooden screws will usually cost no more than the proprietors of jack screws are accustomed to charge for the use of a set of screws while performing such a job. If the screws are placed on the foundation so as to elevate the roof perpendicularly, by raising one side six inches, then the opposite side one foot, and after this, lifting each side alternately one foot, there will be no difficulty in carrying up the roof in a perpendicular direction, to any desired hight, provided the screws and the blocking are supported by a broad foundation of blocks that will not rock. Before removing the screws, see that the blocking is so secure that the roof cannot slip, in case the screws are not set perpendicularly on the opposite side. As the roof is lifted, let a plumb line be frequently employed to determine whether it is not being carried in any direction away from a perpendicular line. In case the entire roof is one inch, or more, too far to the north, let the north side be lifted one foot higher than the opposite side and be blocked up; then set the screws under the opposite side inclining about one inch per foot in hight. By this means, the roof can be carried in any desired direction, the distance of half an inch or two inches. If the screws are always set perpendicularly, the roof will rise in the right direction. If, for example, the plates beneath the roof to be raised were four feet from the chamber floor, in lieu of square blocks, make a strong platform for each screw to rest on, by placing four pieces of scantling, two feet long, on the ends, for corner posts, and nailing stays from the top of one to the lower end of another. Then, let the scantling stand on strong planks resting on the floor. A crib can then be carried up, on the tops of the corner posts, with pieces of plank, or studs or boards, and the foundation will not topple. As soon as the roof has been elevated to the desired hight on one side, let the space in the side wall be filled by nailing pieces of studs to the sides of the pieces attached to the plates, and the sides of the studs beneath. Then, lift the opposite side of the roof, and secure pieces of studs to the sides of any timbers that have been sawn in two. If studs, when lapped together, be nailed firmly, the side wall will be about as strong as if the studs were of one entire piece of timber. Should there be partitions extending from the floor to the roof, tear away the base boards and saw off the studs near the floor; and let another screw be employed to carry up such portions of the structure, or let a self-acting lever, with a weight at the farther end, hold the partition wall up to the desired position as the roof is rising.—*Technologist.*

RANSOME ARTIFICIAL STONE.

F. Ransome originally prepared his artificial stone by making an intimate mixture of sand, pulverized carbonate of lime, and silicate of soda (soluble glass), and treating the mass with a solution of chloride of calcium, by which an interchange of elements took place, resulting in the fermentation of silicate of lime, which became hard, and chloride of sodium, which could be dissolved out. The silicate of lime served to combine the sand to a hard and permanent stone. The washing out of the chloride of sodium was regarded as the worst feature of the operation; and if it were neglected, an efflorescence of common salt was formed, which destroyed the appearance, if not the quality of the stone.

The process of dissolving the salt was facilitated by following Bessemer's suggestion of applying atmospheric pressure, by exhausting the air from the vessel containing it, but under the most favorable conditions it was annoying and expensive. In consequence of this, Ransome sought to modify his invention so as to dispense with the chloride of calcium solution; and after numerous experiments, arrived at the following mixture. Out of a mixture of common sand, Portland cement, ground carbonate of lime, and some silica which is soluble in caustic soda at ordinary temperature, he prepares, with soluble glass, a mass that remains plastic long enough to be run into molds, and gradually changes to a hard stone, which resists the action of heat and cold, is impervious to water, and in process of time increases in hardness and durability. Ransome explains the chemical reaction in the following way. If Portland cement, which consists of silicate of alumina and lime, be mixed with soluble soda, the latter is decomposed in such a way that its silica forms silicate of lime with the lime of the cement, while caustic soda is liberated; this latter, however, at once re-unites with the soluble silica placed there for the purpose of producing soluble glass, to be again decomposed by the Portland cement. The whole of the caustic soda does not appear to be liberated each time, but a silicate of lime and soda is produced, and in that way all of the soda is absorbed.

By the addition of fragments of quartz and oxide of iron, artificial granite can be produced, and also, in another way, imitation of marble, both of which are very hard, and admit of a fine polish; and have the advantage of the natural stone in being cast in molds and patterns of any forms.

Influence of Female Magnetism on the Compass.

A commander in the Royal mail service found his steamer some thirty miles out of her course. He was sorely troubled, and could not account for the local attraction that had sent him so far out of the way. Instruments and calculations appeared equally faultless. Sorely troubled, from having passed a sleepless, watchful night, the captain went on deck after breakfast. Seeing a lady sitting (as was her custom) and working near the binnacle, it occurred to him that probably the scissors were resting on the ledge of it. Detecting nothing of the sort, and bent on closer investigation, he discovered that her chair had an iron frame. It also, quite reasonably, flashed across him that the lady's ample crinoline was extended by steel hoops. So, mustering all his faculties, he exclaimed, with as much forgiveness and as little reproach in his tones as possible, "Madam, you have, by your local attraction, drawn my ship some forty miles from her course!"

Aeronautic Machine.

A correspondent sends us a suggestion for a governable aeronautic machine, and prefaces his description by pointing out an important fact in the science of ballooning, which is generally overlooked. A body, floating in the air, of any shape, must move in the direction and with the velocity of the wind that propels it, the power being indescribably uncertain and various; and thus a balloon, provided with sails, rudders, or other governing apparatus, is more likely to turn on an axis perpendicular through its center of gravity, than to be subject to the control of a guide. His idea is to have two balloons, joined by an inflexible rod, which, he argues, would be less subject to the rotating power of the wind, and be more amenable to the guide, when the course and force of the wind were unusually changeable.

The Strains on Ships at Sea.

A paper embodying an investigation of the strains which ships undergo at sea, was read on February 9th, at the Royal Society, by Mr. E. J. Reed, C. B., late Chief Constructor of the Navy. The author, after pointing out that little or no practical progress has been made on this subject since the early part of the present century, proceeded to state that the introduction of steam navigation and of iron and steel as ship building materials, had rendered a thorough examination of it extremely necessary, and that he had consequently selected four ships as types of the various descriptions of modern vessels, namely—Her Majesty's yacht *Victoria and Albert*, as a type of long, fine-lined, lightly built ships, with great weight of engines and boilers in the middle; the *Minotaur*, as a type of long, fine-lined ships, with great weights distributed along their entire length; the *Bellerophon*, as a representative of short, stoutly built ships, with weights more concentrated; and the *Audacious*, as a model of ships with extremely concentrated weights.

The smooth water strains of all these ships were illustrated by numerous diagrams embodying the results of various calculations, and the effects of placing such ships among waves were then no less fully investigated. The great bulk of the paper consisted of detailed calculations too long to insert, but some of the facts and figures deduced were very striking. It was shown, for example, that a ship like the *Minotaur*, floating among waves 400 feet long and 25 feet high, from hollow to crest, which have a time of transit of about eight and three fourths seconds, passed in half that time from a bending or "moment" of 140,000 foot tuns, tending to break her in two by the drooping of the ends, to a reverse strain of 74,000 foot tuns, so that fifteen times per minute a "wave of strain," as Mr. Reed designated it, having these enormous quantities for its positive and negative amounts, sweeps through the fabric of her hull. The *Victoria and Albert* yacht has to undergo, in like manner, strains which tend to break her downwards at the ends with a force of 16,400 foot tuns, and in less than four seconds encounters a strain tending to break her downwards at the middle, and let her engines and boilers fall through her, equal to nearly double this amount, or 31,000 foot tuns. It is remarkable that this change of strain in this lightly built hull is proportionately greater than that of either of the ironclads. The *Bellerophon's* maximum strains in waves, similarly calculated, were 43,600 foot tuns, and 48,800 foot tuns, respectively.

In illustrating the influence which rapid changes of strain exert upon structures, the author referred to the experiments of Sir W. Fairbairn, who has shown that the joints of an iron riveted beam broke under the action of a rapidly alternating strain, although it was only one third in amount of what the beam would sustain at rest.

Mr. Reed stated that his investigations had shown many of the general principles laid down by former investigators, who had dealt with very different forms of ships, to be erroneous; and, in particular, opposed the very common notion that there is a compensating action between the strains of, and the wave actions exerted upon, very long fine-lined vessels. He further stated that while the weakness exhibited by many modern ships had induced him to enter upon these investigations, the result of them had been to convince him that calculations which had hitherto been neglected were becoming daily more and more necessary, especially as the length of steamships and the lightness of their construction in iron and steel were being very rapidly and simultaneously developed.

A Single Rail Tramway.

In thinly populated and mountainous countries, and especially in many parts of Turkey, the want of roads for internal communication is the great difficulty in the way of national progress. The present need, however, is to provide a means of traffic not much in excess of the actual or probable demand, and suited to the wants of a country, in which railroads are impossible from their cost, in which roads are useless because the natives find that carriages do not pay, and in which there can be no canals, because water will not run up hill. In the face of these conditions, Mr. J. L. Haddan, C. E., has devised a single rail tramway for conveyances, of which he gives the following description:

"Imagine a bicycle let into a longitudinal aperture in the center of the bottom of a cart, and the cart nearly touching the ground, so that only about six inches of the wheels would be visible; next, a kind of balancing pole run through the sides of the cart at right angles to the single rail on which the bicycle is to run. The two ends of the pole are to project about three feet on either side of the cart, and rest upon, and be harnessed to, the backs of two mules. The animals will thus be one at each side of the load, instead of being in front, in the ordinary way. It would be impossible for the cart to turn over, because, in order to do so, it would have to force one mule to the ground and to lift the other in the air; and, moreover, as its floor would only be six inches above the rail, an overtip would be of no account. All the weight in the cart, if evenly distributed, would bear upon the rail, and the animals, having no load on their backs, would be able to exert considerable traction power."

Mr. Haddan thinks it an incidental advantage, that, with such a tramway, the muleteers would be compelled to keep the appointed way, instead of leaving it, as they now do, by side tracks that enable them to avoid toll bars; but, at the same time, he proposes to give the wheels broad double flanges, so that in case of need the carts would run upon any good road. He states that responsible contractors are prepared to lay his single line, with 30 lb. rails and De Bergue's pot sleepers, at a cost of £450 per mile, all sidings included.

Mr. Haddan does not consider that the utility of his invention will be limited by the precise conditions that first called for it. He not only suggests its employment for military purposes, but also for tramways in large cities; and he says that, where space is very valuable, a horse or mule on only one side of the cart would be sufficient. In towns, on bridges, and other important places, the rail might for a short distance be dispensed with; and passenger vehicles should be fitted with small friction wheels on either side, so that, if a horse should fall down, the balance of the carriage would remain undisturbed.

How Palm Leaf Hats are Made.

In America, the only places where the leaf of the palm tree is manufactured into wearing apparel are in Massachusetts. Amherst, in Hampshire County, Palmer, in Hampden, and Barre and Fitchburgh, in Worcester, are each the site of manufactories, but of these (says the Boston *Adeertiser*) the first named is the largest in buildings, business, and completeness of work. Several of the others perform only a part of the whole course of operations necessary to fit the goods for market.

From Cuba the raw leaf is shipped to New London, Connecticut, in bunches of twenty five leaves each, and the stock is unloaded and placed on cars which stop at the door of the bleaching house. As delivered, the leaf is from four to five feet long. This, standing on the stock end, is closely packed in the bleaching rooms, where it is kept sixteen days Brimstone is used to whiten the leaf. The rooms are closed airtight and the brimstone burnt in pans standing in the room. When bleached to the requisite whiteness, the next process the leaf undergoes is splitting. Nearly a third of all that passes the splitters is absolutely worthless for use here. Till recently it was thrown away; but since paper manufacturers have been straitened for material, this palm leaf has been found to make good paper. Fifty dollars a ton are paid for it at the paper mills.

After the straw is now ready to be worked into hats, all the work must be done by hand. In all the New England States, except Rhode Island, are agents of the firm who send the leaf out into the country among the wives and daughters of the farmers, by whom it is braided into hats and woven into webs for shaker hoods. Large teams are constantly passing over the rugged hills, carrying material to be braided, or the work that has been finished. The number of people who find employment in this business is very great. Little children are kept at it, for it is light work, and a nimble fingered girl of ten or twelve can earn as much in a day as an adult woman. The pay for the work is too small to make even decent wages, if the worker be not of remarkable deftness of hand, but it is, with many, a work of odd moments which would otherwise be wasted, so the frugal housewife will include in her day's work a "stent" of so much braiding to be done. In some parts of the country, chair bottoming is practiced in the same way. Country merchants frequently take the leaf and put it out in their neighborhoods. They are satisfied if no profit be made on the braiding, for they pay for it from their stores, and make the increase of business thus secured afford them a fair profit. Some, however, make a profit at both ends, and in any case the worker's recompense is a mere pittance.

The Wealth in our Western Veins.

A White Pine correspondent of the Chicago *Tribune* has a few words on new discoveries and the ways of old miners. He says:

Some new discoveries of fine milling ore have been made upon the eastern slope of White Pine Mountain, opposite Treasure Hill. Its existence in that locality had not previously been suspected. The assays reach up into the hundreds. One of the veins is three feet in width. It has been named "The Narrow Gage." Meantime, our neighboring districts of Eureka and Mineral Hill are excited over the discovery of free ore, in mines hitherto yielding only large quantities of base metal. The base ore, say the people of Eureka, almost entirely disappears, and the free ore comes in instead. This will necessitate the erection of mills, and the discontinuance of some of the smelting furnaces. A similar phenomenon to the above has been observed in one or two of the base mines of White Pine.

The depth of the snow, and threatening prospect of more, still deter many excited people from venturing forth in search of the new "land of promise" in Utah. The emigration will not set out in full strength for a month yet. Stragglers who have reached the goal write back that they can do nothing on account of the snow—a fact of which they were as well informed by starting as they are now. Americans are so fearful, always, that some other Americans, or some other people, will "get ahead" of them! They must all be first, on the ground—first on board of a ferry boat, railroad car, and everywhere else, even at the risk of life.

It does seem singular that these periodical mining excitements should startle and start, upon a weary tramp, old and experienced California miners, as well as the simple minded "greenhorns" just out from "the States." But such is the fact. Men who emigrated to the golden land in the "Fall of '49 and Spring of '50," and have been in every mining "rush" since, are now rushing into Rush Valley, and the Big and Little Cottonwood Canyons, as if Dame Fortune had actually contracted at last to fulfil their dreams in the "promised land" of the Mormons. Some reflecting persons will not go thither with a "rush," however, even at the risk of losing the "cream" of the speculation in town lots, and the chance of representing the State of Utah in Congress. They remember the early days of White Pine.

But Utah will not long be the sole inheritance of a close community of fanatics and defunct politicians. People from all parts of the Union will soon emigrate thither, attracted by the glitter of the precious metals, and the large majority of persons will be of a class that will make Utah a great State. The country is not so much of a desert as is Nevada, and agriculture among the Mormons is the principal occupation. As it is said that employment has a tendency to promote honesty in its followers, we may hope that the leaven of that almost extinct virtue will pervade the future political character of Utah, as a State and as a social community.

Underground Explorations---Visit to a Missouri Cave.

A western writer who has recently visited a cave in nearly the highest point of the Ozark Mountains, Green county, Mo., and about six miles from the city of Springfield, thus describes it:

"This cave was recently discovered by a hunter, whose dog chased a fox into it. The entrance was small, but has been so enlarged that a horse might be ridden in. In beauty it far exceeds anything of the kind of which the writer has any knowledge. As you enter you will observe hundreds of bushels of sweet potatoes, apparently as fresh as when first taken from the ground, placed in the cave last fall. Next in view will be seen, when brilliantly lighted, which the proprietor always does for his patrons, a vast profusion of splendid stalactites and stalagmites, in some cases meeting; and with a little help of the imagination, one can see statuary of rare beauty, variety, and of vast proportions, as well as dogs, cats, sheep, horses, lions and hooded women.

"The ceiling is completely decorated for a very long distance from the entrance with stalactites, resembling in many cases vast icicles, beautified by an endless profusion of smaller ones, and what have the appearance of small sea shells and fish. When the stalactites and stalagmites meet, as the formations often do, they form in some places columns of vast proportions, one of which I think is 18 feet in height, and 7 to 9 in diameter. Apparently some of these columns are beautifully draped in snowy white, resembling cloak or mantle, of beautiful, heavy woolen goods, hanging in graceful folds from the shoulders of a tall man. All the formations are white, except where they have been soiled by handling or the smoke of lamps Of course they are carbonate of lime, found only in limestone countries, and to the geologist it must be an interesting study to estimate the vast time of their formation. It is impossible to describe the varieties of these lime formations. To the traveler, a visit I think will richly pay. It is proposed to sell and deliver for $30,000, one of these columns to the Central Park Committee, New York. I believe the full extent of the cave has never been explored. In southwest Missouri are many other caves, from south of which large streams of excellent water run, in quantities sufficient for manufacturing purposes."

Asphalting Garden Walks and Street Pavements.

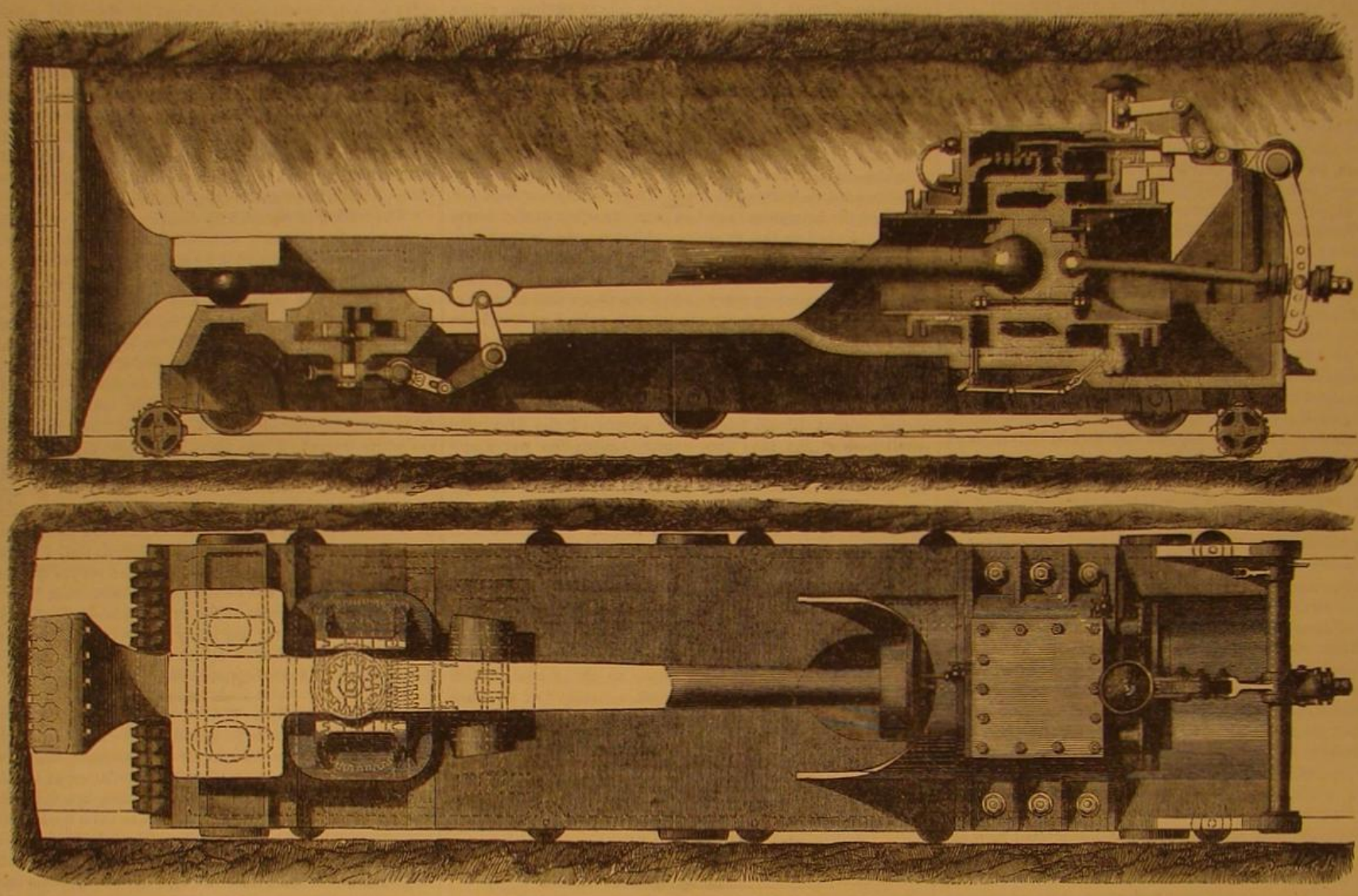
Gas tar is not soluble in water. Make a note of this, for it is the chief point in asphalt works—roofs, tanks, walks, roads, and the like. As well might you attempt to mix tallow with water as gas tar with water, and hence the importance of all articles being dry, that have to be united with gas tar. Now, when you get lime from the kiln (says a writer in the *Gardeners' Chronicle*), and slack it nicely by adding a large amount of cold water to cold stones of lime, the mixture will neither be cold nor wet, as one would think it ought to be, but fiery hot and apparently dry; yet there is no disputing the fact that into this dry powder you certainly did pour real water by the gallon, and it must be there now in some shape. Chemists tell us that, when fluids assume the solid form, heat is evolved, and although we may not recognize the presence of water, the gas tar will; so that in all cases where slaked lime is mixed with gas tar, it is a grave error, for water is there, and "gas tar is not soluble in water." But if you wish to get at the secret of asphalt making, pound the new lime and pass it through a fine sieve, and mix this with coal tar, and see the result. The writer was shown a large factory that was roofed with paper, and covered with gas tar and lime in this way. The owner had previously tried the slaked lime and wondered at his failure. The intelligent workman will boil his gas tar to get any moisture out of it, and having his pounded lime ready, he can add to suit his circumstances. The composition of bone is the point to be aimed at, for the bone earth by itself would be hard, but not tough, and the gelatin would be tough and clammy, but not hard; mixed together in due proportions, they are perfection.

Mineral pitch used in paving is very well for street work, but when the sun is powerful, it is quite fluid; not so is the pitch when lime has been added, and as a small sample tried will give the proper proportion, there can be no excuse for having melted pitch adhering to the shoes of the passenger. Lime is able to do the master-stroke, but it must do it in its own way. If the carriage-way or foot-way is to be a permanent way, its levels must be rigidly set out first, and good hard materials used to make up the levels; while fine dry gravel, pebbles, or cracked stone, may be tarred, and levelled, and rolled, just as would be done if no tar were used. But when the stone or gravel is tarred it absorbs none, whereas the lime unites with the tar, and the compound is quite different from either of its parents. We see constantly, about any of our large towns, heaps of cinders and clinkers (scoriæ) being mixed for making footpaths, the gas tar poured on or over at random, the finer parts being left to make a smooth finish. This is good enough for parish business, and is, moreover, cheap, but whoever has seen first class asphalting in London and elsewhere, will allow that it is very nearly all that could be desired for walks or roads.

ASHLAND, formerly the home of Henry Clay, has passed into the hands of the University of Kentucky.

Rock-Tunneling Machine.

During the past twenty years or so many machines have been designed for facilitating the excavation of tunnels or galleries in the solid rock, these machines having, with but few exceptions, been intended for boring in the rock a series of holes for receiving blasting charges. Several machines of this class have done excellent work, but they require to be withdrawn during each explosion, and the *débris* has to be removed, and the roadway and the face of the rock prepared before another set of holes can be commenced; and the loss of time occasioned by these operations, together with the fact that in many cases objections exist to the use of explosives, have led several inventors to design machines for cutting away the whole bulk of the rock to be excavated. It is a new machine of this latter class, patented by Mr. F. T. Henley, of London, England, which we illustrate this week.



HENLEY'S ROCK-TUNNELING MACHINE.

This tunneling machine may be described briefly as a horizontal steam—or compressed air—hammer, having a head furnished with cutting chisels, which are driven against the face of the rock at each blow, and provided with a traverse motion, which causes this head to move to and fro laterally, and thus cut out a gallery of rectangular section. Provision is also made for the automatic removal of the *débris*, and the machine is, in fact, intended to work on steadily day and night, only stopping under exceptional circumstances, or in the event of repairs being necessary.

The particular machine shown in our engraving is intended for cutting a gallery four feet wide by five feet high. It consists of a massive cast iron bed plate mounted on six wheels, and carrying near one end the steam or compressed air cylinder, and at the other the traversing gear by which the head is made to traverse to and fro laterally. The head is shown in our illustration made in one piece with the shaft. The shaft may, however, be in some cases made of wrought iron, and bolted or keyed to the head; this, however, is merely a question of construction, and does not affect the principle of the machine. The head extends the full depth of the gallery, and is one foot eight inches broad at the widest part. In the face of the head are formed five grooves of a kind of dovetail section, as shown, the ribs on the sides of the grooves forming the dovetail being, however, removed for a depth about twelve inches from the top of the head. The grooves receive the chisels, which are made in twelve-inch lengths, and which are inserted (the head being drawn back from the face of the rock) at the upper part of the grooves where the ribs are absent, and dropped into their places. The upper lengths are held in their places by bolts. The chisels are each made with four cutting edges, so that there are altogether twenty rows of cutting edges in the width of the head. Each of the outer rows of chisels stops short four inches from the bottom of the head, and thus the latter is made to cut a gallery having a step or ledge, four inches high by four inches wide, at each of its lower corners. These ledges serve to support the machine, the wheels, on which the latter is carried, traveling on these ledges and being thus kept clear of the *débris*. The chisels may be made of steel or of wrought iron with steel faces; but for many kinds of rock, they will serve perfectly well if made of a much cheaper material, namely, chilled cast iron. From their cutting faces being straight, they can be very readily ground, and when they are chilled castings, they will require no fitting to the grooves in the head. In the ease with which they can be made, fitted, and sharpened, these cutters form a great contrast to those used in the Penrice machine, the latter being all curved and the series of rings being all of different radii.

The shaft, formed in one piece with the head, or keyed to the latter, is furnished with a spherical end, which abuts against a wrought iron cup placed at the bottom of the front trunk of the piston, and which is held firmly in its place by a suitable gland. This gland is made in three pieces, namely, two halves of gun metal fitting the sphere, and an outer ring of wrought iron holding these halves together. The gland is tightened by bolts furnished with countersunk collars, so that they serve also to attach the wrought iron cup to the piston, and the whole arrangement is such that the thrust of the piston, when delivering a blow, throws no strain upon the bolts, the latter merely having to draw the ram back on the return stroke. At a short distance from the head, the shaft is provided with a pair of lateral projections or lugs, hollowed on their under sides where they bear upon a pair of spheres which roll on a suitable table formed on the base plate, and which carry almost the entire weight of the shaft and head. The spheres are in fact so situated that when the machine is at half stroke, they are almost directly under the center of gravity of the combined head and shaft, and thus the piston is relieved of any excessive pressure which might cause it to wear unduly. The two spheres are one foot five inches apart laterally, from center to center, and they thus form a tolerably wide base, and serve to keep the head from canting.

At a short distance from the lugs just mentioned, the shaft has a swell formed on each side of it, as shown in the plan, this portion of it fitting between a pair of guides cast on a carriage which is moved to and fro laterally by traversing gear. This gear consists, in the first place, of a lever, the upper end of which enters a recess in the under side of the ram shaft, this recess being curved to an arc struck from the center of the spherical end, formed on the shaft where the latter is attached to the piston. The lever just mentioned is fixed on a rocking shaft, which extends partially across the machine beneath the base plate, and which carries two other levers, which are coupled as shown to another pair of levers which oscillate on a second shaft, and each of which carries a pawl gripping a wheel with a V groove in its periphery, the arrangement being similar to that known as Worssam's silent feed motion. The shaft on which the V groove wheels are fixed has a double-threaded worm formed on it, and this worm drives a worm wheel fixed on a short vertical spindle, as shown. At the upper end of this spindle is a pinion which gears into a mangle rack on the under side of the carriage by which the ram is guided, and thus imparts to this carriage, and consequently to the shaft, the to-and-fro motion of which we have already spoken. The pawls which we have mentioned are set to grip their wheels during the return stroke of the ram, and it is during this return stroke, consequently, that the lateral feed is given. The rate of this lateral feed can be altered by varying the proportions of the levers, according to the nature of the materials on which the chisels have to operate.

A Night on Vesuvius during an Eruption.

Mr. F. L. Capen, of Boston, gives the following account of a night passed on Mount Vesuvius during an eruption:

On the 9th of April, a party of us, among whom were Mr. W. W. Griscom, a sound scholar and scientist from Philadelphia, and his pupil, Master S. C. Stanton, of Boston, now a resident of London—started for the scene. We reached the stream of lava before sunset, and the summit before dark. We had a close view of the new crater, at the foot of the great cone, which, having no accumulation of ejected matter, *i.e.*, no cone of stones and ashes, shows clearly how it was first formed.

A thick bed of solid rock seems to have been rent by the pent-up forces beneath, and forced upwards into a vertical position, like the jaws of a monster, broad at the base and tapering at the top. Three or four of these vast rocks form the chimney, through which pour volumes of steam and smoke, roaring flames and lava, with great violence, as if from a mighty conflagration under intense pressure below. Our party were in haste to descend, as the night drew on; but I was not satisfied, and, being on the ground, I resolved to stay till morning; and I was well repaid for my trouble and privation.

It is impossible to do justice to such a subject in a brief article. There are really three separate throats, so to speak, from the depths below, quite distinct in their mode of action. Two are within the main crater at the summit, on a line with the new one above named, which is near the N base of the great summit, or apex cone, whose action I have described. The middle throat or register is the only one that was violent in its action; and through the night, at longer or shorter intervals, it was terrific. After brief periods of rest it broke forth again with a tremendous explosion, as sudden and intense as that of the heaviest cannon, but many, many times vaster and grander, as if a magazine of powder or nitro-glycerin had suddenly been ignited far down in the deep bowels of the earth. Sometimes one, oftener several reports, came in quick succession. Sometimes the first was loudest, but often the second and third reports followed with increasing rapidity and violence, and with much greater intensity than the first. At all the explosions of this opening, immense volleys of glowing stones and hot cinders were thrown to the hight of from 100 to 200 feet, spreading into magnificent bouquets of great brilliancy, many of these stones, some of large size, falling outside the crater and rolling down the cone in glowing fragments to its base. Sometimes the explosions were preceded by subterranean rumblings far down in the deep caverns of the mountain, accompanied by a trembling of the solid frame to its very base.

The action of the third spout or register was wholly different from the other two. There was no violent explosion, as of pent-up power, as in the case of that just described, though, like that, its delivery was fitful; blowing out at intervals, and never uniform, continuous, and unexplosive, like the first described new crater outside the cone, whose flow was a copious compressed volume of smoke and flame, as from a well-fed furnace, and with no noise, except that of constant roaring of the flames. This third register made a great blowing noise like an immense fuse, and very much

like the noise of an ascending rocket of immense proportions. It threw out volumes of black smoke and great bouquets of glowing cinders, but with much less violence than its companion, as if the opening were much larger—so much larger in proportion to its discharge as to divest it of all explosive violence. I should regard this as the old and nearly spent crater.

APPARATUS FOR DYEING HAIR.

This is a device by the use of which hair may be dyed without staining the hand of the operator. It consists of a cone, to the side of which is attached a sponge. The cone is provided with a handle like the handle of a shears' blade



To this handle another handle is pivoted, having formed upon it a convex blade. In use, the sponge is made the vehicle of the coloring fluid, and the hair is grasped and drawn through between it and the convex blade. This device was invented and patented in 1867, by Charles Merritt, of South Weymouth, Mass.

The First Telegraphic Instrument.

An interesting relic of the early days of telegraphy has, it is said, been discovered at Morristown, N. J. It is the first instrument by which messages were received and sent by the aid of the electric current. When Professor Morse was experimenting on the power and capability of electricity as adapted to the transmission of words, he spent a large portion of his time at Morristown, where he was assisted by Alfred Vail, esq., a practical machinist and inventor. At the Speedwell iron works of that town, then owned by the father of Mr. Vail, the experiment on the wires and on the construction of suitable instruments took place. On the completion of the experiments and the removal of Mr. Morse to Washington to bring his invention before Congress, Mr. Vail accompanied him, and, receiving the appointment of assistant superintendent of telegraphs, was stationed at Baltimore at that end of the experimental line. The instrument now at Morristown was one of two taken from Morristown by Morse and Vail—Morse using one at Washington and Vail the other at Baltimore. The first message sent was the now well known "What hath God wrought," which Morse transmitted to Vail; but the first public message was the news of the nomination of Polk to the presidency, by the Baltimore convention of 1844, sent by Vail to Morse. These instruments were in constant use for six years, when Mr. Vail, returning to Morristown, brought his with him, and where it has ince remained in the possession of his family. Mr. Vail dying soon after, his instrument was specially left, by a clause in his will, to his eldest son as an heir-loom, while parts of instruments made during the experimental trials were left to Professor Morse, with a request that he would give them at some future day to the New Jersey Historical Society. The old instrument works as well as when first made, and Saturday a message was sent to New York, and a reply received at Morristown. An excellent photograph of the instrument was also taken, and with it a visit was made to Professor Morse, in New York. The professor was delighted to see the representation of the first instrument, having destroyed, as he said, the fellow instrument which he had used in 1844. He readily recognized it, and wrote a certificate across the picture as to its being a true photograph of the first instrument ever used to transmit public messages. He also expressed a wish that the photographs might be generally distributed, that it might be seen how little, in essential points, it differed with those now in use. With the exception of size and clumsiness, the instruments are almost exactly similar. The dimensions of the instrument are sixteen inches in length, seven inches in hight, six inches wide, with two magnets of three inch diameter. The paper used was two and a half inches in width, three pens being proposed to be used. The weight of the instrument is twenty pounds.

Rice's Process of obtaining Gelatine from Bones, Horn-Pith, etc.

Nathaniel B. Rice, of East Saginaw, in the county of Saginaw and State of Michigan, has invented a new process of obtaining gelatine from bone, horn-pith, etc.

The invention consists chiefly in the application, to the bone or similar substance, of phosphoric acid, which dissolves and separates the mineral constituents, leaving the gelatinous matter free and ready for use, and also in such a treatment of the acid charged with earthy matter that it can again be separated therefrom, for further use on fresh material. It is claimed that the expense of the treatment is greatly reduced by this process.

The phosphoric acid of the bone is also taken therefrom and added to the acid used for original separation, so that an actual gain of acid is effected.

The bone, horn-pith or equivalent substances is placed in dilute phosphoric acid. The earthy matter of the bone, horn-pith, etc., is thereby dissolved and removed from the gelatine, which latter can be converted into size or glue, or refined for table or other uses, by any of the known processes.

The acid is next recovered from the earthy matter, to be used for repetitions of the same process in the following manner:

About two thirds or more of the solution of acid phosphate of lime, resulting from the above process are subjected to the action of sulphurous or sulphuric acid, which precipitates the lime in the form of sulphite or sulphate, either of which can be readily removed, leaving the acid or acid phosphate, according to the amount of sulphurous or sulphuric acid used in an available condition for further use on other bone, horn-pith, etc. This process, by extracting the phosphates, originally held in the bone or other similar substance treated, yields an actual surplus of phosphoric acid, so that it is claimed, almost fifty per cent. can be gained at each process.

The residuum from the the last described process, and that part of the solution not treated with sulphurous or sulphuric acid, can be used for fertilizing or other purposes.

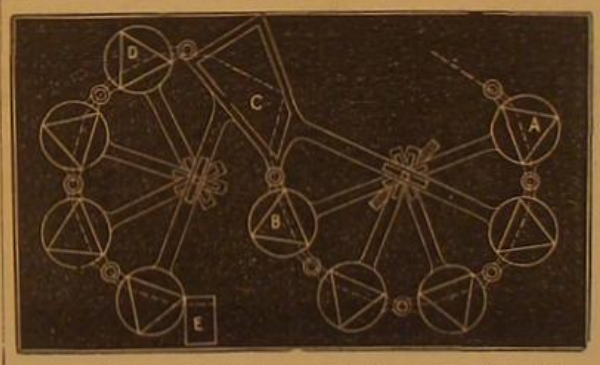
In the place of the phosphoric acid alone, a combination of it with any other acid or acids, in such proportions that the mixture will dissolve and remove the earthy matter in bone, horn-pith, or equivalent substances, may be used. But the simple phosphoric acid is more advantageous, as it acts in a satisfactory manner, and may be regained.

A NEW SPECTROSCOPE.

At a recent soirée at the Royal Society, says *The Engineer*, Mr. Browning exhibited a spectroscope in which the rays of light pass through two batteries of prisms, and are then sent back through both trains of prisms to the eye of the observer, by means of a reflecting prism placed behind the last prism of the train. In this manner a dispersive power, equal to nineteen prisms of flint glass, is obtained. Both trains of prisms, as well as the intermediate prisms, are under the control of an automatic movement, which insures that every ray shall pass at the minimum angle of deviation for the particular ray under examination. Both the collimator and telescope are fixed—the prisms only are movable. It will readily be understood that this arrangement is highly advantageous.

The D lines in the spectrum of sodium are seen in this instrument separated by an apparent interval of more than one eighth inch, and under favorable conditions of the atmosphere ten or twelve lines are visible between them.

The engraving will give an idea of the principle of construction of this powerful spectroscope. The dotted line shows the path of the rays through the two batteries of prisms. The line of light first falls on the side of the prism, A; it is then refracted by each prism successively until it



reaches B, from this it passes into the prism, C, which refracts the light at the first surface, and then totally reflects it at the second surface to the third surface, where it is once more refracted to D. It is then further successively refracted by each of the train of prisms, and sent back through the upper half of the prisms, having, in the first instance, passed through the lower half. With the exception of the hight at which the ray passes, it may be considered to retrace the path which has been already described, and to emerge again at A. For the sake of clearness, the contrivance by which motion is continued from the first to the second train of prisms, is omitted in the diagram. This spectroscope is intended for application to a very powerful telescope, for the purpose of observing the solar prominences.

Mr. Browning also exhibited a diffraction spectrum, produced by means of fine lines cut about $\frac{1}{1800}$th of an inch apart from each other on the surface of a small piece of glass. The plate was prepared by Mr. L. Rutherford, of New York.

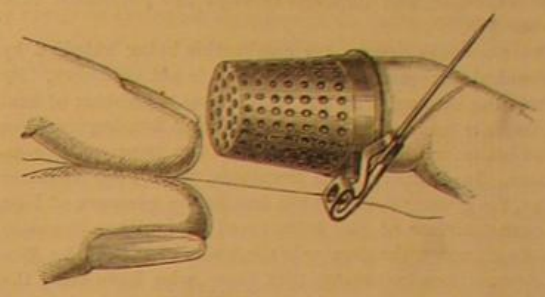
How to Preserve Fats.

Every pharmaceutist, says the *Journal of Applied Chemistry*, experiences great difficulty in the preservation of fatty compounds. During the hot weather of summer and in the warm atmosphere of the shop in winter, ointments and pomades become rancid and useless. This is particularly the case in those compounds into which animal fats enter largely. The chemistry of these changes is apparent to every intelligent pharmaceutist. The usual mode of benzoating fats is to mix with them tincture of benzoin. The objection to this is that there is often a certain quantity of moisture in lard, especially that which is steam rendered; as a consequence the tincture is decomposed, and the benzoin is thoroughly mixed. The fat of the bear, opossum and skunk, is liquid at the ordinary summer temperature, and when the tincture is mixed with them, it rises to the surface. The following mode of benzoating all kinds of animal fats will be found the most effectual for preserving them for a long time.

Make a saturated solution of gum benzoin in alcohol by simple heat, allow the liquid to settle clear, then strain and mix with equal parts of fresh castor oil. Of this mixture add four ounces to each gallon of fat or ointment while warm. The proportion of the solution of benzoin may be increased for pomades, as it forms, by its aromatic odor, an excellent basis for perfumes. The benzoatic fat should be kept not in tin, but in jars well covered. Steam rendered lard, or that treated with salt and alum, should be carefully remelted in water bath to allow all the water to settle so as to pour off the pure fat. In preparing ointment and pomades it is important that the wax should be first melted, and the oil or fat warmed before adding to the wax. This precaution, which will save much time and trouble, is often neglected by young beginners.

COMBINED THIMBLE AND NEEDLE THREADER.

A neat little device, for rapidly and easily threading needles, is shown in the accompanying engraving, and is the invention of Alex. Hunter, of Buffalo, N. Y. It consists of



a piece of metal so bent that the needle may be thrust between the two limbs of the instrument till its eye rests beneath a funnel-shaped hole which guides the end of the thread into the eye of the needle. It is a useful and tasty little instrument, calculated to save eyes and improve the temper.

Poison of the Cobra.

At the meeting of the Boston Society of Natural History, Mr. George Sceva gave the results of an experiment, which he had recently made in connection with Dr. Thomas Dwight, Jr., with the poison of the Cobra di Capello, *Naja tripudians*.

One quarter of a grain of the dried poison, which had been kept a little more than seven months, was put into twenty drops of water, the poison dissolved, and the liquid reduced by evaporation at a temperature of 85° F., to four drops. This was exposed to the air at a temperature of 22°, and was completely frozen in four minutes, the warmth of the porcelain vessel retarding the process slightly. The poison was allowed to remain in the frozen state for sixteen hours, during which time the temperature fell to 8°, or 24° below the freezing point. On the following day, the poison was thawed and diluted with three or four drops of water, and two drops of the liquid injected with a fine pointed syringe into the pectoral muscle of a pigeon, about half an inch from the keel of the sternum, the point of the syringe penetrating the muscle about one eighth of an inch. This part of the pigeon's body was selected in order to avoid wounding any of the viscera or large blood vessels.

The poison was injected at 4·32 P. M., and at a few minutes past 7, the pigeon was found dead.

Mr. Sceva then made some general remarks on the habits of the cobra, and on the action of its poison. In J. G. Wood's "Natural History of Reptiles," several pages were devoted to accounts of antidotes, such as the leaves and roots of the *Aristolochia Indica*, the "snake stone," etc. These, with a great many other reputed antidotes, had been found by recent investigation to be utterly worthless.

Mr. Sceva, during the past three years, while attached to the Indian Museum at Calcutta, had assisted Dr. Fayrer, the Professor of Surgery in the Medical College there, in his numerous experiments with the venom of poisonous snakes. Among those made to test the value of local applications was that of the actual cautery by plunging red hot irons deeply into the flesh in the places where the fangs had entered, but this failed to destroy the poison.

To show the rapid effect of the poison on the blood, Mr. Sceva read one of Dr. Fayrer's experiments that he had witnessed, in which the inguinal fold of the skin of a dog was held by two pairs of long-bladed forceps in such a manner as to include a triangular piece of about three inches in length. The cobra's fangs were applied to the middle of the free edge, and with a sharp scalpel, held in readiness, the fold of the skin was at once cut out, and yet the dog died from the effects of the poison in fifty-nine minutes. The infinitesimal portion of time during which the cobra's fangs were inserted in the tissues was sufficient to have sent the poison through the circulation beyond the reach of incision, and yet how very small must that portion have been.

Mr Sceva exhibited on the table a living specimen of the cobra, which he had brought with him from India. It was about five feet in length, and of the variety known in India as the keuteah. It had eaten nothing while it had been in his possession (since the eighth of June last), a period of seven months and ten days. He had also kept others in India for over five months without food.

He said that the common belief that the cobra would seek to exercise its deadly power, by biting any person who should come within its reach, was quite erroneous. On the contrary, it avoids using its fangs as much as possible, except when securing its food.

Of the great number of deaths (some thousands) occurring annually from cobras, the bites were almost always received when people stepped upon them.

J. H. COOPER says, in the *Journal of the Franklin Institute*, "A good adhesive for leather belts is printer's ink. I have the case of a six inch belt running dry and smooth and slipping, which was entirely prevented for a year by one application of the above."

Economizing Fuel, and Preventing Smoke.

An improved economizer, the essential feature of which is the application of a forced blast through the mass of fuel in a fireplace having no fire bars, has been patented by Mr. J. M. Stanley, of Elwy Hall, Rhyl, Wales. The inventor states that he does not confine himself to any particular kind of blast. Any of the known methods of obtaining one may be employed; but, for the sake of convenience, he generally uses a jet of steam (by preference superheated), which is injected through the nozzle of a steam pipe, having about a three-sixteenth aperture, into the mouth of a blast pipe, leading to a perforated cast iron tube, placed in the body of a fireplace, under or in front of the boiler. Thus a powerful blast is induced, and impelled through the perforated tube into the fire.

The necessary oxygen for combustion being supplied by mechanical pressure, a chimney draft is not necessary. By contracting the outlet for the waste gases, a pressure of heat and flame is made to impinge upon all the heating surfaces of the boiler, without interfering with the progress of combustion. In ordinary open fireplaces, with long chimney stacks, the greater the draft the less is the pressure of heat upon the surface of the boiler; and the quicker it passes into the chimney, the greater is the waste of fuel. The *Mining Journal* (London) states that those who have tried the experiment aver that inferior fuel will, with this apparatus, generate as much steam as superior coal in common fireplaces; and, in many cases, the small slack, such as is thrown on the waste hill at the pit, has been used with great advantage.

The invention, when applied, has a twofold effect. It economizes the consumption of fuel, by rendering the combustion of the gaseous products of the fuel more perfect, and also prevents the emission of black or opaque smoke from the chimney, and causes the heat evolved by combustion to impinge more effectively or powerfully upon or against the boiler or other heating surfaces or flues, before passing into the chimney.

In the case of Cornish and other similar tubular boilers, the front part of the boiler tube or tubes is used for the fireplace, but in lieu of the ordinary fire bars, there are introduced, along the bottom of this portion of the boiler flue or flues, a metal tube or tubes, perforated at the top and sides, as may be required; this tube may be either of a circular, elliptical, or any other suitable shape, in section according to the size or form of fireplace, and may be either in one or more pieces.

For ordinary tubular boilers, the inventor prefers to have the upper part of the metal tube, which is perforated, in loose parts, for the convenience of replacing them when worn out. This tube extends from the front part of the boiler to the bridge air chamber, and is provided with a throttle valve at the inner end, which is worked by means of a connecting rod at the front of the boiler. The bridge air chamber is formed by two parallel partitions across the flue of the boiler at the end of the fireplace; the space betwixt the two partitions forms the said air chamber, and is covered with perforated metal or brickwork. In some cases, the front part of the perforated tube is left open to the external air, and by means of a suitable pipe or pipes, a jet or jets of steam are injected into the tube for the purpose of inducing or propelling a blast, which is forced through the perforations in the said tube into the fire.

After coaling the fire, and when a partial combustion is going on in the fireplace, or black or opaque smoke is being emitted, the valve before mentioned is opened, and allows part of the air to pass directly through the tube into the bridge air chamber, and thence through the perforations at the top of the bridge. This air, in passing through the hot tube and air chamber, becomes heated sufficiently to effect the combustion of the smoke and the gaseous products of the burning fuel as they pass over the bridge. In other cases, the front part of the perforated tube is closed by means of a cast iron box, fitted with a blast pipe at the side, and an airtight door in the front, through which the ashes and refuse products of combustion may be removed; the blast may be either driven through the pipe at the side of the box by means of a fan or blowing engine, or be induced or propelled by a jet or jets of steam, as before described. By these means of supplying fireplaces or furnaces with the air necessary for the combustion of the fuel, a high chimney stack for inducing a draft is rendered unnecessary, and by contracting the outlet for the products of combustion by means of a damper or valve, the heat is caused to impinge more effectively and for a longer period against or upon the heating surface, and thus operate more powerfully than when passing over such surface in the usual way. For egg-shaped and similar boilers, a cast iron firebox is used. It may be ogee, semicircular, or elliptical in section, as the case may require. This firebox is fixed in a chamber of similar shape; its sides are perforated with holes inclined downwards to prevent the small fuel or ashes from falling into the chamber. A blast of air and steam is forced under the firebox, and through the holes into the fire, and into an air chamber formed at the end of the fireplace, as before described. A pipe, in which a throttle valve is fitted, connects the two chambers; in this case, the jet of steam is injected into a pipe or pipes placed at the end of the boiler, and leading into the chamber under the fire box. The fuel is supplied through doors, as in common boilers. For marine or locomotive boilers, a firebox is used having several perforated tubes, semicircular or quarter circular in shape, and through these the blast is forced by steam jets, as before stated. Arrangements for regulating the blast and for forming an air chamber, and also for consuming the smoke, being provided, as before described.

Correspondence.

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

Steam Hygrometer.

MESSRS. EDITORS:—Ever since 1848 I have been a careful reader of your most valuable paper; and frequently, since 1852, you have honored me by inserting short articles written by me. A hundred thousand minds, in all parts of the Christian world, expand and bring forth valuable fruit through the scientific light radiated from 37 Park Row. To the careful reader, every issue is replete with valuable information; yet, to be useful to so large a variety of readers, much must be written that has more value for some than for others. Different pursuits, different habits, and different minds, must necessarily have articles specially adapted to their wants.

I read nearly all domestic and foreign scientific journals, and find none equal to yours for general diffusion of practical knowledge to the great mass of readers. Now, in a late issue of the SCIENTIFIC AMERICAN, I find an extract from a paper by Leicester Allen, Associate Editor, which I consider the most valuable paper that has been written, on the all-important subject of steam, for many years. This paper (with the invention of the steam hygrometer, by its author), will open a new era in the generation and use of steam; for now the true standard of a steam generator will be the number of foot-pounds produced by a pound of coal, and not the absurd and indecisive test of the evaporation of water. The greatest possible power with the least coal and the least water, will be the criterion.

Some fifteen years ago, I was so fully impressed with this truth that I stated my belief, before the Polytechnic branch of the American Institute, that the quantity of water was no better test of the true efficiency of a steam generator than the quantity a horse drank would be of the work he could perform. This, as a matter of course, was in debate and merely figurative. In one thing I do not agree with Mr. Allen, namely, that sectional and admittedly safe boilers do not compare favorably with tank boilers as to economy in fuel. I am well acquainted with, and have professionally examined and tested, more than fifty sectional safety boilers in use in the New England States, and have found that an economy, ranging from two to forty per cent, over cylinder, flue, tubular, or upright tubular boilers, is always produced by these safety boilers. One case is very remarkable. The celebrated tool manufacturers, Messrs. Wood, Light & Co., of Worcester, Mass., bought a boiler, which, at a careful trial at the Fair of the American Institute, evaporated nearly fourteen pounds of water per pound of coal. As the boiler is directly under the works in the midst of the workmen, they concluded to put in a safety boiler. This safety boiler evaporates only some eleven pounds of water per pound of coal, but furnishes very dry and highly elastic steam; and the same engine is doing the same work with little more than half the coal. Both boilers are of ample size to do the work easily, and have nearly the same grate area.

There are a large number of works in this section, where the same results have been obtained with safety boilers.

I hope Mr. Allen will have his "steam hygrometer" manufactured, so that engineers and large manufacturing establishments may be enabled to judge of the true value of their generators, and he will thus do much to bring steam engineering to the desired perfection, when one pound of coal will give us five horse-power instead, as is now too frequently the case, five pounds of coal giving one horse-power.

YOUR BOSTON CORRESPONDENT.

Galvanized Water Pipe.

MESSRS. EDITORS:—In your issue of May 13, 1871, you have an article upon "Galvanized Water Pipes." It seems to the writer, who does not claim to be well posted upon such topics, that there may be a wide field for investigation in regard to the thermo-electric influences at work upon metallic pipes. May not these exert a force so constantly at work that the aggregate results are not to be despised, although these results for a day, month, or even year, considered alone, are comparatively trifling? Does not any system of water water pipes connecting, by metallic and fluid mediums, two extremes of heat and cold, such as exist where one end of the system is terminated by, perhaps, hundreds of branches into as many houses, with their kitchens and water backs, and also by other branches, into manufacturing establishments, with their boilers and other steam apparatus where a high temperature is secured, and the other end of the system terminated in a spring or reservoir having a much lower temperature, develop a force constantly at work in the depletion of metal composing the pipes? Should not this force act most freely upon the cold portion of the pipes, and particularly upon any portion that might happen to be the purest, thus depleting the metal and leaving it to the force of the water to carry the material of this depletion where it can do most harm, namely: into domestic use? Is not any such force (if it does exist), intensified by using any two metals instead of one, as is the fact in all lined metallic pipes? Could it not be removed to a considerable extent, by introducing a section of rubber, gutta-percha, or other non-conducting pipe a little outside, or removed from the warm portions of the pipe, thus breaking the connection between the two extremes of temperature?

CENCI BULL.

Boston, Mass.

How do you Prove your Plumb Rule?

MESSRS. EDITORS:—An article appeared some weeks ago in the SCIENTIFIC AMERICAN entitled, "How do you Prove your Plumb Rule?" This was afterwards criticized in an article by a Georgia man, who justly claimed that the writer had lost sight of the question and given directions for *making* a plumb rule instead of a way to prove one.

The Georgian gave a pretty good way to test a plumb rule, and then proceeded to show that the first mentioned writer's method of constructing one was impractical and not likely to produce a correct tool. I think any good carpenter will agree with him.

This was followed by an article from a New Jersey man, who gave the practical and most exact way to make a plumb bob, and also showing why the geometrical or "circle" way is not the best way, though perfect in theory.

Practical carpenters will indorse every word these two men said. Now comes the May number of the *Manufacturer and Builder* with the original article, which is fixed up with a pretty story of a lawyer posing a master builder in court. Now, I must say that that builder was a blockhead or was very much embarrassed, that he didn't teach the lawyer that he had got above his business, and was talking nonsense. I think the *Manufacturer and Builder* is sadly behind times in coming out thus late with the article, and rather stupid not to profit by the corrections of the Georgian and Jerseyman.

But now I wish to ask a question. All this controversy has been about "plumb bobs." Pray tell me if the Southern and Middle States carpenters still use that ancient and honorable, but (so far as this part of the country is concerned) obsolete implement? I have not seen one in use since I was a small boy, and then only by a country carpenter, who, I suppose, did not know, or could not afford the luxury of a good spirit plumb and level.

I could give a better test for proving either a level or plumb. But I cannot believe there is any builder who cannot originate ways and means for himself.

A MAINE CARPENTER.

[Our correspondent is making the not very common mistake of supposing that most people know as much as he does. Give us the better rule.—EDS.

Fallacies in Building.

To suppose that timber, growing in the woods or floating in water today, can be placed in a building next week, and stay where it is put.

That if such timber be used, the walls will not crack.

That the base, window panels, casings, etc., made of such timber, will not part company with the floors from one fourth to three fourths of an inch in less than a year, and that the builder put unseasoned lumber in the latter.

That kiln dried lumber is as good as lumber thoroughly air seasoned, or that the atmosphere has no influence upon it.

That a joint once tight will always remain so.

That if trimmings be put up before plastering, or trimmed on green walls, that putty will not be in great demand when they dry.

That hot air from a furnace will not start and open every piece of wood work with which it comes in contact, nine times out of ten.

That if partitions be not properly braced, bridged, and secured at angles, that plastering will not crack.

That ceilings are less likely to crack if cross furred.

That a pailful of lime to a cartload of sand will make mortar of any practical use, either for plastering or brick work.

That it injures mortar by mixing it some time before using it, or that if mixed one day and applied the next, it won't blister and crack.

That a cement roof, so soft that it fills the leaders in summer, or so hard it cracks in winter, will not occasion the want of new ceilings in a little time.

That a "botch" can build as good a building as a thorough mechanic.

That in all cases money is saved by contracting with the lowest bidder.

That all knowledge in relation to building is embodied in every one who signs "Architect" after his name.

That architects and builders never "lay in together," and owners never get "shorn" through that little arrangement.

That architects, as a rule, get no other commissions on buildings except the traditional "five per cent on the cost."

That builders always carry out plans and specifications to the letter.

That there are no high-minded, conscientious, competent architects, and no honest, reliable builders; and that either class does not bear a reputation equal to that of any other business men.

That a builder does not require an extended theoretical, nor an architect as extended a practical knowledge, to be successful.

That no builder can be a successful architect, or that a practical architect cannot be a successful builder.

That you, reader, without practical knowledge, know a great deal more about the details of a house than of a locomotive.

JOHN HENRY.

Paterson, N. J.

PROPORTION OF SLIDING SURFACES.—We see a reference in one of our cotemporaries to the fact, that if sliding surfaces are equal to each other, they will wear true and straight, while if one be smaller than the other, the smaller will wear convex and the latter concave. The reason of this is obvious on a little reflection. In the case of equal surfaces, the wearing action will be greatest on the parts which are always in contact, and will diminish to the outer extremities. As, however, the conditions are identical for each surface, this will tend to make both concave, by which the bearing will be brought upon the ends, until these are reduced to a normal condition. With unequal surfaces, however, the longer becoming concave through the greater wear of its middle portions, the shorter grinds away to fit it.

A FEW CORRECTIONS OF THE METHOD OF DETERMINING THE PERCENTAGE OF WATER MECHANICALLY SUSPENDED IN STEAM DELIVERED FROM BOILERS WHICH PRIME.

BY P. H. VANDER WEYDE, M. D.

It is only in the interest of science that I feel called upon to draw attention to the existence of some errors in the calculation of the amount of priming of steam boilers, given by Mr. Leicester Allen, page 313 of this volume of the SCIENTIFIC AMERICAN. So long as they remain uncorrected, a conflict of scientific theory and practical experience must result; as, by the method there laid down, good boilers delivering dry steam will be accused of considerable priming, moderate boilers will be supposed to be some 30 per cent worse than they are, and only such boilers as deliver very highly superheated steam, would be considered not to prime.

The suggestion of the method itself (the application of the difference, in latent heat, of steam and water, as a practical test of one of the most important qualities of steam boilers), I consider as very ingenious, and creditable to Mr. Allen; and it is only for this reason that I have taken the trouble to write this communication, which I trust will be a useful contribution to an important subject, and to the so ardently desired agreement between theory and practice.

There are seven errors in the calculation—two in the making up of the formula, three in the use of the formula, and two in arithmetic—one in multiplication and one in division.

The first error is, that the latent heat of steam is accepted as 1,178 units, counting them from the zero of Fahrenheit; while it is clear that, in order to heat water of 80° above that point, all the units derived from the heat below that temperature are not available, and must not be counted.

The second error is of the same nature; counting the units of latent heat of water at 212°, as 212 units, he again counts 80 units from zero for the heat up to 80°; while, in fact, zero Fahrenheit is an arbitrary point—32° below freezing—with which, in this case, we have nothing to do.

The third error is made in the attempt to correct these errors in the making up of the formula, and is, in fact, an acknowledgment of the same. A subtraction is made of 5×80, or 400 units, for the heat in 5 lbs. of water heated above 80°, but a similar subtraction is not made for the units of heat derived from the temperature below 80° in the half lb. of steam used.

The fourth error is arithmetical, and of minor importance. It is in the calculation of the units of heat contained in 5½ lbs. of water of 180°. This should be 5½×180, or 990, and not 960, as stated, and used in the further calculation. This would give for b=590, or corrected from the first error also, 550.

The fifth error is of a more serious nature; it is in applying the value ½ for a, in the formula:

$$x=\frac{1178\,a-b}{966}.$$

The formula is made by Mr. A.,

$$x=\frac{1178-560}{966\times 2},$$ which is equivalent to $$x=\frac{1178\times\frac{1}{2}-560\times\frac{1}{2}}{966}$$

and therefore all wrong, as we must multiply only 1178 with $a=\frac{1}{2}$, and not b or 560 with a or ½. The formula should be

$$x=\frac{1178\times\frac{1}{2}-560}{966}=\frac{589-560}{966}=\frac{29}{966},$$ which would correspond with only 3 per cent priming in place of over 31, as found on page 313; but in this reasoning is contained:

The sixth error. This is very grave also. The value of x is here considered by Mr. A. to be the proportion of water in a unit of steam, as is evident from his calculation of the percentage which he finds by dividing 100×(1178—560), or 100×618, by 966×2, or 1932. Now this again is wrong, as the formula has been based on the assumption that x shall "represent the water in pounds," $x+y=a=\frac{1}{2}$lb. Therefore the value found for x is the direct amount of water in half a pound of steam, which must be doubled to find its amount in one pound, and then the percentage would be (assuming the other figures to be correct) 100×618×2, divided by 966×2, or 63$\frac{6}{8}\frac{4}{6}$ per cent of water. The correction of this error makes matters worse; but applying it to the partially corrected calculation, which gave 3 per cent, it would bring it to only 6 per cent.

The seventh error is in the final fraction, $\frac{9\,0\,8}{1\,9\,3\,2}$, in place of $\frac{1\,8\,0\,8}{1\,9\,3\,2}$, but this may be typographical, and is, besides, of little importance comparatively.

Applying now these corrections to the example given, where half a pound of steam has raised the temperature of 5 lbs. of water 100°, so as to have a mass of 5½ lbs., its units of heat, b, must be 5½×100, or 550, while a is ½. Applying these values for a and b, in the corrected formula,

$$x=\frac{1098\,a-b}{966},$$

we have

$$x=\frac{1098\times\frac{1}{2}-550}{966}=\frac{549-550}{966}=\frac{-1}{966},$$

which means a deficiency of $\frac{1}{9\,6\,6}$ of water in ½ lb. steam, or $\frac{1}{4\,8\,3}$ lbs. of water in 1 lb. of steam, or about one half of one per cent. The steam is thus slightly superheated, and could still absorb this small amount of water and yet be dry steam, a result quite different from that found, namely, 313, or over 31 per cent of water.

Before dismissing the subject, it may be well to test this surprising result by inverting the operation, and calculating backward. Let us investigate what the result must be when 5 lbs. of water of 80° is heated by half a pound of pure dry steam of 212°. Such steam contains one half of 966 units of latent heat, and one half of 212—80 units of sensible heat available to heat water of 80°; this gives ½ (966+212—80—549 heat units, which divided in 5½ of the resultant amount of water, gives $\frac{5\,4\,9}{5\cdot5}$, or 99·8°, not quite 100°, bringing its temperature to 80+99·8, or 179·8°. It is thus seen that perfectly pure and dry steam can, under the given conditions, not possibly heat water to 180°, which is a perfect corroboration of the above criticism, and a proof that the result of obtaining in the example given, a negative value for x is strictly correct.

In a similar way, it is easily ascertained how much one half pound wet steam, containing 31 per cent of water, must heat five pounds of water of 80°; it consists of one sixth of a pound of water and two sixths of a pound of steam. The units of heat in the steam are nearly 323, and in the water 62, total 385. This, divided by the 5·5 lbs. of water, gives an increase in temperature of 70°, bringing it to 80°+70°, or 150°, in place of 180° as found on page 313.

I could easily prove that the absorption of heat by the copper lining, with unavoidable losses of heat by the manipulation, require another correction in favor of the boilers tested, as without these losses of heat, the five pounds of water would obtain a temperature of some two, three, or four degrees higher, which we ought, in order to be just, to credit to boilers tested. Taking this into account, the value for x, found in the above example, becomes about two per cent negative, proving the steam to be not only dry and without water, but considerably superheated.

REPLY TO THE ABOVE, BY L. ALLEN.

The paper which I find is complimented by the criticism of a man of such acknowledged scientific acumen as Dr. Vander Weyde, was written at the urgent request of the President of the Society of Practical Engineering—a request made at 4 o'clock P.M. on the day previous to the reading, the method of testing steam having been some time previously explained verbally to him. Pressure of other duties too important to be neglected, postponed the writing till late at night. The paper had not even a revision before it was read. Under such circumstances of haste, it would not be surprising that some purely arithmetical errors crept into the calculation, more especially as, having found the standards of quantity of water and steam I had been using inconvenient, I hastily changed them to the ones named in the paper. I shall show that the errors are only in the application of the formula to the quantities named, and not at all in the construction of the formula. Meanwhile, I am much obliged to Dr. Vander Weyde for calling my attention to these mistakes, as I should probably otherwise have passed them unnoticed, although they are apparent at a glance, now that my attention is called to them. So long as the principle is sound, and the formula deduced therefrom correct, and the method is in itself pronounced essentially valuable by others of known scientific attainments, I may well be content that nothing worse than a few stray figures and a transposition of a factor, from a numerator to a denominator of a fraction, are all the flaws so acute an observer as Dr. Vander Weyde can fasten upon my humble production. These mistakes could mislead no one capable of understanding and working a simple equation.

As to the correctness of the formula, Dr. Vander Weyde asserts that I assume the latent heat of water at 212° to be 212 heat units, and the latent heat of steam at 212° to be 1,178 heat units. If he will again look at the paper in question, he will see that I assert no such thing. I *do* assume the *total number* of units of heat in steam at 212° to be 1,178, and the *total number* of units of heat in water at 212° to be 212, an assumption usually made in calculations relative to latent heat of steam, and which, while it abbreviates the calculation, gives results as exact as to compute the total from ice at zero, as the following comparison of the two methods will show:

DR. VANDER WEYDE'S METHOD.

No. of units of heat required to raise 1 lb. of ice from zero to 32°	= 16·1
No. of units of heat required to change 1 lb. of ice at 32° into water at 32°	=142·4
No. of units required to raise 1 lb. of water from 32° to 80°	= 48·0
Total units of heat required to convert 1 lb. of ice at zero into water at 80°	=206·5

Multiplying this by 5, we have for the total number of units of heat in 5 pounds of water at 80°—206·5×5—1,032·5 heat units.

In the same manner, the total number of units of heat after the water has been raised to 180° by the admission of steam, and increased in weight ½ pound, will be found to be 306·5×5·5—1,685·75. The heat added by the induction of steam will therefore be 1,685·75—1,032·5 heat units—653·25 heat units.

The formula should, on this basis, be changed from $x=\frac{1178a-b}{966}$, to $x=\frac{1304{\cdot}5a-b}{966}$, and as a represents 0·5 lb., and b has been found to be 653·25, we have

$$x=\frac{652{\cdot}25-653{\cdot}25}{966}=\frac{-1}{966}$$

a result which shows that the steam admitted in the example is slightly superheated, as Dr. Vander Weyde has shown, instead of containing water, as the errors in working my formula made the result indicate.

Now working my formula correctly, we have

$$x=\frac{1178a-b}{966}=\frac{589-590}{966}=\frac{-1}{966}$$

the same result as obtained by Dr. Vander Weyde's calculation, showing that, for all purposes of calculation, the results will not be altered by assuming the total number of units of heat, in a pound of steam at 212° to be 1,178, and the total number of units of heat in a pound of water at 212° to be 212. In making this assumption, I followed the example of many standard writers on steam, well known to engineers, and with whose works Dr. Vander Weyde must be well acquainted. The work is thus shortened by the absence of decimals, and the numbers are more convenient. Had I supposed for a moment this assumption would have led to a misconception in the mind of any one sufficiently acquainted with the physics of heat to understand the principle of the method, I should have adopted the extended mode of calculation, instead of the abbreviated one, although the results attained are the same. With regard to the absorption of heat by the copper lining of the steam hygrometer, and other losses during manipulation, I think they are deemed by Dr. Vander Weyde of greater importance than they really are found to be in practice; but it is easy to make the necessary corrections, should it be found essential to do so. The specific heat of copper is 0·09515. The lining of the water chamber of the instrument weighs about 0·5 pound; it would therefore absorb from 80° to 180°, only 4·75 heat units.

Things Worth Knowing.

J. H. T., in the *Coach-Makers' International Journal*, gives the following recipes:

TO COUNTERFEIT TORTOISE SHELL, VERY FINELY.—In order to do this well, your foundation or ground work must be perfectly smooth and white, or nearly so; you then gild it with silver leaf with slow size, so as to have it perfectly smooth, with no ragged edges, cleaning the loose leaf off. Then grind Cologne earth very fine, and mix it with gum water and common size; and with this, having added more gum water than it was ground with, spot or cloud the ground work, having a fine shell to imitate; and when this is done, you will perceive several reds, lighter and darker, appear on the edges of the black, and many times lie in streaks on the transparent part of the shell. To imitate this finely, grind *sanguis draconis* with gum water, and with a fine pencil draw those warm reds, flushing it in about the dark places more thickly; but fainter and fainter and thinner, with less color towards the lighter parts, so sweetening it that it may in a manner lose the red, being sunk in the silver or or more transparent parts. When it is dry, give it a coat of varnish, let it stand a few days, then rub it down with pumice stone and water. Then grind gamboge very fine, and mix with varnish, giving of this as many coats as will cause the silver to have a golden color, then finish with a clean coat of varnish.

HOW TO CLEAN ALABASTER.—Take ground pumice stone of the finest quality, and mix it up with verjuice; let it stand for two hours, then dip in a sponge and rub the alabaster therewith; wash it with a linen cloth and fresh water, and dry it with clean linen rags. Any kind of marble may be done in the same manner.

TO CLEAN SILVER OR GOLD LACE.—Lay the lace smooth on a woolen carpet or piece of woolen cloth, and brush it free from dust, then burn rock alum and powder it fine, and afterwards sift it through a lawn sieve; then rub it over the lace with a fine brush, and in so doing it will take off the tarnish and restore it to its brightness, if it be not too much worn on the threads.

HOW TO MAKE ARTIFICIAL MARBLE FOR PAPER WEIGHTS OR OTHER FANCY ARTICLES.—Soak plaster of Paris in a solution of alum; bake it in an oven, and then grind it to a powder. In using, mix it with water, and to produce the clouds and veins, stir in any *dry* color you wish; this will become very hard and is susceptible of a very high polish.

Plague in Buenos Ayres.

Letters recently arrived from Buenos Ayres, giving sad and distressing accounts of a terrible visitation of yellow fever to that city, during the months of March and April. The fever was exceedingly virulent in the whole city, and neither the strong nor the well nurtured were spared by it. It is stated that nearly one hundred thousand people left the city in a few days, the terror being justified by the scourge, which destroyed, in some instances, whole families in a single night. The panic was such that the suburbs and surrounding country became over-crowded, and lodging could not be obtained. On March 29, the mortality reached the appalling figure of 367, and the whole state of society seems to have been upset.

At a meeting of merchants at the Exchange, it was agreed to suspend all business, and to grant an extension of sixty days to all debtors and on all pecuniary obligations; and although the arrangement did not receive legal sanction, it has been practically carried out by the benevolent tolerance of all holders of securities. The devotion of all classes to the afflicted or bereaved is deserving of the highest laudation; a great many sanitary and relief commissions are appointed, and the exemplary conduct of the entire population is worthy of great commendation. Money subscriptions in aid of the sufferers are pouring in from all quarters. Such visitations seldom fail to show us the sad spectacle of good men falling victims to their own charity and disinterestedness, and a great number of those whom Buenos Ayres could ill spare have fallen, among whom the President of the General Relief Committee, Don Roque Perez, may be numbered.

We are informed that this is the first visitation of yellow fever to Buenos Ayres, and that the contagion was imported from Paraguay. Our advices unite in considering the affliction so severe as to be a certain check on the rising prosperity of the country.

CATGUT is the name applied to strings, made chiefly from the intestines of sheep, used for harp, violin, guitar and bow strings, hatters' strings, etc. It is said that the best strings are made in Naples, because the Italian sheep, from their leanness, afford the best raw material—the membranes of lean animals being tougher than those of animals in high condition. The same name is also given to a species of linen or canvas with wide interstices.

Improved Furnace Grate.

Our engraving illustrates a furnace grate, patented Feb. 28, 1871, by G. W. Hildreth, of Lockport, N. Y. The grate is intended to burn anthracite coal screenings, without any preparation or the admixture of any other fuel. The inventor claims that, by the use of this grate, such screenings may be successfully used as fuel for the generation of steam. He further informs us that one has been in constant use since June, 1870, with perfect success, the fire not having gone out in a single instance during the day.

The grate bars, when closed, form a level, smooth, and imperforate upper surface; and, when open, form a series of inclined upper surfaces, upon which the coal dust, or fine coal, may rest and burn, while the air is admitted between them.

By working the shake handle laterally the grate is opened or closed. There being teeth or cogs on one side only of the shake handle pinion, only the front half or the rear half of the grate is opened or shaken, at the same time, the racks being respectively pivoted to the bar in the front and rear halves of the grate. This allows the grate to be used with as large or as small openings as may be desired. One half of the grate only may be used when a smaller fire is needed. The working of the shake handle also shakes the grate for clearing the fire of ashes.

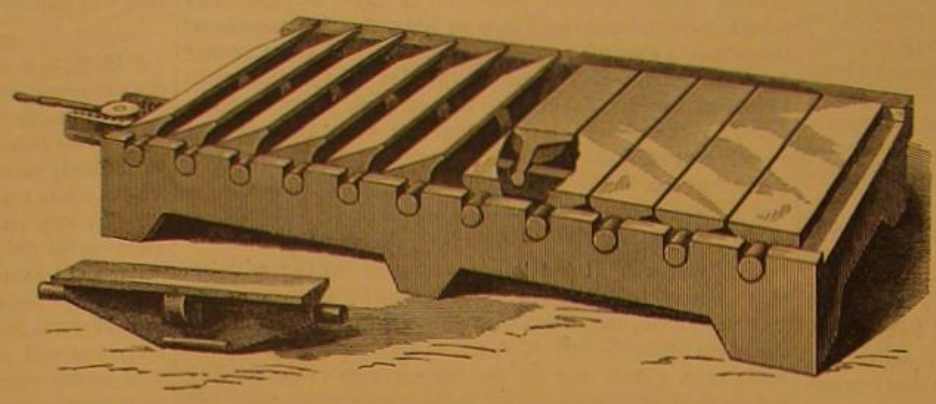
A blower may be used, discharging a blast into the ash pit, or a plain chimney draft, according to particular exigencies.

We are informed that the grates, after eleven months' use, show no signs of burning out or warping, being as good as when first put in. The fire being kept on the top of the grates, they are kept much cooler than grates of some other forms.

Coal screenings can be obtained in most of our cities at scarcely more than the expense of handling, and at the mines are without limit or cost.

It is claimed that these grates are as effective as any other for burning coarse coal or wood, and that they will burn sawdust perfectly.

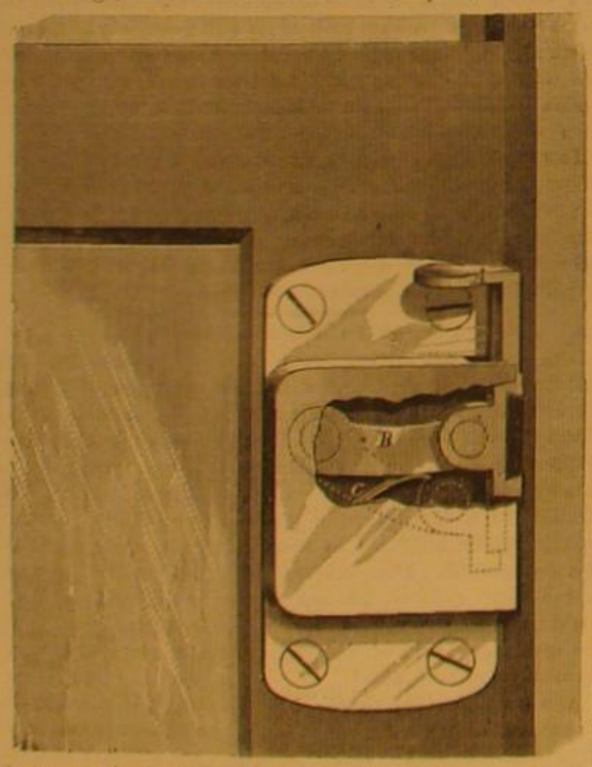
For further information address G. W. Hildreth, Lockport, N. Y.



HILDRETH'S FURNACE GRATE.

SASH LOCK.

Our engraving represents a very neat, simple, and efficient sash lock, which is, in our opinion, well adapted for use on the sashes or blinds of railway cars, as well as on windows in dwellings, and which can be made to compete, in cost, with



almost any in market. A good, convenient fastening of this kind has long been demanded by the traveling public.

Its construction and operation will be understood from the engraving. A is the catch piece, pivoted to the bar, B. The bar, B, turns radially on a pivot at the opposite end from A, and is forced upward by a spring, C. The catch piece, A, is faced with india-rubber on the side which engages the jamb of the window, and the bar, B, being slightly longer than will allow the catch piece to turn by its point of contact with the jamb, operates like a toggle joint, to press the catch piece against the jamb whenever the sash seeks to descend. In this way the sash is firmly wedged in the frame, so that it cannot fall. The rubber, while it affords a good hold to the catch, obviates all defacement of the wood work.

On the contrary, when it is desired to raise the sash, the upward motion of the sash immediately releases the catch piece, so that the thumb piece formed upon the upper part of the catch piece is not used except when it is desired to lower the sash. In this case, pressing upon the thumb piece disengages the catch piece from its pressure on the jamb.

Patented March 21, 1871, by P. B. Hovey, New London, Conn. The whole or a portion of the right will be sold. Address the patentee for further information.

THE timber on 600 acres of land on Welsh Mountain, near Reading, Pa., was burned lately.

Electricity as a Motive Power.

In our issue for December 15, 1870, says the *Technologist*, we expressed our fears that the articles written by the Rev. Mr. Highton, and published in a journal of such recognized authority and extensive circulation as the *Chemical News*, would lead to a great amount of wasted effort on the part of oversanguine inventors. The result has confirmed our anticipations. Already applications are passing into the Patent Office at an unprecedentedly rapid rate, and every few days we find an announcement to the effect that some lucky inventor has devised an electromotor whereby an engine of enormous power may be driven for weeks with an infinitesimally small amount of zinc. And as there are hosts of sanguine but unscientific inventors throughout the country, who think that each has just as good a chance to be the successful man as any one else, these reports are setting all our inventors wild with excitement. It may be well, therefore, for us to say that thus far we have no trustworthy accounts of any engine exhibiting a marked superiority over those that have been known to the scientific world for some years. Moreover, the ablest scientific men of England have expressed their dissent from Mr. Highton's views, and have shown the fallacy of his arguments. We may add further, that Mr. Highton's papers do not seem to be based upon any experiments he himself has made, but upon theoretical deductions from old experiments of Joule, Jacobi, and others, many of which were made a quarter of a century ago, and in a comparatively rude way. As a still further general objection to the theories of Mr. Highton, we would say that he confounds and mixes up force, work, energy, etc., in a most ludicrous manner, and that such minor points as time and space, which are regarded by most engineers as of paramount importance, are looked upon by him as not worth taking into account. Now, the shortest and most conclusive way for Mr. Highton to prove that a given amount of zinc, consumed in a galvanic battery, will produce an unlimited amount of power, is to show it by a practical experiment. Half the time and labor that he has spent in writing about this question would have served to submit it to a crucial experimental test; but then it is a great deal easier to write than to experiment, and, moreover, work done in the study with the pen, brings notoriety more readily than work done in the laboratory. For the present, at least, we would recommend our readers to be cautious about investing in electromagnetic engines.

Oil Well Torpedoes.

In a recent trial at Pittsburgh, before Judge Strong, of the United States Circuit Court, the Roberts patent for increasing the flow of oil wells, by the firing therein of torpedoes, was fully sustained.

The patent consists in sinking to the bottom of the well, or to that portion of it which passes through the oil-bearing rocks, a watertight flask, containing gunpowder or other powerful explosive material, the flask being a little less in diameter than the diameter of the bore, to enable it to slide down easily. This torpedo, or flask, is so constructed that its contents may be ignited either by means of caps, with a weight falling upon them, or by fulminating powder, placed so that it can be exploded by a movable wire, or by electricity, or by any of the known means used for exploding shells, torpedoes, or cartridges under water. When the flask has been sunk to the desired position, the well is filled with water, if not already filled, thus making a water tamping, and confining the effect of the explosion to the rock in the immediate vicinity of the flask, and leaving other parts of the rock surrounding the well not materially affected. When these arrangements have been completed, the contents of the flask are exploded by the means already mentioned, and, as the evidence showed, with the result, in most instances, of increasing the flow of oil very largely.

The theory of the inventor is, that petroleum, or oil taken from oil wells, is, before it is removed, contained in seams or crevices, usually in the second or third stratum of sandstone or other rock abounding in the oil regions. These seams or crevices, being of different dimensions, and irregularly located, a well sunk through the oil-bearing rock may not touch any of them, and thus may obtain no oil, though it may pass very near the crevices; or it may in its passage downward touch only small seams, or make small apertures into neighboring crevices containing oil, in either of which cases the seams or the apertures are liable to become clogged by substances in the well or in the oil. The torpedo breaks through these obstructions, and permits the oil to reach the well.

Judge Strong, in delivering the opinion of the Court, holds that while the general idea of using torpedoes for the purpose specified is not patentable, the particular method of employing them invented by Mr. Roberts is patentable, and therefore that he is entitled to protection.

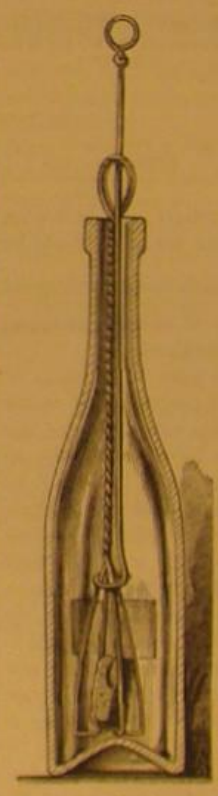
Boxwood.

It is surprising to what perfection engraving on wood has been brought. A few years ago a woodcut might have been readily distinguished from all other illustrations by the coarseness of the engraving. At present, we find some of the best artists devoting their time to delineating on wood, and such is the delicacy of the drawings, the highest skill of the engraver is required to preserve the effect produced by the masterly use of India ink, the lead pencil, and China white. The pictures in the illustrated journals, such as Leslie's, Harper's, *American Agriculturist*, Appleton's *Journal*, SCIENTIFIC AMERICAN, and others, are all cut in boxwood. Boxwood, as is well known, grows in different parts of the world. The bulk, however, of that which is used in this country is imported from Turkey. The growth of the tree is slow. If it be twelve inches in diameter, its age is to be numbered by centuries, for it is above 500 years old. Those trees which attain a diameter of eighteen inches are about 1,000 years old. Block makers prefer trees eight to ten inches in diameter. The wood is sold by the tun, is very costly, and is of such various qualities that not more than an eighth or a tenth part of a tun is suitable for the finest engravings.

The best quality of wood is of a bright canary color, the texture fine and close, and the surface free from dark markings; great care is required in preparing the blocks. After the wood in the log has been sawn up into sections of a proper thickness, and becomes thoroughly seasoned, it is ready to be cut into blocks, and here one may see what an amount of waste wood there is. Checks and other imperfections require close cutting of the sound wood, and as these pieces are necessarily small, several must be joined together to form a large block.

Blocks, the size of our fashion plates, are composed of from four to six different pieces, fitted, doweled, and glued together with such extreme nicety as to present the appearance of a solid piece. Large blocks are generally joined together with screws, so as to admit of being taken apart for engraving, and re-united when ready for the printer.—*Coach-Makers' International Journal.*

CORK EXTRACTOR.



The removal of a cork from a bottle into which it has been driven, is often a work of some difficulty. The implement shown in the annexed engraving, is designed to meet this difficulty. It is the invention of C. Rosenberry, of Chicago, Ill. It consists of a wire grapple, made of four wires twisted together to form a handle, leaving four ends projecting and hooked to seize the cork. The hooks are made to engage the cork, by a sliding ring with a wire handle which slides through the ring of the handle of the grapple. When, in taking out the cork, the grapple meets the neck of the bottle, the latter holds it firmly to its work.

We have often, in the laboratory, felt the need of such an instrument as this, when wasting time endeavoring to ensnare a cork with a string. Corks, at such times, seem endowed with an amount of sagacity which enables them to elude a noose almost as surely as a Sixth Ward rough in New York. Had such an implement as this been within our reach, we have no doubt we should have been saved many a trial to a temper not the best adapted to withstand severe strains.

Italian Maritime Exhibition.

A grand maritime exhibition was recently inaugurated at Naples, which is described as being a very interesting and instructive display. The exhibition was divided into ten groups or subdivisions, including steam machines, models of ships, military arsenal machines, cordage, instruments for navigation, marine comestibles, fishing instruments and materials, articles illustrative of the ancient and modern marine, etc. Finally a number of objects were admitted under the class of articles of exportation, among which were some exquisite Venetian corals and glass.

The exhibition building was erected at the water's edge, and in fact extended partly over the water of the bay, which gave an opportunity for the construction of an aquarium in an ingenious manner. It was in an apartment below the level of the water; in fact, it was a little submarine grotto, with a portion of the sea itself shut in by wire walls, where the fish swam about for their own and the visitor's pleasure. Cuttlefish, starfish, lobsters, a turtle some five feet in circumference, and numerous other citizens of the blue Mediterranean, disported in their native element, quite unconscious of the admiring gaze of the crowd. Large panes of blue glass at the sides let in a strong light that reminded one of Capri, and rendered the cave a most interesting feature.

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Importance of Advertising.

The value of advertising is so well understood by old established business firms, that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it: upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the venders of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of from 25,000 to 30,000 copies per week larger than any other paper of its class in the world, and nearly as large as the combined circulation of all the other papers of its kind published.

THE ERIE CANAL NAVIGATION PROBLEM.

In the present article, we propose to notice some of the plans and devices that have been patented in this country for the propulsion of canal boats. In doing this, we shall not, perhaps, enter into a detailed description of any, but will give, in as few words as possible, the general principle of operation of such as may be suggestive in their character, or the defects of which may be either shunned or remedied by inventors.

One of the first we find recorded, is an Archimedes screw surrounded by a casing, which was intended to protect the propeller and insure a more perfect action by reducing the slip. What was expected to be gained through the use of an Archimedes screw, that could not be obtained by the use of a flat screwblade, the record does not set forth.

Next, we find paddle wheels *set in shafts* placed parallel to the line of motion of the boat, having blades or paddles placed obliquely to the axis of the wheel. It is obvious that wheels of this kind might be made to propel a boat. When moving in one direction, their tendency would be to throw the water toward the sides of the boat. Moving in the opposite direction, they must cause a powerful swell against the banks, if moved with even moderate velocity.

We also find a screw propeller having grooved or ribbed blades, undoubtedly intended to obviate slip. It is not surprising that in the earlier attempts to use screws for this purpose, such devices should have been tried, since at that time very little of the philôsophy of screw propulsion was known.

A propeller consisting of two hinged buckets, connected by rods to a horizontal oscillating beam, which caused the buckets to move back and forth, like the feet of a man in the act of swimming, is also one of the earlier devices. A screw wheel, hung in the rudder, and having a miter wheel at the end of its shaft next the boat, receiving power from a vertical shaft, which was driven by miter gearing from a horizontal crank shaft, is another of the earlier devices. Of course, the connection of the propeller shaft by miter gearing enabled it to be swung about with the rudder, and it was evidently sought by this means to aid the rudder in changing the direction of the boat, since the action of the propeller would always be in the central vertical plane of the rudder. The screw was placed at the outer edge, and near the lower part of the rudder blade, and its shaft passed through the blade at right angles with the rudder post, being sustained by suitable bearings or boxes.

We find, also, a pump with changeable valves, which drew in water at the bow of the boat and discharged it at the stern. The changeable valves permited the water to be drawn in at the stern and discharged at the bow, in order to reverse the motion of the boat.

A screw, with a portion of the blade made elastic, is also one of the patented devices, the object of which is not very apparent.

Placing a steamboat at the stern of a boat and pushing it along, is also one of those devices of which we seek in vain some intelligible purpose.

A queer device is that of an oscillating propeller, placed one on each side of the stern of the boat; the propeller being a flat blade, propelled by a pivoted lever.

Another curious idea is that of placing a screw at the stern of the boat, to work in water, and another at the bow to work in air. The latter was intended to aid in raising the bow out of the water, though how it could do so, or what good there would be in so doing, could it have been done, probably was apparent only to its inventor.

A screw with a cylinder cast or formed upon the ends of the blades, and revolving with it, is an attempt to carry out in another form the supposed obviation of slip, which preceding inventors had sought to gain by fixed cylinders.

A boat, constructed with two water channels, extending one on each side of the whole length of the boat, with paddle wheels in the middle of the channels, is another attempt which has in it some elements of value. At least, the inventor evidently comprehended the fact, that the displacement must be made toward the rear of the boat, in order to avoid side swells.

The next device worthy of notice is a boat with a central channel and a single paddle wheel. This boat was, essentially, made with two hulls, though above the water line they were decked in common. The exterior lines were straight, the general plan being such as would be described by splitting an ordinary hull lengthwise, and placing the outsides inward, so as to leave a channel between.

Later, we find a series of vertically adjustable paddles, working in a reciprocating frame.

Then follows a pole propeller, or what might be appropriately styled crab feet, which, engaging the bottom, push the boat along.

Subsequently, a toothed rack, to run the entire distance along the side of the canal, was invented and proposed, the power to be applied from a toothed wheel, attached to the boat. The same idea has been, more recently, modified by another inventor, who proposed a chain instead of the rack, the teeth of the wheel to engage the links of the chain.

Further along, we meet with an endless chain propeller, with paddles, like the buckets now used in chain pumps. Also, a reciprocating propeller, somewhat on the principle of a duck's foot.

Then we fall upon reciprocating rods, with adjustable floats, and another reciprocating duck's foot propeller, and a frame working oscillating paddles at the side of the boat.

It will be seen that in this, as in other departments of invention, the earlier ideas were many of them crude and impracticable, but the history of the application of steam power to the propulsion of canal boats, from the first attempt down to the one which will at last prove successful, will be scarcely less interesting than that of the various modes of propulsion for larger craft upon rivers, lakes, and oceans. In a future article, we may give some further information in regard to later inventions of this kind.

HOW LABOR ENSLAVES ITSELF TO CAPITAL.

If, in speaking plain truths, we hit somebody hard, our duties as public journalists admonish us to "cry aloud and spare not." The recent coal strikes, with their attendant riot and bloodshed, are an effort on the part of the working miners to shake off chains which they themselves have helped to rivet.

The right of working men to form associations to protect their own interests is conceded. So long as any class is conceded this right, working men must be allowed the same right. Availing themselves of this right, their trade associations have become numerous, and, in one way, powerful. In compelling their fellows to obey the dictates of their associations, whether members or not, they succeed sometimes, by adopting the most ruffianly and dastardly means. The latter remark, however, applies with greater force to the European trade associations than to the American. Blowing up workmen with powder, putting needles in clay, rattening, etc., have not to any great extent disgraced the cause of labor in this country, principally because the superior education of American workmen has produced a civilization which revolts at such outrages.

In the struggle between capital and labor, which bids fair to be a long and bitter one before a final adjustment of their mutual relations shall be reached, the working men possess three essential elements of weakness. The first is, in supposing brute force to be stronger than mental and moral force. The second is that their want of frugality disqualifies them for holding out in long strikes, when starvation takes sides with capital. The third is, that, by excluding apprentices, they act like a general who, advancing to meet a powerful foe, refuses to accept recruits.

If they opened their ranks to all new comers, and, by intelligent leadership, were directed to expend their efforts in creating opinion, and were caused to act as an unit, they could do almost anything they wished. By keeping at work and living providently, they could use their money to better advantage than by contributing to the support of isolated bands of strikers, at war with individual capitalists.

At present the trade *unions* coöperate in only a feeble manner, and only for temporary results. Their leaders often use them to further their own political, or other selfish interests; and so long as the mere control of present wages, and restriction of other working men from entering the trades, are the objects of these organizations, they may and must be so used by their leaders. They have no grand principle for which they struggle; no definite idea of a final adjustment between capital and labor; nothing that looks forward to a time when the interests of both shall be recognized as mutual. Hence they are divided by dissensions, and led by demagogues. Capital, guided by intelligence, is stronger than they in all except brute force. At any time it retreats, it conquers, while retreat with a trade union, as at present organized, is disastrous defeat.

CHARLES E. EMERY ON COMPOUND ENGINES.

A given measure of expansion of a given volume of steam will develop a constant measure of mechanical power. Upon this axiom have those based their arguments, who maintain that compound engines have no capacity which theoretically can account for any economy of the fuel required for the performance of a given amount of work.

With this axiom Mr. Charles E. Emery takes no issue; but, in a paper recently read before the Society of Practical Engineering, he announces a new theory, which, while it does not conflict with the fundamental axiom enunciated, does, he claims, account theoretically for a larger gain in economy made, or which it is possible to make, through the compound system.

That for marine engines "it furnishes a better working engine mechanically, for utilizing the benefit of the expansion of high pressure steam, will," he thinks, "be very generally conceded;" but, he claims that "independently of mechanical considerations, it is more economical to use steam expansively, in a compound engine, than in any form of the ordinary engine."

While admitting that there is no power gained through the use of a small high pressure cylinder, in combination with a large low pressure cylinder, and that, in so far as it is asserted that there must be loss of power owing to multiplication of passages, increase of clearance, etc., the engineers who deny the essential value of the compound system are right, he asserts that they err in considering the capacity of the cylinder as the measure of the steam used. This fact, he asserts, has been proved over and over, but has not till now received much attention.

As additional proof, however, he cites some experiments of his own, made with two cylinders of like dimensions, the one of glass and the other of iron, the iron cylinder using fully twice as much steam as the glass one. The details of the experiments given by Mr. Emery leave no doubt that the difference in condensing power between the two cylinders actually existed, as would also be supposed by those conversant with the difference in conducting and radiating powers possessed by the materials named.

Mr. Emery does not state, however, whether one cylinder performed more work than the other, and we are left in the dark on this point. The amount of steam used in the two cylinders was determined by condensation, and we have no doubt that had it also been measured by the work performed, under circumstances calculated to economize the power of the steam to its utmost practical limit, the iron cylinder would have done nearly as much work as the glass one, with the same volume and pressure of steam, the difference being only that due to external surface radiation.

He states that the experiments referred to suggested the employment of cylinders of non-conducting materials, when it occurred to him that nearly the same result might be obtained through properly constructed compound engines, involving no difficult mechanical details.

The material part of the loss he regards as arising from the transfer of heat, by radiation, from the cylinder to the exhausting steam. Connecting this fact with the fact that "the quantity of heat transferred from a radiating body to an absorbing body varies as the square of the difference of temperatures," he argues that if the temperature of the metal surface of a steam cylinder be 280°, and that of the exhaust 150°, the employment of two cylinders, reducing the temperature in each to one half the original amount, would reduce the condensation through radiation to one fourth that of the first cylinder; or, making all due allowance for increased extent of surface, to not less than one third as much, thus making a clear gain of two thirds of the heat lost by radiation in the single cylinder.

We have endeavored to give in brief a fair statement of Mr. Emery's theory, though necessarily omitting much of his argument. It is a most plausible one, but we are not yet willing to concede that it demonstrates the superiority of the compound system. We are willing to admit—in fact, we have already shown in a previous article—that engines of this class have mechanical advantages which render them desirable for marine service.

If our readers will refer to the interesting communication of Mr. Harrison, published in our last issue, they will see that the boiler pressure of a first class steamer, having one of these engines, is fifty-four pounds, and that expansion and condensation are both employed. The usual expansion is, we believe, about twelve times, in such engines; and, in the diagram accompanying Mr. Harrison's communication, the steam is shown as being cut off at half stroke in both the cylinders. The vacuum is maintained at twenty-seven inches. The boiler pressure used with these engines rarely exceeds sixty pounds, at which the temperature of the steam is 307°. Suppose this steam to be expanded down to the atmospheric line. The difference between its temperature, when expanded, and that at sixty pounds, would be 95°. The amount of heat, then, that might be lost, by internal radiation, sup

posing the steam to heat the cylinder at 307° at the commencement of the stroke, and to cool it down to 212° at the end of the stroke, would be 95° × .12983 (specific heat of iron) multiplied by the weight of the cylinder, piston, and that portion of the piston rod subjected to steam heat, estimated in pounds. The product would be expressed in units of heat. It is evident that such loss would be large on heavy cylinders, unless the heat was converted into work by the expansion of steam at lower temperatures. This is done in the compound engines of the Magellan, as, according to Mr. Harrison's statement, the steam performs work to within six inches of vacuum.

Now, will Mr. Emery explain what other than mechanical difficulties impede the attainment of the same result with single cylinder high pressure engines, using condensers?

As the heat leaves the cylinder, what does it do but continue to expand the contained steam, thereby enabling it to follow the piston with greater efficiency down to and below the atmospheric line, the steam exhausting at a pressure of six inches of mercury column? Is this not possible, at least theoretically, in a single cylinder, with a condenser?

The heat abstracted by the cylinder at high pressures, is stored up and imparted again at lower pressures, in both systems; and we maintain still, that, under the same conditions, the same amount of expansion will produce the same economical result. Of course, the surface radiation in compound is greater than that in single cylinders.

If Mr. Emery's theory be correct, the steam jacketing of a cylinder is bad practice; for, though the cylinder abstracts no heat from the steam, as soon as the steam expands, the cylinder imparts heat, the amount of which must be greater when the cylinder is kept at a constant temperature, than when the temperature decreases and keeps more nearly uniform with that of the steam. If the heat imparted by the hot cylinder be not converted into work, it is lost; and we admit that, if allowed to exhaust without condensation, so that expansion can be carried to its lowest practical point, there would be loss; but why this cannot be done in a single cylinder, we, in common with many others, fail to see.

POPULARIZING SCIENCE.

We have seen it stated that, during the siege of Paris, Henry St. Claire Deville, one of the most illustrious, and, at the same time, genial and popular of the scientific men of France, made an address to the members of the Academy of Sciences, which was the occasion of earnest debate; but the text of the speech had not reached us until the English periodical *Nature* gave it in the original French to its readers. Deville says, what all the world had been uttering before him, that France was conquered by the science of Germany. The very discoveries and inventions of their own men had been used to destroy them. "The discoveries of Ampère, the inventions of our military engineers, have been cruelly employed against us, and thus they say on every side, and with truth, that we have been conquered by science," are his words.

In seeking for an explanation of this disastrous state of affairs, Deville gives two adequate reasons: the first, that men of science had been overlooked by the Government, and mere politicians appointed in their places; and secondly, that the members of the Academy had devoted themselves too exclusively to abstract science, and left the world to find out what was going on in the best way it could. He proposes as a security, that the Institute should appoint committees to discuss all matters relating to the government; and, at the same time, seek to popularize science, and, by well edited publications, to familiarize the public mind with the grand discoveries of the day.

It ought not to be forgotten, in this connection, that it was Deville who obtained an appropriation of 50,000 francs from the Emperor, to make investigations into the properties and uses of aluminum. But this was a paltry sum compared with the millions expended by the same ruler on the luxuries and vanities of his court. And yet, out of the research made by Deville has grown the cheap manufacture of sodium, and, indirectly, the preparation of the rare metals aluminum, magnesium, boron, silicon, and the gold amalgamation process. He made the fifty thousand francs go a great way, and showed what might be accomplished if the patronage of the government could be extended to similar investigations in other directions. Deville was, therefore, entitled to call upon his fellow members to come out from the dry bones of abstract science, and try to clothe them with the garments of usefulness and intelligence.

It is certainly true that the French Institute has for a long time presented a curious spectacle to the world. Its members have grown old in the study of theoretical matters. They could not see beyond the ends of their noses, and when the war broke out, and they found themselves shut up in Paris, they suddenly tried to make themselves useful by attacking some of the practical questions of the day, such as proper food for famine times, and deadly weapons and explosives for their enemies.

It is amusing to read what they said about Boston brown, or Graham bread. Payen, who has written volumes, said that he had tasted it, and found it good; Dumas had seen it baked; Chevreul, the founder of all we know about soap and candles, had had some experience with it, and so on, through the list. And these grave men actually decided that "unbolted flour was safe to eat in war times." It is evidently high time that the members of the Institute were woken up, and, as an inducement for them to look more to practical matters, it would be well for the new government to assign them places in the bureaux where a scientific knowledge is requisite. What they need in France is less politics and more science. Would it not be wise for us to investigate matters in this country, to see how far our own Government is conducted by politicians, and how often scientific men are invited to take part in the various branches of administration?

France, by her own showing, has been ruined by politicians; it may be well for us to take note of this and profit by the lesson. In the matter of popularizing science, we can safely challenge criticism, in the United States. There is scarcely a newspaper, magazine, or weekly, that has not a special scientific department, and the SCIENTIFIC AMERICAN, in the course of the year, furnishes an account to its readers, of every invention of importance that is made in any part of the world.

The result of this wide dissemination of knowledge is that the American people are famous for their practical talent The universal Yankee is a mystery to European nations, as they have no analogous character with which to compare him. There is more danger of our running to the other extreme, and of our rendering scientific knowledge superficial by too great a desire for popularizing it. It is better to strike an average, and to secure well-endowed universities, as well as technological institutes; and as our journal is outside the arena of politics, we may with propriety suggest that a little less politics and more science, in the administration of the affairs of Government, would enable us to escape the dangers which have brought France so low, and threaten some day to overturn our own Government.

TRIAL OF OLMSTEAD'S ELECTRIC CAR BRAKE.

An excursion party, consisting of members of the press and railroad men, was recently invited to witness the trial and operation of this novel brake on a train of five cars on the Erie Railway.

The levers are of the ordinary kind, and may be operated by hand in the ordinary manner. The electric device is an attachment to one of the levers of the ordinary brake. The electric arrangement is as follows; A horizontal swing shaft is placed within the car truck, parallel with the car axle, on which shaft is a loose shell pulley which receives motion from the car axle against which it rests. Within the loose pulley is a fixed pulley, keyed on the swing shaft. On the face of the fixed pulley are two powerful electro magnets, each capable of sustaining 300 pounds, so that their combined force is 600 pounds; these are connected by wires with a Daniell's battery, on the car; each car having its separate battery. A chain extends from the swing shaft to the brake lever.

The wires, connecting the battery and the magnets, extend to a key board attached to the ceiling of the car, and the electric connection is made at this point by a simple lever or key, operated by the bell cord. On pulling the cord, whether by the engineer or conductor, or by the breaking of the coupling, the electric circuit is made, and the magnets draw the loose and fixed pulley together, whereupon the swing shaft winds up the brake chain, and the brakes operate on the wheels and stop the train.

It may be said that the electricity forms a clutch, and thus holds the brake shaft to a pulley which is kept in motion by the movement of the car. Electricity is therefore employed as an aid to utilize the momentum of a moving train or car.

The party started from Jersey City at 12 30 P. M., and, after passing through Bergen Tunnel, the trials were made on the level grounds of the meadows, as follows:

1st. The train was stopped in 55 seconds with hand brakes.

2nd. The electric brake stopped it in 45 seconds.

3rd. With the electric brake and reversing the engine, the train was stopped in 28 seconds.

4th. The engine was detached from the train when going at full speed, which set the electric brakes in operation throughout the train, the latter being stopped by their action in 22 seconds.

5th. This was the last trial, and consisted in detaching the two rear cars, when the train had attained a maximum speed. The moment they were detached, the electric brakes were set by the cord itself, and the two cars stopped in 13 seconds, while the part attached to the locomotive was stopped in about 40 seconds. The maximum speed in all the above trials was 30 miles per hour.

Every trial was a success, showing the great utility of the device.

The electric brake may be operated by the engineer or by the conductor, by simply pulling the bell cord. In case of separation of the train, by the running off of one of the cars or other cause, the brakes become self-acting, and their force is instantly applied.

On the conclusion of the experiments, which were eminently successful, the party returned to Jersey City, and partook of a sumptuous lunch at the Erie Depot.

We learned that this brake had been in use on the Middletown train of the Erie road, for the last seven months, stopping the train fifty times daily; and further that it was the means of saving the train from a fearful accident at West Paterson Bridge, where the engineer was warned of danger only 2,000 feet distant, and stopped the train within 50 feet of an oil train, in 23 seconds on a down grade.

The brake was patented April, 1870, by J. Olmstead and W. O. Cooke, of Providence, R. I.

OCEAN TELEGRAPHY.

Cyrus W. Field, Esq., in a recent letter to Prof. Morse, states that the date of completion of the first Atlantic cable, between Great Britain and America, was August 5, 1858. This cable ceased to work on September 1st of the same year, after exactly four hundred messages had been transmitted.

An attempt to lay another cable was made in 1865; but on the 2d of August of that year, when about two thirds of the length had been laid, the cable broke from the vessel and was lost.

The second cable, between Ireland and Newfoundland, was completed July 27, 1866.

The third cable (consisting of the lost cable of 1865, which was recovered in 1866,) was completed September 8, 1866.

The fourth cable, from France *viâ* St. Pierre, N. F., to Duxbury, Mass., was completed July 23, 1869.

During the month of March of the present year, 12,547 messages, or about 405 per day, were transmitted by Atlantic cable.

At present, only one cable—the French—is in working order. The first cable is supposed to have been defective in construction. The second and third cables ceased to work some time ago, owing to defects in the shore ends near Newfoundland. These cables are to be fished up and repaired in June next. All the business is at present done on the French cable.

Telegraph lines now reach as far east as Singapore, a distance of some nine thousand miles from New York. From Singapore to Hong Kong, a line is to be completed within a month; and from this line a cable to Australia is to be completed in November next.

JEAN LAFITTE AND HIS TREASURE.

The reputation for wealth acquired by piracy, which Jean Lafitte has attained, has set many to employ time and means, worthy of nobler ends, in searching for his hidden treasures. Lafitte was not a sailor, nor a pirate. He was a blacksmith by trade, and became agent to an association engaged in the capture of Spanish merchantmen. This association was under a commission from the Republic of Columbia, which was, in the early part of the present century, at war with Spain. Columbia issued letters of marque to the ships of Lafitte's organization, and a great deal of valuable merchandise was seized. The property was taken into possession by the United States Government, and consumed during the defence of New Orleans, in 1814 and 1815. Lafitte's men were released from the prison, in which they had been placed, and sent to man the batteries in Jackson's lines. They were granted full liberty at the end of the war, and received the thanks of General Jackson.

These facts must be in the remembrance of some now living, and are mentioned in books accessible to all the world; but there is a curious superstition among the more credulous of the inhabitants of some of the Southern States, that Lafitte and his followers buried untold mines of wealth in some of the islands outside the Rigolets. The folly of the believers in this "yarn" has led many of them to risk their fortunes in attempts to recover the treasures, and the fact that Lafitte's men, when discharged from service, never visited the place where they are reported to have deposited their property, has not prevented men, even in our own day, from following the chimera. Jean Lafitte was drowned in the Gulf, in the wreck of a little ship of which he was supercargo, and his associates mostly remained in New Orleans, and were always poor men.

Recently, Mr. A. J. Newell, a compositor by trade, and lately employed on the New Orleans *Picayune*, left his home to explore the islands which tradition pointed out as the depository of the treasures. He had received from his father an oral communication (said to be derived from one of Lafitte's men), detailing the place of deposit with minute exactness. Many members of Mr. Newell's family had made similar voyages, and their credulity was not shaken by the always-repeated failure. But a disaster has now changed the comparatively harmless folly into a tragedy. Mr. Newell's body was discovered in the water, near the islands, with the marks of a fatal gunshot on it. Thus ends a life made remarkable by its utter engrossment by one idea, spent in pursuing that idea in the teeth of common sense, reason, and history.

CANALS, ANCIENT AND MODERN.

The ancients early recognized the importance of canals as mediums for internal communication. Probably the first work of this kind was constructed by the Egyptians. It connected the Nile with the Red Sea, and in 1798 the work was in such a state of preservation that a company of French engineers reported that it only needed cleansing to render it navigable once more. Herodotus attributes its commencement to Pharoah Necos, in the year 616 B.C. Although Pliny, Strabo, and other historians do not agree with Herodotus as to the date of its commencement and the name of its founder, they all agree in that there was such a canal, and that it was commenced some five or six centuries before the Christian era. Strabo says the canal was 150 feet (100 cubits) broad, and that ships were four days in sailing through it.

The Cnidians, ancient inhabitants of Caria, in Asia Minor, designed and dug a channel through the isthmus joining their territory to the continent.

The Greeks made an unsuccessful attempt to cut a navigable passage between the Ionian Sea and the Archipelago.

The Romans built large canals, called "Fossæ Philistinæ," at the mouth of the Eridanus or Po river. The canals of the Pontine marshes were accomplished 162 B. C., and, after a long period of disuse, were restored by the Emperor Trajan.

From time immemorial, the rivers of China have been united by canals, and there is no country on the face of the globe where the advantages of such a network of canals are so manifest; for these canals, with the natural water communications, render the tunnage of that country but a little less than the combined tunnage of the rest of the world. The Grand Canal of China is the most stupendous work of the

kind ever executed. It was commenced in the tenth century of our era. It is nearly 700 miles in length, and extends from Hang-choo-foo to Yan-liang river, forming an unbroken connection between fifty cities. It joins the great rivers Yang-tse-kiang, 2,000 miles long, and Ho-hang-ho, 2,000 miles. This and other Chinese canals are not constructed upon the same plan as the canals of Europe and America, nor composed like them of standing water, fed by reservoirs, elevated and lowered by means of locks. The want of locks obliges the Chinese to conduct their canals around the different elevations encountered, and to lift the boats by means of chain and capstan. The irrigation supplied by the Grand Canal renders the country through which it passes exceedingly fertile, and, in proportion to its size, the most populous spot in the world.

The construction of canals in modern Europe was commenced in the twelfth century. Sluices, with double doors, were not introduced until 1481. They were first used at Viterbo, in Italy.

The first canal made in England connected the rivers Trent and Witham. It was begun during the reign of Henry I. England has now 2,800 miles of canal communication, Ireland 300, and Scotland 175; making a total of 3,275 miles for the United Kingdom. The longest of these canals is that which joins Leeds and Liverpool, 127 miles in length, finished in 1816. The New river, which has supplied London with water, is a canal. The canal connecting Manchester with Worsley, built by the Duke of Bridgewater, in 1755, was cut, for eighteen miles, under ground, at a cost of £170,000.

The canal of Briare, the oldest in France, was commenced in the year 1606, during the reign of Henri Quatre, and finished in 1740. It is 34½ miles long, and in conjunction with the canal of Loing, at Montargis, forms a communication between the rivers Loire and Seine. It was constructed under Hugues Cromier, a renowned engineer of that time. The celebrated canal of Languedoc is the largest in France. It has more than one hundred locks, is 153 miles in length, and is capable of admitting vessels of one hundred tuns burthen. Commencing in the river Garonne, at Toulouse, and terminating in the lake of Thau, it forms a connection between the Atlantic and Mediterranean seas. The canal from the Durance to Marseilles is 52 miles long; 11 miles of this length are subterranean passages through the Alps. It was finished July 8, 1847.

Holland, the land of dikes and ditches, is completely cut up into small islands by its extensive system of canals, which cross and interlace each other like the threads of some large fishing net. Owing to the level state of the country, the construction of a canal involves but comparatively little labor and expense, and many of them are used as substitutes for public highways; in the winter, their frozen surfaces offer convenient roads for skaters. The North Holland canal, the finest work of its kind in Europe, was built during the years 1819–23, at a cost of $4,750,000. It is 50 miles long, 125 feet broad at the surface, 36 feet at the bottom, and has an average depth of 21 feet. By means of this canal, ships bound to Amsterdam avoid the danger and delay incurred in navigating the Zuyder Zee. Since not only the surface, but the bed of many of these canals is above the level of the land, the drainage of the meadow lands, through which they run, is a matter of great solicitude. It is effected by means of wind mills, working pumps.

In spite of many difficulties, Russia is traversed by canals. An unbroken communication, by this means, has been established between St. Petersburg and the Caspian Sea; canals unite the Baltic and Black Seas; and the White and the Caspian are in like manner united. A traveler can go from St. Petersburg to Selmquisk, in Siberia, with the exception of a few miles, all the way by water.

In 1817, Mehemet Ali, perceiving the importance of Alexandria as a commercial center, restored the ancient communication with the Nile by means of the Mahmoudieh Canal. Since the building of this canal, the population of Alexandria has quadrupled. About a half a century after the completion of the Mahmoudieh Canal, the great canal of Suez was opened to the commerce of the world.

The first canals constructed in the United States were those of South Hadley and Montague, in the State of Massachusetts. The company received its charter in 1792, and the work was commenced without delay. The South Hadley canal was built to afford a safe transit around the South Hadley Falls. It is two miles long, has five locks, and for a distance of 300 feet is cut 40 feet deep through solid clay-slate rock. The Montague canal passes around Turner's Falls, is three miles long, and has 75 feet of lockage.

The largest canals of the United States are:

NAME.	STATE.	LENGTH.	COST.
Erie	New York.	363	$ 8,401,394
Chesapeake & Ohio	Maryland.	191	10,00[illegible],000
Central Division	Pennsylvania.	173	5,90[illegible],252
Western "	"	104	3,096,522
Delaware & Hudson	New York and Pennsylvania.	108	9,000,000
Ohio & Erie	Ohio.	307	4,695,824
Miami "	"	178	3,750,000
Illinois & Michigan	Illinois.	102	8,654,397

The Welland Canal, in Canada, which connects the Lakes Erie and Ontario, avoiding Niagara Falls, is but 36 miles in length, yet it cost the enormous sum of $7,000,000.

With the invention of the locomotive engine, and its subsequent introduction, the time of the construction of large and expensive canals passed away. While the increase in the total length of the canals of the United States, during the past twenty years, can be not more than a thousand miles, the increase in the total length of railways, during the same period, is more than forty thousand. An additional barrier to an extensive increase of canal communication, looms up in the shape of narrow gage railways, which are attracting great attention at this time, and which at no distant day will be the great freight carrying methods of this country.

THE DESCENT OF MAN.

A CONTINUATION OF AN OLD SONG.

Air—"Greensleeves." (*Darwin loquitur.*)

"Man comes from a mammal that lived up a tree,
And a great coat of hair on his outside had he,
Very much like the dreadnoughts we frequently see—
Which nobody can deny.

He had points to his ears, and a tail to his rump,
To assist him with ease through the branches to jump—
In some cases quite long, and in some a mere stump—
Which nobody can deny.

"This mammal, abstaining from mischievous pranks,
Was thought worthy in time to be raised from the ranks,
And with some small ado came to stand on two shanks—
Which nobody can deny.

"Thus planted, his course he so prudently steered,
That his hand soon improved and his intellect cleared;
Then his forehead enlarged and his tail disappeared—
Which nobody can deny.

"'Tisn't easy to settle *when* Man became Man;
When the Monkey type stopped and the Human began;
But some very queer things were involved in the plan—
Which nobody can deny.

"Women plainly had beards and big whiskers at first;
While the man supplied milk when the baby was nursed;
And some other strong facts I could tell—if I durst—
Which nobody can deny.

"Our arboreal sire had a pedigree too;
The Marsupial system comes here into view;
So we'll trace him, I think, to a Great Kangaroo—
Which nobody can deny.

"The Kangaroo's parent, perhaps, was a bird;
But an Ornithorhyncus would not be absurd;
Then to frogs and strange fishes we back are referred—
Which nobody can deny."

Thus far Darwin has said: But the root of the Tree,
Its nature, its name, and what caused it to be,
Seem a secret to him, just as much as to me,
Which nobody can deny.

Did it always exist as a great institution?
And *what* made it start on its first evolution?
As to this our good friend offers no contribution—
Which nobody can deny.

Yet I think that if Darwin would make a clean breast,
Some botanical views would be frankly confessed,
And that all flesh is grass would stand boldly expressed—
Which nobody can deny.

—*Blackwood.*

SCIENTIFIC INTELLIGENCE.

HYDRATE OF CHLORAL AS A REDUCING AGENT.

It is stated in some of the pharmaceutical journals that the hydrate of chloral can be employed as a reducing agent to great advantage. All of the noble metals are at once reduced by it, in the presence of caustic potash or soda; and as chloroform is evolved in the process, and this envelopes the reduced powder, the precipitate can be readily washed out. When the solutions of gold, or of the metals of the platinum group, are treated with hydrate of chloral, warmed, and an excess of caustic soda added, and the whole boiled for a minute, a complete reduction of the metals takes place, probably in consequence of the formation of some formic acid by the splitting up of the chloroform. In the case of silver salts, the reduction is also complete, and chloride of silver is formed. Mercury salts are not acted upon. These properties of the hydrate of chloral suggest its possible application for metal plating on glass, and possibly in photography. Let some one try the experiment, and report the results.

HYDROSTATIC-GALVANIC GAS LIGHTER.

A number of patents have been taken out for the instantaneous ignition of gas by electricity, but they all require the laying down of long connecting wires, and more or less complicated apparatus. Professor Klinkerfues, of the University of Göttingen, has invented for his use, in the astronomical Observatory, of which he is Director, a simple apparatus, which may be capable of more extended application than the learned professor contemplated when he had it constructed. It was in this same observatory that the famous Gauss had an electromagnetic telegraph in operation ten years before one was set up in the United States, but in those days there was little enterprise among the scientific journals, and so the world lost the benefit of the invention. We therefore hasten to relate what Professor Klinkerfues has done to avoid a repetition of the former error; but we are unable to give the drawings, as they have not yet reached us. The hydrostatic-galvanic gas lighter consists of a simple apparatus, attached to each street lamp or gas jet, and communicating with the supply pipe in such a way that by increasing or diminishing the pressure, it is immediately brought into or thrown out of action. Keeping the apparatus in order would be the work of the lamp cleaner, and would not require any particular skill. It is well known that a jet of steam, through wire gauze or pointed teeth, will evolve electricity, and it is probable that the same principle is applied to a jet of gas. The experiments tried in Göttingen are said to have been entirely successful.

TECHNICAL USES OF CARBOLIC ACID.

Emil Sommer gives, in a German industrial paper, a summary of the more recent technical applications of carbolic acid, from which we translate the following:

1. In tanning. The fresh hides are kept fresh and from putrefaction by employing a weak solution of carbolic acid, instead of salt, as formerly; and further, to avoid considerable loss in the liming process, in the preparation of the lime a solution of carbolic acid (1 in 300) is employed. It would be well to cover any animal refuse about tanneries with weak carbolic acid, to destroy the bad gases and fetid odor arising from this source.

2. Catgut manufacture. In this industry, the chief evil arises from the necessity of macerating the entrails, which renders the neighborhood unendurable. By soaking the parts in a weak solution of carbolic acid (1 in 1,000) for an hour, then hanging up to partially dry, and repeating the operation, the entrails will have lost their disagreeable odor, and can be macerated and further worked up without inconvenience.

3. Glue. The crude material for this industry can also be treated as above described.

As carbolic acid is explosive, coal-tar water can be employed as a substitute. Shake up a quantity of coal tar in water, and allow it to settle, and use the decanted water. In this way, one pound of coal tar will yield fifty quarts of weak carbolic acid.

A CARD FROM PROFESSOR LIEBIG.

Professor Liebig publishes a card in the last number of Erdmann's *Journal*, in which he stoutly protests against the use of his name in connection with all manner of patent medicines, extract of malt, and the like. He says: "The only preparation which bears my name with my permission is the extract of meat manufactured at Fray-Bentos, in South America, and this is accompanied by the condition that none of the extract shall be put into the market until it has been thoroughly tested by Professor Pettenkoffer or myself; this condition has hitherto been conscientiously observed by the Fray Bentos Company." As the extract of meat is sent to market, from all parts of the world, bearing Liebig's name, it may be well to observe that none is genuine excepting that from the above-mentioned authorized South American company.

Painting Iron Work.

There is no production for iron work so efficacious as well boiled linseed oil, properly laid on The iron should be first well cleaned and freed from all rust and dirt; the oil should be of the best quality, and well boiled, without litharge or any dryer being added. Their on should be painted over with this, but the oil must be laid on as bare as possible, and on this fact depends in a great measure the success of the application, for if there be too thick a coat of oil put upon the work, it will skin over, be liable to blister, and scarcely ever get hard; but if iron be painted with three coats of oil, and only so much put on each coat as can be made to cover it by hard brushing, we will guarantee that the same will preserve the iron from the atmosphere for a much longer time than any other process of painting. If a dark coloring matter be necessary, we prefer burnt umber to any other pigment as a stain; it is a good hard dryer, and has many other good properties, and mixes well with the oil without injuring it.

Note on Caseine and Milk-ash.

In chemical text books the caseine is generally said to be held in solution in milk by means of an alkali, with which it is suppo ed to form a kind of salt; and the precipitation of caseine by means of an acid is explained as a consequence of the decomposition of the compound between caseine and the alkali, milk-ash being described as containing abundance of alkaline carbonates. The editor of the *Milk Journal*, in examining samples of milk-ash, obtained in the course of an inquiry into London milk, was struck with the fact that there is no effervescence when an acid is poured on a milk-ash This led to careful experiments on the action of a very dilute "standard acid" on the ash, and he found that there is no appreciable quantity of alkali or alkaline carbonate. According to his observations, made on a great variety of milks the milk ash does not contain so much alkaline carbonate as would amount to the $\frac{1}{100}$ of its weight. Therefore the current theory, that caseine was rendered soluble in milk by means of an alkali, cannot be true.

Zinc Water Tanks.

The *Lyon Medical* contains an article, by M. Zinrek, who has examined water which had long been kept in such tanks He has found that the water dissolves so much the more zinc as it contains more chlorides, such, for example, as the chloride of sodium. The water also takes up larger quantities of zinc in proportion to the length of contact. Boiling does not, however, precipitate the zinc from water charged with the metal. A sample of the former was tried, in which the chlorides were in small proportion, but which had been a long time in a zinc tank. As much as fifteen grains of zinc was found in each quart. To prevent this state of things the author advises the zinc tanks to be coated inside with an oil paint, the bases of the paint being ocher or asphalt. No minium, ceruse, or carbonate of zinc should, however, be used. Fifteen grains in a quart seem an enormous proportion, nor does the author say whether he found the actual metal or a salt of oxide of zinc. Better than painting it, is to discard its use for this purpose altogether.

CLOVES are the dried unexpanded flower buds of the clove tree, a celebrated spice cultivated on the island of Amboyna in Sumatra, Zanzibar, Bourbon, and Cayenne; the culture and trade in this article was a monopoly in the hands of the Dutch for many years. The imports into the United States are about 200,000 po nds annually; and into England about 1,000,000. The name is derived from the resemblance of the spice to small nails, and in all countries it is called by a name having this signification.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of May, 1871:

During the month, there were 644 visits of inspection made, and 1,201 boilers examined—1,064 externally and 321 internally, while there were 120 tested by hydraulic pressure. The number of defects discovered by these examinations is large, being 438, of which 70 were regarded as dangerous. No one can tell what may have been the result, had they remained neglected for a longer period. It is always best to repair defects of any kind in season, and by so doing prevent what otherwise may lead to serious difficulty. These defects in detail were as follows:

Furnaces out of shape, 17—1 dangerous; fractures, in all, 22—9 dangerous; burned plates, 24—4 dangerous; blistered plates, 64—6 dangerous; cases of sediment and deposit, 75—3 dangerous; cases of incrustation and scale, 63—3 dangerous; cases of external corrosion, 19—2 dangerous; cases of internal corrosion, 21—1 dangerous; cases of internal grooving, 3; water gages out of order, 20—3 dangerous; blow-out apparatus out of order, 9—4 dangerous; safety valves overloaded, 13—1 dangerous; safety valves stuck fast in their seats and inoperative, 5—all dangerous; pressure gages out of order, 9—4 dangerous, varying from —17 to +8; cases of deficiency of water, 2—both dangerous; broken braces and stays, 10—4 dangerous; boilers condemned, 4—all dangerous.

During the month there were 4 serious boiler explosions, by which 12 persons were killed and 4 wounded. In two of these cases the boilers were under government inspection. What condition the inspectors found them in, we have no means of knowing, but we must believe that the examinations were very inefficiently made, or that the boilers were under the management of careless and ignorant men.

CHAMOIS, or shammy leather, is leather made from various kinds of skins dressed with fish-oil, which is hammered or beaten into the pores of the skin. The leather, partially dried and washed in alkali, becomes soft and pliable. The true shammy leather, which, however, is very rare, is made from the skin of the chamois, a species of the antelope tribe of animals, which inhabits the Alpine mountains.

Advertising Agencies.

"It is a fact that all those persons doing a business which requires extensive advertising, and who from the mode of conducting it are able to arrive at a close approximation of the results produced by each separate investment in this way, are universal in the opinion that better contracts can be secured through a well-established advertising agency, like that of Geo. P. Rowell & Co., New York, than can be obtained from publishers direct, no matter how familiar with rates and papers the advertiser may be. It stands to reason that an agency controling patronage to the extent of from fifty to one hundred thousand dollars per month should be able to secure favors which would not be accorded to any mere individual, even if we omit entirely the benefits which they must derive from their extensive experience."—*Exchange.*

Business and Personal.

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

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

For the best, purest, and most economical Machinery Oils, of all kinds, send to Oil House of Chard & Howe, 134 Maiden Lane, N.Y.

Gang Lathe.—See advertisement on last page.

A Patent for sale.—A good investment for a firm or person with capital to manufacture it. Patterns complete. Address, for full description, Lock Box 356, Lockport, N.Y.

Patent Agency.—Persons having Patents, or small Patented Articles, to sell, will do well to write or call on J. N. Bebout, Oberlin, Ohio.

Manufacturers of Fire Engines (hand or steam) and Hose, please send circulars, with prices, etc., to J. P. Hale, Mayor, Charleston, Kanawha C. H., West Va.

To Watch Repairers.—Compound for tempering pivot drills, warranted to make a drill ten times as strong, with the required hardness, as an ordinary drill. Price $2.00 per package, with instructions for use. James H. Flynt, South Bend, Ind.

Globe Turbine Water Wheel, 7½ inch diameter, under 16 feet head, 12x12-100 horse power. Andrew J. Payne, Inventor, Unionville, Conn.

Engine Lathe wanted, about 30 inch swing, 12 feet bed, in good order. Pratt & Co., 87 Chambers st., and Buffalo, N.Y.

Stockholders learn what their companies are doing by reading the RAILROAD GAZETTE.

Mitchell's Grindstone Depot—310 York ave., Philadelphia.

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Bead Grindstones for Nailers. Mitchell, Philadelphia.

Cancer cured by a process almost painless in its operation. No knife, arsenic, or black plaster used. Send for address of parties cured to Dr. Carpenter, Newark, N.J.

Oak Tanned Leather Belting and Manufacturers' supplies. Greene, Tweed & Co., 18 Park Place.

Blake's Patent Belt Studs, the best and cheapest fastening for Leather or Rubber Belts. 40,000 manufacturers use them. Greene, Tweed & Co., 18 Park Place.

"American Manufacturer's Review," Pittsburgh, goes over the whole country. Subscription, $4. Advertisements, 15c. per line. Try it 1 year.

Improved mode of Graining Wood, pat. July 5, '70, by J. J. Callow, Cleveland, O. See illustrated S. A., Dec. 17, '70. Send stamp for circular.

The Philadelphia Scientific Mechanics' Circle will answer any mechanical question for 25 cts. Address as above, 125 N. 7th st., Philadelphia.

Electrical Instruments, Models, etc., made to order, and Gear Wheels and Pinions cut, by W. Hockhausen, 113 Nassau st., Room 10, N.Y.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Wanted.—A reliable party to manufacture a *specialty* in the House Furnishing line, either on royalty or become sole proprietor for the United States. Address J. H. Beardsley, 119 Nassau st., New York.

Experimental Machinery and Models, all sizes of Turned Shafting, Paper Box, Paper Collar, and Bosom Plaiting Machines, Self-operating Spinning Jack Attachments. W. H. Tolhurst, Machine Shop, Troy, N.Y.

Best Scales.—Fair Prices. Jones, Binghamton, N.Y.

Steam Watch Case Manufactory, J. C. Dueber, Cincinnati, Ohio. Every style of case on hand, and made to special order.

Agents Wanted—on a new plan—to sell a patent Collar Stud. Send for Circular. S. E. Williams, Hartford, Conn.

L. & J. W. Feuchtwanger, Chemists, 55 Cedar st., New York, manufacturers of Silicates of Soda and Potash, and Soluble Glass.

For Hydraulic Jacks, Punches, or Presses, write for circular to E. Lyon, 470 Grand st., New York.

Wanted.—A responsible dealer in every town in the United States, to sell "The Tanite Co.'s" Emery Wheels and Emery Grinders. Extra inducements from May 1st. Send for terms to "The Tanite Co.," Stroudsburg, Pa.

The new Stem Winding (and Stem Setting) Movements of E. Howard & Co., Boston, are acknowledged to be, in all respects, the most desirable Stem Winding Watch yet offered, either of European or American manufacture. Office, 13 Maiden Lane, New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Ashcroft's Low Water Detector, $15; thousands in use; can be applied for less than $1. Names of corporations having thirty in use can be given. Send for circular. E. H. Ashcroft, Boston, Mass.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, capable of pressing 35 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Tin Presses & Hardware Drills. Ferracute Works, Bridgton, N.J.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N.Y.

American Boiler Powder Co., P. O. Box 315, Pittsburgh, Pa.

Carpenters wanted—$10 per day—to sell the Burglar Proof Sash Lock. Address G. S. Lacey, 27 Park Row, New York.

Manufacturers' and Patentees' Agencies, for the sale of manufactured goods on the Pacific coast, wanted by Nathan Joseph & Co., 619 Washington street, San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

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

A. G. Bissell & Co. manufacture packing boxes in shooks at East Saginaw, Mich.

Twelve-horse Engine and Boiler, Paint Grinding Machinery Feed Pumps, two Martin Boilers, suitable for Fish Factory. Wm. D. Andrews & Bro., 414 Water st., New York.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

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

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., 25 Whitney ave., New Haven, Conn.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N.Y. Send for catalogue.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N.Y. (Send for Circular.)

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 64 Nassau st., New York.

Winans' Boiler Powder.—15 years' practical use proves this a cheap, efficient, safe prevention of Incrustations. 11 Wall st., New York.

Read J. H. Beardsley's card in this column; it is worth looking after.

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.

Answers to Correspondents.

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

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

CHEAP BATTERY.—I would answer F. R. S. that the cheap battery described by me March 11, 1871, is rightly described by him, and will work if connections be properly made. I have just set one up for a physician to run a medical apparatus, and it works to a charm. I have hundreds of electrotypes made by such battery. Let F. R. S. immerse both poles in solution of sulphate of copper, and see if one will not be dissolved and the other increased. Of course it will not make an electric light to knock down an ox or run a saw mill, but it will do any ordinary copper electrotyping, or work any small magnetic apparatus.—A. G., of Wis.

MENDING BROKEN CASTINGS.—If the castings J. G. G. wishes to make from a broken one as pattern, requires to be in all respects exactly like it, that is, if plating the broken one together (for pattern) would spoil the shape of the new one, and cementing would make it too large, I would suggest that it might, with careful drilling, be put together with small and short doweling pins.—J. G. H., of Pa.

F. S., of Conn.—The amount of sulphuric acid and chalk necessary to produce 10 cubic feet of carbonic acid would be 19 ounces, avoirdupois, of the acid, and 43 ounces of chalk.

GEAR CUTTING ON FOOT LATHE.—The answer of C. H. J. to B. B. L., of Md., gives a very crude way of cutting gear with a foot lathe. I have tried the same plan; but with a revolving cutter, we can cut ten teeth or more, to one that can be cut with a chisel or shaping tool. The plan that I use (but I make no claim to it) is as follows: In the first place we suppose that the lathe has a slide rest, that can be put to any angle, for cutting bevel or miter wheels. I have my lathe back to the wall, but it can be placed in any position, by putting two stems or posts up from the frame or from the wall. I place one over the back edge of the fly wheel, with a pulley running vertically, parallel with the lathe frame. On the other post, at the right hand side, I place a pulley running horizontally. In the T rest, I put a post with a pulley on the top, running horizontally. This is used both as a quick and a tightening pulley. I place another pulley over the front of the fly wheel, running vertically, and parallel with the frame of the lathe. All those pulleys are only to give horizontal motion to the lathe band, from the fly wheel, so as to turn the shaft which carries the cutters vertically, the frame for which is fixed in the tool post of the slide rest. There may appear to be more pulleys than are necessary, and I have tried to do with less, but find this way the best. I put all the pulleys about 2½ inches above the line of center of lathe. A blacksmith can make a frame to hold the cutter shaft, out of iron ⅛ by ¼ inches, and 10½ inches long, bent at each end at right angles, 2¼ inches from the ends, so as to leave about 5½ inches between the ends to carry the cutter. I drill holes through each end for a screw center with jamb nuts, so that the shaft with the cutter can revolve. I put the pulley on the shaft where it is most convenient. For the slide rest I weld a piece of iron to the frame to hold the cutter frame in the tool post. The cutters have to be made to suit the wheel to be cut. I get a dial plate, and place it on the pulley mandrel of the lathe—almost any watch maker will show how that is arranged. Any kind of gear wheel can be cut by this arrangement, whether spur, crown, or bevel (from 2 to 1, to 10 to 1), worm or spiral. The wheel to be cut is fixed on the lathe, on the plate or between the centers; the only difference in any wheel is in the way of feeding the slide rest. Inside gear can be cut by making the cutter frame small enough to pass right inside the wheel to be cut, and putting another pulley on the back of the slide rest, to carry the band out again. I know these will all work, as I have cut inside wheels, from 9 inches inside to 2 inches, without having to touch them with a file.—W. H. B., of Ill.

CHEAP BATTERY.—Notwithstanding that F. R. S. has not succeeded in making his flower pot battery and salt solution work, such an arrangement forms, for some purposes, a good and efficient battery. It is simply a Daniell's battery. By using salt and water, it makes a little less powerful battery than it would were sulphuric acid (say 24 parts to 1 of water) used. I would recommend F. R. S. to subject his copper plate to a dull red heat, and while hot, plunge it in water, to remove the oxide from its surface. The connecting rod should be soldered to the copper plate, and his zinc plate should be bright and clean. Let it be dipped into hot soda or potash solution to remove grease, and then into a weak solution of sulphuric acid (say 1 part acid to 30 parts water) for about one minute. This will remove all oxide from its surface. If he will amalgamate the zinc with mercury, the battery will work all the better. This arrangement will give very fine deposits of copper or silver, but it is too weak for gold, as it will give a pale yellow color. For electromagnetic purposes, 1 part of sulphuric acid to from 12 to 24 parts water will work well. In a short time, however, the zinc will become of a dirty drab color, in consequence of a deposition of copper on its surface. A very small portion of sulphate of copper passes through the porous cell; the zinc plate deprives the copper of its oxygen; and the copper, as a consequence, is deposited on the zinc. Keep to it, F.R.S., as I have done, and you will succeed.—T. T., of D. C.

CHEAP BATTERY.—Observing in your issue of May 20th, the remarks of "D. B., of N. Y.," in reply to "F. R. S. and friends," in regard to the construction of a cheap battery, I desire to submit the following as my experience: I constructed a battery according to the formula laid down by "A. G.," that is, according to my conception of his instructions. I placed the zinc in a solution of ½ pound of Epsom salts (instead of common salt), and the copper in a porous flower pot, containing a solution of sulphate of copper (¼ pound). This I found to work admirably, and, when connected with an electromagnetic machine, to give shocks too severe to be withstood by most persons. This battery worked finely for several weeks, when the porous pot was accidentally broken. I substituted another, but it would not work for the reason, as I conceived, that the pot was not sufficiently porous; but upon changing the pot for one which was found to be porous, the battery again worked and continued in force for some time. If the solutions were placed wrong, as D. B. contends, how does he account for the successful working of my battery?—G. A. B., of D. C.

A. M., of N. Y.—Multiplying the diameter of a circle by 3·0075, will not give even a very coarse approximation to the area of a circle. Multiplying the square of the diameter by 0·7853 gives a very fine approximation, so near indeed as to be sufficiently accurate for any practical purposes.

S. A. R.—A combined atmospheric and lifting pump will enable you to raise the water to the hight required. It is possible that at the hight of your place above the sea level, the atmospheric pump alone might fail. Any dealer in pumps will supply you, or refer you to some one who can.

BLUEING SMALL ARTICLES.—Make a box of sheet iron, fill it with sand, and subject it to a great heat. The articles to be blued must be finished and well polished. I immerse the articles in the sand, keeping watch of them until they are of the right color, when they should be taken out, and immersed in oil. This is the way many pistol barrels are blued. C. W. L.

CLEANING GUN BARREL.—I saw a statement in an old paper that mercury rolled about in a gun barrel would clean it when foul, and that the same mercury would also do for several successive cleanings. F. S. of Conn. [We doubt the efficiency of this, but if mercury would clean gun barrels, we think it an unnecessarily expensive substance for the purpose.—EDS.

C. C. C., of Ohio.—We think a wooden would be far preferable to a concrete vat for holding vinegar. Our opinion is that both the vinegar and the concrete would be injured by the contact with each other.

APPLICATIONS FOR EXTENSION OF PATENTS.

SHEARS FOR CUTTING METAL.—Timothy F. Taft, Worcester, Mass., has petitioned for an extension of the above patent. Day of hearing, August 2 1871.

APPARATUS FOR SUSPENDING EAVES TROUGHS.—James A. Watrous, Green Spring, Ohio, has petitioned for an extension of above patent. Day of hearing, August 16, 1871.

Value of Extended Patents.

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

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Recent American and Foreign Patents.

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

ROLLING METAL.—Charles White, William Lewis, Thomas Strickland, and Samuel Caddick, of Spuyten Duyvil, N. Y.—Power is applied at each end of a revolving frame through a system of bevel gearing. Each of the rolls is revolved on its own axis, simultaneously with the frame and in the same direction, but at reduced speed. Revolving the rolls and frame in the same direction counteracts the revolving motion imparted, by the rolls to the iron, in manufacturing long bars. The rolls are placed obliquely to each other so that their action is not only to crush but to elongate. The iron or other malleable metal is fed into the machine through a hollow journal, and is caught by the rolls and gradually worked forward until it is forced out of another hollow journal in a finished state.

CARRIAGE TOP.—William Bander, of Circleville, Ohio.—The upright brace is pivoted to the second bow from the back of the frame. From this point extends a horizontal jointed brace forward to the front brace, and another horizontal jointed brace, backward to the rear bow. The horizontal braces are worked by tongues projecting from the upper end of the upright brace.

SEWING MACHINE FOR BOOTS AND SHOES.—Nathan M. Rosinsky, of New York city.—The details of this machine are numerous, as the nature of the invention would imply, comprising an adjusting apparatus for bringing the high and low places, in the sole and in the shank, into the proper position for the action of the needle; a suitable holder for the last and the boot or shoe stretched upon it; a hooked shaped needle working through what the inventor styles a tubular discharger, for casting off the loops of thread formed by the needle in passing through the leather; with apparatus for giving the needle motion, etc., only to be understood by reference to the drawings. Seven claims are made in the patent specification, covering devices which seem well adapted to make the machine an efficient one.

HARVESTER BINDER.—This invention furnishes an attachment for harvesting machines, whereby the cut grain is taken as it falls upon the platform, pushed back, gathered into gavels, bound securely, and then pushed off the machine. As might be expected, it is somewhat complicated, yet apparently not so much so as to derogate from its efficiency and durability. The method, by which the binding cord is passed about the gavel and tied, is a most ingenious piece of mechanical invention. The cord is carried on a spool, and is wound off as wanted, and cut after tying, the whole being performed automatically. As a specimen of elaborate invention, and reasoning back from ends to means, this invention will compare favorably with anything lately brought to our notice. The inventor is Joseph Barter, of La Crosse, Wis.

PROPELLER.—Reuben W. Heywood, Baltimore, Md.—This invention relates to an apparatus for propelling canal boats, in which a reciprocating carriage, armed with hinged blades that are placed transversely of the boat, travels back and forth lengthwise of the boat, the said blades, when the carriage is moving in one direction extending down into the water, and communicating to the boat the motion derived from the resistance of the water, and said blades, when the carriage is moving in the other direction, folding up against the bottom of the boat, and consequently imparting no motion thereto.

SELF-FILLING BOBBIN WINDER.—Robert H. Smith, Baltimore, Md.—This invention has for its object to lay thread from the spool evenly upon the bobbin of a sewing machine shuttle, and consists of a shaft, on which is cut a right and left screw, the threads of which occupy the same space, intersecting each other at diametrically opposite points; and in a fork which follows one of the threads from end to end, and then enters the other thread and travels back again; and in a carriage which holds the fork and receives a reciprocating movement back and forth; and in a thread guide connected with said carriage, which, by means of said reciprocating motion, lays the thread evenly upon the bobbin.

GLOVE.—Remus D. Burr, Kingsboro, N. Y.—This invention relates to gloves whose backs are make of some cheaper material such as cloth, and consists in a front piece, cut with a tongue on its thumb side, at the lower corner, and with a recess between said finger and the rest of the front piece, the tongue forming a re-inforce for the thumb side of the hand, and the recess being for the reception of a tongue formed on the thumb piece. The invention also consists in a thumb piece cut with a tongue on its palm side for the purpose of being joined to the aforesaid tongue of the front piece and cut with another tongue that fits into the recess, aforesaid, of the front piece at or near the base of the thumb, for the purpose of giving the space necessary for the free action of the thumb.

REGULATOR FOR SEWING MACHINES.—Alexander B. Bates, Baltimore, Md.—This invention relates to an improvement on the patent of T. A. Macauley, January 24, 1871, wherein is described a mechanism for varying the length of the stitch, which mechanism is connected with the inner end of the shaft that passes through the side of the cloth table, and is operated by turning said shaft by hand, by means of a knob placed upon its outer end. The invention consists in an apparatus for automatically turning said shaft, for the purpose of regulating the feed, combined with a graduated plate, which answers the purpose both of indicating how many stitches will be produced to the inch at each different position of the lever by which said apparatus is worked, and of holding said lever in any position desired.

GIRDER RESTS FOR TIMBERS.—This is the invention of Jonathan Preston, of Boston, Mass. It consists of a rest or bearing of cast metal, so made that it can be slipped on to the lower flange of the girder before the latter is put in its place. The ends of the rods project from the girder, so as to give a fair and broad bearing for the timbers which the girders are destined to support.

EXTENSION TABLE.—In this table the extension is performed by a screw running in a nut held by a transverse bar. One end of the nut revolves in a plate attached to the table, the screw revolving in, but having no longitudinal motion through, the plate. The screw turns by means of a crank key, in a tube attached at one end to the extension end of the table; or tubes made to telescope one within the other may be used, either with or without the screw, the parts of the table being made to keep their proper relation to each other by means of rabbeted strips and slides. Invented by F. Souweine, of New York city.

DOVETAILING MACHINE.—John B. Ritchey, of Pomeroy, Ohio. In this machine, the board to be cut is clamped upon a table, which is guided by sliding way and gages, so as to bring the board into contact with the cutter at the desired intervals, the guides, gages, and stops being so arranged that the cutting may be done at wider or narrow intervals, as required. The mortises and tenons are not straight on their sides, but curved in a graceful manner. The mandrel carrying the cutter is fixed in a vertically sliding frame or gate, which is worked by a hand lever. While much cheaper than some other forms of dovetailing machines running gangs of cutters, this machine can, we think, do excellent work.

PLOW.—Thomas H. Reynolds, of Rome, Ga.—The standard is of metal, bifurcated at the lower end. The plowshare has a projecting lug on the back side, which rests upon a shoe formed at the front end of a slotted bar, the share and the shoe being locked together by a bolt or pin. A suspended slide, arranged on the slotted bar, forms the land side of the plow, and from the van of the slotted bar descends a shank, having a small pointed share, penetrating considerably deeper than the regular depth of the furrow, and calculated for subsoiling.

STEAM MANGLE.—Wherever steam can be applied, it is found to be the best and most economical conveyer and distributer of heat. Taking advantage of this valuable property of steam, P. Rundquist, of New York city, has invented a mangle in which the rollers are heated by steam, admitted through stuffing boxes in the ends of the journals. The rollers can be heated to any desired temperature by regulating the pressure of steam in the boiler which supplies them. The rollers are compressed together by stirrups, rods, and springs.

SCREW JACK.—Hackley T. Morrison, Lawrenceville, Va.—This invention has for its object to enable a screw jack to work continuously, (either while lifting or lowering, and while the lever by which the screws are rotated is turning back, as well as while it is turning forward), to the end that there may be no lost motion, which object is accomplished by the provision of two separate screws, arranged one above the other, one of which raises or lowers itself in the foot-piece, while the other raises or lowers the head-piece, said screws working alternately.

HEMMER AND BINDER FOR SEWING MACHINE.—Milo Harris, Jamestown, N. Y.—This invention consists in the combination with a hemmer and binder, having a scroll for turning a hem on cloth, of a plate pivoted at one end to the shank of the hemmer, extending through a slot in the back of the scroll, and terminating at such a point within the scroll as to serve as a stop to prevent the cloth, while running through the hemmer, from turning up at the edge against the back of the scroll, and making an uneven hem.

WRINGER.—Cyrus E. Carter, Martinsville, Ohio.—This invention relates mainly to the application, to the upper roller of a wringing machine, of an apparatus worked by a treadle, for drawing said roller downward, so as to make it press the article to be wrung between itself and the lower roller with all necessary force.

CHURN.—This is the invention of Benjamin H. Steele, of Barnesville, Ohio. Dashers of two peculiar forms are attached to a vertical shaft, and made to revolve back and forth by means of a bevel pinion attached to the lower end of the shaft, and a sector bevel gear, worked by a hand lever. The second or gathering dasher is in the form of the letter S, and replaces the first when the butter is ready to gather.

DEVICE FOR OPENING AND CLOSING WINDOW BLINDS.—The blind is provided with a bar, bent at right angles, so as to form a long staple, the body of which forms a slide for an eye in the end of a bar pivoted to the jamb of the window casing. This apparatus is placed low down near the window sill. A notched bar passes through under the sash, the notches of which engage with a keeper fastened to the window sill, so that the blind may be opened to any desired position and held there. Invented by Frederick Shattner, of Wilmington, Del.

MORTISING BLIND STILES.—This invention consists in the application of ingenious, and, we think, efficient, devices for holding the stile of the blind while being mortised and bored; and also in the feeding of the stile. It is the invention of Lawe M. Collins, of Lebanon, N. H. Any bevel or angle of the mortises, required in such work, is secured by the devices used.

SAW MILL.—The line of teeth in the saw is made rounding or convex, toward the log to be cut: and the bottom of the sash is made to move towards and from the wood during its downward stroke by means of a rock shaft connected with the lower part of the sash by a forked arm, the forked end joining the sash. The rock shaft is moved by an eccentric on the crank shaft of the saw, through a suitable connecting rod joining the eccentric and a crank on the rock shaft. The saw is moved backwards until half way down, then forward till about seven eighths of the way down, then backward again to the end of the stroke. The setting of the eccentric on the crank shaft governs this motion; and the inventor claims that a smoother cut can be thus produced than by methods hitherto employed. Invented by Charles C. Lewis, of Bay City, Mich.

PRUNING SHEARS.—Albert Barling, Westchester, Pa.—This invention relates to a pruning shears, in which the cutting is effected by a blade working past a serrated hook, the edge of the blade that comes next to the hook being beveled to prevent its catching on the latter, and the edge of the hook next the blade being longitudinally recessed, for the same purpose.

INVALID BEDSTEAD.—A. J. Russell, Baltimore, Md.—This invention consists in an apparatus for raising and supporting one or both of the patient's legs, said apparatus being composed of a pair of standards connected at their lower ends with the windlasses that are placed, one at each side of the cot, on which the patient lies, the upper ends of said standards being united by a cross bar that passes transversely above the cot, on which cross bar is a sliding frame bearing pulleys, with which is connected the cord that is used for elevating the patient's leg.

SAWING MACHINE.—H. P. Ohm, Baltimore, Md.—This invention relates to a portable sawing machine for the use of farmers and mechanics, and consists principally in the mechanism whereby the feeding of the carriage that supports the wood to be sawn is effected from the same shaft that operates the saw.

RAILROAD CAR RUNNING GEAR.—Reuben Winslow, Lock Haven, Pa.—This invention has for its object to practically enlarge the outer wheels of a railroad car and diminish the inner wheels, during the time the car is running on a curve, for the purpose of enabling the outer wheels to travel the greater distance, which they have necessarily to accomplish, as compared with the inner ones, without the slipping of the wheels on either side along the track, or the binding and excessive friction which attend the passage of running gear, as ordinarily constructed, over curves.

Queries.

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

1.—NOISY GEARS.—I am in trouble with two large cog wheels, which appear to be running as near right as can be, yet they make such a noise, and always have, that I can hardly stand it, and I fear for my hearing if I continue to run them in this way. I have tried everything that I know of, and if any of your correspondents can give me any information on the subject, I shall ever feel grateful for the same.—S. R.

2.—BOILS.—Will some kind reader give me a preventive for boils, which will do no injury to the system?—W. E.

3.—CUTTING SCREWS.—In cutting screws with a lathe, can the connection between head and feed screw be so arranged that the feed screw alone can be reversed without getting out of time, so as to avoid a cross belt to the counter shaft?—W. E.

4.—SOFTENING RUBBER HOSE.—I have rubber hose for my pump, that, lying idle, have become hard and stiff. How can I soften them and make them pliable?—J. P.

5.—HOUSE MOTH.—Just at this time many of your readers are particularly interested in knowing as much as possible about the common house moth, so troublesome to all housekeepers having carpets and other woolen fabrics to take care of. Will some of your scientific, practical correspondents give us a sketch of its natural history, and of the best mode of fighting it, both offensively and defensively?—E. A. T.

6.—DRAWING INK.—I wish to procure a good drawing ink, one that when used in the ruling pen will produce a deep black, and not a blue or gray one? Where can I procure such ink, or how can I make it?—W. R. S.

7.—SIZING CONE PULLEYS.—Will some of your readers tell me what is the best and simplest rule to determine the relative diameters of cone pulleys working together, as on lathes, etc., so that the belt shall be equally tight on any and all of the different speeds? also, when a train of different sized pulleys is set in motion by one driver, what is the best rule to find out the speed of the last pulley, as compared with that of the first driver?—J. E.

8.—GALVANIZING CAST IRON.—Can some one give me some information about galvanizing cast iron? I can do wrought iron without any trouble, but cannot make the zinc adhere to the cast. Any information in regard to galvanizing will be gladly received. Do parties that do galvanizing on a large scale allow visitors in their works?—T. L.

9.—CLEANING GUN.—F. S. S., of Ohio, says he has been using a rifle gun for fifteen years, and has to wipe or clean it for the first time. For the benefit of rifle shooters, will he please state what kind of powder he uses? I find that all of our Eastern powder leaves a residue in the cone or breech, which necessitates the taking of the gun apart to clean, after a few month's use. Another thing: if I did not wipe the gun occasionally, it would be impossible to push the ball home, without tearing the patch, although it is a very fine rifle.—C. W. L.

10.—CANAL BOATS.—Seeing in your three last issues of the SCIENTIFIC AMERICAN, the very liberal reward offered by your State for a motor other than animal power for canal purposes, adaptable to the present construction of boats, your correspondent wishes to know the following: 1st. Average depth of canal. 2d. Build of said boats most common in use wall sided or not. 3d. Average draft of boat when light, and also when laden with cargo. Answers to the foregoing will help me considerably.—G. T.

Inventions Patented in England by Americans.

May 2 to May 8, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.

ACETIC ACID.—Theodore Schwartz, New York city.
LAMP BURNER.—R. S. Merrill, Boston, Mass.
LIQUID METER.—J. F. de Navarro, New York city.
OSCILLATING ENGINE.—J. Goulding, Worcester, Mass.
PULVERIZING ORES.—Van B. Ryerson, New York city.
RETORT.—Junius Gridley, New York city.
SEWING MACHINE.—W. G. Beckwith, Newark, N. J.
SUBSTITUTE FOR HAIR CLOTH.—J. J. Comstock, Providence, R. I.
WATERPROOF COMPOUND.—P. E. Minor, Schenectady, N. Y.

Foreign Patents.

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

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING MAY 23, 1871.

Reported Officially for the Scientific American.

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115,010.—SETTEE.—W. C. Adams, W. B. Mayhew, West Tisbury, Mass.
115,011.—ANCHOR.—A. B. Babbitt, Taunton, Mass.
115,012.—DOOR SECURER.—B. F. Baer, Lancaster, Pa.
115,013.—ROOT CUTTER FOR PLOWS.—J. W. Baker, Elkton, Md.
115,014.—HEATING STOVE.—Frank Barclay, Aurora, Ill.
115,015.—VAPOR BURNER.—W. E. Bartlett, Newburg, N. Y.
115,016.—WAGON TONGUE SUPPORT.—Wm. Beers, Milan, O.
115,017.—SEASONING HUBS.—A. Benninghofen, Hamilton, O.
115,018.—COOLER.—T. Bergner, S. Zeisse, Philadelphia, Pa.
115,019.—RULER.—Edward Bostock, Philadelphia, Pa.
115,020.—FLAX SEPARATER.—James Boyce, Muncie, Ind.
115,021.—STOVE GRATE.—Pardon Boyden, Amsterdam, N. Y.
115,022.—PULLEY BLOCK.—G. C. Brown, Brooklyn, N. Y.
115,023.—SPITTOON.—S. G. Cabell, Washington, D. C.
115,024.—EARTH CLOSET.—R. A. Cannall, New Orleans, La.
115,025.—DAMPER.—E. H. Clinton, W. H. Lavinia, Chicago, Ill.
115,026.—HARROW AND PLANTER.—R. J. Colvin, Lancaster, Pa.
115,027.—HEATING CARS.—J. H. Connelly, Wheeling, W. Va.
115,028.—GAS.—J. H. Connelly, J. McLure, Wheeling, W. Va.
115,029.—CEMENT-PIPE MOLD.—D. Copeland, Jr., Rochester, N. Y
115,030.—DRAIN PIPE.—David Copeland, Jr., Rochester, N. Y.
115,031.—ROASTING FURNACE.—F. W. Crosby, Washington, D. C.
115,032.—MEDICINE.—C. P. Crossman, West Warren, Mass.
115,033.—CULTIVATOR PLOW.—David Culver, Kingston, Pa.
115,034.—WAGON SIDE BRACE.—T. H. Daniels, Anderson, Ind.
115,035.—LANTERN GLOBE HOLDER.—J. S. Dennis, W. F Kistler, Chicago, Ill.
115,036.—SEWING MACHINE.—P. Diehl, L. Oehring, Chicago, Ill.
115,037.—LOCK.—J. W. H. Doubler, Darlington, Wis.
115,038.—DOOR STOP.—M. V. Doyle, Jacob Behel, Rockford, Ill.
115,089.—PASTE MACHINE.—Robert Duff, New York city.
115,040.—HANDLE FASTENING.—E. F. Dunaway, Cincinnati, O
115,041.—INKSTAND.—Thomas Duncan, Brookville, Md.
115,042.—REVERSIBLE CRIB.—A. E. Eaton, Portland, Me.
115,043.—RED BOTTOM.—M. W. Farber, Mount Pleasant, Iowa.
115,044.—SEWING MACHINE.—T. M. Farrand, Skowhegan, Me.
115,045.—LAMP WICK.—John Farrell, Brooklyn, N. Y.
115,046.—CORN HARVESTER.—D. C. Flint, Bardolph, Ill.
115,047.—CLEANER FOR OIL WELL.—W. Forker, Rockland, Pa
115,048.—SEWING MACHINE.—W. H. Fowler, W. Pettingall, Painesville, Ohio.
115,049.—MOLDER'S SLICKER.—W. J. Fryer, Jr., New York city.
115,050.—DRAW HOOK.—B. G. Gardiner, New York city.
115,051.—SIRUP AND SUGAR.—J. J. Grosheinz, Logelbach, Fr.
115,052.—HARVESTER RAKE.—James Harris, Janesville, Wis.
115,053.—FRONT FALL FOR PIANOS.—A. H. Hastings, New York.
115,054.—INVALID BEDSTEAD.—Wm. Heath, Bath, Me.
115,055.—CORN HARROW.—George Hill, Galva, Ill.
115,056.—HOLLOW VESSEL.—W. F. Holske, New York city.
115,057.—RIDING PLOW.—B. C. Hoyt, Fort Atkinson, Wis.
115,058.—MOTOR MACHINE.—I. G. Hubbard, Nokomis, Ill.
115,059.—LANTERN GLOBE HOLDER.—J. H. Irwin, Phila., Pa.
115,060.—SEWING MACHINE CASTER.—H. Jones, Richmond, Ind.
115,061.—HARNESS CHECK HOOK, ETC.—W. V. Kay, Chicago, Ill.

115,062.—HARNESS PAD TREE.—Wm. V. Kay, Chicago, Ill.
115,063.—SHUTTER FASTENER.—Peter Keffer, Reading, Pa.
115,064.—HORSESHOE NAILS.—E. W. Kelley, Hamilton, Scotland.
115,065.—ARTIFICIAL LIMB.—S. B. Kepperling, T. B. Kreiter, Neffsville, Pa.
115,066.—COMB GUIDE FOR BEEHIVE.—H. A. King, New York.
115,067.—MEAT SAFE.—August Knoche, St. Louis, Mo.
115,068.—CALK SHARPENER.—G. W. Lane, Chichester, N. H.
115,069.—ATTACHING PLOW HANDLES.—J. L. Laughlin, Peru, Ill.
115,070.—DENTAL POLISHER.—H. Laurence, New Orleans, La.
115,071.—HORSE HAY RAKE.—J. G. Lockwood, Davenport, N. Y.
115,072.—COOLING BEER.—Jacob Lorenz, Hamilton, Ohio.
115,073.—SPRING FOR TREADLE.—H. Lull, Hoboken, N. J.
115,074.—RAILWAY STOCK CAR.—W. M. Lyon, Salem, Ohio.
115,075.—BOOT HEELS, ETC.—F. Marquard, Newburyport, Mass.
115,076.—WASHING MACHINE.—W. C. Marr, J. S. Maughlin, Onawa City, Iowa.
115,077.—PIANO ACTION.—L. Matt, B. Greuter, Boston, Mass.
115,078.—WHIFFLETREE.—R. W. McClelland, Springfield, Ill.
115,079.—HEATING STOVE.—John McCoy, Philadelphia, Pa.
115,080.—COFFEE POT.—J. T. McNamee, Baltimore, Md.
115,081.—THRASHING MACHINE.—A. McNaught, Alliance, O.
115,082.—WATER WHEEL.—A. H. Merriman, W. Meriden, Conn.
115,083.—JAPANNED LEATHER.—F. S. Merritt, Boston, Mass.
115,084.—EXCAVATOR.—S. Miller, E. Claringdon, Waterloo, N. Y.
115,085.—SPOON.—H. C. Milligan, South Orange, N. J.
115,086.—LIFTING JACK.—H. T. Morrison, Lawrenceville, Va.
115,087.—EXTENSION TABLE SLIDE.—S. B. Nash, Buffalo, N. Y.
115,088.—TUB, PAIL, ETC.—P. H. Niles, Boston, Mass.
115,089.—VAPOR BURNER.—A. F. Noble, Indianapolis, Ind.
115,090.—WATCHMAKER'S GAGE.—T. Noel, Memphis, Tenn.
115,091.—COCK.—S. Norton, Stockport, Great Britain.
115,092.—SAWING MACHINE.—H. P. Ohm, Baltimore, Md.
115,093.—KEY HOLE PROTECTOR.—J. H. Parker, Waltham, Ms.
115,094.—CANE STUBBLE SHAVER.—F. F. Patout, Jeanerett, La.
115,095.—SPINNING MACHINE.—O. Pearl, Lawrence, Mass.
115,096.—KEY BOARD.—J. P. Perry, Yarmouth Port, Mass.
115,097.—BARREL CAR.—W. A. Plantz, Iowa Falls, Iowa.
115,098.—TRUSS.—William Pomeroy, New York city.
115,099.—CLOTHES CLAMP.—C. L. Poorman, Bellaire, Ohio.
115,100.—TANNING.—F. P. Porcher, Charleston, S. C.
115,101.—CIGAR MOLD.—John Prentice, New York city.
115,102.—WIRE FASTENING.—H. W. Putnam, Bennington, Vt.
115,103.—SAW ARBOR.—Jacob Rand, Boston, Mass.
115,104.—CAR COUPLER.—T. Ray, Pelham, Canada.
115,105.—WASHING MACHINE.—C. P. Remington, Smith's Mills, N. Y.
115,106.—HAY PRESS.—Eugene Rock, Greenvale, N. Y.
115,107.—STUPEFYING BEES.—A. Y. Rozenbury, Waterloo, Ind.
115,108.—BEDSTEAD.—A. J. Russell, Baltimore, Md.
115,109.—LAUNDRY BOX.—Mary A. H. Saurman, Phila., Pa.
115,110.—SPLINT.—A. F. Scow, Chicago, Ill.
115,111.—FURNACE.—T. P. Scripter, Des Moines, Iowa.
115,112.—CIDER MILL.—G. Seger, Humberstone, Canada.
115,113.—CLEVIS.—John H. Shaw, Inlet, Ill.
115,114.—BRIM OF HAT.—J. Sheldon, Newark, N. J.
115,115.—EXCAVATOR.—J. Shelly, Mahanoy, and M. C. Bullock, Pottsville, Pa.
115,116.—BURIAL CASE.—I. C. Shuler, Amsterdam, N. Y.
115,117.—SEWING MACHINE.—W. Sidenberg, New York city.
115,118.—CUTTING PRESS.—N. S. Simonds, Woburn, Mass.
115,119.—REGISTERING PUNCH.—J. H. Small, Buffalo, N. Y.
115,120.—MOVING HAY.—A. Smith, Hoosick Four Corners, N. Y.
115,121.—MEDICINE CASE. H. M. Smith, New York city.
115,122.—FIFTH WHEEL.—J. P. Smith, Hillsborough, Ohio.
115,123.—PLANTER.—P. E. Smith, Scotland Neck, N. C.
115,124.—SEWING MACHINE.—R. H. Smith, Baltimore, Md.
115,125.—STUMP PULLING MACHINE.—W. Smith, Tomah, Wis.
115,126.—COTTON PRESS.—W. M. Smith, Augusta, Ga.
115,127.—OIL TANK.—H. F. and G. S. Snyder, Williamsport, and Autes Snyder, Freeport, Pa.
115,128.—HAMMOCK.—J. M. K. Southwick, Newport, R. I.
115,129.—BRAKE BLOCK.—I. W. Spore, New Scotland, N. Y.
115,130.—BRAKE.—W. I. Spore, New Scotland, N. Y.
115,131.—LEATHER, ETC.—L. H. Stanley, G. B. Draper, Attleborough, Mass.
115,132.—HOE.—John Stilwell, Griffin, Ga.
115,133.—WAGON TONGUE.—L. E. Stilwell, Franklinville, N. Y.
115,134.—COFFEE POT.—O. M. Tinkham, Pomfret, Vt.
115,135.—DAMPER.—Albert Tracy, Paris Hill, Me.
115,136.—PRINTERS' FURNITURE.—J. F. Uhlborn, Sacramento, Cal.
115,137.—ELECTRICAL TREATMENT.—M. H. Utley, Montreal, C.
115,138.—CULTIVATOR.—L. Walker, Victoria, Texas.
115,139.—WASHING MACHINE.—H. Warner, Ridgeway, Pa.
115,140.—CARRIAGE JACK.—A. H. Wellbrock, Boston, Mass.
115,141.—HARVESTER RAKE.—G. H. Weller, New Village, N. J.
115,142.—RAILROAD RAIL.—E. Williams, Batavia, N. Y.
115,143.—MINER'S LAMP.—W. C. Winfield, Hubbard, Ohio.
115,144.—BUTTER WORKER.—P. G. Woodard, Waterford, Pa.
115,145.—STEAM ENGINE.—J. C. Woodhead, Allegheny City, Pa.
115,146.—NAME PLATE FOR ORGAN STOPS.—C. E. Bacon and W. J. Kent, Buffalo, N. Y.
115,147.—SASH FASTENER.—G. L. Bailey, Portland, Me.
115,148.—REPAIRING RAILS.—H. Baines, Toronto, Can.
115,149.—PATCHING RAILS.—H. Baines, Toronto, Can.
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115,157.—CUTTER FOR CUTTING WASHERS.—E. R. Brown, Mauch Chunk, and James Long, Packerton, Pa.
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115,160.—SPINNING RING.—W. T. Carroll, Midway, Mass.
115,161.—CLOTHES WRINGER.—C. E. Carter, Martinsville, O.
115,162.—PLANT GROWER.—B. B. Chadwick, Buffalo, N. Y.
115,163.—BUTTON HOLE MACHINE.—W. Chicken, Boston, Mass.
115,164.—SAND EJECTOR.—M. Christiansen, Winneconne, Wis.
115,165.—FENCE.—L. N. Clark, Brighton, Mich.
115,166.—SPADES AND SHOVELS.—L. D. Clift, Philadelphia, Pa.
115,167.—GATE.—D. M. Cochran, L. A. Hawkins, Richmond, Ind.
115,168.—CHIMNEY COLLAR.—J. H. Congdon, Coventry, R. I.
115,169.—SHOE.—E. S. Converse, Boston, Mass.
115,170.—WASHING MACHINE.—F. L. Copps, Atlanta, Ill.
115,171.—ROTARY ENGINE.—James Cox, Belle Plaine, Iowa.
115,172.—STAMP MILL.—J. M. Crawford, Philadelphia, Pa.
115,173.—CENTER BOARD.—A. G. Crossman, Huntington, N. Y.
115,174.—WASHING MACHINE.—J. Curtis, North Parma, N. Y.
115,175.—BLIND STAPLES.—B. C. Davis, Binghampton, N. Y.
115,176.—FASTENER.—J. Z. Davis, San Francisco, Cal.
115,177.—CHURN DASHER.—S. F. Dolloff, Bloomington, Ill.
115,178.—WINDOW SHADE.—A. S. Dickinson, Brooklyn, N. Y.
115,179.—CHUCK FOR LATHE.—R. H. Dowling, Fenton, Mich.
115,180.—TAILOR'S MEASURE.—I. Du Bois, Brooklyn, N. Y.
115,181.—GUN CARRIAGE.—J. B. Eads, St. Louis, Mo.
115,182.—CARBURETING.—George Edmonds, New Orleans, La.
115,183.—FOLDING BOX.—N. and J. Erpelding, Chicago, Ill.
115,184.—THILL COUPLING.—J. H. Fleming, Dundee, Mich.
115,185.—CARDING MACHINE.—J. F. Foss, Lowell, Mass.
115,186.—LAND MEASURER.—Wm. Frasius, Chatsworth, Ill.
115,187.—ROCK DRILL.—Gideon Frisbee, Titusville, Pa.
115,188.—SAMPLE BOX.—J. C. W. Frishmuth, Philadelphia, Pa.
115,189.—BURNER.—T. S. Gates, A. H. Fritchey, Columbus, O.
115,190.—PLATFORM SCALE. W. P. Goolman, Kansas City, Mo.
115,191.—SPINNING MACHINE. J. Goulding, Worcester, Mass.
115,192.—SCHOOL DESK.—G. H. Grant, Richmond, Ind.
115,193.—GAS-BURNING FURNACE.—J. Green, Philadelphia, Pa.
115,194.—TURNING LOGS.—D. S. Griffes, Flint, Mich.
115,195.—SHOW CASE.—W. H. Grove, Philadelphia, Pa.
115,196.—FORGING AXLES.—J. Harrington, Bridgeport, Conn.
115,197.—SEWING MACHINE.—Milo Harris, Jamestown, N. Y.
115,198.—PNEUMATIC ENGINE. J. F. Haskins, Fitchburg, Mass.
115,199.—HARVESTER DROPPER.—I. Hedges, Radnor, Ohio.
115,200.—STEAMING APPARATUS.—L. M. Heery, Hinsdale, Ms.
115,201.—THRASHER.—G. W. Helges, Franklintown, Pa.
115,202.—BLEACHING.—J. Helm, Jr., New Brunswick, N. J.
115,203.—FINISHING CLOTH, ETC.—C. Heubach, Chicago, Ill.
115,204.—PROPELLER.—J. W. Heywood, Baltimore, Md.
115,205.—FIRE KINDLER.—J. R. Hice, Salem, Ohio.
115,206.—HEEL FOR BOOTS.—A. L. Holbrook, Fremont, Neb.
115,207.—VULCANIZING.—B. M. Hotchkiss, Naugatuck, Conn., and G. M. Allerton, New York city.
115,208.—STEAM ENGINE.—John Houpt, Springtown, Pa.
115,209.—COTTON BOLLS.—J. Hughes, New Berne, N. C.
115,210.—SCROLL SAW.—H. H. Humphrey, and Henry Bickford, Cincinnati, Ohio.
115,211.—BUNG BORER.—W. A. Ives, New Haven, Conn.
115,212.—VELOCIPEDE.—B. Janson, Effingham, Ill.
115,213.—CULTIVATOR.—Moses Johnson, Three Rivers, Mich.
115,214.—MOLDER'S FLASK.—E. F. Jones, Foxborough, Mass.
115,215.—ROACH OR BUG TRAP.—J. M. Keep, New York city.
115,216.—FIRE KINDLER.—A. B. King, Camden, ohio.
115,217.—TURBINE.—J. J. Knowlton, Saccarappa, Me.
115,218.—BRICK MACHINE.—J. L. Kucker, Philadelphia, Pa.
115,219.—BOOT HEEL.—R. C. Lambert, Quincy, Mass.
115,220.—ALLOY.—G. M. Levi, Brussels, C. M. Kunzel, Liege, Belgium.
115,221.—SAFE.—S. S. B. Lewis, W. H. Sterling, Troy, N. Y.
115,222.—ANIMAL TRAP.—Christopher Long, Newark, Ohio.
115,223.—THRASHING MACHINE. M. H. Mansfield, Ashland, O.
115,224.—CHECK REIN.—A. P. Mason, Franklinville, N. Y.
115,225.—BALE TIE.—J. R. McClintock, New Orleans, La.
115,226.—COTTON GIN. F. M. McMeekin, Morrison's Mills, Fla.
115,227.—SHELLING CORN.—J. Miller, N. Dubrul, Joliet, Ill.
115,228.—COFFEE ROASTER.—R. L. Mills, Springfield, Ohio.
115,229.—CORPSE PRESERVER.—G. W. Nash, Columbus, Ohio.
115,230.—LOCK.—Jacob Obernesser, Cincinnati, Ohio.
115,231.—LOCK.—Jacob Obernesser, Cincinnati, Ohio.
115,232.—SCHOOL DESK.—John Peard, New York city.
115,233.—SPINNING MACHINE.—O. Pearl, Lawrence, Mass.
115,234.—WASH BOILER.—H. W. Pell, Rome, N. Y.
115,335.—BUSTLE.—G. V. Pierce, Jersey City, N. J.
115,236.—CAR COUPLING.—Hiram Plumb, Philadelphia, Pa.
115,237.—HEAD BLOCK.—H. M. Popple, Warren, Pa.
115,238.—ATTACHING NAPKINS. P. H. Raiford, Houston, Texas.
115,239.—PRIVY.—Frank Riedel, San Francisco, Cal.
115,240.—GRAIN DRYER.—Alfred Robert, Paris, France.
115,241.—ATTACHING BOOMS.—E. Rogers, Waterford, Conn.
115,242.—COUPLING.—J. Royal, M. A. Lentz, J. M. Deibert, La Fayette, Ind.
115,243.—STEEL.—E. L. Seymour, New York city.
115,244.—DUMPING WAGON.—Jacob Skeen, Mound City, Ill.
115,245.—FIFTH WHEEL.—Jacob Skeen, Mound City, Ill.
115,246.—FIFTH WHEEL.—Jacob Skeen, Mound City, Ill.
115,247.—LUBRICATOR.—G. E. Smith, Fitchburg, Mass.
115,248.—PULLEY BLOCK.—H. Smith, Providence, R. I.
115,249.—LOCK NUT.—L. J. Smith, New York city.
11 ,250.—TOWEL RACK.—P. A. Snyder, Jersey City, N. J.
115,251.—FLUTING MACHINE.—H. Sommer, C. Bauer, Newark.
115,252.—TRAP BALL.—C. F. Spencer, Cleveland, Ohio.
115,253.—BUNG CUTTER.—A. W. C. Sternberg, Davenport, Iowa.
115,254.—ROTARY PUMP.—H. P. Tenant, E. Germantown, Ind.
115,255.—SEWING MACHINE.—G. Thompson, Springfield, Ill.
115,256.—EARTH CLOSET.—C. A. Wakefield, Pittsfield, Mass.
115,257.—TOOL HANDLE.—C. G. Wegner, Philadelphia, Pa.
115,258.—FIREARM.—Eli Whitney, New Haven, Conn.
115,259.—BLOWING MACHINE.—J. M. Williams, Conn'ville, Ind.
115,260.—SASH HOLDER.—B. Wilmot, Montana, Iowa.
115,261.—CAR TRUCK.—R. Winslow, Lock Haven, Pa.
115,262.—LAMP.—F. Yeiser, S. W. Hedger, Lancaster, Ky.
115,263.—WASHING MACHINE.—T. Tebow, Lexington, Ky.

REISSUES.

4,388.—MACHINE FOR HUSKING CORN.—L. A. Aspinwall, Albany, N. Y.—Patent No. 101,809, dated April 12, 1870; reissue No. 4,099, dated August 16, 1870; reissue No. 4,174, dated Nov. 8, 1870.
4,389.—BOLT FOR SAFES.—G. L. Damon, Cambridge, Mass.—Patent No. 102,780, dated May 10, 1870.
4,390.—LATHE.—L. R. Faught, Philadelphia, Pa.—Patent No. 60,163, dated December 4, 1866.
4,391.—Division A.—WATER METER.—National Meter Company, New York city.—Patent No. 92,884, dated July 20, 1869.
4,392.—Division B.—WATER METER.—National Meter Company, New York city.—Patent No. 92,884, dated July 20, 1869.
4,393.—BOILER.—W. B. Scaife, Pittsburgh, Pa.—Design No. 4,224, dated July 12, 1870.
4,394.—BAYONET.—H. Waters, Boston, Mass.—Patent No. 47,590, dated May 2, 1865.
4,395.—HARVESTER RAKE.—J. C. Durborow, Ellicott City, Md.—Patent No. 78,654, dated June 9, 1868
4,396.—REGULATING VALVE.—B. Holly, Lockport, N. Y.—Patent No. 94,748, dated September 14, 1869.
4,397.—PARAFFIN.—F. Lambe, London, England.—Patent No. 102,135, dated April 16, 1870; patented in England, December 4, 1868.
4,398.—IRON BRIDGE.—D. H. Morrison, Dayton, Ohio.—Patent No. 70,245, dated October 29, 1867.

DESIGNS.

4,916.—STOVE.—J. Beesley and J. J. Ferris, Philadelphia, Pa.
4,917.—CARPET PATTERN.—J. Crabtree, Philadelphia, Pa.
4,918.—CARPET PATTERN.—J. Crabtree, Philadelphia, Pa.
4,919.—MEDAL.—S. L. Denney, Christiana, Pa.
4,920.—CARPET PATTERN.—J. Fisher, Enfield, Conn.
4,921.—DRINKING GLASS.—G. B. Fowle, Cambridge, Mass.
4,922.—CHAIN PUMP.—H. L. Fry, Cincinnati, Ohio.
4,923.—GLOVE.—W. B. Green, Mayfield, N. Y.
4,924.—HOUSING PLATE.—J. L. Haven, Cincinnati, Ohio.
4,925.—CARPET PATTERN.—H. S. Kerr, Philadelphia, Pa.
4,926.—CARPET PATTERN.—H. S. Kerr, Philadelphia, Pa.
4,927.—OILCLOTH PATTERN.—V. E. Meyer, Lansingburg, N. Y.
4,928.—CARPET PATTERN.—E. J. Ney, Dracut, Mass.
4,9 8.—CARPET PATTERN.—E. J. Ney, Lracut, Mass.
4,930.—LATCH.—J. Ottner, New Britain, Conn.
4,931.—OILCLOTH PATTERN.—C. L. Pierpont, Salem, N. J.
4,932.—OILCLOTH PATTERN.—C. L. Pierpont, Salem, N. J.
4,933.—TRUNK HANDLE.—T. L. Rivers, Newark, N. J.
4,934.—LAMP SHADE.—J. B. Russell, Wheeling, W. Va.
4,935.—KINDLING WOOD.—J. L. Seymour, Washington, D. C.
4,936.—STREET LAMP.—T. D. Stetson, New York city.
4,937.—PAPER BAG.—S. W. Valentine, Bristol, Conn.
4,938.—DRAWER.—H. P. Wetmore, Elizabeth, N. J.
4,939.—CLOCK FRONT.—J. H. Bellamy, Charlestown, Mass.
4,940.—REFRIGERATIVE BUCKET.—J. Liming, Phila., Pa.
4,941.—BROILER.—J. T. Page, Rochester, N. Y.

TRADE MARKS.

266.—LUBRICATING OIL.—F. M. Backus, Cleveland, Ohio.
267.—PREPARATION FOR THE HAIR.—G. C. Barclay, N. Y. city.
268.—BEER.—B. Bates, Baltimore, Md.
269.—MACHINERY.—J. Cooper, Mount Vernon, Ohio.
270.—FURNISHING GOODS.—Fisk, Clark, & Flagg, New York.
271.—FURNISHING GOODS.—Fisk, Clark, & Flagg, New York.
272.—LEAF TOBACCO.—S. Hernsheim, New Orleans, La.
273.—SHIRT.—Hutchinson & Thomas, Baltimore, Md.
274.—TOBACCO.—W. S. Kimball & Co., Rochester, N. Y.
275.—WHISKY AND BITTERS. A. K. Lewis & Co., Covington, N. Y.
276.—FRUIT JAR.—Mason Manufacturing Co., New York city.
277.—HORSE NAIL.—N. Horse Nail Company, Chicago, Ill.
278.—COOKING STOVE.—Perry & Co. Albany, N. Y.
279.—TOBACCO.—E. T. Pilkinton, Richmond, Va.
280.—MEDICINE.—G. Reno, Titusville, Pa.
281.—PAPER.—Rock River Paper Company, Beloit, Wis.
282.—BURNING FLUID.—B. A. Rose, Urbana, Ohio.
283.—VINEGAR AND CIDER.—Rowe, Graves & Co., Chicago, Ill.
284.—FRYING PAN.—S. Smith, New York city.
285.—FISH.—The American Club Fish Co., New York city.
286.—TEA.—Fusiyama Tea Importing Co., Pittsburgh, Pa.
287.—STOVE.—Scranton Stove and Manf'g Co., Scranton, Pa.
288.—BOOTS AND SHOES.—J. H. Walker, Worcester, Mass.
289.—LEATHER.—Walker, Oakley & Co., Chicago, Ill.

EXTENSIONS.

MACHINERY FOR COMPRESSING GASEOUS BODIES.—W. A. Royce, of Newberg, N. Y.—Letters Patent No. 17,294, dated May 26, 1857.

CORN HUSKER.—Evelyn F. French, New York city.—Letters Patent No. 17,269, dated May 12, 1857.

NAIL PLATE FEEDING MACHINE.—J. C. Gould, Oxford, N. J.—Letters Patent No. 17,273, dated May 12, 1857; reissue No. 2,301, dated July 10, 1866.

MODE OF FASTENING SHEET METAL ON ROOFS, ETC.—Asa Johnson, Brooklyn, N. Y.—Letters Patent No. 17,331, dated May 19, 1857.

MANUFACTURING SHOE BINDING.—E. L. Norton, Charlestown, Mass.—Letters Patent No. 17,445, dated June 2, 1857.

PLOW.—J. S. Hall, Pittsburgh, Pa.—Letters Patent No. 17,430, dated June 2, 1857.

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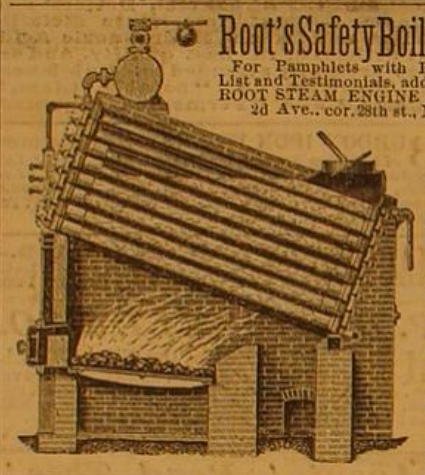
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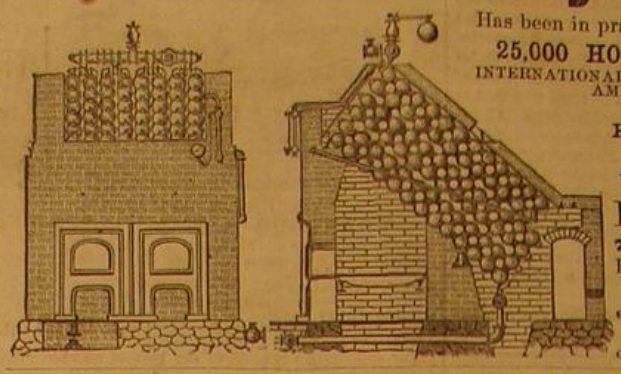
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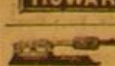
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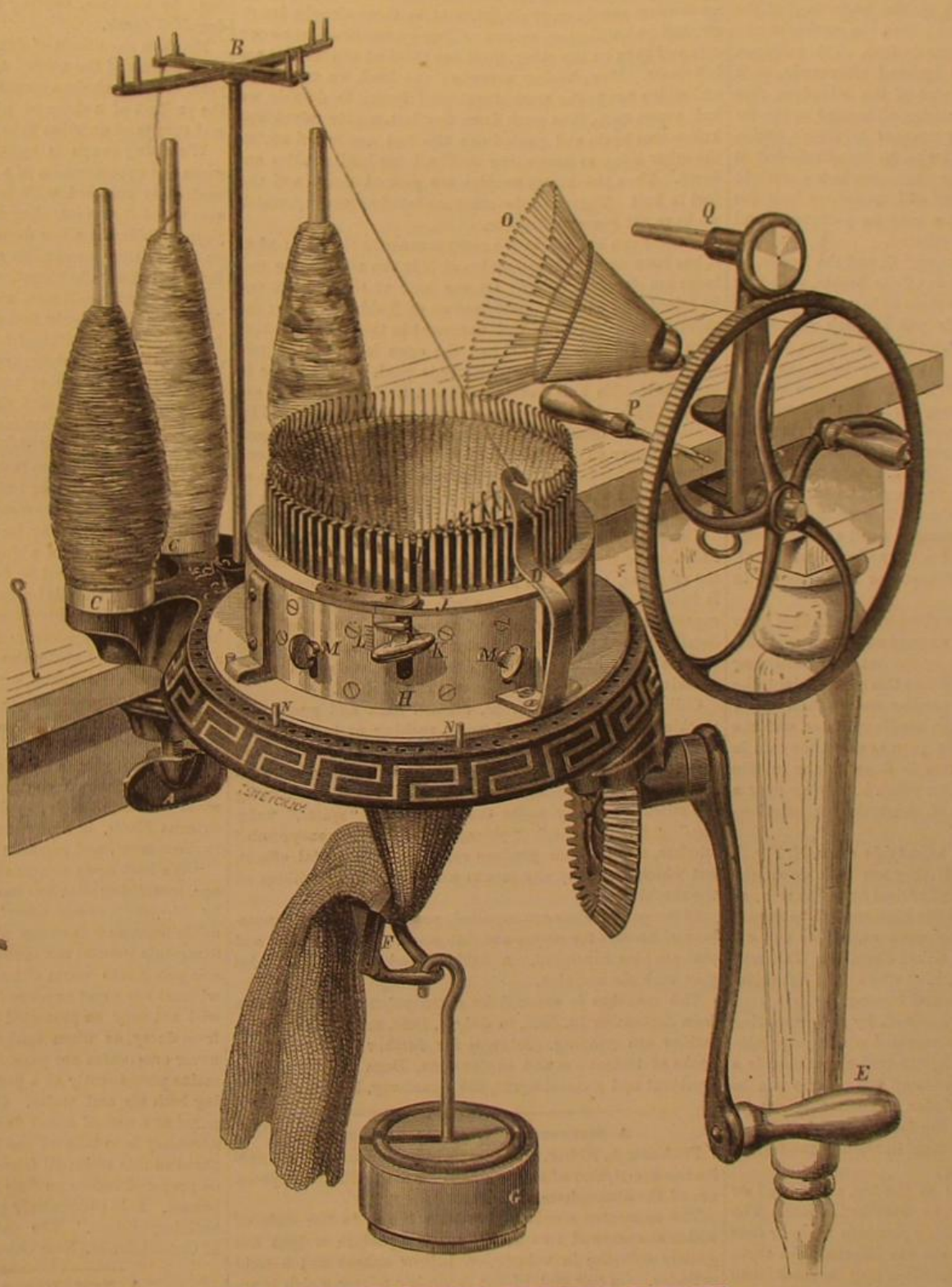
THE BICKFORD FAMILY KNITTING MACHINE.

The machine we this week bring before our readers is one which, in the accomplishment of varied results through the employment of the most simple means, has been rarely equaled. Those who have seen the complicated knitting machines, at work in the large factories, which at present fill the American market with knit goods, have been accustomed to regard them as essentially and necessarily complex. The inventor of this machine has shown, however, that only a few parts are necessary to accomplish a great variety of work, and also that these parts may be of forms easily understood, put together, and operated by those unfamiliar with machinery.

We have taken great pleasure in personally inspecting and operating this machine, and have become convinced that it comprises all that is essential for family use.

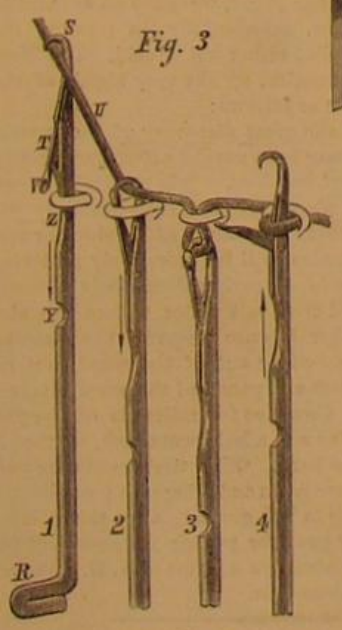
It supplies a means of fabricating many articles of usefulness in every household. A great many ornamental kinds of work undertaken for the purpose of filling up leisure hours, but becoming tedious and burdensome before they can be completed by hand, can be begun and finished in an hour or two in such a perfect manner, and with such facility that the delight in making them is not marred through prolonged labor. We can conceive of nothing more fascinating to a tasteful mind than the rapid production of forms of beauty and usefulness effected by this machine.

The merits justly claimed for it are, the variety of work it executes, its non-liability to get out of order by transportation or use; the perfect manner in which it is made; ease in working, and absence of noise in running; the little skill required to operate it; and its capacity to knit anything that the most expert operator can knit or crochet by hand, from a watch cord to a bed blanket. The machine, having no tension, does not wear or tear the yarn to pieces; it can therefore be raveled and knit over and over again.



THE BICKFORD FAMILY KNITTING MACHINE.

Fig. 3



Referring to the engraving, Fig. 1, it will be seen that the machine, exclusive of needles and the toothed wheel, consists of only sixteen parts, as follows: A, thumbscrew to fasten machine to table; B, yarn stand; C, pins for bobbins; D, yarn carrier, and sliding ring to which carrier is attached; E, machine handle; F, buckle; G, weights; H, revolving cylinder; I, needle cylinder; J, ring clasp; K, cam and screw for changing length of stitch; L, indicator, to show distance moved; M, swing cams and their thumb screws; N, pins for knitting flat web; O, set-up; P, looper.

The three first and the three last enumerated, as well as the buckle, F, and the weight, G, are not moving parts, the latter being only eight in number. To enable the reader to comprehend the action of these parts, we must first explain the stitch taken in the knitting of an ordinary stocking after the ribbed top has been knit, and the work is proceeding in the leg or foot. Fig. 3 represents four of the needles with the yarn looped thereon, as when the machine is at work. The needle employed is shown complete at No. 1. In the other numbers a portion of the lower part is broken away. The needle consists of a body, an angular bent portion or foot, R, a hook, S, and a latch, T. The latter is pivoted to the body of the needle at U, and works partly in a slot formed in the body. The latch has, moreover, a spoon-shaped end, shown at V, which, when the latch is closed as shown in needle No. 2, meets and partly shuts over the point of the hook, S, so that the loop formed on the needle easily slips off when the latter makes its downward movement.

Fig. 2



The needle as thus described is not a new invention; but Mr. Bickford, the inventor of the machine under consideration, has made important improvements in its form, which obviate all the devices hitherto considered necessary to close the latch. One of these improvements is the depression or hollow shown at Z, Fig. 3. This allows the loop, when passing off the needle, to always pass under the point of the opened latch, so that the latter is closed by the loop itself, avoiding all strain upon the needle, or liability to break from rigid parts getting out of adjustment. The deeper depression, Y, is also another improvement, the use of which will be explained when describing the process of narrowing, further on. Now let the reader suppose one line of stitches already formed on these needles, as shown in the engraving, and the thread of yarn, to be knit, so held that the needle marked 1 will hook over it when the latter descends. The thread will be drawn down by the needle until the latch, T, meets the loop previously formed. This loop, sliding along the body of the needle, lifts the latch and closes it into the position shown in No. 2. The loop then slides off the needle as it continues to descend, and the thread, being drawn down through the former loop, forms a new loop, through which the needle will pass in rising, as shown in No. 4, opening the latch, and leaving the hook free to engage the yarn when the latter is brought under it again, and so on.

Now, it is obvious that if we supply mechanism that will bring the yarn under the hook at the proper moment, and also move the needles up and down successively, and also provide a device for supporting each row of loops till the next row is formed, we shall have a machine that will knit a straight tube.

As soon as the reader understands how this is done, we shall be able to explain how widening and narrowing can be done, and how a variety of stitches can be made, or a flat web knit.

Fig. 2 shows the parts employed for moving the needles up and down. M, in this figure, represents cams. These are screwed on to the inside of the revolving cylinder, H, Fig. 1, their position being directly under the set screws, M. As these cams are carried around by the revolving cylinder, the angular bent part or foot, R (see Fig. 3), of the needle passes through the curved space between the cams, Fig. 2; and as the needles are held from moving sidewise, by being placed in grooves formed in the needle cylinder, I, Fig. 1, they are forced up and down as desired. Each row of loops is also sustained until the next is formed, by means of the needles themselves, as the needle cylinder prevents their bending inward, and keeps them in a vertical position, as shown in Fig. 1.

On the bottom of the revolving cylinder are formed teeth which mesh into a bevel gear turned by the crank, E. The yarn being wound upon a bobbin, is placed on one of the pins, C. It is passed over the yarn stand, B, and thence through a hook in the top of a bent bar, D, called the "carrier." This carrier is fastened to the revolving cylinder, H, which carries the cams, and travels with it, carrying the yarn, and holding it in just the right position to be caught by the hook of each needle as the latter is depressed by the action of the cams.

We have now all the conditions established for knitting a straight tube. If we attach the buckle, F, and hang on the weights, we have but to turn the crank to cause the machine to knit continuously.

The crank may be turned either way, but as the carrier in the position shown will not hold the thread in advance of the cams when the motion is reversed, the needles will de-

scend before the thread is brought under them. The position of the carrier must therefore be so changed as to move in advance of the descending needles. This is effected as follows: The carrier, D, is attached at its base to a sliding flat ring, which moves about the cylinder, H, its motion being limited by stops to a little more than enough to pass the cams, and take its proper position to lead the thread in advance of the needles. If it be desired to knit backwards and forwards, the pins, N, are inserted in the holes of the fixed base of the machine, as shown in Fig. 1. The heel of the carrier striking against one of these pins, is held from further motion, but the cylinder, H, will still move onward till the carrier is shifted to the other stop, when the cylinder, H, also is held from moving any further in that direction. Its motion may, however, be reversed till the carrier reaches the other pin, and is again shifted. Then the crank must be turned in the opposite direction again, and so by this arrangement, the cylinder, H, is made to move backwards and forwards to any desired distance, as regulated by the pins, and as the knitting proceeds, a flat web is knit with a perfect selvedge on each side.

Such a web may be knit from the outset, or in connection with the tube, as in forming the heel or the toe of a stocking. Let the reader suppose the leg of a stocking to have been narrowed (by a process hereafter to be described) down to the heel, and that it is required to knit a straight flat section, to be subsequently joined on to the beginning of the foot. The pins would then be set to limit the motion to the extent required to knit the flat strip desired. This strip can be closed on to the previous web by hand afterwards, or it can be knit on by slipping the loops of the selvedges over the other needles, previous to knitting all around again for the foot. This is not the exact process of knitting a heel—which is done in two ways hereafter to be described—but it illustrates the principle. Having thus seen how a straight tube or a flat web may be knit, we will now show how the work is set up, how various stitches may be performed, and how narrowing and widening are effected.

In setting up the work, the "set-up," O, and the looper, P, are used. A length of thread is run off the bobbin, sufficient to form the first set of loops, the same as in setting up work on hand needles. This thread is put through an eye in the point of the looper. The "set-up" is taken in the left hand, put up and held in the cylinder, so that its hooks are nearly on a level with the tops of the needles. The looper is then passed about the hooks of the set-up and the tops of the needles, carrying the thread with it, and forming a series of loops, like those shown in the lower series, in Fig. 3. As soon as the needles are filled, the machine is given one turn, which completes the first set of stitches. The set-up is then drawn down, and the knitting proceeds until a length sufficient for the attachment of the buckle and weights is attained, when the latter are substituted for it, as shown in Fig. 1.

The stitches are made longer or shorter, so as to knit open or close, by the regulation of the upward and downward motion of the needles. This is done by the raising or lowering of the movable cam, K, Fig. 2. When this cam is raised, the stitches are made shorter, as the needles are not then drawn so far down into the grooves of the needle cylinder, and the loops do not then contain so much yarn as when the cam is set lower. This setting of the cam is done by the middle thumb-screw, K, Fig. I, an indicator point, L, moving over a scale showing the proper degree of shortening or lengthening of the stitches.

In knitting flat webs, both the adjustable cams, M, Fig. ?, must be in the position shown. If they are both down, the machine will not knit either a cylindrical or a flat web, as there is nothing to raise the needles high enough to release the latches. In this position, the work cannot be run off, should the machine be turned in either direction. This may be done while setting up the work, or when it is left unfinished, as a security against accidental turning.

The needles are taken out, or inserted, by first removing the jointed ring clasp, J. This is provided with a rule joint and a spring catch, so that it can be removed or replaced in a moment of time. When it is taken off, the needles can be drawn up out of the needle cylinder. When they are inserted, they must be put in with the foot, R, Fig. 2, pointing outward. This must be borne in mind in reading the following method of knitting a stocking:

If the stocking is to be seamed at the top, every third or fourth needle is first taken out, as described above. The work is then set up, and the knitting proceeds three or four inches. Then the needles taken out are inserted, and three or four inches are knit plain. The stitch may be made loose over the calf of the leg, and gradually tightened to the ankle, shaping it nicely; or it may be narrowed down to the size desired by taking out needles. This is done by first taking out one exactly in front, putting the stitch over the next needle, and then knitting round six or seven times. Then the third needles on both sides of the one first taken out are removed. Then knit round six or seven times again, and take out two more; and so continue to knit and take out needles till the leg is narrowed to the size desired. The work is then ready for the heel. For a common sock, thirteen or fifteen needles will usually need to be taken out; the number of times knitting between the needles taken out may be determined by the length of the leg, which is about one hundred times round for a common sock.

In knitting a stocking or sock, either a square or round heel may be formed. The square heel is knit as follows:

After knitting the leg long enough, the machine is stopped with the carrier, D, at the back side. The needles in front or toward the operator, are then pulled up, being half of the entire number in the cylinder. These may be called the instep needles. They are drawn up till each loop passes into the notch, Y, Fig. 3, which holds them so that they will pass over the cams without knitting for the instep. Then the pins, N, are inserted on each side opposite the fourth needle of those drawn up. The object of the holes in the base of the machine is, as already explained, to insert the pins for the purpose of gaging the width of work knit; for example, in using thirty-six needles for knitting the heel, these pins are inserted far enough beyond the number of needles used to form each stitch perfectly on either side of the web. After the carrier, D, strikes the pins, the machine is turned until the sliding ring the carrier is attached to comes to a full stop. This places the carrier opposite the other cam in a position to knit the other way. The knitting is continued backwards and forwards until the heel is long enough, being thirty-six times for a common sock. Then the heel is run off and closed up; and, taking up the loose loops on the selvedge of the heel on the needles the heel was on, and pushing the instep needles down in place, we proceed to knit the foot the length required, being seventy times round for a common sock.

In knitting a round heel, one half the needles are put up, and the pins are placed as described for the flat heel. Then the machine is turned as far to the left as it will go, then back to the right, when the first needle on the left, next to those already drawn up, is raised; then to the left, pulling up the first needle on the right, next to those already drawn up; and so knitting across and pulling up needles, first on one side and then on the other, until one third of the needles are left down. Now, having narrowed the heel, we commence and widen out to the same size started from; to do this we knit across once, then push down the last needle raised up; knit across again and push down the last one raised up, on the other side; so continuing until all the heel needles are down. Then the instep needles are pushed down, and the foot is knit. There are also other modes of narrowing, which we have not space to describe.

The toe can be knit in the same manner as the heel; after it has been narrowed and widened, it is run off and the end loops are closed together. Or, one half of the needles can be raised, and one third narrowed on each side as before; the other half pushed down and narrowed in the same manner; then the whole is run off, and the open loops of the two sides closed together. Either way is good, but the latter is preferable. To knit double heels and toes, two threads are used. Old heels and toes are quickly and nicely mended by knitting new ones on. The minute description of this process may give an impression that the manipulation is complicated. This is not the case, however; a single sitting of half an hour will enable any one of ordinary intelligence to knit a stocking perfectly.

The example given of the knitting of an entire stocking is sufficient, in connection with this description of the parts of the machine, to give an idea of its principle and operation. It fails, however, to give any adequate idea of its scope and capacity to perform a variety of work. Our space forbids a detailed exposition of the manipulations through which the various styles of stitches are effected, and we will content ourselves with an enumeration of some of them.

Children's socks, flat webs, seamed back and gored foot stockings, mittens, Balmoral work, ruching or tufted work, fringes, cords, scarfs, affghans, blankets and spreads, are some of the many articles which can be wrought in a beautiful and substantial manner with ease and rapidity. Among the stitches we may name the "diamond," "spiral," "zig-zag," "herringbone," "pineapple," and "honeycomb" stitches, all of which produce very fine ornamental effects, but which do not by any means exhaust the capabilities of the machine.

Different cylinders are supplied, containing different numbers of needles for coarse and fine work. Extra needles and pins are also furnished. A bobbin winder, Q, Fig. 1, also goes with the machine.

The machine is covered by seven patents, bearing dates from September 10, 1867, to July 6, 1869, and further applications are pending. Address for further information, or books of instruction and explanation, Dana Bickford, Vice-president and general agent, 689 Broadway, New York city.

A Barometer without Mercury.

Professor A. Heller, of Ofen, gives in Poggendorff's *Annalen* the description of an apparatus for determining the pressure of the atmosphere.

The apparatus consists of a scale beam, to the ends of which are screwed two bodies nearly equal in weight but greatly differing in volume,—a hollow sphere and a solid cylinder. On one end of the beam is a mirror which is approximately at right angles to the axis of the beam. At some distance from the apparatus is a telescope with a vertical scale, the image of which in the mirror is observed by means of a telescope. It is clear that when there is any change in the expansion of the air in the vicinity of the apparatus, the beam will indicate varying angles with the horizon, which angles may easily be read off in the mirror by means of the telescope.

The variations of the scale beam in consequence of alterations in the pressure will not amount to much, if the dimensions of the apparatus are moderate; but the use of Poggendorff and Gauss's method of reading affords such a degree of accuracy that, as a brief calculation shows, under assumptions which are easily realized, the changes in the position of the beam can be measured with far greater certainty and accuracy than the hight of the mercurial column in the ordinary barometer, provided the whole construction is light, and that its center of gravity is at a short distance from the knife edge of the beam.

Causes of Summer Diseases.

The *Journal of Health* for June, under a different heading, states the following facts concerning the causes of disease:

The mistletoe bough, like the Spanish moss, which drapes the trees of Southern swamps in such sad funereal garb, is a growth outside of the natural condition of the tree; it is a parasite, a fungus; a very low form of life, exceedingly slow in development in some cases, in others so inconceivably rapid as to be reproduced in millions in a few hours, as in the toadstool and mushroom. The common yeast, with which we make our bread, is a mass of living things, a dozen of them generating myriads more in a night. These fungi, sporules, or germs, are not only the pests of living plants, eating out the entire life in the course of time, but they infest animals and man, carrying with them, sometimes, the most dreadful deaths. The mushroom, the morel, and the truffle, among the greatest delicacies of the table with some, are fungi. In some cases they kill, or cause disease, or poison. Ergot, blight, mildew, rust, brand, dry rot, are all the diseased results of fungous growth.

There are similar growths or products in the animal world, called "cell" life. Vegetables come from seed, animals from eggs by cell development, and these cells or eggs are as amazing in their fecundity as fungous growth. A man swallows a few mouthfuls of raw pork in which are a few trichinæ. In a very few days, living things are found burrowing in the flesh by millions, causing the most agonizing pains and a dreadful death.

Between the effects of fungi and cell products, the vegetable germ and the animal egg, men perish in millions every year. Asiatic cholera seems to be, by the latest researches, the product of a thing of life, but whether vegetable or animal admits of question thus far.

Whooping cough is apparently of vegetable growth; for when the expectoration of a child suffering from it is examined, it is crowded with germs; on one occasion a small amount of it was introduced into the windpipe of a healthy young rabbit; in a few days it had a troublesome cough, and on examination a countless number of these same germs were found all along the throat, windpipe, and lungs.

Plague and pestilence, and all those diseases, called epidemic, which suddenly fall upon a whole community, such as fever and ague, chill and fever, bilious fever, yellow fever, diarrhœa, and dysentery, are caused by marsh miasm.

In the worst time of yellow fever and cholera in New Orleans, the evening and the morning air was so cool and delicious and balmy that many a time we have breathed it by the hour in perfect delight; and yet the resident knew that it was but the sure intimation that the disease would be more fearful in a day or two. But if this air be bottled and taken a thousand miles away, put into a close room where a healthy man is sleeping, he will have the ordinary symptoms of chill and fever in a day or two, and myriads of these pestiferous things will be found about his tongue, his throat and windpipe, and his lungs and stomach.

The newspapers announced recently that the Asiatic cholera had made its appearance in India; its progress has been always westward along the most prominent lines of travel, until it reaches America, crosses to the coast of California, and is lost in the boundless Pacific.

Thomas' Process for Preserving Wood.

In a previous number of our paper, we gave an account of this process, which consists, substantially, in treating the wood with oil of resin, applied either hot or cold. The New Orleans *Times*, in a recent notice, speaks very highly of the improvement, and remarks as follows:

"We look upon this as the great discovery of the present age, something that has long been sought after, particularly by ship builders and wharf builders. It is particularly valuable because it is cheap, plentiful, and easily applied. By using this process the timbers or bottoms of all ships or vessels going into warm climates will be thoroughly protected without the great expense of coppering them, their bottoms will not only be protected from salt water worms, but also from decay, as when timber is once prepared the material never evaporates nor passes off or out of the wood, but remains permanently as a part and parcel of the wood, excluding both air and water. Crossties for railroads can be prepared at a cost of about five and a half cents each, all that is necessary is to take off the bark. Other timbers can be prepared in this ratio; all fence posts and telegraph posts should be prepared before putting in the ground; also, the sills of houses. It is particularly good for paving purposes and for building bridges." The patentee's address is N. H. Thomas, 32 Carondelet St., New Orleans, La.

A New Danger to Ocean Cables

A recent announcement of the Superintendent of the International Telegraph Company between Punta Rosa and Key West, has placed a new item upon the list of dangers to which ocean cables may be subjected.

The cable in question had, during the past year, been so frequently injured or broken, that a careful examination was decided upon, the result of which was to the effect that the damage was to be ascribed to the loggerhead turtles, which are abundant in those waters. In many places, the cable presented the appearance of having been bitten through; and in others of having been crushed from both sides until it had become so much flattened as to destroy its conductivity. The conclusion of Colonel Heiss, the superintendent, is further confirmed by the fact that at the depths where the breaks and injuries occur, there the loggerheads most abound. The Company has sent an order for a much larger and stronger cable, and when it is laid, the assailants will have something more substantial than the present steel-wound cable, upon which to whet their teeth.

THE APPLICATION OF STEAM TO CANALS.---NO. I.

BY GEORGE EDWARD HARDING., ESQ., C.E.

The immense capital invested in canal property, and the extended lines of inland navigation throughout the various districts of Great Britain, Northern Europe, and the United States of America, cause regret that, while so much has been done in years past to develop the trading interests of these countries, such extensive internal communications have been suffered to remain dormant, burdened by the same defective system of navigation which, once ample for the transportation of goods, when the pack horse and the country wagons were their only competitors, now is in most miserable contrast with the perfected system and dispatch that characterizes the management of the railways of the present day. The defects and delays in the transportation of goods *vid* canal, not lessened by the private interests and conveniences of drivers, boatmen, and others engaged in their traffic, where heavy boats are dragged from one destination to another at the slowest possible speed, by the wretched beasts that lean for support against the towing lines, point to the necessity of a radical change, to redeem them from the position to which they have sunk, in the competition of the day.

Commencing with the early history of canals, we propose to present some of the more prominent experiments which have been designed to improve the construction of vessels adapted to inland navigation, and the application to them of mechanical means of propulsion.

Save that the large drains cut by the early churchmen in the Cambridge fens seem to have been employed for purposes of occasional inland navigation as early as the fifteenth century, the great commercial republic of Holland may safely claim centuries of European priority in the construction of a system of artificial water-roads, which the industry of its people had turned to a good account of prosperity and power. France, Sweden, add even semi-barbarous Russia, had also taken the lead in this respect long before England had entered upon her career of canal construction; though in Egypt, long before the invasion of Great Britain by the Gauls, and in China, at a still earlier date, we know of their introduction, yet their origin is undoubtedly merged in the system of irrigation which, for unknown ages, has been pursued in those countries.

Certain authorities have claimed that during the invasion of England by the Romans, the works executed by them in the Fen districts were also used for navigable purposes, but of this we have no tangible proofs. In 1623, however, we find from Parliamentary records that Sir Hugh Myddleton was engaged in considering a bill "For the making of the River Thames navigable to Oxford;" while, twenty-three years later, one Francis Mathew addresses, to Cromwell and his Parliament a paper upon the immense advantages of opening up a water communication between London and Bristol, which purposed making the rivers Isis and Avon navigable to their sources, with a short canal to connect their heads across the intervening country; but, for Mathew's time, a scheme for the construction of three miles of canal, even by the State, was far too daring, and a century elapses before a canal is made in England.

Andrew Yarrington, gentleman, next publishes, in 1677, a curious book, entitled "England's Improvements by Sea and Land, to outdo the Dutch without fighting, to pay debts without moneys, to set at work all the poor of England with the growth of our own land," in which he strongly contrasts the prosperous energy of the Dutch, especially regarding their inland water communication, with the passive indifference of Englishmen to the immense advantages in their numerous streams and rivers, lying dormant at their very doors, wanting only improvement in their existing beds, with proper connection, to develop the trade and prosperity of the country.

To the lack of capital at this time can be traced the secret of the little progress of the internal communication of the country, and, though Parliament liberally granted permission for river improvements, yet, from the want of money, few were attempted, or, if commenced, failed from the same cause.

About the beginning of the eighteenth century, the opening of the navigation of the rivers Aire and Calder gave a great impetus to the trade of that portion of Yorkshire, and stimulated the demand for improvements in inland navigation; and we find its first fruits in an act of 1720, to make navigable the Mersey and Irwell, from Liverpool to Manchester; and, at about the same time, acts for the improvement of the Weaver, Douglass, and the Sankey navigations were granted, and, what was more to the purpose, the works carried out. Again, in 1817, as a reference to the pamphlets of the British Museum will show, Dr. Thomas Congreve published some views, headed "A Scheme and Proposal for making a Navigable Communication between the rivers Trent and Severn, in the County of Stafford," which paper project slumbered for forty years, till, in 1755, a survey was made for this very line of canal, under the auspices of the "Liverpool Corporation of Merchants," which line proceeded by Chester to Stafford, Derby, and Nottingham; and from Brindley's "Note-book" we find that he executed a fresh survey over the same ground in the years 1759–60, but at the expense of Earl Gower and Lord Anson.

Thus, it is not till the middle of the last century that English enterprise was fairly awakened to the necessity of a system of artificial canals; and directly traceable to the execution and extension of these earlier river improvements, can we date the present system of internal communication, which has conduced so largely to the industrial prosperity of the English nation; and to the consequent increase of British manufactures, and their distribution, do all countries owe many of their indispensable comforts of life.

Apart from the deductions that would naturally follow from the river improvements, it is well known that, in 1755, the deepening and widening of the Sankey-brook, tributary to the Mersey, with the application of a floodgate for retaining tide water, gave the hint which culminated in the construction of the well known Bridgewater canal, under James Brindley; but the rapidity of extension was afterwards such that, between the years 1760 and 1803, no less than 2,295 miles of canal were opened. From the exceedingly interesting history of this society, written by Mr. Davenport, we learn that the gold medal of the Society of Arts was awarded, in 1800, to the Duke of Bridgewater, as the father of inland navigation, and for his general exertions in promoting the interests of inland water carriage; since which date there seems to be no note of special award to the workers in this particular field of the economy of the nations. Indeed, since the adoption of canals, except in the substitution of horses for men at the towing lines, and some improvements effected in the manner of passing boats from one level to another, they may be truly said to have remained stationary in the general march of improvement, and, unlike all other arts, have partaken of none of the benefits arising from the increase of mechanical science.

It is with the view of calling attention to the fact, that, by the exercise of a tithe of the mechanical ingenuity which has been expended on railways, canals might again assume a position and importance which, if not in general economy superior to railways, yet may, in relative utility, compete in the transit of minerals, and other merchandise, that this paper is now before you; and the immense capital embarked in canals certainly renders it a subject of national as well as pecuniary importance.

A further enumeration of the progress of canal construction in this country is unnecessary, yet a glance at the commencement of inland works in America will be interesting; and in connection we find, as early as 1724, Cadwallader Colden, then Surveyor General of the colony of New York, suggesting a system of works somewhat similar to those now existing. Sir Henry Moore, the Governor of the colony, in 1768, also recommended the improvement of the inland navigation. These recommendations slumbered through the Revolutionary war which followed, to be again projected with the independence of the country. As in England, the improvement of the existing navigations was first in course, and, as early as 1791, acts for surveys and estimates relating to the removal of obstructions to the navigation of the Hudson and Mohawk rivers were passed. In the following year, the Western and the Northern Inland Companies were incorporated, and, by 1802, the former company had succeeded in spending an immense sum of money, with but very small proportional results. The route now occupied by the Great Erie Canal was adopted in 1812, repealed in 1814, to be again revived two years later. Ground was broken near Rome in July of the same year, while the first boat passed from Lake Erie to the Hudson in October, 1825, thus consuming a little over eight years in constructing the distance of 364 miles, with a total of 71 locks. The Champlain Canal was commenced in 1816, and completed in 1823, since which date the many lateral branches of the Erie have been added to the system, and the application of inland navigation extended to many of the other States.

It is a fact of interest, that the original dimensions of these canals were established by the commissioners, in 1817, at 40 feet in width by 4 feet deep, with locks 90 feet by 15; but, as early as 1834, the wants of a growing commerce demanded an increase of capacity, and in 1835, an act of enlargement of the Erie Canal was passed, since which time the depth has been increased to 7 feet, its width to 70, and the locks to 18 by 110 feet. Before the commencement of the Erie, the cost of transporting a tun of merchandize from Buffalo to Albany equaled £20, and consumed twenty days; the canal at once reduced the cost to £4, or one fifth, and the time to eight days. But mark, that the mere enlargement of the canal again reduced the average cost of movement, including all tolls, to ten shillings per tun, or one eighth of the expense previous to the improvements.

It may be interesting to review some of the more or less ingenious attempts to overcome the disadvantages of towing by horses, and hastily glance at the various methods of propulsion by mechanical means which have been especially designed to supersede animal labor in propeling boats on inland navigable waters, in Europe and America, up to the present time. In this enumeration, we shall necessarily find, among the first experiments, some which have been broadly designed for purposes of general navigation, and touch upon the early history of the steam engine; but, so far as possible, preference will be given to those where application to canal or river navigation has been the paramount idea of their inventors.

CARAVANS.

Every caravan is under the command of a chief. When it is practicable, they encamp near wells or rivulets, and observe a regular discipline. Camels are used as a means of conveyance, and there are generally more camels in a caravan than men.

The commercial intercourse of Eastern and African nations has been principally carried on, from the remotest period, by means of caravans. The formation of caravans is the only way in which it has ever been possible to carry on any considerable internal commerce in Asia or Africa. The governments that have grown up in these continents have seldom been able, and seldom have they attempted, to render traveling practicable or safe for individuals. The wandering tribes of Arabs have always infested the immense deserts by which they are intersected, and those only who are sufficiently powerful to protect themselves, or sufficiently rich to purchase an exemption from the predatory attacks of these freebooters, can expect to pass through territories subject to their incursions without being exposed to the risk of robbery and murder.

In the pilgrimage to Mecca enjoined on the followers of Mohammed, the prophet grants them the privilege of trading: "It shall be no crime in you if ye seek an increase from your Lord by trading during the pilgrimage." The camels of each caravan are loaded with those commodities of every country which are of easiest carriage and readiest sale, and during the latter part of the month of June and the early part of July, the Holy City is crowded with opulent merchants and zealous devotees. A fair or market is held in Mecca on the twelve days that the pilgrims are allowed to remain in the city.

Few pilgrims, says Burckhardt, except the mendicants, arrive without productions of their respective countries for sale. Pilgrims from Morocco and the north coast of Africa bring their red bonnets and woolen cloaks; the European Turks, shoes and slippers, hardware, embroidered stuffs, sweetmeats, amber, trinkets of European manufacture, knit silk purses, etc.; the Turks of Anatolia bring carpets, silks, and Angora shawls; the Persians, cashmere shawls and large silk handkerchiefs; the Affghans, tooth brushes, made of the spongy boughs of a tree growing in Bokhara, beads of a yellow soapstone, and plain coarse shawls manufactured in their own country; the Indians, the numerous productions of their rich and extensive regions; the people of Yemen, ornaments for Persian pipes, sandals, and various other works in leather; and the Africans bring various articles adapted to the slave trade. The pilgrims are, however, often disappointed in their expectations of gain: want of money makes them hastily sell their little adventures at the public auctions, often at very low prices.

The two principal caravans which yearly rendezvous at Mecca are those of Damascus and Cairo. The first is composed of pilgrims from Europe and Western Asia; the second, Mohammedans from all parts of Africa. The Syrian caravan is said by Burckhardt to be very well regulated. It is always accompanied by the Pasha of Damascus, or one of his principal officers, who gives the signal for encamping and starting by firing a musket. On the route, a troop of horsemen ride in the front, and another in the rear, to bring up the stragglers.

The different parties of pilgrims, distinguished by their provinces or towns, keep close together. At night torches are lighted, and the daily distance is usually performed between 3 o'clock in the afternoon and an hour or two after sunrise on the following day.

The Bedouins or Arabs, who carry provisions for the troops, travel by day only, and in advance of the caravans, the encampment of which they pass in the morning, and are overtaken in turn and passed by the caravan on the following night at their own resting place. At every watering place on the route is a small castle and a large tank, at which the camels water. The castles are garrisoned by a few persons, who remain the whole year to guard the provisions deposited there. It is at these watering places, which belong to the Bedouins, that the sheikhs of the tribe meet the caravan, and receive the accustomed tribute for allowing it to pass.

The caravan which sets out from Cairo for Mecca is not generally so large as that of Damascus, and its route along the shores of the Red Sea is more dangerous and fatiguing. But many of the Africans and Egyptian merchants sail from Suez, Cosseir, and other ports on the western shore of the Red Sea, for Djidda, whence the journey to Mecca is short and easy. The Persian caravan for Mecca sets out from Bagdad; at many of the Persians are now in the habit of embarking but Bussorah, and coming to Djidda by sea.

Caravans from Bagdad and Bussorah proceed to Aleppo, Damascus, and Diarbekir, laden with all sorts of Indian, Arabian, and Persian commodities; and large quantities of European goods, principally of English cottons imported at Bussorah, are now distributed throughout all the Eastern parts of the Turkish Empire by the same means. The intercourse carried on in this way is every day becoming of more importance.

The commerce carried on by caravans in the interior of Africa is widely extended and of considerable value. Besides the great caravan which proceeds from Nubia to Cairo, there are caravans which have no object but commerce, which set out from Fez, Algiers, Tunis, Tripoli, and other States on the seacoast, and penetrate far into the interior. Some of them take as many as 50 days to reach the place of their destination, traveling at the rate of from 18 to 22 miles per day.

The trade of these caravans is a barter of various kinds of goods for slaves. Three distinct caravans are employed in bringing slaves and commodities from Central Africa to Cairo. They do not arrive at stated periods, depending upon the success they have had in procuring slaves, ivory, gold dust, drugs, and such other articles as are fitted for the Egyptian markets. The largest of these caravans, the Darfur caravan, consists of 2,000 camels, and its departure is looked upon as a most important event, and for a while engages the attention of the whole country.

Caravans are distinguished into heavy and light. Camels loaded with from 500 to 600 pounds form a heavy caravan; light caravans being the term applied to designate those formed of camels under a moderate load or half a load.

No particular formalities are required in the formation of caravan. Those that start at fixed periods are mostly under the control of government, by whom the leaders are appointed. But any dealer is at liberty to form a company and make one. The individual in whose name it is raised is considered as the leader, unless he appoint some one else in his place. When a number of merchants associate together in the design, they elect a chief, and appoint officers to decide whatever controversies may arise during the journey.

Paine's Electro-magnetic Improvements.

These improvements are covered by several patents, granted to H. M. Paine, of Newark, N. J., in 1870 and 1871, and we shall allude to them in this description by their patent numbers, quoting chiefly from the specifications of the patents.

Figures 1 and 2 are illustrations of patent No. 103,231, being an improvement in the construction of electro-magnets. The object of the invention is to increase the power of electromagnets by neutralizing the induced currents, and thus rendering available the full dynamic value of the battery. The improvement consists in the interposition, between the layers of coils, or the application as a clothing or covering to the insulated wires of which the coils are composed, of a metallic medium, by which the antagonism of like currents to each other is neutralized. The metallic medium which may be employed may be of various kinds, but that which it is now proposed to use, as most convenient for the purpose, is what is known as metal foil. The medium may be applied in various ways, but for illustration there are shown in the engravings two ways of applying it. In Fig. 1, metal foil, *a*, in the form of a sheet or ribbon, is shown wound or lapped around and between the successive layers of coils, *b b'*, of insulated wire. In Fig. 2, the entire length of the insulated wire is shown as having a ribbon, *d*, of metal foil wound around it, to form a complete clothing or covering.

CLAIM.—The interposition of a metallic medium between the layers of the coils of an electro-magnet, or the application of a metallic medium as a clothing or covering to the wire of an electromagnet.

Figs. 3, 4, and 5, illustrate patent No. 103,230, being an improvement in electro-magnets. The object of the invention is to obtain the same relative results by compounding electromagnets as are acquired by the compounding of permanent magnets. In order to accomplish this result, the poles of two or more rectangular bars, A, Figs. 3 and 4, are wound with insulated wire, commencing at *a*, Fig. 3, on each bar, and winding around the requisite number of turns to reach the guide pin, *b*, and then pass down to guide pin, *c*, and wind in same direction till the same number of turns has been made on the opposite end of the bar: then return up to guide pin, *c* and *b*, and up to commencement, *a*. Having thus wound two or more bars (all being wound in the same direction), they are bound together, as shown in Fig. 4, and connection is made between the coils at *d*. It is not proposed to obtain any valuable result from magnetic induction by this method of constructing electro-magnets, but an increased dynamical value is claimed from the action of the currents on each other. It is well known that electrical currents moving in opposite directions accelerate each other, and, although the currents are moving in the same direction around the axis of all the bars, yet, at the juncture, *e*, Figs. 4 and 5, of the combination, their course is directly opposite, as shown by the arrows, *f f*, in Fig. 5, which is an end view of Fig. 3.

CLAIM.—The compounding or binding together of bars, separately wound, and in the same direction.

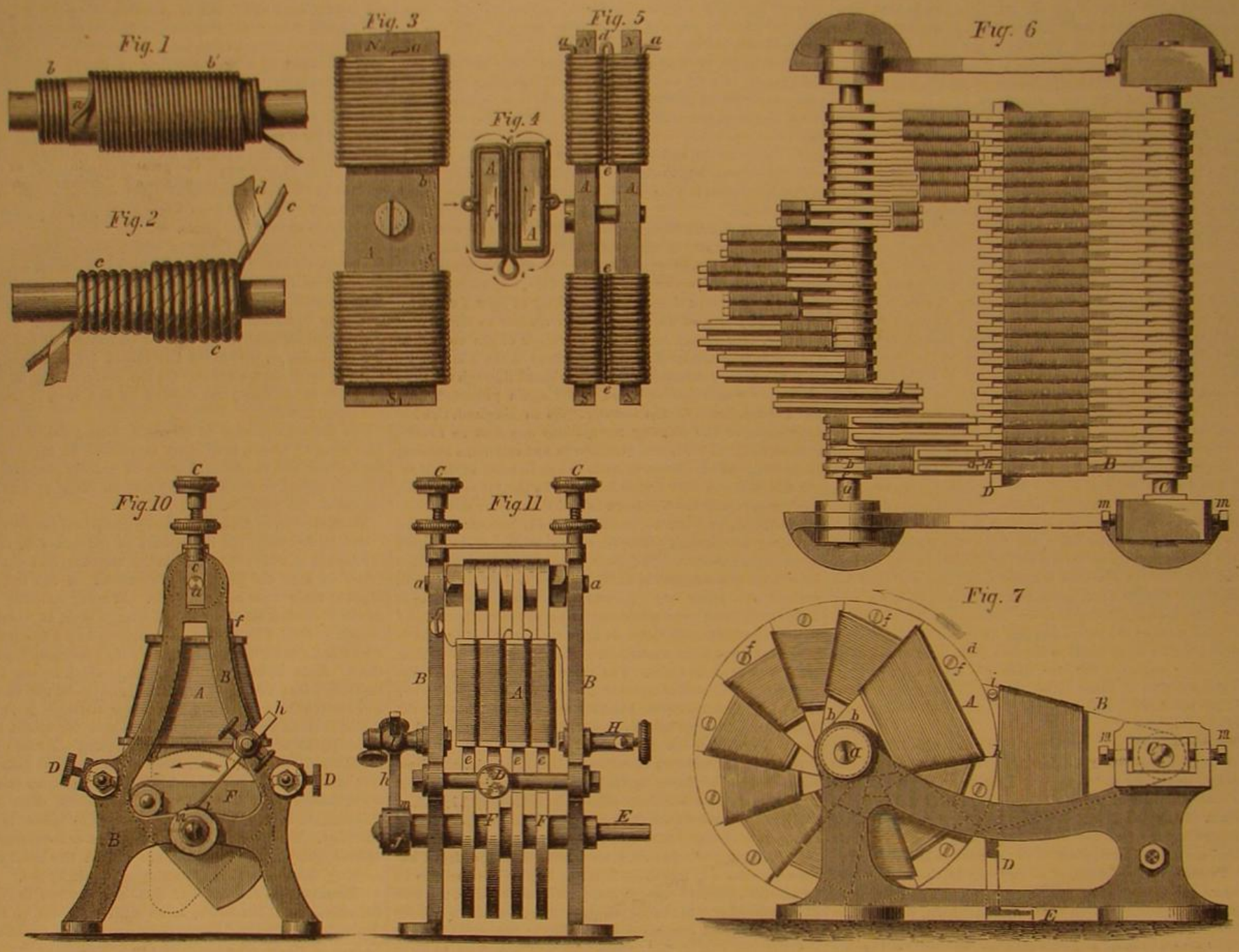
Figs. 6 and 7 illustrate patent 103,229, being an improvement in magnetic engines. The invention relates to a peculiar and novel mechanical arrangement of a sector magnet for purposes of motive force, which has for its object economy of space, cost of construction, and rigidity of parts. The value of the magnet attraction being inversely as the square of the distance, it becomes necessary, in order to obtain the best results, to work the poles in as close juxtaposition as possible. To accomplish this requirement, even in very small engines, with the poles working with a between-space of $\frac{8}{100}$ths of an inch, without contact by spring of frame or other parts, requires a heavy cumbrous frame and shaft. To avoid this necessity, both the rotating and fulcrum magnets are so arranged that all strain of attraction will be resisted by the longest cross section of the magnets themselves, and thus just in the ratio that the magnets are enlarged the increased strength is met. Any required number may be taken, of magnet sector limbs, A, Figs. 6 and 7, and they should pass the driving shafts, *a*, Figs. 6 and 7, through their several tie bolt ends, *b*, with washers, *c*, between, to secure even spacing for the current wire. These sector limbs are then so arranged on the shaft as to make the poles, *d*, describe a circle as regards their path of rotation, and a thread of one or more revolutions as regards the length of the shaft. They are then bound in their position by the nuts, *e*, and screw bolts, *f*, which pass through one series of limbs into the next, till the whole series is securely held in its required position. It will be seen that this combination presents the longitudinal section of the sector limbs to the strain. The fulcrum magnets, B, are bound on one common bolt, C, Figs. 6 and 7, in the same manner that the rotating magnets, A are held, and their poles, *h*, are bound by the rods, *i*, passing through the whole series, which makes one uniform breast of sector limbs, the axis of all lying in one common plane. As in the rotating magnets, so in these, all the strain is met and resisted by the longitudinal section of the limbs, and this extreme stiffness of construction allows the two series of magnets to be brought in close and accurate range of motion by means of the adjusting screws, *m*. The magnets, A, revolving in the direction of the arrow, will subject the fulcrum magnets, B, to a downward strain, which is met by the bridge, D, resting firmly on the bed plate, E.

CLAIM.—First. The arrangement of the magnets on the shaft. Second. The breast of fulcrum magnets in their combination with the rotating magnets, A.

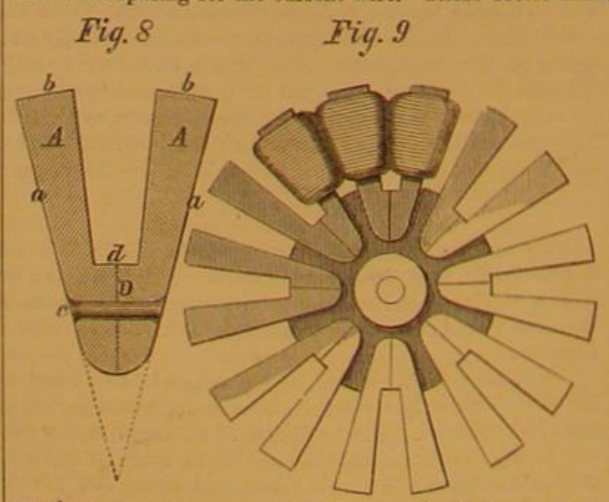
Figs. 8 and 9 illustrate patent No. 103,768, being an improvement in sector electro-magnets. This improvement relates to shaping the limbs of sector magnets in such wise that they will describe radial lines, and thus form a compact mass, when brought together around a common axis. The limbs, A A, Fig. 8, are made separate, and their outer lines, *a a*, taper from the poles, *b b*, toward their junction, D, at angles that will meet at the center of the shaft, which forms the center of motion around which they rotate. The junction of the limbs is shouldered, *d*, so as to secure a space between them for the current coils, and screw bolts, *c c*, or rivets, bind the limbs together. Fig. 9 represents a wheel made up of these radial magnets.

CLAIM.—The construction of radial limbed magnets, substantially as described.

Figs. 10 and 11 illustrate patent No. 103,228, being an improvement in electro-magnetic engines. A sector magnet, A, Fig. 10, is suspended in a frame, B, the tie bolt, *a*, being seated in an adjustable box, *c*, which is operated by the milled head screw, C. D D are adjusting screws, which operate as lateral adjustments of the magnet, A. On the driving shaft, E, Figs. 10 and 11, a sector armature, F, whose links correspond in number and position with the links of the magnet, A, is keyed. The radius of this armature, if described from the center of the shaft, E, and the curve, *d d d*, Fig. 10, described in the poles, *e e e e*, Figs. 10 and 11, of the magnet, A, must coincide with the radius of the armature, the vertical and lateral adjusting screws, C and D, determining the proper distance between the poles of magnet and armature, which, to secure the best results, should be only sufficient to avoid the friction of actual contact. One end of the wire around the magnet, A, is secured to the frame at *f*, Figs. 10 and 11, and the other end to a pole binder, H, Fig. 11, which is electrically insulated from the frame. Another pole bind-



PAINE'S ELECTRO-MAGNETIC IMPROVEMENTS.



er, I, Figs. 10 and 11, also electrically insulated from the frame, holds a spring arm, *h*. Fig. 10, which rests on a circuit breaker, *i*. The operation of this arrangement is such that, when the arm, *h*, rests on the non-conducting portion of the circuit breaker, no current can traverse the links of the magnet, but, when the conducting part, *m*, comes in contact with the arm, *h*, a circuit is made, and the armature made to rotate during the contact. Having thus described the mechanical details of the application of the sector magnet to the production of rotary motion, we will proceed to describe the mode of utilizing the reflex currents. Referring to Fig. 10, and considering the armature to be revolving in the direction of the arrow, and supposing that the circuit breaker is so adjusted, with reference to the arm, *h*, as to continue the action of the current till the axis of the magnet and armature are coincident, and then break, we should find that the reflex action of the current would resist any attempt of the armature to continue its onward motion, and this resistance is equivalent to seventy-five per cent of the battery current. But, if the adjustment of the circuit breaker be such that the current is broken previous to the coincidence of axis of the magnet and armature, then the reflex current, instead of retarding the motion of the armature, will expend itself in assisting its motion; therefore, in order to convert this reactionary property of the currents into a valuable element of force, the circuit breaker is adjusted under such conditions as will insure a break previous to the coincidence of the axis of the magnet and armature, as shown in Fig. 10, the dotted lines showing the position that the armature obtains through the action of the reflex currents, the break having been made when the armature was in the position shown by the full lines.

CLAIM.—First. The combination of the sector magnet, A, and sector limbed armature, F, with their adjustments or without. Second. The breaking of the circuit previous to the coincidence of the axis of magnet and armature, substantially in the manner specified.

Breweries and their Fittings.

A paper "On the Machinery and Utensils of a Brewery," was read before the Society of Engineers, in the hall of the Westminster Palace Hotel, London, by Mr. Thomas Wilkins, C.E.

The size of a brewery is stated in the number of quarters of malt that can be used in one brewing; thus, a brewery having a mash tun in which twenty combs of malt can be mashed at a brewing, would be a "ten quarter brewery," and so on, the rest of the plant being made in proportion.

Until steam came into general use as a motive power, all the labor was done by hand or horse power; sometimes a water wheel was used; but it is believed that on no occasion has wind power been applied. Of late years, steam has not only been used in breweries as a motive power, but also as a means of transmitting heat; so that the brewer having a boiler to supply steam to the engines, uses it also to supply steam for boiling both liquor and wort, either by forming the boiling coppers with an outer pan or jacket of iron, and passing steam through the space between that and the inner pan of the copper, or by passing the steam through coils of copper pipe fixed at the bottoms of vessels made of wood, iron, or copper, whichever of these be preferred.

In building a brewery every advantage should be taken of any favorable natural features of the locality, such as a hill side, where the building may be arranged so that the utensils can be placed in a position one above another in level, taking advantage of the natural slope to save labor, which might otherwise have to be expended in pumping the worts or beer about. A good supply of suitable water, or "liquor," as it is called in breweries, is also indispensable. That there is this should always be ascertained before either building a new brewery or extending an old one.

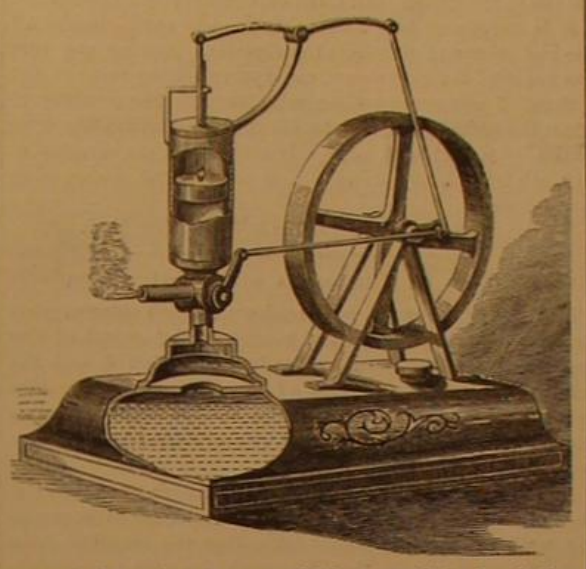
The mash tun should be made either of good yellow deals or of oak, and should have a false bottom, generally of iron, made of several plates, so as easily to be removed for cleansing the tun. These plates are very closely perforated with holes about one twelfth of an inch in diameter; sometimes, however, with slots that *width*, but about two inches to three inches long, cast in them. These slots and also the small holes are about three eighths of an inch on the bottom side of the plate, being made so much taper to prevent their blocking. The plates with slots are more expensive than the others, but some brewers prefer them. The mash tun should contain from eighteen to nineteen cubic feet for every quarter of malt. Formerly, when the crushed malt had been placed in the tun, the nearly boiling hot liquor was run in, and the whole was thoroughly mixed together by men with poles, each having several cross pieces, about the size of the staves of a ladder, in one end. This operation is termed mashing, and these oars are still used by some brewers, more especially where a "Steele's" or a similar machine is used.

A better and more certain method of mashing was required; for it was found that in some parts of the mash tun a sort of cake or dumpling would be formed, the outside of which, consisting of a pasty mass of flour, prevented the liquor reaching the inside, to extract the valuable ingredient of the malt. The machine which for many years has been fitted to mash tuns, to perform this operation, is made as follows: A circular crank, with radial teeth, is bolted to the sides of the mash tun; a vertical shaft is erected in bearings in the center of the tun. This shaft is either carried some few feet above the top of the tun, or else passes through a stuffing box in the bottom, and is worked by bevel wheels from a horizontal shaft. The vertical shaft supports loosely a bearing which carries one end of a second horizontal shaft, which is inside the tun, at about half its depth. The other end of this shaft has a pinion keyed upon it. This pinion gears with it, and is supported by the circular rack before mentioned. A revolving motion is given to this horizontal shaft by bevel wheels from the vertical one, and upon it is hung a sort of rake, which, as the shaft revolves, thoroughly mixes up the mash. Sometimes there are two, and even three of these rake shafts. It will be obvious that, as these shafts revolve, the pinion gearing into the fixed rack causes the whole to revolve somewhat slowly round the tun.

In large breweries, where there are sometimes a dozen or more mash tuns, rather than have a large engine, it is better to have a small one to pump all the liquor, and another to grind the malt; and these may be kept at work all day, preparing for the morrow. Indeed, a vast amount of money in first cost, and in labor afterwards, may be saved by properly planning and arranging everything beforehand.

TOY STEAM ENGINE.

This is a very simple and pretty toy engine, consisting of very few parts. It is the invention of Philander Macy, of Rochester, N. Y. It is a beam engine with oscillating valve



gear, and the pedestal upon which it stands is the boiler. By filling the boiler and setting it upon a stove, the engine will work as long as the water supply lasts.

Cracked Sovereigns.

It has probably fallen to the lot of many readers to have come into possession occasionally of gold or silver coins which were hollow, or cracked on their edges, and therefore not sonorous when tested by the well known "ringing" process. Speculations as to the source of the imperfection are numerous, and various theories have been advanced and discussed in regard to it.

Perhaps one of the most extensively prevailing notions as to the origin of cracked sovereigns and cracked coins of other denominations, is, that all pieces of money fabricated at the British mint are, in the first place, made in halves, the heads and the tails being afterwards paired and united by cementing, soldering, hydraulic pressure, or some other means. This operation being in some cases imperfectly performed (as it is argued), a partial or complete divorce may afterwards take place, and hence the phenomena of cracked moneys.

Another supposition is, that the hollow coins have been tampered with by gamblers for their own nefarious purposes. Neither of these theories, however ingenious they may be, is the correct one. The evil really arises in the way we shall attempt to describe. All the legitimate metallic money of this country is made from bars of cast gold, silver, or bronze. At the Royal mint there are orthodox sizes for these bars, so as to produce each variety of coin in use outside its walls. Those for sovereigns are twenty-six inches long, one and a half inches wide, and one inch thick; and, for the purpose of facilitating explanation, let us confine our attention to gold only.

Such bars are cast in vertical molds of iron, which latter are fitted together in halves, so as to allow the giant nuggets to be realized easily from within them. On filling a mold from the crucible of molten metal held over its mouth, the resulting bar cools rapidly. Those parts of the bar which touch the sides of the mold cool first, and more gradually the center is reduced in temperature. As the sides of the bar harden at once, they cling, as it were, to the walls of the mold, whilst the metal in the middle contracts in cooling, and subsides down the mold. The upper end of a bar of gold resembles much at this juncture the mercurial column in a barometer when the "glass" is said to be "falling." It is hollow or depressed in the middle, and sometimes very much so, the depression occasionally extending to one inch.

The lower end of the bar is perfectly squared, because the base of the mold is square. When removed from its iron case, the bar is carried to the rolling mill for lamination. It is passed again and again between the rollers, until it is attenuated into a strap or ribbon; but that which was its upper end is still defective. The rollers have simply compressed the precious metal, and therefore left the hollow end a mere crevice or thin line in the middle of the strap. This end is considered as scrap, and, first cut off by a pair of shears, it is returned to the melting pot. It happens, sometimes, nevertheless, that a sufficient portion of imperfect ribbon is not cut away, the crack thus extending beyond the amputating point. When this occurs, it creates the evil of "cracked sovereigns." The ribbon is removed to the punching press, and perforated from end to end by a punch of the exact size of a sovereign. Some of the disks of metal thus produced *may* be cut from the bad end of the strip of gold. To detect these criminals, if they exist, a small staff of boys is employed. They are each armed with a bright-faced anvil block of cast iron, and they ring every individual disk in very rapid succession on the anvil. The sound and perfect pieces give forth harmonious music, whilst the others are dumb dogs, and have no music in their souls. The defaulters are, or should be, all picked out, and condemned to the "fiery furnace" once more. Boys are not infallible, and they have permitted "dummies" to escape now and then. These pass forward to be stamped at the presses, milled on their edges, and issued to the public, by whom they are criticised, and justly condemned. The hollowness of their characters is only detected, it may be, after some contact and friction with their neighbors, just as speciousness in the human character is only found out by the application of the tests of adversity and trouble. With the care at present exercised at the mint, hollow coins cannot escape detection.

Correspondence.

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

Utilizing Coal Dust for Fuel.

MESSRS. EDITORS:—Bringing into practical use the coal dust or slack coal, is today the great question; and as you have given space in your columns to a great many communications on the subject, will you do me the favor to insert this letter on the manufacture of artificial fuel or compressed coal dust?

It is a well known fact that coal, either bituminous or anthracite, produces in mining, breaking, screening and handling, an amount of dust, commonly known as slack coal, amounting, on an average, to 50 per cent of the coal production, thus causing a considerable loss to the parties engaged in mining, as but a small portion of this dust coal, and that only of the bituminous coal, is needed for blacksmith purposes, while the anthracite slack is entirely useless. The immense quantity of refuse coal must necessarily be got out of the way, whether dumped into a stream, to be carried off, or heaped on ground which has to be dearly paid for.

In the anthracite coal regions, this immense amount of waste is constantly being piled up around the mines in vast, unsightly mounds, burying the mining villages, and sadly encroaching on the limits of many of the chief towns. The amount of this waste cannot be less than fifteen millions of tuns, and every year adds to the rapidly increasing dirt bank.

In France, in Germany, in Belgium, and in England, the slack of the bituminous coal has been converted into lumps or cakes of different sizes and shapes by mixing it with coal tar. Monsieur Dehaynin, from Paris, started the first manufacture of artificial fuel or agglomerated slack, at Montigny-sur-Sambre (Belgium) about eleven years ago. He possesses today two manufacturies in Belgium and two in France. He manufactured in 1870 over 1,200,000 of tuns; railroad companies used 931,600 tuns, the navy used 250,000 tuns, and other industries used 70,000 tuns.

Among the railroad companies, that of the Paris, Lyons, and Mediterranean consumes pressed coal exclusively, requiring 1,200 tuns per day. The Northern Railroad Company, of France, between Paris, Amiens, Dunkerque, and Calais, does not use pressed coal exclusively, although its daily consumption amounts to 300 tuns. The scarcity of coal tar is the only thing which prevents M. Dehaynin from erecting other factories and increasing the manufacture of his compressed coal.

It will be observed that the railroad companies and the navy are using almost exclusively compressed coal, while private manufacturers do not seem to like it. The reason is that the burning of that coal produces such a smoke and such a bad smell that it is entirely unfit for domestic use, and cannot even be used in stationary engines, people in the neighborhood complaining of the nuisance. It was only permitted to be used in some sugar refineries and distilleries, situated at a reasonable distance from cities; and even then the law compelled the proprietors of those manufactures to raise their stacks to a specified hight.

So important has this subject of converting coal dust into lump coal been regarded, that the United States Commissioners, to the Paris exposition of 1867, have made a report on pressed or agglomerated coal, which presents the subject and its importance in an able and instructive manner.

That report sets down among the advantages attending the use of pressed coal, the following:

"Its purity and compactness adapts it to the rapid production of steam in furnaces and small fire grates, and it is, therefore, a desirable fuel for steamers and locomotives, for which it is largely used in Europe.

"Being manufactured in prismatic form, it can be very compactly stored on shipboard or elsewhere.

"It can readily be transported to great distances with very little waste, amounting, it is stated, to less than one tenth the waste of ordinary coal, handled under similar circumcumstances.

"It is not injured by frost, by snow, or by rain. Bricks of pressed coal produce as much steam in locomotives as an equal weight of coke. It is much liked by firemen, especially for raising steam in ascending heavy grades.

"Soft bituminous coal, or the mixture in which it predominates, is generally used in the manufacture of pressed coal."

I will especially call your attention to this last paragraph of the Commissioner's report.

In France and Belgium, the soft bituminous coal contains from 60 to 70 per cent carbon, and costs twice as much as the hard coal, which contains only from 30 to 40 per cent carbon, the balance being slate, schist, and other substances. The compressed or agglomerated coal, made from the bituminous slack, is sold as high, and sometimes higher than the bituminous lump coal itself. In this country, on the contrary, the bituminous coal contains from 45 to 60 per cent carbon, and is sold at a cheap price, whereas the anthracite contains from 80 to 95 per cent carbon, and is sold twice as high as the bituminous coal. The bituminous slack has some value for blacksmiths, and is burnt in furnaces, while the anthracite slack has no value at all.

The difference in the value of the coals accounts for the fact that all the experiments, or, at least, most of them, made in this country, have been made on anthracite slack.

A great many attempts have been made to convert slack coal into a solid combustible. For this purpose, gum, coal tar, petroleum, asphaltum, rosin, solutions of glue, alkalies, silicates, magnesium, Grahamite, and the remains of fabricated oil have been used, and the processes patented. These various experiments of solidifying anthracite slack have been failures. The high price of the ingredients used increased the expense so that it could not be applied to bituminous slack, in order to compete with the lump coal. Applied to anthracite slack, there was another difficulty. It has always been easy enough to solidify the slack, but to keep it solid in the fire till the coal is entirely consumed is something which has not been achieved yet.

Some inventors are still trying to solidify anthracite slack by means of coal tar, pine pitch, or rosin, giving the lump a heavy pressure, by using powerful machinery. In their opinion, the more compact the lump, the better it will stand the fire. In my opinion, no matter the pressure given to the lump, fire will penetrate it and consume the resinous substance, before half the heating power of the coal has been obtained. The pitch or rosin being consumed, the lump will slack in the fire, and pass through the grates.

I have been for five years, from 1857 to 1862, commercial agent of one of the most important coal mines in Belgium, and have sold to Mr. Dehaynin tho first two shiploads of slack coal for his factory at Montigny-sur-Sambre. I have seen him trying for three years to compress slack of hard coal with pitch and other substances, so that it would stand the fire, without succeeding.

In Belgium principally, and also in Germany and in France, the working population in the coal regions, and the country people, are burning any kind of slack coal by mixing it with from 30 to 40 per cent of yellow clay. It will be easily understood that such a large proportion of clay must reduce considerably the burning qualities of the coal. Still, after a fire has been started with ordinary bituminous lump coal, they pile upon it, as high as they can, a pyramid of coal dust and clay, mixed together, and simply molded and pressed by hand. The coal is used exclusively for open grates. They obtain, at least, a good fire, sometimes lasting a whole day without replenishing. The coal made in that way has to be sheltered, as rain and snow dissolves it.

This being a fact well known by everybody who has traveled in these countries, I have been working and experimenting for three years on that principle, always trying to increase the proportion of coal, and consequently reducing the proportion of clay. I succeeded so far, by a peculiar way of mixing and of working the mixture, as to reduce the proportion of clay to 8 per cent for bituminous slack. I invented a composition in which the coal is dipped, so that it becomes waterproof, and does not need to be sheltered. I have been manufacturing and selling that coal made from Sewanee slack coal, for the last four months, in Nashville (Tenn). The cost of manufacturing, including the ingredients used, has not exceeded one dollar per tun.

As I had never tried my process on the anthracite slack, I came to Philadelphia expressly for that purpose. The slack of the anthracite not being so coarse as the bituminous slack, I have been able to make the lumps compact with only 5 per cent of clay. Samples of all shapes have been submitted to the Franklin Institute, who will report on it at the next meeting. These samples have been made from Lehigh coal slack, by myself, at the Delaware Chemical Works, or at those of Messrs. Baugh & Sons, of this city, who have had the kindness to give me all the facilities for my experiments.

I am going to manufacture some tuns of it, so as to be able to test publicly the burning qualities of this fuel, and will send you the results of the experiments.

Philadelphia, Pa. EMILE F. LOISEAU.

The Earth Closet System.

MESSRS. EDITORS:—On page 326, current volume of your valuable paper, I was pleased to see an article on the earth closet system, accompanied by an engraving of a new English invention in this line. Too much cannot be said or written on this important matter, and you will therefore, I trust, pardon me for relating some of my experience, for the benefit of your readers.

I have tried a good many experiments with dry earth, and have used the earth closets at my country place, and am convinced that nothing but ignorance stands in the way of the universal adoption of the system, both for the city and country. It is always with regret that I return to the wasteful and unhealthy water closet of the city, after having been spared all of its bad odors and dangerous gases during the summer months, by the employment of the simplest of all disinfectants, dry earth.

The open vaults of the country are the worst contrivances, for the dissemination of malaria and fevers, that could be invented. The saying that "there is health in the old house and death in the new," is founded upon the effects of those vaults in a thickly settled country, to poison the waters by percolation and the air by the escape of bad gases. When the homestead was built on the side of a hill, the drainage water ran away, and did little damage, but when the shoots from the parent stock planted their houses on the plain, they caught the foul waters and the fever at the same time, and hence the origin of the saying.

The simplicity of the dry earth disinfectant prevents many persons from trying it; they are as wrath as was Naaman when commanded by the messenger of Elisha to wash in Jordan seven times—they want some extravagant chemicals—nothing short of carbolic acid, permanganate of potash, protosulphate of iron, or chloride of lime, has the true scientific ring about it; as for dry earth, they do not believe in it. In the country, it is a few minutes work to sift enough earth to last a family, of five persons, a month, especially as the earth can be used over again five or six times.

The great point is to avoid sand, and to have perfectly dry earth. Hard coal cinders can be used, but not wood ashes.

After the small wagon under the seat is full, it can be emtied upon a protected floor for drying, and when the odor of the earth resembles that of guano, it is admirably adapted for use in the garden, and fresh earth may take its place.

It is surprising how thoroughly the dry earth absorbs all the bad gases and disinfects the deposits. And no one who has not tried the experiment can appreciate the value of the system. I advise every one who lives in the country to adopt the earth closet, and to abandon the unhealthy open vaults, which are such unsightly objects and the occasion of so much irregularity of habit, and the fruitful source of so many diseases.

CHARLES A. JOY, Columbia College, New York city.

Examination of Engineers and Boiler Tenders.

MESSRS. EDITORS:—I have read with much interest your complimentary article, on the second annual report of this department, in the number bearing date May 6, and the reference to it in the number of May 13, in which the idea is conveyed that more light on the subject of the examination of persons having charge of steam boilers, would be acceptable.

In answer to your words: "I am not aware what the standard of classification adopted in Philadelphia is; it is probably none too rigid," I would state that the standard for a first-class engineer is, that he should be able to calculate safety valve lever examples, and thoroughly understand the principles involved; also to calculate the pressure required to burst a boiler, when all the dimensions are given, together with the value of the material to be used to the inch of section. He is also required to calculate the difference between the strains on the curvilinear and longitudinal rivets; the difference in value between double and single rivets; and the comparative strength between the shell, flues, and other parts of a boiler. His knowledge of the importance of keeping the water at all times above the fire line; of keeping the safety valve in good order, together with daily examination, and the necessity of keeping the boiler clean inside and out, is also tested. He is also questioned as to the proper mode of blowing off a boiler. Should he answer all of these questions satisfactorily, and still entertain the idea that a boiler will not explode so long as the water is at its proper level, he would not be entitled to a first class certificate.

Then with reference to the engine, he must know how to set the steam valve, and be able to explain the effect and advantage of lap, lead, and cushion. He must also be reasonably well posted on the various parts of a stationary engine.

I should be pleased to know your opinion of the Philadelphia standard for a first class certificate, and if you consider it too rigid.

You say the safe boilers are those known as "sectional." This is a fact beyond controversy, but I cannot resist the temptation to call your attention to another fact with reference to the boilers under the charge of this department. This is the third year of its existence, and it has inspected as large a number as 2,000 in a year, of which only one, and that a sectional Harrison boiler, has so far scratched a single individual. Some of these boilers are eighty inches in diameter, and of all sizes and forms.

Five men have been scalded by insured boilers during our existence. These are exempt from city inspection at the option or the owner or user. We have one boiler insurance company in operation and another in prospect.

T. J. LOVEGROVE,
Inspector of Steam Engines and Boilers.

Philadelphia, Pa.

[We do not think the system of examination described by our correspondent any too rigid. It is perhaps sufficiently so, however, when coupled with proper inspection of boilers. —EDS.

Invention Wanted.

The following letter from a Texas deer hunter has been forwarded to us by Messrs. E. & H. T. Anthony & Co., of this city, dealers in photographic materials, etc., who think such a lamp as is sought for, would meet with good sale:

Gentlemen: Those in this country who follow hunting feel the need of a perfect head lantern to hunt deer with at night. Seeing the kind of business you are in from your advertisement in the papers, I thought you might be able to invent a lamp or lantern for night hunting, that would be a success. We want such an one as will reflect the light in front of the one who wears it to the distance of 100 yards or more. A strong reflector is needed; it must be made light, so that it can be worn on the head without much inconvenience. It should reflect the light in front only. We have a lamp made here, of tin, to burn lard oil, but it is not a complete success, though we kill a great many deer with it, by first shining in their eyes and then shooting them.

Such a lamp as described above, and patented, would be a source of revenue to the getter up of it. It should be constructed to burn lard oil, as this oil does not produce much heat or deposit much soot. J. B. STEMSON, M. D.

Sherman, Texas.

Wyoming Coal.

MESSRS. EDITORS:—In a recent issue, I notice an account of Wyoming coals, which was really news to people here; and whoever wrote it must have obtained his knowledge from some very unreliable source.

In the first place, they are not using Carbon, or any other Wyoming coal, at the gas works in Omaha, for the very reason that it is not at all suitable for gas making, and it is not probable that it is used at Denver. Rock Spring and Evanston coals, which are by far the richest in gas, only give about 7,000 feet to the nett tun, and the quality of it for light is about equal to an alcohol flame, which it greatly resembles. Wyoming coal will not coke, but turns in the retorts to what is known as breeze. An approximate analysis is, carbon, 76·95; volatile matter, 15·00; ash, 8·00; sulphur, 0·05. Of the volatile portion, about one half is water.

Pittsburgh coal is used in the gas works here. The Wyoming is not a bituminous coal, but more properly a black lignite; nor is it the opinion of competent geologists that bituminous coal will ever be found in the Rocky Mountains. It is reported, however, that 120 miles south of Salt Lake City, there exists a bed of true bituminous coal. For smelting furnaces and blacksmithing, it is nearly as good as nothing. It is splendid for heating the chimney above the forge fire, but the helpers might as well go to sleep, for they would not be needed to strike for hours; and I doubt if a welding heat can be obtained easily in an ordinary forge fire, on an iron of any considerable size. They are not using it at the Union Pacific Railroad shops, for smithing or smelting. They have carefully tried it, and condemned it. For domestic, and also for steaming purposes, it is certainly very fine; but it is all nonsense to talk of its giving more heat than Lehigh. It makes but very little clinker, and can be burned so that there is little waste. It is hoped for and believed that some mode may be discovered by which it can be used in the manufacture of iron; but it is not so used now, to the knowledge of the leading mechanics of the city, with whom I have conversed, or from whom I have heard.

Let me say that Western people would rather have the truth known in regard to their country; and before that Philadelphia paper again comments, it would be well to ascertain the facts. T. L. VONDORN.

Omaha, Nebraska.

Diamond Drills.—Another Richmond in the Field.

MESSRS. EDITORS:—We inclose a slip from your issue of 6th inst., under heading "Removal of the Hell Gate Obstructions," the last paragraph of which contains a misstatement to which we beg leave to call your attention. The paragraph reads: "These diamond drills are being used very extensively in the marble and slate quarries of Vermont, and Severance & Holt are extensively engaged in making them. In addition to drilling single holes in the rock, they are used for channeling purposes, a number of drills being used intersecting the holes, so that a complete cutting is made."

It is a fact that such machines as are above described are in general use in the marble quarries of Vermont. It is *not* the fact that Severance & Holt made or are making such machines, all, without exception, now in operation having been manufactured by the Sullivan Machine Company. Messrs. Severance & Holt employ the core drill of Rudolph Leschot. The drill employed in our quarrying machines is the solid head diamond drill. Yours, etc.,

Sullivan Machine Co., R. W. LOVE, Treasurer.

Claremont, N. H.

Metal Founders' Blacking.

To provide metal founders with a blacking possessing good sleeking and heat resisting properties, and to enable them to produce castings with smooth skins of desired hues, the inventor mixes sea weed, sea grass, or sea plants, in any convenient or desired proportion, with still coke, peat charcoal, soft wood charcoal, gas coke, coked coal, oil retort coke, coal dust, soot, hard wood charcoal, or other suitable coke or charcoal, or with lime, chalk, or clay, or with a mixture of two or more of these substances. The seaweed may be added in the newly cut, partially dried, dried, or dried and pulverised state to the coke, coarcoal, lime, chalk, or clay, the latter being either in a rough or ground condition. The addition of seaweed to coke, charcoal, lime, chalk, and clay in every proportion, so long as the moisture is insufficient to cause the mixed mass to form a paste in the process of reducing or grinding or to cause the particles of the blacking when furnished to adhere and form lumps, is beneficial either, first, for improving the quality, or, second, for reducing the cost.

This is an English invention recently patented by J. C. Sellars, Birkenhead.

SILVER SOAP FOR CLEANING SILVER AND BRITANNIA.—One half pound of soap, three tablespoonsful of spirits of turpentine, and half a tumbler of water. Let it boil ten minutes; add six tablespoonsful of spirits of hartshorn. Make suds of this and wash with it.

ON SOUND.

BY PROFESSOR TYNDALL.

Last week, Professor Tyndall delivered the first of a series of lectures on sound to a large auditory at the Royal Institution.

Dr. Tyndall began by saying that sound makes itself known to human consciousness by means of objective and subjective phenomena. The objective phenomena exist entirely outside of ourselves, and are altogether independent of us; so sound, objectively considered, is not sensation at all; it is but a kind of motion given to the air. That motion reaches the brain by some process not yet unveiled, and perhaps it will never be given to man to unveil how the motion produces sensation. A very little observation will show that sound consists of some kind of mechanical motion. For instance when a gun is fired, say at Shoeburyness, the observers near the gun feel a shock which disturbs them from head to foot, and sometimes the shock is so great that it will flutter an umbrella. Everybody also knows that glass windows may be broken by loud noises. Sound also is evidently a kind of wave motion, and not something projected from the sounding body; for instance when a gun is fired, and a person is placed near it so as to be perfectly protected from all projected portions should it burst, he still hears the noise.

All the foregoing facts about sound might be learnt in very early times, but before the knowledge of the nature of sound could progress to any great extent, it was necessary that other sciences should grow and give their aid. The air pump and other things had to be invented before the philosophical mind could trace its way from facts to causes. By means of the air pump it can be proved that it is the air which conveys waves of sound. The speaker then set a small bell, driven by clock work, in motion in a very perfect vacuum under the receiver of an air pump, but not a sound was heard. The objection might be made, he said, that the glass sides of the receiver cut off the sound, but he would prove this not to be the case by letting the air in gradually. He did so and as the air entered, the tinkling of the bell made itself perceptible, grew louder, and finally was clearly heard all over the theatre of the Royal Institution.

The foregoing experiment, said Dr. Tyndall, might lead to the impression that the loudness of the sound depends upon the destiny of the atmosphere. He then proved this to be not necessarily the case by a very remarkable experiment. He admitted air into the exhausted receiver, till a pressure of only 2 in. of mercury was exerted inside, and in this partial vacuum he set the bell to work. A faint tinkle could be heard. He then let hydrogen gas into the receiver, so as to greatly increase the pressure and density of the atmosphere inside, yet instead of the sound growing louder, it gradually became fainter. Thus increasing the density of the atmosphere diminished the sound. He then explained that air has to be struck violently and sharply to produce a sound. Waving the hand in the air, for instance, does not set up sound waves, because the disturbed air has time to flow round to the other side of the hand, instead of being set in that kind of wave motion which produces sound. Hydrogen gas, he believed to have the power of flowing round a vibrating tongue more rapidly than air, so that it is less easily beaten into sound waves; and this surmise, which was first mooted by Professor Stokes, he believed explained the true philosophy of the experiment he had just shown.

In some other experiments he took some long polished wooden rods, and rubbed them with resined flannel, whereby each rod in turn was made to give a musical note. In this way he proved that deal conveyed sound more rapidly than oak, although oak is the denser wood of the two, so it is an error to ascribe this power to density.

Professor Tyndall then called attention to the top of a thin wooden rod projecting 2ft. into the air through the floor of the theatre. He said that the rod went down through two floors of the building, and rested at its lower end upon a musical box. That box was then playing, and throwing the rod into musical vibratory motion, which music, however, could not be heard in the theatre because the top of the rod presented too small a surface to the air to set up good loud sound waves. He then placed a guitar, on the top of the rod to act as a sounding board, and instantly the playing of the musical box could be heard distinctly by everybody. A piece of board instead of the guitar, answered the same purpose when it was placed on the top of the rod. Next, one of his assistants played a fiddle, which was placed in contact with the lower end of the rod, and every time the lecturer placed a board on the top of the rod the music could be heard.

The lecturer next explained that sound travels more rapidly through warm than through cold air, and whenever the elasticity of the air is augmented, the velocity of sound is augmented likewise. At the temperature of 0° C. the velocity of sound is 1,090ft. per second, and it augments about 2ft. for every degree C. added to the pressure. The velocity of sound in air depends upon elasticity of the air in proportion to its density; the greater the elasticity the swifter is the propagation, the greater the density the slower is the propagation. The velocity is directly proportional to the square root of the elasticity, it is inversely proportional to the square root of the density; hence, where elasticity and density vary in the same proportion, the one will neutralise the other as regards the velocity of sound. But that this law shall hold good, it is necessary that the dense air and the rare air shall have the same temperature. From the foregoing it follows that given the velocity of sound in air, the temperature of the air may be readily calculated. If the molecules of air be supposed to be balls held together by springs, then heating the air is tantamount to increasing the rigidity of the springs. The very motion of waves of sound through air raises the temperature of the air; thus a sound wave raises in its own path things which augment its rate of propagation.

The distance of a fired cannon or of a discharge of lightning may be determined by observing the interval which elapses between the flash and the sound. Hence, it is easy to see that if a row of soldiers form a circle, and discharge their pieces all at the same time, the sound will be heard as a single discharge by a person occupying the centre of the circle. But if the men form a straight row, the simultaneous discharge of men's pieces will be a continuous kind of roar. A discharge of lightning along a lengthy cloud may in this way produce a long roll of thunder; the roll of thunder must, however, be in part, at least, due to echoes from the clouds.

The following was the most beautiful of the experiments exhibited in the course of the lecture. A thin thread of light from the electric lamp was thrown upon a small mirror, about the size of a sixpence, mounted on the top of one of the legs of a large tuning fork. This mirror reflected the line of light back, behind the lamp, upon a looking glass which Professor Tyndall held in his hand; this large mirror reflected the light as a bright spot upon a large white screen facing the observers. The vibrating fork gave a slight up-and-down motion to the line of light, and the lecturer by by moving the large mirror on its vertical axis, gave a horizontal motion to the light. The result of these was that a series of very beautiful waves of light was seen upon the screen, and thus gave optical expression to the sound of the fork.

PAPIER MACHE AND CARTON PIERRE.

The use of paper for various constructional purposes has occupied the attention of the *savans*, in many forms. We have seen boots, shoes, panelling for coaches and other purposes, coffins, and even guns, made of this material; but with these exceptional and speculative adaptations of the material we have not now to deal, the subject of the present notice being simply the use of paper in its various forms for architectural decorative purposes. It probably does not strike the unpractical or unprofessional mind, when assisting at the opening of some new theater, and admiring the decorations of the house, and the enrichments of the front of the stalls, the proscenium and the ceiling, that these are for the most part hollow, and made of that most homely of all materials, brown paper. Such, however, is, in the great majority of cases, the simple fact; and we propose to give a short account of the manipulation of the material, and the method of its adaptation.

The sweepings and waste of the factories are the materials used, moistened with water with a little glue, and pressed in a brass mold—this is *papier maché* (pressed paper); while the cuttings of cardboard stewed to a pulp and ground to an even consistency by steam rollers and cast in a plaster mold, are the constituents of *carton pierre* (stone made of card); and we quote Her Majesty's Theatre, the Gaiety, most of the new theatres in the provinces, and private mansions in numbers throughout both town and country, as instances of its use. The brown paper for the *papier maché* is softened in water sufficiently to allow it to be forced into the sharpest angles of a brass mold previously coated with a light skin of paper pulp which has been cast for the purpose, and has the inside carefully chased. The sharpest curves and angles of delicate foliage are thus reproduced; and for all the lighter portions of the work, enriched moldings, beads, and foliage, this is the material adopted, light strips of wood glued to the back keeping the work in its place, and being available for its fixing, which is simply a matter of nails and screws. For the heavier portions of work, such as sofa or table legs, large coffers for ceilings, trusses, figures, and the more solid features, *carton pierre* is used. A mold is prepared in plaster, which takes to pieces in the ordinary way. This is, in the majority of cases, not filled up solid, but only carefully lined by hand pressure with a thickness varying from one fourth inch to one half inch, or perhaps a little more, with the *carton pierre* in a state of pulp. It is allowed to dry for a certain time; and when sufficiently consolidated for the mold to be removed, it is heated in a drying room until hard, and the process is then complete. A similar process of drying is applied to the *papier maché*; in fact, they are dried in the same room. As compared with ordinary plaster, upon the question of cost, plane surfaces, or work involving a large amount of repetition, can be more cheaply executed in plaster; while the most elaborate and expensive enrichments can be executed to better advantage in *papier maché* which has the great advantage of being much more manageable in fixing. It can be prepared to any pattern, and put together in the workshop; and its fixing is either by glue, nails, or screws. The mess invariably attending the working of plaster is also avoided—a most important element in buildings finished, as is now so much the fashion, with the wood stained in its native color, and not painted; and the use of water is avoided—a great advantage in new buildings, where it is of importance that the seasoned joiner's work should be kept as dry as possible.

Before dismissing the subject, we may just allude to a material which, though neither *papier maché* nor *carton pierre* is used for some of the same purposes. This is Desachy's patent fibrous plaster. There is nothing new in the materials employed; it is a combination of ordinary fine or common plaster, and canvas. The plaster is cast very thin, less than one-fourth inch, in a mould, and then upon the back of it is laid the canvas, which becomes incorporated as it sets; the shape is supported by light strips of wood, laid on at the same time; and for the plain moldings and large panelling, this system gives all the usual effect, combined with extreme lightness and facility for fixing. As an instance, we saw a large circular molding, more than seven feet in diameter, for surrounding a light, made in one piece, ready for fixing, no portion of the face of which was more than a quarter of an inch in thickness. We may mention the ceiling of the library of the new Record Office as an instance of its use, the apparently massive Gothic ribs, forming the groins between the skylight, being of this material, screwed to wrought iron girders inside, which really do the work. The method combines great lightness with absolute security from fire; and its cost is not such as to preclude its being adopted in any case where it is desirable to attain a similar result. In addition to the advantages alluded to above, as gained by the introduction of these various materials, the demand for which is increasing, we may notice the question of rapidity of completion as most important. Time, especially in connection with theatrical matters, is of the first importance; the delay of a few months in the completion of a building makes a difference of a whole season; and it would have been impossible to complete any of the theatre recently opened within some months of the time actually occupied, had it not been for the facility afforded for their decoration by the use of *carton pierre* and *papier maché*.—*London Architect.*

Profits on Patent Sewing Machines.

The organization of a large sewing machine company—capital, five hundred thousand dollars—is being agitated at Chicago, for the manufacture of the Secor machine. The following statements in regard to the past and present progress of the sewing machine business are furnished by the projectors of the new enterprise:

Up to 1860 there had been manufactured and sold in the United States only about 104,000 machines of all kinds. In that year, the total number made was less than 55,000 machines, of which Wheeler & Wilson made 21,000; Grover & Baker, 10,000; Singer & Co., 11,000; Willcox & Gibbs, 7,500; all others, about 5,000.

The business was then in its infancy, still $5,000,000 were invested in the manufacture; and these leading manufacturers have, since that date, so increased their great establishments that in the year 1870 there were turned out more than 500,000 machines, a half million in a single year, and yet the demand could not be supplied. It is stated as a fact, that orders came in upon these factories much faster than, even with all their facilities, they can turn out the machines.

In 1870 Singer & Co., made and sold the enormous aggregate of 140,000 sewing machines, and the others kept up their proper proportion.

These companies have their own factories and their own own machinery, and do all of their own manufacturing, and the cost at which a complete machine can be put upon the market, in working order, ready for sale, would be surprising to the uninitiated. But if Singer & Co. only realized $10 profit upon each machine, (which is less than half the real profit on the cost) then the dividends in 1870 must have been 1,400,000, or ten per cent on a capital of $14,000,000, all of which has been accumulated within ten years. At the same rate, the profits on all the machines sold reached the great sum of $5,000,000. But it is probable that the sum of $10 does not amount to more than a third of the profit on a single machine.

These machines have not only become a necessity in every family, but they are largely used in all the factories of boots and shoes, clothing, hats and caps, etc., so that the merely domestic demand does not amount to one fourth part of the entire trade; some of the large factories of New York and New England have in constant use from 200 to 1000 machines each. In the State of Massachusetts, in the manufacture of boots and shoes alone, $15,000,000 are annually saved by the use of the sewing machine, and in New York city, the clothing manufacturers save yearly more than $12,000,000 in the same manner, and this applies with equal force to all of the various branches of trade where the use of the needle is required.

There is no limit to the demand for all first class machines, and it has been estimated that before the expiration of the next ten years, 1,000,000 sewing machines per annum will be required.

It is generally understood by the public, that sewing machine companies have made large fortunes; but we doubt if the facts are not sufficient to show that the dividends declared by the companies making the most popular machines, have been much larger than the most extravagant ones outside of the ring have supposed.

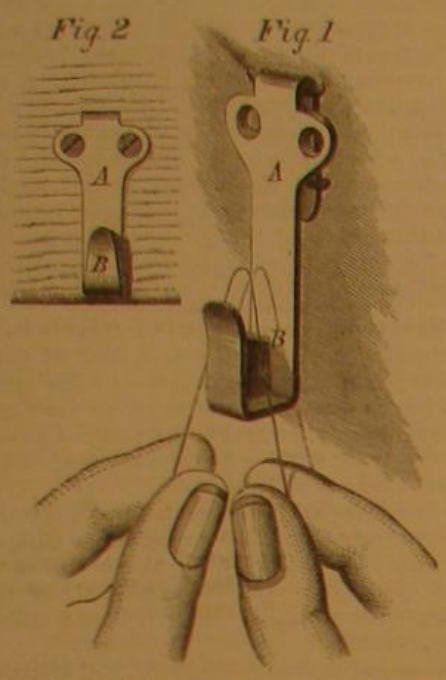
The old companies accumulated their vast capital of millions out of the profits of the business, and the principal companies have declared and paid dividends for years, of from 75 to 400 per cent upon their capital stock, besides accumulating a reserved fund of an equal or larger amount, for the extension of their works and the general business of stocking their branch offices throughout the country.

Of the value of the stock in the principal companies, we would illustrate by stating the fact, that the par stock in some of the best companies five years old cannot be bought for 2,500 per cent premium, and the value is entirely unknown to the outside public.

SEXES OF THE LOBSTER.—A correspondent of *Land and Water*, makes an announcement, which is endorsed by the editor of that paper, to the effect that the sexes of lobsters can be readily determined by the character of their claws, since, in nearly fourteen hundred specimens examined, it was ascertained that in the male, the blunt, tufted claw is always on the left side, and the sharpest serrate claw on the right, a condition of things exactly reversed in the female. This, however, has been subsequently denied, and the question, of determining the sex by means easily understood by the laity, yet remains open.

THREAD CUTTER.

Our engraving illustrates a very simple device intended to replace scissors in the cutting of thread while sewing, and for use on counters for cutting twine, etc., in the tying of packages. Fig. 1 shows it attached to a lady's dress, and Fig. 2 shows it attached to a counter. When fastened to the dress, it is secured by sewing, or by a hook formed for that purpose on the upper end. Screws are used to fasten it to the counter.



It consists of a metal hook, A, formed as shown, with a small blade, B, the vertical sides of which fit in recesses formed in the bent part of the hook, and are held there by the springing together of the opposite sides of the hook. By springing the hook open slightly, the blade is easily removed for sharpening. The upper and cutting edge of the blade is inclined backwards, as shown, so that the thread slides along over the edge of the cutter, and is thus more easily severed than if pulled straight down over the edge. The implement may be attached to the waist of the dress of the operator.

To avoid using the scissors, which necessitates the releasing of the work with one hand, ladies have very generally adopted the injurious process of biting off threads. This practice damages the teeth, and ought never to be employed. The device herewith presented will enable the thread to be severed without releasing the work, and thus obviate the bad habit alluded to.

Patented through the Scientific American Patent Agency, by J. J. Henry, assignor to Henry & Williams, corner Pearl and Baltimore streets, Baltimore, Md., whom address for further information.

APPARATUS FOR CARBURETING HYDROGEN GAS.

Jacob Ambuhl, of Morristown, N. J., has invented an apparatus for carbureting hydrogen gas. A tank in which the hydrogen gas is generated, of a capacity which depends upon the amount of gas to be supplied, or, in other words, to the number of burners to be supported, has a top plate or cover connected with the top of the tank by a rubber connection, so that the cover may yield to, or raised by, the pressure of the gas which is forced out by the weight of the cover.

From a hook attached to the cover is suspended a wooden basket to receive iron filings or turnings. The bottom of the basket is perforated to allow water or dilute sulphuric acid contained in the tank to have free access to the iron contained in the basket. Beneath the perforated bottom is placed a close bottom to receive any small pieces of iron that may drop through the holes in the upper bottom, in order to prevent pieces from dropping to the bottom of the tank.

The tank is filled and emptied through a stop cock as may be required, and is provided with a glass gage pipe, in which the water or acid stands at the same hight as in the tank, so that it may be conveniently seen when the tank has been sufficiently supplied.

The hydrogen gas passes from the generator to the carbureter through a pipe connected with the tank by a three-way cock; one of its openings being connected with the tank, the second with the pipe, and the third being left free; and so arranged as to point towards a stand attached to the cover and holding a platinum sponge.

When the tank has been charged, the cock is so adjusted that the air in the tank and the hydrogen gas, as generated, may escape through the open way or branch, and impinge upon the platinum sponge, which will become red hot when the air has all escaped from the tank and pure hydrogen is escaping. The cock is then adjusted to cause the hydrogen to pass through the pipe to the carbureter.

The body of the carbureter is formed of a series of ten, more or less, shallow rectangular pans, set parallel with each other, securely soldered together, and filled with granulated charcoal. The pans have openings formed through them, near the ends of their upper sides, and the first pan or compartment is connected by a short return pipe with the second pan or compartment. The first compartment is filled with granulated charcoal and soda, and with this compartment is connected the pipe leading to the generator. The carbureter is supplied with gasoline or other suitable light hydrocarbon oil, which passes through the middle part of the pans near one end, through a pipe perforated with numerous holes, opening into all the pans except the first one.

The hydrogen enters the first compartment, is purified by the soda, and passes thence into and circulates through all the compartments, where it becomes carbureted, and escapes from the last compartment into a pipe, through which it passes to the burners.

Any water that may form in the first compartment, or any surplus oil that may remain in the other pans or compartments may be drawn off through suitable cocks.

IMPROVEMENT IN STOCK CARS.

George Washington Fox, of Laramie Territory of Wyoming, has invented a new and useful improvement in stock cars, which will, we think, commend itself to stock shippers, and as a sanitary benefit to the public at large.

The invention provides for the better transporting of beef cattle, from the western prairies, mountains, and valleys, to the seaboard markets, without suffering, or having to unload or reload them, thereby delivering them to the markets in a sound, healthy condition.

The invention will be valuable, also, for shipping horses or mules. Water buckets or troughs are supplied by hose, connected with a tank, the hose connecting with pipes to receive and conduct the water through the car, and connecting with sections of pipe or hose to conduct the water to the troughs.

The timbers for the roof are framed together, so that the rafters and the cross pieces form openings for doors on the roof, one half of which are over a loft floor, and one half over a feed rack, giving space to reach the provender and fill the feed racks from the top of the car, over which openings are made through the floor of the provender space at the top of the car.

A pipe extends from the bottom of each trough or bucket, down through the floor, with a cock at the end to hold the water, or to draw off the surplus water in freezing weather. The water is forced to each trough or bucket at the same time, by the pressure of water in the tank with which the hose is to be connected at the stations.

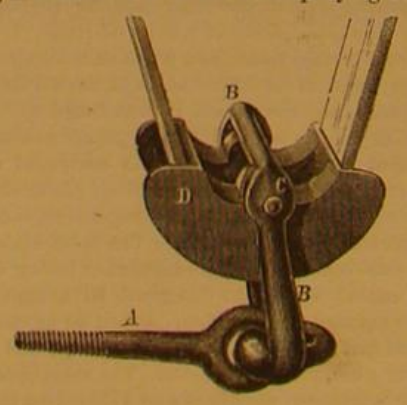
Wire nettings are employed to keep out sparks of fire, and flies during warm weather, while affording the required ventilation.

The partitions between the stalls are made of hard wood plank, the ends of which slide in the grooves of the posts. The partitions have a hand hole at either end, by which they can be removed without entering the car by using the pike hooks, one man being at each side of the car to place a pike hook in the hand hole, raise the partition to the top of post, and take it out of the groove at the niche for that purpose.

Gentle stock may be loaded in this car all at one door, by having the partitions down, and putting them up as the animals are led to their places; they may be unloaded in the same manner, by taking the partitions down as they are led out. In shipping valuable stock, every alternate partition may be taken out, thus giving them double stalls. Wild, ferocious stock can be put through the doors in their respective stalls, after which there is no need of entering the car to take care of them. In unloading ferocious animals, it is necessary to use the pike hooks and remove the partitions, held by the posts, for letting out two animals at a time, each passing out at the door the other came in at, or passing nearly directly forward through the car, instead of backing them out; the next are led out in the same manner, and so on to the last.

REAT'S IMPROVED DESIGN FOR NECK-YOKE RING AND SLIDE.

The design shown in our engraving possesses advantages over the old style ring, which will appear on reference to the engraving, in connection with the accompanying description.



The part, A, screws into the end of the neck yoke, in the usual manner. The ring, B, is made of an elongated angular shape, as shown, and has pivoted to it, at C, a slide, D. This slide is made with a broad surface, upon which the breast strap draws; the method of pivoting allowing any ordinary motion of the ring to take place without any sliding of the strap on the ring and consequent wear. The strap is, moreover, kept smooth and flat on the slide, which also adds to its durability.

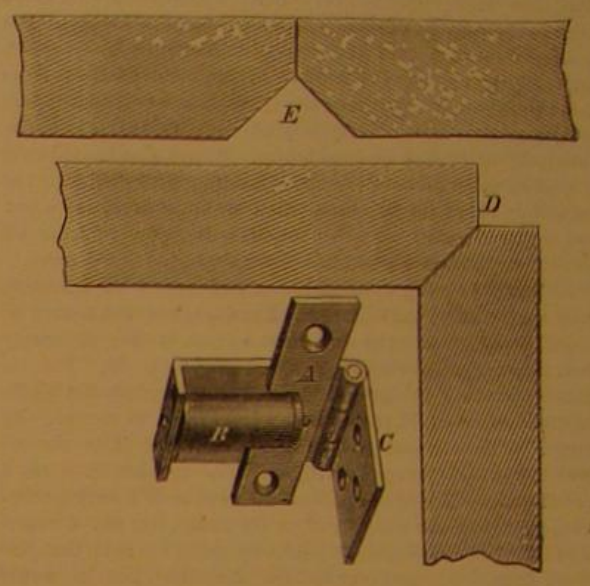
Patented, August 9th, 1870, through the Scientific American Patent Agency, by Robert L. Reat, of Charleston, Ill, whom address for state, county, or other rights.

THE recent dry weather has had the effect of producing such a demand for hose pipe that the New York Belting and Packing Company find it difficult to supply the demand although they turn out over one mile a day.

HIRE'S PATENT TABLE HINGE.

Our engraving represents an improvement, patented April 25, 1871. It consists of a wrought or malleable cast iron hinge for table leaves. One end, C, is of the same size and shape as the hinge now in use, and is screwed to the leaf in the same manner; the other part, A, is fastened to its place by a cast iron plate, and slides on a gum or spiral spring, B, as shown.

The joint is made by cutting down a square bevel on the table and leaf, thus entirely doing away with the knuckle, the only troublesome and expensive part of the table as now made, and the only part that gets out of order. The cost of



the hinges over those of the old style is trifling, and the bevel can be worked and the hinge put on, thereby completing the joint, in a very few minutes, by any ordinary mechanic. The positions of the joint when the leaf is dropped and extended are respectively shown at D and E.

For rights, or other information, apply to Hires, Ringo & Co., Columbus, Ky.

PLOWING AND CULTIVATION OF CROPS BY STEAM. IMPROVEMENTS WANTED.

We publish in another column an interesting description, by Horace Greeley, Esq., of the practical operation of steam power in agriculture, as now worked in Louisiana, near New Orleans. Mr. Greeley is at present travelling in the South, and his letters to the *Tribune* contain much useful information.

The importance of steam in plowing is well illustrated in the example which Mr. Greeley describes, whereby the furrows are turned to a depth of two feet, when before, without steam, a depth of six inches only was attainable. The practical result of the steam plowing is 2,000 pounds of sugar per acre, against 800 pounds by mule plowing.

He shows that an equally important gain results from the use of steam in the cultivation of the crops.

The general adoption of steam for the purposes of agriculture would add incredibly to the wealth of the nation. If it works so well and profitably in the hands of the colored laborers of the South, we see no reason why it may not be be adopted with equal success in all parts of the country. But it is clear that the mechanism needs to be simplified and reduced in cost.

We call the attention of our readers to the subject in the hope that it may be carefully examined and studied. A great and important field for invention is here opened for the ingenious. Steam plows, steam seed planters, steam cultivators, and steam harvesters, are wanted everywhere. But our farmers must have small, strong, simple, and reliable machines.

What Is a Carat?

The carat is an imaginary weight, that expresses the fineness of gold, or the proportion of pure gold in a mass of metal; thus, an ounce of gold is divided into 24 carats, and gold of 22 carats fine is gold of which 22 parts out of 24 are pure, the other two parts being silver, copper, or other metal; the weight of 4 grains, used by jewelers in weighing precious stones and pearls, is sometimes called diamond weight —the carat consisting of 4 nominal grains, a little lighter than 4 grains troy, or $74\frac{1}{16}$ carat grains being equal to 72 grains troy. The term or weight *carat* derives its name from a bean, the fruit of an Abyssinian tree, called *kuara*. This bean, from the time of its being gathered varies very little in its weight, and seems to have been, from a very remote period, used as a weight for gold in Africa. In India also the bean is used as a weight for gems and pearls.

ARTESIAN WELL.—Great trouble and expense has heretofore been experienced by the Union Pacific in supplying their stations and cars in the alkaline district with water. The extent of territory from Rawlins to Green river—136 miles—had to be provided for entirely by water transported in cars. Mr. T. E. Sickels, the General Superintendent, was of the opinion that purer water might be had if a well were sunk deep enough, and a recent experiment has justified his view. The Omaha *Daily Herald*, May 10, '71 says it has a specimen of soft, pure water, from a well which has been sunk 350 feet deep, at Point of Rocks. This is 805 miles west of Omaha, and is in the heart of the alkali district. The supply of water is plentiful, and it rises to within eleven feet from the top of the well.

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NEW YORK, SATURDAY, JUNE 10, 1871.

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Importance of Advertising.

The value of advertising is so well understood by old established business firms, that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it: upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the venders of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of from 25,000 to 30,000 copies per week larger than any other paper of its class in the world, and nearly as large as the combined circulation of all the other papers of its kind published.

PAINE'S ELECTRO-MOTOR.

In recent numbers of the SCIENTIFIC AMERICAN, we have given accounts of the extraordinary claims put forth by Henry M. Paine and friends, concerning his improvements in electro-magnetic machinery. They assert that his engine, now running at Newark, N. J., develops two horses' power by the use of a battery of only four ordinary telegraph cups; and, further, that any desired degree of power may be obtained with the same four cups, simply by multiplying the number of magnets.

In other words, Mr. Paine has discovered the perpetual motion, and found the long sought philosopher's stone.

This absurd proposition has been received, yea, swallowed whole, by persons who have heretofore enjoyed reputation for common sense, if not sagacity, in things scientific. But this easy credulity in the present case, shows that they have been over-rated. They belong to that large class of individuals, intelligent and sound in ordinary matters, but in whose minds there runs a vein of lunacy upon the perpetual motion question; the result of careless and deficient training in scientific principles. From this class, Mr. Paine will draw followers and money; in fact, he has already done so, with much success, unless we are misinformed.

The exhibition of the original machine, which, for a time, was open to a favored few who had money to invest, is now closed, for the purpose, it is stated, of perfecting preparations to show the improvements on a more grand scale.

Mr. Paine's patents have been assigned to a joint stock company, capital three millions of dollars, called the Paine Electromagnetic Engine Company; and they are now busy, at Newark, in building a new machine, by which they expect to convert all such doubters as the SCIENTIFIC AMERICAN, and bring the world in general to a realizing sense of the astounding nature of their discoveries.

The company is said to be composed, for the most part, of gentlemen of wealth, who are abundantly able to lose any amount of money that they choose to subscribe. It is to be hoped that they will be liberal in their estimates, and give us an example of the mechanism on a scale sufficiently large and brilliant to attract the attention of the world. It is only by the exhibition of the most striking examples of absurdity and failure, that the malady to which we have alluded can be reached or suppressed.

We understand that the new machine is to be of five hundred horse power, and is to run, as before stated, with only four cups, at a cost of about twenty cents a day, and is to be ready for operation about the 4th of July next; after which date, unless the company should be disappointed, steam boilers will be no longer wanted, horses may be turned out to grass, and workmen may take things easy. Their places will be supplied by electric engines, electric horses, and magnetic laborers.

During the brief interval that remains before the inauguration of this great electromagnetic revolution, we have thought it best to prepare and enlighten the minds of our readers concerning the nature of the mechanism by which the Paine Company expect to accomplish so much. We have, accordingly, provided a series of engravings, representing the salient points of Mr. Paine's improvements, which we print on another page, together with his own explanations of them, as presented in his patents.

These patents embody several apparently good improvements in electro-dynamics; but we are unable to detect in them anything that is likely to turn the world upside down, in the astonishing manner that Mr. Paine and his worthy co-adjutors so confidently predict.

THE NEW SYSTEM OF PIERS FOR NEW YORK.

It seems at last that the Dock Commissioners have resolved upon definite action in the matter of the improvement of the docks and piers. Many plans have been submitted to them, but it is finally announced that the one adopted will be that of a magnificent street, completely surrounding the water front, to be in width not less than 150 feet in any part. The river front is to present a solid wall of granite masonry, in combination with *béton*, which has proved its value for this purpose in many European harbors.

The plan is a very expensive one. Its cost is estimated at about two and one half millions of dollars per mile. The building of docks and piers is, however, essentially a costly undertaking, and we are inclined to believe that the plan proposed could hardly be replaced by another, embracing greater durability and convenience at less cost.

In any system of public works, durability is an element that should be considered of primary importance; especially in structures where frequent repairs entail interruption to business.

The depth of water along the frontage is to be not less than twenty feet. From the granite wall will project piers, from three hundred to five hundred feet in length, and from sixty to one hundred feet wide, according to situation. The superstructures will be, for the most part, of timber, supported on iron, stone, or timber pillars, but having at the head of each pier a column of solid granite masonry the full width. It is stated that some of the piers will be constructed wholly of iron, and a limited number entirely of stone.

The iron columns are to be hollow and six feet in diameter, so that men may enter them to work, while sinking them to their permanent foundation. Each pier will have three rows of these columns, which, when sunk to bed rock, will be filled with a concrete of stone and cement. The spaces between the piers will be two hundred feet in width. The sewers are to be carried through under, and made to discharge their contents at the outer ends of the piers, so as not to fill up the slips.

The completion of this work is not intended to be accomplished at present, but it is designed to at once carry out the system from Grand street to East Fourteenth street, on the East River, which, it is stated, will give a pier length of twenty-one and one half miles, and will for a long time to come amply accommodate the commerce of the port.

It seems to be the general opinion among those qualified to judge of the merits of this plan, that it is one of the best that could have been adopted, and it is estimated that the additional rents will pay the interest on the bonds to be issued, without advancing the rates at present demanded.

The completion of this great work, and that of the East River suspension bridge, together with the removal of the Hell Gate obstructions, will render the East River famous for the engineering skill devoted to its improvement.

There is, however, one point which the system proposed does not cover. It makes, so far as we can see, no provision even in anticipation of any disposal of sewage, other than its discharge into the river as now practiced. The results attained by several processes, particularly that known as the "A. B. C. process," in which sewage is treated by the use of alum, blood, and clay, indicate that the time is coming when the discharged filth of cities will be used to restore fertility to impoverished lands instead of being allowed to poison the water about docks and piers. In constructing a work of such permanence as the one under consideration, it would have been wise to have anticipated the future employment of improved methods of treatment in such a way that their application would not entail expensive alterations. This could be done without increase of first cost to any noticeable extent.

DOCTORING IRON.

The attempts made, from time to time, to obviate the process of puddling, in the manufacture of iron by doctoring, are, while they have some warrant in chemistry, still entirely empirical. The two principal substances sought to be removed—carbon and phosphorus—possess strong affinities, and form combinations in the metal, very difficult to break up. Their presence in undue quantity produces qualities in iron which unfit it for many purposes; and, practically, only oxygen, administered in large doses, has, as yet, been able to remove these undesirable elements. The introduction of oxygen mixed with nitrogen, as in atmospheric air, is the essential feature of puddling and of the more recent Bessemer process. In the Heaton process, which has now ceased to attract much attention, the oxygen was introduced in the nitrate of soda employed, the salt, being decomposed by the heat, yielding its oxygen to the crudities contained in the metal, and forming with them gases which passed off. In the Ellershausen process, oxygen is introduced in the oxide of iron employed in making the pig blooms. The Peters process, which, we understand, is soon to be put into practical operation in Rhode Island, is a new way of introducing and controlling the admission of oxygen.

Thus we find that oxygen is the giant of the chemistry of iron. This fact, however, is not, and should not alone be, a bar to experiments with other materials, although the uniform failure which has attended dosing with chemicals, is, to say the least, discouraging. There would be more hope in this direction were our knowledge of iron more complete than it is. There is scarcely a field of industry more beset with difficulties and perplexities, than that of the iron manufacture. So manifold have the varieties of iron and steel become, that no one knows where to draw the line of distinction between them, and the terms have become entirely too indefinite. There are so many things called steel, that no one knows where to say iron leaves off and steel begins.

There are also mysterious reactions and physical changes, in the condition of these metals, yet unexplained, upon which more light must be shed before the use of chemicals, salts, etc., can be intelligently applied.

To attempt to doctor iron is, then, to grope in the dark The attempts may add to our stock of knowledge, but there is little prospect of their revolutionizing the processes now employed. For this reason we accept with much allowance the glowing statements indulged in by some English journals, in regard to the Sherman process, and also that of a central New York paper, which now lies on our table, containing an enthusiastic encomium of what it calls the "Bendell" iron, which, it states, is produced by dosing, the drugs and medicines employed being exceedingly cheap, but the names of which are not given. The sanguine author of the article in question regards the process as destined to revolutionize iron working throughout this country. We hope it may—but for the reasons above assigned, we doubt it.

MENTAL EMACIATION.

A strange title, do you say? What new disease is this? Not by any means a new disease, dear reader, but one astonishingly prevalent. The number of men whose minds are weaker and smaller at forty or fifty, than when they were were twenty-five, is legion. Their bodies are sleek and plump, their purses, many of them, are fat; both have been well nourished; but their minds are in a feeble, emaciated condition, unable to cope with the great questions of this pre eminently advancing age.

Engage them in conversation upon any topic involving much grasp of thought; propound to them any one of the great problems of vital importance to the human race; you shall see how their minds shrink from effort they are incapable of performing; and how they fall back upon the supports of old superstition and prejudice, and there find rest from the labor such questions involve. This general mental emaciation is one reason reforms move so slowly. The best and strongest minds are tugging at the mysteries of nature, and expending their energies in physical researches. Some intellectual giants are also grappling with problems of social construction, political economy, and morals, but, as their teachings are directed mainly to the mentally emaciated, they make but little headway in correcting existing evils. Men, in the hot pursuit of wealth, which is the most absorbing of present human aims, neglect systematic thought, feed their minds upon little else than the sloppy pabulum of sensational daily papers, and become mentally starved. How few there are that can safely think for themselves upon any subject not immediately related to their profession or calling! What millions might be counted, who might far better shut their eyes and accept without thought the conclusions of such men as Mill and Spencer than even to attempt to reach a conclusion or form a definite opinion from their own thinking!

Talk with men engaged in professions which imply greater breadth of thought than ordinary business occupations, and how often you will hear the admission, that their habits of thought have unfitted them for correct thinking upon topics which require systematic thought, and strictly logical method! Ask nine out of any ten, selected at random, what is their religious belief? and you will find that they either have none, or that they accept a creed they cannot comprehend or explain. If they vote at general elections, they are guided by hastily formed opinions, for which they have never sought good and sufficient reason. Somebody's plausible speech, or some half conceived principle of right or wrong, is enough to influence their action; and so they give their minds the rest they crave, and trust to luck that it will all come right in the end. Many are going on through life, similarly trusting that their future will all come out right—hoping that it will—which they call having faith; and when they suppose themselves to be trusting in God, they are simply trusting in luck.

Hence it follows that sects and creeds multiply, charlatans prosper in politics, religion and medicine, and false teachers only find it necessary to assert, with show of authority and with simulation of knowledge, to win numerous disciples.

The majority of men prefer to have other people think—or pretend to think for them. Glittering generalities that either mean nothing, or mean falsehood, are accepted as formulas of action, and repeated as maxims for the guidance of individual conduct. If such a formula be attacked by

some bold critic who sees its hollowness, the masses who have accustomed themselves to blindly follow, cling to it, refusing to give up that which has saved them the labor of forming an independent opinion, and dreading the mental effort which the formation of new opinions, or the selection of another formula, would entail.

So the world moves slowly in some respects, but it moves. There remains an immense amount of superstition, but day begins to dawn. People are not so easily led blindfold as they were a century ago, and the rights of individual conscience begin to assert themselves.

STEAM ON THE ERIE CANAL--ANSWERS TO QUERIES.

We call attention to an able paper read by George Edward Harding, C. E., before the Society of Arts, in London, May 10, of the present year. The paper is entitled "The Application of Steam to Canals," and gives a great deal of practical information, useful to inventors at the present time. We shall publish it in parts.

We also take the present occasion to answer a large number of queries relative to the dimensions and models of canal boats. The largest boats are 96 feet long, 17 feet 8 inches in width, and 9 feet in depth over all. Their greatest draft is 6 feet, as prescribed by law, and they will carry 240 tuns of freight.

The bridges are 11 feet from the water; that is, this is the least distance allowed. The mean depth of the canal between the bottom of the banks, is 7 feet.

The model of the boats may be described as an oblong box with vertical sides, and having all the corners slightly rounded. To propel such a boat, when loaded, at a rate of three miles per hour, would require not less than sixteen horse-power, taking as a basis for the estimate, the fact that two horses now scarcely make more than a mile and one half per hour when the boats are loaded to full capacity, and that the resistance of fluids increases as the cubes of the velocities of bodies moving through them.

From this it will be seen how visionary it is to suppose that any boat of this model can be propelled, when loaded, at five or six miles per hour, without reducing its freight carrying capacity more than can be allowed. To propel such a boat at five miles per hour would require a power of nearly seventy-five horses, not making the least allowance for waste of power, which always takes place in any method of steam propulsion. To propel it at six miles per hour, would require one hundred and twenty-eight horse-power.

Another query, in which many are interested, is: what does the law, offering the prize, mean by the "Belgian system" of propulsion? We will give an engraving of this plan in our next issue. Meanwhile we will say, that the plan is the invention of Baron Oscar de Mesnil and Max Eyeth, who patented their inventions in the United States, Feb. 9, 1866.

It consists essentially of a rope, laid on the bottom of a canal, which is simultaneously wound on and off a drum, attached to the boat and turned by steam or other power.

In answer to other inquiries, we give it as our opinion that the meaning of the last clause of the first section of the act authorizing the prize, excludes all use whatever of the banks, and confines the means of propulsion to the boat itself, and the propeller must be made to act either upon the water or the canal bottom.

The commissioners have not held their first meeting, and have as yet no office in this city. As soon as they take action of any kind, our readers will be informed. The chairman of the Commission is General George B. McClellan, and his office is at the Department of Docks, 348 Broadway, New York.

PLOWING AND CULTIVATING BY STEAM.

Horace Greeley, editor of the New York *Tribune*, is now on a tour in the South, and, in a recent letter to the above paper, describes a visit to a plantation fifty miles below New Orleans, where the manufacture of sugar is a specialty. The plantation, Magnolia Grove, is 3,000 acres in extent, and the owner, Mr. Effingham Lawrence, conducts all the operations on a large scale, and in an enterprising manner. One thousand acres are actually cultivated. Fowler's plowing machinery is used, imported from England. The plows are drawn across the field by two thirty horse steam engines, provided with drums, on which the wire ropes that operate the plows are wound. One engine is placed on each side of the field, and the drums alternately wind and unwind the rope, drawing the plows back and forth between the engines.

"The ground," writes Mr. Greeley, "was cane stubble, heavily ridged or hilled to counteract excess of moisture, with the 'trash' of last year's crop lying between the rows, and constantly clogging and choking the plows, often requiring the machinery to be stopped in order to clear them. The subsoil—never disturbed till now—was a glutinous clay loam, compacted by sixty years treading of heavy mule teams, so wet that it came up unbroken, as if it were glue, and about as easy to pulverize as so much sole leather. So obstinate is it that Mr. Lawrence had reduced each gang of plows to two, lest his engines should be stalled, or his wire ropes broken. These two each cut a furrow sixteen inches wide, and fully two feet in average depth; had the surface been level, they would have averaged twenty-six inches. They were drawn across the field (576 feet) faster than most men would like to walk. Three men were required to keep them in place, and clear them of the choking 'trash,' which I would have burned out of the way, though I, had I been planter, would have preferred to have it buried, as they buried it. Against all these impediments, each set of machinery was plowing from five to six acres per day—plowing them two feet deep, remember, and thus relieving them of the generally superabundant moisture, as shallow plowing, or even ordinary subsoiling, never did and never can. Mr. Lawrence, upon land thus plowed, makes an average of 2,000 pounds per acre of sugar, where he formerly made but 800 pounds. And he regards himself as yet on the threshold of steam cultivation.

"And even this was not the best he had to show us. In other fields, perhaps half a mile distant, other machines were cultivating cane by steam. I believe the like of this has not yet been done elsewhere on earth. The rows of cane are fully seven feet apart; the plants now fully a foot in average hight. A locomotive engine stands at either end of the field, moving forward or backward by a touch of the hand of the negro boy standing upon it and looking out for signals. The cultivator is composed of five or six ordinary horse cultivators, enlarged and fixed in a frame, whereof the half that that has just stirred the earth to a depth of two and a width of five feet is lifted clear of the ground on reaching the engine which draws it, while its counterpart is brought down to its work by the plow guider stepping upon it. At a signal, the boy at the other end of the field, or 'land,' starts his engine, and begins to unwind his wire rope, and uncoil or pay out that of the drum beneath the opposite engine, pulling the cultivators through the earth as they are guided nearer the row that they were kept further from as they passed in the opposite direction. Having thus thoroughly pulverized the space between two rows, by traversing it twice, the engines move forward to the next space and repeat the operation; and so on till nightfall. Mr. Lawrence assured me that one such thorough working answers for the season; whereas, while tilled by mule power, every cane field required working six times per season, at intervals of fifteen days. A set of machinery and hands tills about twelve acres per day. I judge the cost of this day's work, including fuel and wear of machinery, ranges from $25 to $30. This is far below the cost of repeated workings by mule power, while it is far more efficacious. The land plowed and tilled by steam is far dryer than the rest. Mr. Lawrence considers his thousand acres under tillage worth $100 per acre more than they would be but for steam culture. He will keep his two sets of plowing machinery at work, not only throughout each day, when the earth is not too sodden, but (by relay of hands) throughout each night also, when the moon serves. Steam tillage of growing crops, being a nicer, more critical operation, will be confined to daylight.

"I close with an avowal of my confident belief, that Mr. Effingham Lawrence has rendered an immense service to American agriculture, especially that of the Prairie States, by demonstrating the benefits not merely of steam plowing, but of subsequent steam tillage, and that the day is not remote wherein the 'barrens' of Long Island and New Jersey, the rich intervales of the Connecticut and the Susquehanna, will be profitably plowed and tilled, to a depth of 24 to 30 inches, by steam power, and that far larger and surer crops than those of the past will therefrom be realized."

The Birmingham Gunmakers' and Inventors' Club.

At the first general meeting of the Birmingham (England), Gunmakers' and Inventors' Club, the President, Mr. A. Wyley, delivered an address in which he reviewed the position held by gunmakers and other mechanics; noted the difficulties which beset the trade, and suggested means by which these might be alleviated or overcome. He said that "the manufacture of firearms at the present day, involves a wider range, if not a greater amount, of knowledge than any mechanical pursuit, if we except the more scientific manufactures, such as those of optical, geodetical, and astronomical instruments." Referring to the drawbacks of the manufacture of firearms, Mr. Wyley said that, "First of all, the trade, especially the military branch of it, is, in its nature, exceedingly spasmodic and irregular; at one time utterly stagnant, at another in a perfect fever of activity. During the period of slackness, men take to other branches, sometimes to totally different pursuits. When the trade suddenly revives (and the transition is always sudden) these men return to their former posts, but, of course, not so efficient as if they had remained in it all along. This is one cause of the indifferent work that is always turned out when any sudden demand arises." The gunmaking trade had not taken the position in public estimation that it might occupy, and its leading men were ranked far below civil and mechanical engineers. Many causes have contributed to this, but clearly one of the foremost is the utter want of unity or cohesion in the trade. In almost every case, the individual interests of its members seem the only motives of action (and even these interests are poorly understood), while those of the trade and of the public are totally disregarded. These causes have kept the masters in the gun trade at arms length from each other, and they naturally endeavor to to keep all those in any way dependent on them in the same state of isolation; and so it happens that no one knows or cares what his next neighbor is doing. Hence it is that blunders innumerable are made, costly experiments repeated over and over again, although the question, to solve which the experiments were made, may have been settled years before. From this source arise endless multiplication of patterns, all sorts of useless bores of barrels, all sorts of rifling, and that inability to judge of the cost of manufacture of anything out of the usual course of their own experience which often leads masters to give unduly low estimates, these necessarily ending in screwed down prices and inferior work. If those engaged in the gun manufacture, were animated with a spirit of brotherhood—if they were to unite and co-operate, many great improvements would be effected by systematising the details of the trade. To bring about a closer union among the active members of the the trade, is the principal object of the Gunmakers' and Inventor's Club.

The Wreck of the Saginaw---Mechanical Ingenuity of a Shipwrecked Washingtonian.

The following is from the Washington *Morning Chronicle*:

When the Saginaw was wrecked on Ocean Island, last October, a boat saved from the wreck was started for Honolulu to seek aid to rescue the crew from that island. The boat foundered in the surf when near her destination and all of the crew perished save one, who told the tale of the Saginaw's fate, and had relief sent to the shipwrecked crew. The length of time which elapsed before succor came, caused such apprehension in the minds of the sufferers on the Pacific Island, that they fitted out another boat to tempt the perilous navigation of nearly 1500 miles. This work on the boat went on well; but they had no sextant, the only one saved from the wreck having been taken in the other boat. Second Assistant Engineer Herschel Main, U. S. N., of this city, who was among the shipwrecked, collected from the *débris* of the wreck cast ashore, a variety of materials, from which he constructed a sextant with such tools as he could improvise, and which has been tested and found accurate.

Mr. Main exhibited considerable ingenuity in constructing an instrument so delicate and intricate under such disadvantageous circumstances, and has given an additional proof by his achievement of the truth of the old adage that necessity is the mother of invention.

The material used in the construction of the sextant consists of a piece of a steam gage, a piece of zinc, some small pieces of brass filed to suit the different portions of the instrument, rivets made from any material found, and the mirrors necessary, from such pieces of looking glass as were washed from the wreck. These last were set in frames of brass desk locks, and all the work was principally done with a pocket knife and rough tools made for the occasion.

This instrument is now in the possession of Mr. King, chief of the Bureau of Steam Engineering in the Navy Department, and can be seen by all who take an interest in a curiosity which exhibits such skill and mechanical ingenuity as is rarely found under such difficulties.

There happened to be no necessity for a practical test of the instrument, for by the time it was completed and second boat ready to start, relief arrived and the shipwrecked men were rescued from the island and conveyed to Honolulu. The instrument, however, as above stated, has been tested by navy officers and found accurate.

The Decomposition of White Light.

Mr. Lewis Rutherford, of New York, so well known for his magnificent stellar, lunar, and solar photographs, was in London a few weeks ago, and brought with him a prepared piece of glass which would produce a diffraction spectrum. A diffraction spectrum is produced, without the use of prisms, simply by the aid of a glass plate, which contains a great number of fine parallel lines ruled with a diamond upon one of its surfaces. These lines should be $\frac{1}{1500}$th of an inch apart, and extend over a surface about two inches square There is a great degradation of the light when it is drawn out in this way into a spectrum, but the spectrum is a very pure one.

The ruled glass plate is technically called "a grating," and a number of spectra are produced on each side of the glass plate, any one of which spectra may be viewed by a telescope of low power placed in the right position. By means of the grating prepared by Mr. Rutherford, about eight spectra could be seen, and the whole arrangement was exhibited at the last *soirée* given by General Sabine to the Royal Society.

The great difficulty in preparing these gratings consists in ruling the lines with sufficient accuracy, it having been found that an error of $\frac{1}{250000}$ is sufficient to render them inapplicable for purposes of scientific research. The spectrum is exceedingly faint as compared with that obtained by the use of prisms; but in scientific researches it presents the great advantage that any spectrum obtained by the diffraction plate will bear direct comparison with another spectrum produced by any other diffraction plate, even though the plates may have been made of different glass, prepared in a different manner, and the number of spaces between the lines on the glass of different widths.

There are other advantages appertaining to this little-known method of producing a spectrum. It is not liable to the difficulties produced by what is known as the "irrationality" of the ordinary spectrum. This irrationality, as it is called, is caused by the property, possessed by different kinds of glass, of acting specially on different rays of light. For instance, the very densest flint glass, when compared with crown glass, draws out the blue and violet rays of the spectrum more than the red. A bisulphide of carbon prism exerts a still more marked influence of the same kind. In consequence of the impartiality (for so it may be called) of the glass gratings upon the rays, a remarkable spectrum is produced, very unlike the one with which the public are familiar; for in the diffraction spectrum, the yellow rays are in the middle of the spectrum, instead of near one end. They are midway between the extreme red and blue.—*William H. Harrison, in the British Journal of Photography.*

IRON telegraph poles are being introduced into Switzerland with great success. They have also been placed on 350 miles of Swiss railways. It is predicted that in Germany, where iron is cheap, that it will be substituted for wooden poles on all the lines. We would suggest that iron poles be substituted, in our cities, for the cumbrous and unsightly ones which meet the eye in every direction. They may be made light and artistic, and besides they will endure so much longer than wood as to render them economical in the end. President Orton, of the Western Union Telegraph Company, will, we trust, take the matter into consideration.

Optical Appearance of Cut Lines in Glass.

The use of high powers in delicate investigations renders it necessary that the microscopist should study the character of appearances which arise from optical laws, and which can only be rightly interpreted by referring them to forms and structures to which they bear no real or exact resemblance. A short time since, the writer called attention to the deceptive nature of the appearances presented by the fine cracks in silica films; and further observations show that if the finest or narrowest of such marks are selected for examination, the chances of obtaining perfect illusion are increased by the amount of magnification and the perfection of the objectives employed. Delicate interference bands, pseudo-beading, etc., look more real with well corrected object glasses than with bad; and careful illumination will often add to the structural aspect of mere optical effects. The edges of silica cracks differ from edges of minute furrows cut in glass, being smooth instead of jagged. The latter as well as the former are well worth study. Preparatory to examining such furrows as are cut with diamonds in glass for micrometers or diffraction gratings, it is well to notice the edges of thin glass cut for slide covers. If half a dozen or more thin glass squares are held close together, and viewed, edges upward, as transparent objects, a variety of curious optical effects will be seen, arising from interfering reflections and refractions. The examination should begin with an inch or two thirds, after which half inch, and quarter or one fifth will be advantageously employed. It is easy to focus parts of the glasses' edges, so as to show their true form; but portions a little in or out of focus will show beads, appearances like columns of Egyptian architecture, etc. Most of these optical appearances are sufficiently hazy or confused to give warning of their true nature; but generally some will be found so sharp and clear that, if viewed separately, they may easily mislead a practised observer. In making these experiments, it is best to have handy a box containing at least several dozens of the thin glasses, as some sets will prove much more interesting than others. They should be viewed with their edges parallel to the plane of the objective, and also at various angles. The corners of the squares should also be looked at.

Lines cut in glass for micrometers or diffraction gratings are usually filled up with finely divided black lead, and the same material has been employed in the writings and patterns made with the Peter's machine. This substance of course modifies the appearances. To see them in the simpler form, recourse was had to Mr. Ackland (Horne and Thornthwaite), who ruled several sets of fine lines, each on glass slides, at varying distances 1—2000", 1—3000", and 1—4000", and mounted them with Canada balsam, so that they could be safely used with immersion lenses. One set was not covered or mounted in any way.

Those who have examined very minute writing done by the late Mr. Farrants with the Peter's machine will be aware that even when a very fine diamond point is used, the incision partakes more of the character of a scratch than of a clean cut. It seems impossible to cut glass with a smooth, clear edge, such as certain metals readily give with a sharp tool. A line cut in glass is thus a furrow, more or less rough at the bottom and sides, and when viewed correctly under the microscope, has the appearance of a narrow depression less transparent than the adjacent spaces. It is difficult to get a really correct view. Even under favorable circumstances of illumination and correction, the edges of a cut are apt to appear as two raised lines.

Many instructive optical appearances, which might bewilder the observer if the character of the object were not known, may be easily produced, as the following notes will show. The observations are made with Powell and Lealand's immersion one eighth and Ross's four tenths, condenser aperture 109°. Using central stop, A, and varying inclinations of mirror. Paraffin lamp. (1*a*) Cuts as rounded bands; interspaces flattish furrows. The bands illuminated on right side, shaded on left. Tint of lightest part of furrows bluish. (2*a*) Flatti-h bands and rounded furrows, the former slightly shaded on left; tint of shading bluish. (3*a*) Oblique rounded furrows with narrow blue ridges; broadish bands with narrower elevated bands up their centers, light on right side, shaded deeply down the furrowed side on left.

Same condenser 109°, two radial slots forming obtuse angle. Angle of mirror varying. (1*b*) Broad, flat spaces, narrow, shaded, and elevated ridges. (2*b*) Ridges four times as wide as No. 1, with rounded tops. (3*b*) Narrowish grooves, something like actual object. (4*b*) False ridges, puzzling to count and hollow.

Same condenser 109°, two rectangular radial slots. Angle of mirror varied. (1*c*) Half round hollows, with rod-like ridges in the middle; rounded interspace elevations somewhat lower than ridges and between them. (2*c*) Narrower ridges; nearly flat spaces. (3*c*) Appearance of additional ridges, strongly shaded on left. (4*c*) Narrow ridges, shaded on right; flattish spaces, and low ridges, with narrower shelving shade spaces down to ridges, etc., etc.

Same condenser, 109°; one radial slot which was rotated to various angles. Angle of mirror varied. (1*d*) Each cut made into a flattish space, with two narrow raised edges, shaded on left. (2*d*) Cuts made into flattish, ribbon-like elevations, with raised edges. (3*d*) Interspaces raised, with rounded edges; cuts made to look flattish, and at lower level. (4*d*) Appearance of additional and imperfect ridges. (5*d*) Series of imbricated and shaded bands.

In the lines cut by Mr. Ackland no attempt was made to produce the narrowest possible furrows. The width of furrows found practically convenient for micrometers was only slightly deviated from, as some cuts were a little deeper than others, and thus caused the wedge-shaped diamond point to open the furrows a little wider. The interspaces of the narrowest were much wider than the cuts. It is obvious that a cut wide enough to be distinctly seen, under given magnification, will present to view two linear edges, and thus be reckoned as two lines, if its true character be not considered.

Cuts very close together may, if the cohesion of the glass and the perfection of the cutting tool permit, be wider than their interspaces.

It will be seen that in the preceding statements only one instance is mentioned of appearances agreeing tolerably well with the real facts. It must not be inferred from this that it is not easy to exhibit moderately fine cuts correctly, or very nearly so. The object of this paper was to select a number of appearances all looking as if they might correspond with the facts, and all differing more or less from them.

Those who study the most vexatious diatoms or Nobert's test lines must, it appears to the writer, not only take into account what they do se , but what they ought to see, provided the object has a certain definite structure, and certain powers of producing optical images under given conditions.

ON A NEW CONNECTION FOR THE INDUCTION COIL.

By Prof. Edwin J. Houston, in the Journal of the Franklin Institute.

The following experiments were made at the Central High School of Philadelphia, with a view of increasing the quantity of the spark of the induction coil without greatly diminishing its length. The instrument used was made by Ritchie, of Boston, and will throw the spark six inches in free air.

One of the poles or ends of the secondary wire was connected with the earth by a copper wire, attached to a gas pipe. The other pole was connected with a wire, which rested on a large lecture table holding the coil. On turning the break piece, the electricity, instead of being lost by passing along the wires to the earth, jumped from the pole connected with the table to that connected with the earth. The thickness of the spark was greatly increased, its length diminished, and its color changed to a silvery white, as when a Leyden jar is placed in the path of the discharge.

While the electricity is flowing between the points, long sparks may be drawn from any part of the table, or from any metallic article within eight or nine feet of the coil. On one occasion, the gas was lighted by a spark drawn from the finger of a person standing on the floor. The gas pipe being in almost perfect connection with the earth, the spark must have been given to it from the body of the person.

On another occasion, one wire was attached to the gas pipe, as before, and the other to a stove, whose pipe connects with that of another stove in an adjoining room. The thickness of the spark was greatly increased. Sparks were drawn from the distant stove, and even from a small steam engine, which latter was fully thirty feet from the coil. In all the experiments it was found necessary to insulate the handle of the break piece, as a slight shock was experienced at every break. The poles being kept at a distance from each other less than the insulating power of the coil, six inches, no danger of injuring the instrument was apprehended. In one instance sparks were drawn, in a room underneath the adjoining room, from a wire which connected with the table on which the coil rested.

These facts showing great loss of the electricity, but indicating the need for a large conductor, probably to allow the rapid discharge of the secondary wire, a large insulated conductor was extemporized, by placing some old tin stills and percolators on large glass jars. On connecting one of the poles with this conductor, and the other with the gas pipe, the quantity of the spark was increased, though there was reason to believe that, with a larger conductor, better results would have been obtained. The conductor was then divided into two, of about equal size, which were connected with the poles. The quantity of the spark was increased, with, however, great diminution in the length. By successively diminishing the size of one of the conductors, and increasing that of the other, the length of the spark was increased, without any sensible diminution in its quantity, until, when one of the conductors was less than one square foot in surface, a fine quantity spark of about five inches was obtained.

It will be noticed that this connection is somewhat similar to that used in the common cylinder or plate machine, in which one of the conductors, generally the negative, is connected with the earth, and the quantity of the electricity thereby increased.

In all the experiments in which one pole was in partial connection with the earth, as when it rested on the table, the loss of electricity must have been very great, for several gas and water pipes were in connection with the table. If, then, the table merely serves as an imperfectly insulated conductor, which allows the rapid induction of electricity in the secondary wire by its rapid discharge, and thereby, notwithstanding the loss, gives so great an increase in the quantity of the spark, it would seem that if, instead of the table, an insulated conductor of very large surface were used, a much greater increase in quantity would be obtained.

It would seem from the above experiments, that the maximum increase will be obtained when one of the poles is connected with an insulated conductor, say several hundred square feet in surface, and the other with the earth.

Cultivation of Rice.

In preparing the land for rice, the ground is cleared, embanked and ditched in a thorough manner, and is often laid out into independent fields, so that a certain number of hands can complete any one operation connected with the culture of the rice, in a single day. The ditches are often five feet wide, and as many deep, and the main one is sometimes large enough to be used as a canal in boating the rice in large flats, from the fields to the place of stacking. The land is plowed or dug over with the hoe early in the winter, and is kept under water during the warm changes in the weather. In March, the ground is left to dry, and made ready for the seeds. Trenches for the same are run at right angles with the drains from thirteen to fifteen inches apart, with a four inch trenching hoe. From April till the middle of May, the seed is scattered in these trenches at the rate of about two and a half bushels to the acre. The seed is sown lightly covered with the soil, and the plan has been to let in the water upon the land for several days after the seed is put in, or until it sprouts. Latterly it is considered better to stir the seed in clayey water the day before sowing, as the clay adheres to the seed so that it remains in the trenches when the water is let on, if not covered by the soil. After the water stands from four to six days on the sprouts, it is let off, and when the plants are about five weeks old, the first hoeing takes place. The plants are again hoed in ten days, and then the "long water" is put on for two weeks, at first deep for four days, afterwards gradually diminishing the depth of water. After two more hoeings, the joint appears in the plant, and the "joint water" is let on to remain a few days before the grain is ready to be cut with the sickle.

Rice grows much like wheat, with stalks from four to six feet high. It is closer jointed than wheat, with leaves resembling those of the leek, and the seed is inclosed in a rough, yellow looking husk. The average yield on the low land is about forty bushels to the acre, a bushel weighing usually forty-five pounds.

South Carolina is the most successful rice growing State in the Union, and her rice commands the highest prices in market. It is said that the seed was first introduced into the State accidentally, from a Madagascar vessel that put into Charleston in 1694

It was formerly customary for the planters to have their slaves separate the rice from the outside husk by pounding in small hand mortars. Each male hand had his task allotted him, of pounding three pecks before breakfast, and the same amount after the day's work was over in the field. It is now done by machinery at the rice mill. The mill is provided with long upright wooden pestles, which pound the rice a certain number of strokes in long wooden mortars. After undergoing this process the rice is cleaned and then passed over wire sieves, so arranged that the small and broken grain falls through the fine meshes in the sieve, the large and perfect grain through the larger ones. In this way the various grades of rice are assorted for market.

WOVEN WIRE MATTRESSES.

In almost every newspaper one takes up, the eye meets a very artistic engraving of a mattress, fabricated in wire, and, accompanying it, an advertisement of the Woven Wire Mattress Company, Geo. C. Perkins, Secretary, Hartford, Conn.

In the SCIENTIFIC AMERICAN about a year and a half ago, when the manufacture of these mattresses was in its infancy, and before some of the improvements since added were made, we published an engraving of the article, which elicited considerable inquiry from managers of hospitals and other public institutions, in various parts of the United States, and from some of the warmer countries in Middle and South America.

From the time of the fall exhibition of the American Institute of 1869, when the energetic secretary of the company first exhibited them, the wire mattress has been gaining favor with the public, until it is now on sale in nearly all cities and large towns in the United States.

The company, we learn, is turning out several hundred beds a week, and the demand for hospitals, steamships and private use is constantly increasing.

The mattresses are durable, cool for warm weather, comfortable to lie upon, and insects avoid them.

A MANUFACTURER of Easthampton has offered an endowment of $500,000 to Amherst College, on condition of the name being changed to "Williston University."

A RAILROAD of 30 inch gage, 11 miles in length, is to be constructed in Green county, Tenn. It will cost $20,000 only

PATENT OFFICE DECISION.

Henry Moule and James Bannehr—Appeal from Examiner-in-Chief, March 31, 1871.—In the matter of the application of Henry Moule and James Bannehr, for letters patent for Improvements in Earth Closets.—Applicants have invented, and in their specification have described, a particular form of mechanism adapted to the earth closet, and which, if new, will entitle them to a patent. The claims set up are in the following language:

1. The application of dry and powdered earth, in closets and commodes, to the excrementitious matters deposited therein.

2. In combination with an excrement chamber and a hopper, or other receptacle, for deodorizing material, a charger or distributer, located between them, and adapted to discharge portions of the contents of the deodorent receptacle into the excrement chamber in the manner set forth.

3. In combination with a commode or closet, in which there is a means provided for deodorizing the excrement, a means for mixing the discharged mass, substantially as set forth.

In conformity with the current practice of the Office, as grounded upon the decision in *ex parte* Charles Rubens & Co. (Commissioner's Decisions, 1869 107), the concluding words of the second and third claims should be ig- nored in considering the novelty of what is therein claimed; and in fact ap- plicants' attorney has based his whole argument upon the supposition that these words are mere surplusage, and are not to be regarded as in anywise limiting the scope of the claims. It will thus be seen that applicants do not confine themselves to the mechanism described, and of which they are doubtless original, and perhaps the first inventors, but are seeking to secure claims in their nature calculated to lay under contribution every existing form of the useful invention to which their mechanical improvement relates. The English patent granted to these same parties upon the invention now offered for an American patent bears date May 28, 1860.

All the references, then, which are cited by the examiner of a later date than the date of the English patent are manifestly insufficient, since they neither disprove the novelty of the invention nor establish a public use in the United States for more than two years prior to the pending application. At the time when they were given, May 24, 1870, they were pertinent, as tending to establish the fact of common and public use in the United states prior to the application; but the legislation of 1870 so far changed the law in this regard that public use in the United States for a less time than two years prior to an application upon an invention previously patented in a foreign country, cannot constitute a bar to the grant of a patent here; and by the second proviso of section 111, of the act of July 8, 1870, the applicants are entitled to the benefit of this more liberal legislation. Going back, however, to the English patent of Legras, No. 12,869, of 1849, there are found, minutely described, various forms of commodes, port-

able and otherwise, having mechanical devices for applying a disinfectant to the fecal substances deposited therein. By the arrangement of parts shown in Figs. 6 and 7, the deodorizing compound in the form of a powder is placed in a hopper, and from this it is taken in determinate quantities, as needed, and thrown into the receptacle provided below for holding the excreta. Different devices are shown for effecting the discharge of the disinfectants from the hopper into the general receptacle, but the location of them all is between the two. The reference is so complete an answer to the second claim of the pending application that the wonder is that the claim should ever have been carried beyond the first rejection by the primary examiner.

As to the first claim, it is to be considered that commodes were not new at the time when the invention of the present parties was made, as is to be seen by reference to the Legras patent; that it was a part of the plan of prior inventors to employ in their commodes any disinfectants which might be suited to the purpose, as is also to be seen by reference to the same patent; and that the disinfectant properties of earth were previously well known, as is abundantly shown in "Ure's Dictionary," vol. 2, p. 29, cited by the examiner, as also in the twenty-third chapter of Deuteronomy, to which reference is made by the examiners-in-chief. Under such circumstances there certainly can be no foundation for the claim which applicants now assert. To apply this well known disinfectant to an old purpose, and in so doing to employ an old apparatus specially designed for effecting the application of any disinfectant to the same purpose, contains no element of invention. Applicants lay great stress upon the fact that they bring the earth into a *dry and powdered* condition prior to its use, of the advantage of which they claim that they were the first discoverers. In this, too, they mistake. The whole inference from the passage referred to in "Ure's Dictionary" is, that the deodorizing properties of earth depend upon its dryness and its porosity, or, which is the same thing, its fineness. From the note upon page 134 of the "Bulletin de la Société d'Encouragement pour l'Industrie Nationale, 1818," it appears also that earth has been artificially dried in furnaces in order to perfect its action as a disinfectant. The claim must be rejected.

The third claim relates to a stirrer or mixer, placed in the receiving chamber of the commode, and moved by any appropriate means, for the purpose of thoroughly mixing the earth with the other contents of the chamber. There is no evidence to show that the applicants were not the first to conceive of the advantage of thus mixing the contents of the general receptacle, and the first to invent a mechanism therefor. The idea once reduced to practice, it is plain that various forms of mechanism might be found useful for this purpose. It would seem, therefore, that the protection afforded to the inventors should not be confined to the specific device shown, since their real invention consists, not so much in this particular device, as in the discovery that any device mechanically capable of performing the work can be advantageously applied in the direction indicated. With proper amendments of the body of the specification, and the abandonment of the first and second claims, no good reason appears why the last claim should not be allowed.

As the case now stands, however, the decision of the examiners-in-chief is confirmed, and the application refused.

DUNCAN, Acting Commissioner.

The Largest Newspaper Mail

Which goes to any firm in this country, is received by Geo. P. Rowell & Co. the New York Advertising Agents. Their place of business is at No. 40 Park Row, New York.

Business and Personal.

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

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

For the best, purest, and most economical Machinery Oils, of all kinds, send to Oil House of Chard & Howe, 134 Maiden Lane, N. Y.

We will pay more money for Brass Turnings, old Brass, Copper, Lead, and Zinc than any other establishment. Consignments, large or small, solicited from all parts of the United States. Du Plaine & Reeves, 760 S. Broad st., Philadelphia, Pa.

The best Anti-Friction Metal is made by the Tubal Smelting Works, Philadelphia, Pa. Buy it and prove it.

The undersigned, patentee of a valuable improvement in Window Sash Attachments, is desirous of making arrangements for the manufacture thereof, by parties who have good facilities. Freeman Brady, Jr., Washington, Pa.

John A. Sears, Rockford, Corsa County, Ala., has for sale 80 Beaver Hides. He wishes a receipt for baiting Beavers.

Railroad Companies reach all trustworthy contractors by advertising in the RAILROAD GAZETTE.

Machinists' Grindstones. J. E. Mitchell, Philadelphia.

Face Grindstones, for Nail Cutters. Mitchell, Philadelphia.

Craigleith, for Glass Cutters. Mitchell, Philadelphia.

Soap Stone Packing, in large or small quantities. Greene, Tweed & Co., 18 Park Place.

Walrus Leather, for polishing silver or plated ware. Greene, Tweed & Co., 18 Park Place.

Wanted.—Iron Planer, new or secondhand; bed short, and over 30 in. wide. Send prices and cuts to Trevor & Co., Lockport, N. Y.

Wanted.—New or secondhand Carwheel Borer, Axle Lathe, double head preferred; Wheel Press and Centering Lathe. Address, with description, maker's name, and price, Michigan Car Co., Detroit.

Best Cement Water and Drain Pipe Machinery. Works by hand, horse, water, or steam power! State and County Rights for sale. J. W. Stockwell & Co., Nos. 28 and 163 Danforth st., Portland, Me.

Railroad Bonds.—Whether you wish to buy or sell, write to Charles W. Hassler, 7 Wall street, New York.

Cotton Machinery for sale. See advertisement. Also, a three-story Brick Mill. R. H. Norris, Paterson, N. J.

Manufacturers of Fire Engines (hand or steam) and Hose, please send circulars, with prices, etc., to J. P. Hale, Mayor, Charleston, Kanawha C. H., West Va.

Engine Lathe wanted, about 30 inch swing, 12 feet bed, in good order. Pratt & Co., 87 Chambers st., and Buffalo, N. Y.

The Philadelphia Scientific Mechanics' Circle will answer any mechanical question for 25 cts. Address as above, 125 N. 7th st., Philadelphia.

Electrical Instruments, Models, etc., made to order, and Gear Wheels and Pinions cut, by W. Hockhausen, 113 Nassau st., Room 10, N. Y.

Peck's Patent Drop Press. 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.

Experimental Machinery and Models, all sizes of Turned Shafting, Paper Box, Paper Collar, and Bosom Plaiting Machines, Self-operating Spinning Jack Attachments. W. H. Tolhurst, Machine Shop, Troy, N. Y.

Best Scales.—Fair Prices. Jones, Binghamton, N. Y.

Steam Watch Case Manufactory, J. C. Dueber, Cincinnati, Ohio. Every style of case on hand, and made to special order.

Agents Wanted—on a new plan—to sell a patent Collar Stud. Send for Circular. S. E. Williams, Hartford, Conn.

L. & J. W. Feuchtwanger, Chemists, 55 Cedar st., New York, manufacturers of Silicates of Soda and Potash, and Soluble Glass.

For Hydraulic Jacks, Punches, or Presses, write for circular to E. Lyon, 470 Grand st., New York.

A. G. Bissell & Co. manufacture packing boxes in shooks at East Saginaw, Mich.

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

Wanted.—A responsible dealer in every town in the United States, to sell "The Tanite Co.'s" Emery Wheels and Emery Grinders. Extra inducements from May 1st. Send for terms to "The Tanite Co.," Stroudsburg, Pa.

The new Stem Winding (and Stem Setting) Movements of E. Howard & Co., Boston, are acknowledged to be, in all respects, the most desirable Stem Winding Watch yet offered, either of European or American manufacture. Office, 15 Maiden Lane, New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Ashcroft's Low Water Detector, $15; thousands in use; can be applied for less than $1. Names of corporations having thirty in use can be given. Send for circular. E. H. Ashcroft, Boston, Mass.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, capable of pressing 75 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Tin Presses & Hardware Drills. Ferracute Works, Bridgton, N. J.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N. Y.

American Boiler Powder Co., P. O. Box 315, Pittsburgh, Pa.

Carpenters wanted—$10 per day—to sell the Burglar Proof Sash Lock. Address G. S. Lacey, 27 Park Row, New York.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Twelve-horse Engine and Boiler, Paint Grinding Machinery Feed Pumps, two Martin Boilers, suitable for Fish Factory. Wm. D. Andrews & Bro., 414 Water st., New York.

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

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., 25 Whitney ave., New Haven, Conn.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for catalogue

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N. Y. (Send for Circular.)

Winans' Boiler Powder.—15 years' practical use proves this a cheap, efficient, safe prevention of Incrustations. 11 Wall 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.

Queries.

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

1.—EXPLANATION WANTED.—I am running an engine lathe, twenty-four inch swing; and a short time ago, I tried to bore a pair of sixteen inch cylinders, and could not do it, as the gearing gave way at every trial. I first used wood (as "steadies" in my boring head, using a 4½ boring bar of wrought iron); and thinking the wood created too much friction, I took them out and took a single cut (not over one sixteenth cut), and still the lathe would not drive it, and I finally had to give it up. I substituted a brass pinion for one gear, and lost a tooth out of it. The lathe is all right again, and today I am turning off a twenty-four inch pulley (using the same gears on the lathe). Now, it seems to me that the lathe should have more to do (the cuts being equal) in turning off a twenty-four inch pulley than in boring a sixteen inch hole. Will some one explain why it requires more power for the bore than the pulley?—K.

2.—ELECTROPLATING.—How can I prepare Britannia metal, tin, and ordinary soft solder, so that they can be electroplated or gilt in a cyanide solution? I cannot get the information from Smee or Napier, but have no doubt that some of your readers can readily describe the desired process.—J. F.

3.—ICE BOAT.—Will some one tell me the dimensions of an ice boat which would carry two medium sized persons?—C. S. M. K.

4.—FIXING LEAD PENCIL MARKS.—I would like a ready way of fixing lead pencil marks to paper.—J. H. R.

5.—JAPANNING.—I wish a recipe for making and using the quickest baking and best Japan.—B. B. C.

6.—MALLEABLE IRON.—Will some one give me practical information how to make malleable cast iron? Or, are there any works explaining the theory?—E. D. P.

7.—SPECTROSCOPE.—I have a hollow glass prism, filled with bisulphide of carbon, two inches on each face. I would like to know what the width and depth of the slit should be, through which the light first passes, what should be the diameter and focal length of the lens in the first tube, and what distance should it be placed from the prism? Also, what power should the telescope be for viewing the spectrum formed, and of what lenses should it be made?—M. T.

8.—MUCILAGE AND INK.—Will some of your readers give me a formula or making mucilage, such as sold by stationers, and also a formula for a good, cheap, black copying ink?—A. S.

9.—CHEAP LATHE.—I would like practical directions for constructing, at the least possible expense, a light lathe of about eight inches swing; as great accuracy is not essential, metal need be employed only where absolutely necessary, as for spindles, bearings, centers, etc. Precise directions, giving dimensions and all other details, would no doubt be welcome to many an amateur mechanic who cannot afford to buy even a cheap lathe, but would at once go in for one if he could only make it himself.—C. M.

10.—NICKEL PLATING.—I wish plain practical directions and formula for nickel plating?—T. D. T.

11.—DYEING COTTON BLACK.—I want to dye soft cotton black, and have no steam. Can I do it and get a good color without steam, and would it be better to use aniline black, or the usual dye stuffs?—H. W.

12.—GILDING ON GLASS.—What is the size used for gilding on glass?—M.

13.—TELESCOPE AND HOROSCOPE.—I wish to know, if, with the addition of one more convex lens of one inch diameter I cannot make a terrestrial telescope from the directions given in No. 18, by A. W. G., of Mich.; and will it change the power? I also wish to know the meaning of tracing the horoscope, and how it is done.—E. T.

14.—EMERY WHEEL.—Can any reader of the SCIENTIFIC AMERICAN tell me how to make solid emery wheels that will not gum nor chip?—T. W. B.

15.—OVERSHOT WHEEL.—I wish a rule, simple and practical, for calculating the power of overshot water wheels, and the means of determining with accuracy the power of water in a flowing stream.—T. W. B.

16.—SPEED OF CIRCULAR SAW.—I want a rule for determining the number of revolutions a circular slitting saw, of any given size should make per minute.—T. W. B.

17.—REFINING GOLD.—Can some one give me any information on refining gold? I melted over some scrap gold leaf, which appeared to be very free from dirt, but after melting, it looked like a lump of tin instead of gold. When we sell it to the gold beater, he melts it over into fine gold.—F. E. H.

18.—BELT.—Can you tell me why a belt runs to the largest part of a pulley? I have asked a number of mechanics for a year past, but they cannot tell why.—F. E. H.

Answers to Correspondents.

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

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

TURNBULL'S BLUE.—With much deference to the undoubted erudition of your correspondent, E. C., of N. J., I must point him to an error into which he has certainly fallen, and into which he is likely to lead J. B., who wants to know how to make "Turnbull's blue." E. C. has given a good formula for the preparation of ordinary Prussian blue (Fe_7Cy_{18}). But to make Turnbull's blue, (Fe_5Cy_{12}), the ferricyanide (red prussiate), and not the ferrocyanide (yellow prussiate) must be used. Also, instead of using the tersulphate of iron, which is a sesqui-salt, the proto-sulphate, or some other proto-salt of iron is absolutely necessary to the production of Turnbull's blue, which differs from common Prussian only by being of a brighter tint. Fownes, or any other chemical authority will furnish further information.—C. L. R. S., of D. C.

POUNDING OF PISTON.—Let E. S. take out the trap and put in a half inch globe valve at each end of the cylinder, and keep them open while the engine is in motion. The trap, while good in theory, is liable to fail in exhausting the water whenever the spring, which lifts the valve, loses its strength or is held down by weight of water. The advantage of the globe valve is, that while but a little steam will escape, it effectually exhausts the water.—H. A. G.

TO KILL BEDBUGS.—Any woman ought to be ashamed to ask for an article to kill bedbugs. No one will be troubled with these pests if they will take the trouble to thoroughly cleanse the bed and room once a month. Bedbugs can stand anything better than cleanliness. The March cleansing is the most fatal to them; it destroys them root and branch. Any one troubled with this "peculiar heathen" who will take the trouble to observe the foregoing method for three or six months, will be entirely relieved of them without fail. If the cleaning be continued at intervals of three months, bedbugs will never appear.—C. A. H., of Mass

TO KILL BEDBUGS.—If "Housekeeper," No. 11, page 346 Vol. XXII., will use benzine or gasoline, she can kill bedbugs as fast as she can find them; and by using a spring bottom oiler, the fluid can be forced into cracks and crevices which can be reached only by this or similar means. I cleaned them out of a room lined and ceiled with matched boards, by it. Housekeeper will have to be careful about fire, and the room should be well ventilated till the gas passes away.—J. M. A.

HONING RAZOR.—P. R. says that in honing his razor, he always gets a rough wire edge. So he ought to have. Always hone until you turn the edge, or you might as well not hone at all. Now to get a smooth cutting edge is what you want. Moisten your thumb nail and draw the edge of the razor back and forth a time or two across the nail. Put it on the coarse side of your strap first. Keep trying it across the nail until you get a smooth edge. You can tell this by its feel; for when smooth, it will seem to cut right in the nail, and no roughness will be felt. Then bring up the edge on the fine side of the strap, with a few strokes on the palm of the hand to finish it. If you once get a smooth edge, and it shaves well, never use any strap but the palm of your hand; and I will guarantee it to keep its edge for months. It is very easy to strap the edge off of a razor by strapping too much. Never wipe your razor on dry paper, or cloth of any kind; it will take the edge off.—H. D. W., of D. C.

MAGIC LANTERN.—Your querist, No. 11, page 282, can construct a magic lantern to meet his requirements, as follows: Use a plain convex lens, 4 inches in diameter, and 8 inches focus; put one double convex lens, 2 inches in diameter, in the focus of the first. The light should be placed three inches from the large lens.—H. W. G., of Mich.

OILING FURNITURE.—In answer to query No. 1, in your issue of May 20, I would state for the information of A. H. that pure linseed oil (raw oil) is used for walnut furniture, applied with a brush. Some prefer, however, the red furniture oil, as it gives the wood a darker appearance. If it is to be finished with copal varnish, the oil should be allowed to dry perfectly; then two or three coats of varnish should be applied for the purpose of filling the pores or grain of the wood. After which the article must be rubbed with fine or worn out sand paper to get a smooth surface. Then apply two or three coats of varnish, and rub down and polish or flow as necessary. Care should be taken to let each coat of varnish get perfectly dry and hard before putting on another.—H. L., of N. Y.

POUNDING OF PISTON.—Your correspondent "S. E." in issue of May 20th, asks what makes his piston pound. I set up an engine once that was troubled with the same difficulty, and afterwards spent a large amount of time and some money in trying to remedy the trouble. The company that made the engine, made the cylinders a little longer, giving more clearance, and consequently more steam room at each end, and we never had any more trouble from that source. Our company was striving to be too economical in cast iron, and also trying to waste as little steam as possible in "cushioning," as it is called, but always afterward gave plenty of clearance to the pistons.—C. H. C.

POUNDING IN STEAM CYLINDER.—S. E. asks "what is the cause of the knocking in the cylinder?" I have known valves in steam closets to knock, and sound as though the trouble were in the cylinder. I suspect, however, that the trouble of which S. E. complains, is that the crank is ahead of the steam pressure at the beginning of the stroke, when the governor valve is hard down, so as not to admit sufficient steam to start the piston in time for the crank. This can be obviated by setting the eccentric ahead. If his engine be of short stroke and large cylinder, and set high from the bed plate, and pounds when the governor valve is up, giving full steam, S. E. may depend on it that the bed plate is too weak.—S. G. D., of Pa.

M. E. Y.—Some medicines appear to operate in a peculiar way upon the retina of the eye. For example: Dr. Rose, of Berlin, has described a sort of color blindness, in respect to blue colors only, produced by taking a dose of santonine. After the effect of the medicine has subsided, the natural power of the eye to distinguish blue returns.

MILLSTONE.—J. A. P. asks "why his new run of millstones will not do more work?" The fact is that the way his stones are dressed brings the grinding circle similar to that of a thirty inch run of stone. A run of 30 inch stones, revolving at the same speed at which he runs his four foot stones, will give the same results. The best way for him to get out of his trouble, is to take the dress entirely out of both stones, and put in the dress used by the best mills in the United States, namely: Begin every land, at the skirt of the stone, from two to three inches wide, and run every land to a point at the pitch or draft line, being sure to give the lands a true wedge taper from skirt to draft line. This, he will notice, gives the furrows about an equal width from skirt to draft line. Crack the stone on line with the back of the land, which will let the cracking run out on a feather edge.—S. G. D., of Pa.

DRILLING GLASS.—If R. A. P., who asks how the holes in large electrical machine plates are drilled, wishes to drill them for himself, he can do so by making an instrument like a fiddle, or bow drill, and using in place of the drill, a piece of brass tube of the required size, then fastening a thin board tightly over the glass, with a hole in it directly over the spot to be drilled, and large enough to let the tube turn freely in it. Then by putting emery and water in the hole, and after working the drill a little while, a hole will be ground through the glass, leaving a round piece in the center, the size of the bore of the tube. A drill can be made of a piece of wood, an inch in diameter or smaller, turned smallest in the center, with another piece fastened to the top, with a screw, for a handle, and the tube driven into the bottom. A bow can be made of wood.—A., of N. Y.

DRILLING GLASS.—I have had occasion for several years to drill holes in glass from the thickness of common plate to that of an inch, and of various sizes, and have always found satisfactory success with a common machinist's drill, lubricated during the process with oil of turpentine. With the drill properly tempered and run at suitable speed, the cutting is done as rapidly as in drilling steel.—J. E. B.

PRESERVING FLOWERS.—Seeing in No. 21, of current volume, that a correspondent wishes to know how to preserve flowers, so as to keep their natural colors, I send the desired information. Take of white wax, paraffin, or any other waxy substance, any desired quantity; place it on the fire, and bring it almost to a boil. Then take the flowers singly, or in bouquets, and plunge them into the melted wax for a moment; take out and drain. I have also seen flowers preserved with their natural color, by immersing in a thin solution of gum arabic. A lady friend of mine has flowers which were preserved by the wax method three years ago, and they have the same natural appearance they had when they were gathered. H. W. B., of N. J.

MILLSTONE.—The trouble with J. A. P.'s millstone is too much draft, which keeps the face of the stones scant of wheat, and they become smooth in a short time. Let him put in 13 quarters in the stone and 3 furrows to each quarter. This will equalize the draft, and his burrs will grind well.—J. F., of Mass.

MILL STONES.—To make a stone grind fast, make the furrows at least ⅜ of an inch wider at the eye than at the skirt of the stone, with the inclined plane uniform the entire length. The furrows should have, as nearly as possible, the same draft, which can be done by increasing the number of quarters with a less number of furrows. Then crack the face very finely, and keep it sharp. After this, increase the motion of the stone.—H. T. S., of Pa.

H. W. G., of Mich.—We know of no American journal specially devoted to astronomy. The *Journal of the Franklin Institute* publishes much interesting astronomical matter.

LEATHERS FOR VISE JAWS.—In your issue of May 27th, C. A. W. asks what to use for securing leather to vise jaws. If he will use beeswax, he will have no difficulty whatever.—T. A., of N. Y.

DISSOLVING MICA.—"M." wishes to know how to dissolve, and hold in solution, mica. Mica, which is essentially a silicate of lime, is, like most other native silicates, entirely insoluble in any menstruum whatever, excepting by decomposition, when of course it is no longer mica, and is not held in solution as such.—C. L. R. S., of D. C.

TO KILL BEDBUGS.—Use a strong alcoholic solution of corrosive sublimate, carefully.—C. L. R. S., of D. C.

T. D. T., of ——.—By consulting catalogues of industrial books, you will find many excellent works on electroplating, which will give you a part of the information you desire. We insert your other question in our query column.

S. W. S. of Ohio.—There is no accepted standard for the threads of bolts in this country. There ought to be, and we have often urged the adoption of such a standard, but our machine shops are each a law unto themselves in this matter as yet. The standard for gas pipes is as follows:

Diameter inside.	Threads to the inch.	Diameter inside.	Threads to the inch.
⅛	27	1	11½
¼	18	1¼	11½
⅜	18	1½	11½
½	14	2	11½
¾	14		

For all diameters above this, 8 threads per inch is the standard.

C., of Ala.—We do not believe copper was ever tempered to be as hard as good steel, although there are historical traditions of a lost art of this kind. To be able to harden copper like steel, might perhaps be of service to modern industry, but we do not see how copper could be advantageously substituted for steel in any of the purposes for which the latter is now used.

B. H. B., of Miss.—Glass water pipes have been tried, but there are many practical difficulties in their use, for domestic service. Your article on the subject is declined with thanks.

S. G. S., of N. Y.—The thing for you to do, if your eyes are giving out, is to apply to a competent oculist for advice, and, if need be, remedies.

BOILS.—I have recently got rid of eleven or twelve troublesome boils by taking a teaspoonful, in water, of the following mixture, before every meal: 2 grains bichloride of mercury, 2 drams iodide of potassium, 2 ounces sirup of sarsaparilla, 2 ounces water. The boils were gone before I had taken half the medicine.—D. B., of N. Y.

Recent American and Foreign Patents.

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

HAY AND COTTON PRESS.—This improvement consists in a combination of T-shaped pawl plates, double racks, levers, etc., designed to inform an improved mechanism for actuating the followers of hay and cotton presses. It can be applied to all presses in which the follower bar works in slots. Invented by Eugene Rock, of Greenvale, N. Y.

CULTIVATOR.—This invention presents a novelty in this class of agricultural implements, namely, that it makes the two outside plows or teeth adjustable as to their distance from each other, the adjustment being made by the operator as desired for varying width of rows of plants, while the cultivator is in motion and use. This is done in the following manner: The two inside plows are attached to the front ends of beams, which are pivoted to the central and principal beam of the cultivator in such a way that they extend obliquely forward. A chain extends from the front end of each of these branch-pivoted beams, at nearly a right angle to, and under, a pulley fixed to the central plow beam, and thence to the front end of the plow handle on the side next the beam. The plow handles are pivoted to upright supports near their middle. When the end of either of the plow handles is depressed by the hand, the other end is raised, pulling the chain and drawing the plow attached to the chain inward toward the central and principal beams; or by depressing both handles at once, the operator may draw both these plows inward, narrowing the width of land cultivated whenever the plants on one or both sides of the cultivator are endangered. As soon as the handles are relieved of pressure, the position of the pivoted beams branching forward and outward obliquely, causes the resistance of the earth to push them outward and take up the chains as fast as the latter are slackened. This ingenious device is the invention of Leander Walker, of Victoria, Texas.

MEAT SAFE.—August Knoche, St. Louis, Mo.—This invention provides for constant circulation of air through meat safes, the ventilation secured enabling the meat to be longer kept in good condition. The safe is made preferably square in its horizontal section, and of any suitable hight. The air enters a perforated side of a lower chamber, protected from flies by gauze, and, passing out through a perforated side opposite the first, ascends a flue to the perforated side of an upper chamber, thence through this side, and across the upper chamber; and through another perforated side into a flue which extends up to, and over the top of the upper chamber, and opens into a chimney or funnel communicating with the external atmosphere. The flues are made the entire width of the safe.

FOLDING SETTEE.—This is made with cross-legs, pivoted together, like the folding seats and chairs now in use; but the inventors have added an improvement, consisting in hinging the back to the back rail, upon which the canvas, leather, or other flexible seat is nailed. Strap braces extend from the ends of the front seat rail to the tops of the side posts of the back, and, when attached, hold the back at the proper angle with the seat for comfort; but when released, the back may be folded down, and the whole settee so folded together as to occupy very little space, a great desideratum in settees used in public halls, churches, etc. Invented by William C. Adams and William B. Mahew, of West Tisbury, Mass.

SPRING BED BOTTOM.—A rectangular frame supports a long spring bar on each side of the bed; to the middle of each of these bars is bolted a plate, under which the ends of two inclined spring bars are inserted, their inclination being adjusted by wedge-shaped blocks placed under them, near the lower ends, and resting on the first named bars. Cross bars connect these inclined bars at each end of the bed, and on them longitudinal spring slats are placed, to support the mattress. A slat frame is pivoted to the supporting upper frame thus formed, the frame extending from the pivots toward the head of the bed, and occupying a space somewhat more than one third that of the principal frame. This is inclined and held at any desired angle by braces, so as to raise the upper end of the bed higher than the foot. Invented by Manasseh W. Farber, of Mount Pleasant, Iowa.

WASHING MACHINE.—This is the invention of William C. Marr and Joseph S. Maughlin, of Onawa City, Iowa. It consists in a hollow drum, made by joining two disks with cross bars, with spaces between them. Every alternate bar projects inwardly. The drum has a door in the side for putting in and taking out the clothes, and on one of the disks is formed a rubbing surface, to be used for hand rubbing when requisite. The drum is made for attachment to common washtubs, by means of suitable devices. It is turned by a crank, and the agitation of the water through the openings and through the clothing cleanses without rubbing the goods to be washed.

APPARATUS FOR UNLOADING HAY.—Alexander Smith, Hoosick Four Corners, N. Y.—This invention consists essentially of a sling, of canvas or other material, which is to be spread over the wagon rack before the hay is loaded, to be hoisted by derricks. The sling is made of two triangular pieces of the material used, the lower bases of which triangles are joined to wood bars, so arranged that they can be hinged together, and unhinged when the load is raised so as to dump it on the mow or stack. The sling is patented by itself, and also in combination with other devices for carrying the load to the desired point where it is desired to dump it, etc.

FLAX THRASHING AND SEPARATING MACHINE.—This is the invention of James Boyce, of Muncie, Ind. Two or more pairs of rollers, with spiral grooves, are employed to crush the bolls of the flax, one roller in each pair being made to travel faster than the other, by suitable gearing, so that a rubbing as well as crushing action is obtained; and each succeeding pair runs at higher speed than the preceding pair, so that the flax is drawn out and spread, in order to subject all the bolls to crushing and rubbing. The reversed spiral flutes also give a sort of shearing motion, which assists to crush and break the bolls to pieces. A supplementary roller for crushing such bolls as escape the action of the other rollers, and an attachment of shaking riddles and a fan blower, complete the combination.

HYDROCARBON VAPOR BURNER.—This burner is designed for the consumption of naphtha. From a suitable cap, to attach the same to a lamp or a gas burner, rise metal tubes for wicks (the inventor prefers three of these tubes). The wicks lead to a cap at the top, provided with an apparatus for conducting the heat downward to the wicks, and generating the vapor. A peculiar arrangement of orifices is also claimed in the patent, by which, the inventor states, a better illuminating effect is obtained. Invented by William E. Bartlett, of Newburg, N. Y.

HAY RAKE.—This improvements consists in a new method of raising the rake head and rake frame, by a new combination of well known devices. J. George Lockwood, West Davenport, N. Y.

SHARPENING HORSESHOE CALKS.—A heavy pedestal supports a jointed frame, with a system of gearing belts and pulleys which, by the turning of a winch, drives a small emery wheel. The machine is set near a horse, whose foot being raised, the calks are held on the wheel and sharpened, while an assistant turns the winch. Patented by Geo. W. Lane, of Chichester, N. H.

RIDING PLOW.—Benaiah C. Hoyt, Fort Atkinson, Wis.—This invention consists of improvements upon a former invention, patented by the same inventor, September 2, 1856. The plow is one upon which the operator rides. The action of the mold board is supplemented by a complementary concave disk, which formerly turned on a fixed pivot, but in this instance is attached to a shaft which revolves. The machine is easily adjusted for running on level ground, or when a wheel runs in the furrow, maintaining the plow in either case in its proper vertical position. Other improvements provide for increased durability in parts, which have hitherto been subjected to great wear.

FOLDER AND TUCKER.—Thomas Manchester Farrand, Skowhegan, Me.—This is a neat, and apparently very efficient device for folding tucks in shirt bosoms and the like, which cannot be explained without diagrams. It is attached to the table of sewing machines by a clamp screw, in the ordinary way; it occupies but little space, and its design is very neat.

CLOTHES CLAMP.—This is a clasp of non-corrosive wire, bent something in the form of a twisted W, which, when sprung upon a clothes line, gripes it with considerable force. It is a cheap substitute for other devices hitherto used for the same purpose. Invented by Christian L. Poorman, Bellaire, Ohio.

MACHINE OYSTER SHUCKER.—George Holtzman, Baltimore, Md.—This invention relates to a machine that is provided with a socket and jaw for crushing the points or jaws of oyster shells while still closed; and with a rest and spring holder to support the oyster after the point of the shell has been thus crushed, and a sliding knife for opening the shell while thus supported; and with a blade connected with a standard by a universal joint for cutting the oyster out of the shell after it has been thus opened.

SPINNING HEAD.—John W. Chappell, Berlin, Mich.—The object of this invention is to dispense entirely with condensers and jacks, which is accomplished by combining the spinning head, carding cylinder, and winding spool in a novel and peculiar manner.

SEWING MACHINE MOTOR.—D. A. Constable, and John F. Riggs, St. Joseph, Mo.—This invention has for its object to either accelerate or retard the speed of a sewing machine motor, by means of blades hinged to radial arms, which project from a hub that is driven by the motor, the retardation of the speed of the latter being effected by opening the blades so as to cause them to present more of their surface to the air, and thus produce a greater resistance, and the acceleration of speed being effected by closing the blades so as to diminish that part of their surface against which the air acts.

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115,264.—BOBBINS.—J. Adams, W. A. Tolman, Richmond, Ind.
115,265.—FIREPLACE FENDER.—C. C. Algeo, Pittsburgh, Pa.
115,266.—CAR STARTER.—Arthur Amory, New York city.
115,267.—NAIL MACHINE.—Daniel Armstrong, Chicago, Ill.
115,268.—SCALE.—S. C. Baker, Altoona, J. Root, J. Case, York, Pa.
115,269.—HAND STEREOSCOPE.—A. Beckers, New York city.
115,270.—HOT AIR FURNACE.—J. M. Blackman, Decorah, Iowa.
115,271.—SPINNING MULE.—Wm. Bond, Windsorville, Conn.
115,272.—WASHING MACHINE.—Nathan Booth, Cheshire, Ct.
115,273.—CLAMP FOR THILL COUPLING.—W. Boyd, Hartford, Ct.
115,274.—PULP MACHINE.—James Bridge, Augusta, Me.
115,275.—VISE.—H. V. Brown, Warren, Ill.
115,276.—WASHING MACHINE.—J. Brown, W. Manchester, O.
115,277.—GLOVE.—R. D. Burr, Kingsborough, N. Y.
115,278.—ENAMELED METAL.—G. A. Burrough, Providence, R. I.
115,279.—CONVERTER.—Henry Chisholm, Cleveland, Ohio.
115,280.—TRACTION ENGINE.—J. H. Clapham, New York city.
115,281.—BENDING METAL.—W. and H. Cooley, Toronto, Can.
115,282.—HEMMER.—D. H. Darby, Mendon, Ill.
115,283.—FLASK.—H. W. Dee, London, England.
115,284.—GRAIN BINDER.—C. G. Dickinson, Poughkeepsie, N. Y
115,285.—SURGICAL INSTRUMENT.—E. Dithridge, Pittsburgh.
115,286.—KEYED INSTRUMENT.—H. Downes, New York city.
115,287.—MATRICE.—R. E. Draper, Sacramento, Cal.
115,288.—WORK HOLDER.—H. Eddy, N. Bridgewater, Mass.
115,289.—URN STAND.—W. J. Evans, New York city.
115,290.—LATHE SPINDLE.—L. R. Faught, Philadelphia, Pa.
115,291.—DIE STOCK.—L. R. Faught, Philadelphia, Pa.
115,292.—HOISTING APPARATUS.—R. L. Fitch, Sing Sing, N. Y
115,293.—POLISHING ORE.—I. W. Forbes, La Porte, Ind.
115,294.—PULVERIZED ORE.—I. W. Forbes, La Porte, Ind.
115,295.—STAMP BATTERY.—I. W. Forbes, La Porte, Ind.
115,296.—VALVE.—I. W. Forbes, La Porte, Ind.
115,297.—VALVE.—I. W. Forbes, La Porte, Ind.
115,298.—VALVE.—I. W. Forbes, La Porte, Ind.
115,299.—VALVE.—I. W. Forbes, La Porte, Ind.
115,300.—VALVE GEAR.—I. W. Forbes, La Porte, Ind.
115,301.—STEAM ENGINE.—I. W. Forbes, La Porte, Ind.
115,302.—COFFEE ROASTER.—J. Galloway, Webster, Ill.
115,303.—STEAM TRAP.—I. E. Giddings, Springfield, Mass.
115,304.—STANCHION.—W. C. Gifford, Jamestown, N. Y.
115,305.—BLASTING FURNACE.—L. S. Goodrich, Waverly, Ten
115,306.—PACKING BOX.—A. Gregg, Watertown, Mich.
115,307.—WHIFFLETREE.—A. J. Griggs, Pittsburgh, Pa.
115,308.—SOLDERING APPARATUS.—J. Gulden, Keyport, N. J.
115,309.—WIRE ROPE.—A. S. Hallidie, San Francisco, Cal.
115,310.—WIRE ROPE.—A. S. Hallidie, San Francisco, Cal.
115,311.—HORSESHOE.—W. H. Halsey, Philadelphia, Pa.
115,312.—CREASING LEATHER.—B. R. Hamilton, South Deerfield, and S. Swan, Conway, Mass.
115,313.—TURPENTINE BOX.—W. B. Hamilton, N. Orleans, La.
115,314.—TELEGRAPH REPEATER.—C. H. Haskins, Chicago, Ill.
115,315.—LAMP BURNER.—H. W. Hayden, Waterbury, Conn.
115,316.—HUB.—P. Heoter, R. Vietor, Grand Rapids, Mich.
115,317.—WAGON AXLE.—J. H. and P. Hermann, Tell City, Ind.
115,318.—TRIGONOMETRICAL APPARATUS.—E. A. Hickman, Independence, Mo.
115,319.—ANIMAL POKE.—James Hopkins, Akron, Ohio.
115,320.—WASH BOILER.—M. L. Horton, Windsor, Vt.
115,321.—DUMPING CART.—J. B. Hulbert, Hermon, N. Y.
115,322.—STOVE LEG.—H. A. Humphrey, Milwaukee, Wis.
115,323.—CHURN DASHER.—W. F. Jones, Easton, Kansas.
115,324.—CHUCK.—Wm. Kerr, Jr., Boston, Mass.
115,325.—WASHING MACHINE.—B. Kinne, Syracuse, N. Y.
115,326.—GLASS JAR.—W. M. Kirchner, Pittsburgh, Pa.
115,327.—DIGESTER.—W. F. Ladd, New York city.
115,328.—HAND SAW.—O. H. Langdon, Homer, N. Y.
115,329.—LAMP.—H. H. Laughlin, Philadelphia Pa
115,330.—CATCH.—G. C. Lawton, Algona, Iowa.
115,331.—FLOUR BOLT.—F. B. Lewis, Tiffin, Ohio.
115,332.—MUSIC STOOL.—J. R. Lomas, New Haven, Conn.
115,333.—SLIDING DOOR.—T. M. Lyons, New York city.
115,334.—EXHAUST.—P. W. Mackenzie, Blauveltville, N. Y.
115,335.—ELEVATOR.—John Macomb, Chicago, Ill.
115,336.—BAG TIE.—C. P. and W. H. Markham, Rogersville, N. Y
115,337.—CENTERING MACHINE.—E. McNiel, Groton, N. Y.
115,338.—BOILER.—F. Meyer, New York city.
115,339.—VENTILATOR.—B. F. Miller, New York city.
115,340.—EAVES TROUGH.—R. B. Miller, Utica, N. Y.
115,341.—LOCK FOR SASHES.—W. Miller, Boston, Mass.
115,342.—LUBRICATOR.—A. Millochau, New York city.
115,343.—CAR TRUCK.—G. F. Morse, Portland, Me.
115,344.—DRAINER.—P. W. Neefus, New York city.
115,345.—DOOR MAT.—P. W. Neefus, New York city.
115,346.—HORSE COLLAR.—James Nellis, Ypsilanti, Mich.
115,347.—TASSEL.—James Norman, Brooklyn, N. Y.
115,348.—GROOVING MACHINE.—H. J. Noyes, Ashtabula, O
115,349.—LETTER BOARD.—J. H. Palm, Mansfield, Ohio.
115,350.—VAPOR BURNER.—G. T. Parry, Philadelphia, Pa.
115,351.—WATCH.—E. H. Perry, Boston, Mass.
115,352.—GARDEN IMPLEMENT.—A. A. Porter, Griffin, Ga.
115,353.—WASH BOILER.—C. W. Powell, Yalesville, Conn.
115,354.—WIRE FASTENING.—H. W. Putnam, Bennington, Vt.
115,355.—WASHING MACHINE.—L. Putnam, Worcester, Mass.
115,356.—TELEGRAPH RELAY.—C. Rathbone, Albany, N. Y
115,357.—BAGATELLE.—M. Redgrave, Cincinnati, Ohio.
115,358.—PINCH BAR.—Abram Reese, Pittsburgh, Pa.
115,359.—STOVE.—H. R. Remsen, Newtonville, N. Y.
115,360.—BOAT DETACHING.—I. A. Richards, Middletown, Ct.
115,361.—FREEZER.—Moritz Rosenstein, Boston, Mass.
115,362.—WATER WHEEL.—R. R. Royer, Ephratah, Pa.
115,363.—TOBACCO PIPE.—W. G. Ruge, Holstein, Mo.

115,364.—FASTENING.—A. P. Seymour, Hecla Works, N. Y.
115,365.—HYDRAULIC DISK.—T. Shaw, Philadelphia, Pa.
115,366.—WAGON GEARING.—J. Shoulder, Scottsville, N. Y.
115,367.—REMOVING SEDIMENT.—A. J. Simmons, Indianapolis, Ind.
115,368.—GAGE.—D. W. Simmons, Lynn, Mass.
115,369.—CARBURETING.—Byron Sloper, St. Louis, Mo.
115,370.—SHOT GUN.—Dexter Smith, Springfield, Ill.
115,371.—BEDSTEAD.—George Smith, Stratford, Canada.
115,372.—WRINGER.—H. E. Smith, New York city.
115,373.—IGNITING GAS.—W. H. Smith, New York city.
115,374.—FLY NET.—William Sohier, Boston, Mass.
115,375.—DRYING PAPER.—W. H. Soley, Philadelphia, Pa.
115,376.—HARVESTER.—J. Souder and E. Miller, Litiz, Pa.
115,377.—MOLD.—Carl Stadelmann, Pittsburgh, Pa.
115,378.—EXTRACTING TAR.—J. D. Stanley, Baltimore, Md.
115,379.—SEWING MACHINE.—D. E. Stearns, Berea, Ohio.
115,380.—PADDLE WHEEL.—J. M. Story, Cincinnati, Ohio.
115,381.—ENVELOPE MACHINE.—H. D. and D. W. Swift, Worcester, Mass.
115,382.—ENVELOPE MACHINE.—H. D. and D. W. Swift, Worcester, Mass.
115,383.—DESK.—L. and W. F. Sylla, Elgin, Ill.
115,384.—POLISHING STICK.—G. C. Taft, Worcester, Mass.
115,385.—LANTERN.—A. E. Taylor, New Britain, Conn.
115,386.—LIFE PRESERVER.—B. W. Taylor, Henderson, Ky.
115,387.—BREAKING HEMP.—T. Tebow, Lexington, Ky.
115,388.—BAGGING.—Theodore Tebow, Lexington, Ky.
115,389.—WATER WHEEL.—W. J. Thompson, Springfield, Mo.
115,390.—STIRRING MALT.—W. Toepfer, Milwaukee, Wis.
115,391.—PRINTING PRESS.—W. H. R. Toye, Philadelphia, Pa.
115,392.—STEAM HEATER.—C. W. Trotter, Rochester, N. Y.
115,393.—BOBBIN WINDER.—J. W. Vaughan, New York city.
115,394.—CAR COUPLING.—J. B. Vedder, Gloversville, N. Y.
115,395.—BOILING SUGAR, ETC.—I. Vest, New Iberia, La.
115,396.—WAGON JACK.—J. Wagner, Lancaster Co., Pa.
115,397.—SMUT MACHINE.—T. Wallace, Chicago, G. W. Hyde, Joliet, Ill.
115,398.—VAPOR BURNER.—T. Ward, Columbus, O., H. C. Hunt, Chicago, Ill.
115,399.—CARPET SWEEPER.—O. H. Weed, Boston, Mass.
115,400.—STEAM ENGINE.—P. L. Weimer, Lebanon, Pa.
115,401.—PLANING MACHINE.—S. Whitesides, De Pere, Wis.
115,402.—CURTAIN FIXTURE.—W. C. Wilcox, Waltham, Ms.
115,403.—STOP MOTION. P. Wilson, J. Hunter, Manchester, N.H.
115,404.—FURNITURE.—W. H. Windsor, Little Rock, Ark.
115,405.—HORSESHOE CALKS.—E. D. Withers, Parkton, Md.
115,406.—MOVEMENT.—Jacob Woolf, Burr Oak, Mich.
115,407.—WORM REMEDY.—A. E. Wright. Hamlin, N. Y.
115,408.—TABLE SINK.—John Wylie, Bethel, Conn.
115,409.—ICE.—Albert Albertson, Jersey City, N. J.
115,410.—ADJUSTER.—S. A. Alexander, Sunbury, Pa.
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115,412.—FLOUR BOLT.—E. D. Auchey, Manheim, Pa.
115,413.—SPIRAL SPRING.—T. Baggott, Baltimore, Md.
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115,421.—SPIKE EXTRACTOR.—J. A. Bogert. Jersey City, N.J.
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115,551.—WATER WHEEL.—T. Whitmore, Waterloo, Iowa.
115,552.—CHURN.—J. B. Williams, Glastenbury, Conn.
115,553.—SEED DRILL.—G. W. Millner, Charlottetown, P.E.I.
115,554.—PHOTOGRAPH PAPER.—J.L. Winner, Elizabeth N.C.

REISSUES.

4,399.—EVAPORATING BRINE.—S. D. Gilson, Syracuse, N.Y.—Patent No. 108,701, dated Oct. 25, 1870.
4,400.—PRINTING PRESS.—R. M. Hoe, S. D. Tucker, New York city.—Patent No. 84,627, dated Dec. 1, 1868.
4,401.—RADIATOR.—Wm. Steffe, Philadelphia, Pa.—Patent No. 80,883, dated Aug. 11, 1868.
4,402.—STENCIL PLATE.—E. L. Tarbox, New York city.—Patent No. 8 ,883, dated Aug. 11, 1868.
4,403.—Division A.—TAP FOR OIL PACKAGES.—A. Warth, Stapleton, N.Y.—Patent No. 110,612, dated Dec. 27, 1870.
4,404.—Division B.—TAP FOR OIL PACKAGES.—A. Warth, Stapleton, N.Y.—Patent No. 110,612, dated Dec. 27, 1870.
4,405.—CRIB FOR HORSES.—Henry Eddy, North Bridgewater, Mass.—Patent No. 36,287, dated Aug. 26, 1862.
4,406.—WASHER.—J. H. Gridley, Washington, D. C.—Patent No 62,483, dated Feb. 26, 1867; reissue No. 4,354, dated Apr. 25, 1871.
4,407.—CHANNELING ROCK.—E. G. Lamson, Shelburne Falls, Mass.—Patent No. 58,635, dated Oct. 2, 1866; reissue No. 3,366, dated April 13, 1869.
4,408.—ADJUSTABLE DASHER FOR VEHICLES.—G. M. Peters, Columbus, Ohio.—Patent No. 102,315, dated April 26, 1870.
4,409.—CIRCULAR SAW MILL.—S. R. Smith, Cincinnati, O.—Patent No. 16,454, dated Jan. 20, 1857; extended 7 years.
4,410.—RAILROAD TURN TABLE.—A. J. Wight, W. L. Meeker, Newark, N.J.—Patent No. 104,388, dated June 14, 1870.

DESIGNS.

4,942.—CLOCK FRONT.—John A. Batchelor, New York city.
4,943.—CARPET PATTERN.—R. Charlton, Liversedge, Eng.
4,944.—CARPET PATTERN.—John Fisher, Enfield, Conn.
4,945.—CHAIN PUMP.—Henry L. Fry, Cincinnati, Ohio.
4,946.—SHOWCASE.—W. H. Grove, Philadelphia, Pa.
4,947.—STOVE.—L. W. Harwood, Troy, N.Y.
4,948.—CLOCK CASE SASH.—Elias Ingraham, Bristol, Conn.
4,949.—BELLOWS.—Alfred F. Jones, New York city.
4,950 to 4,952.—CARPET PATTERN.—W.Kerr, Philadelphia, Pa.
4,953.—OVEN SHOVEL.—Thomas Lyons, Hartford, Conn.
4,954.—FRUIT CAN.—John F. Merrill, Cincinnati, Ohio.
4,955.—BED QUILT.—John U. Nef, Housatonic, Mass.
4,956.—CARPET PATTERN.—John H. Smith, Enfield, Conn.
4,957.—CELLULAR FABRIC.—Thomas Dolan, Philadelphia, Pa.
4,958 to 4,961.—IRON MANTEL.—C. B. Evans, J. Carlisle, G. H. Burrows, Cincinnati, Ohio.
4,962.—BRACKET.—H. Gilson, C. F. Southwick, Nashua, N.H.
4,963.—CENTER PIECE IN CEILINGS.—E.Goutink, Detroit, Mich.
4,964.—WEATHERBOARDING.—Jacob Jacoby, Johnstown, Pa.
4,965, 4,966.—CENTER PIECE.—S. Kellett, San Francisco, Cal.
4,967.—CLAW BAR.—John McMahon, Wooster, Ohio.
4,968.—FLOOR CLOTH PATTERN. V.E.Meyer, Lansingburg, N.Y.
4,969.—SPADE.—Harrison Parkman, Philadelphia, Pa.

TRADE-MARKS.

290.—FLOUR.—S. H. Anderson & Co., Palmyra, Mo.
291.—TWIST TOBACCO.—R.W.Cameron & Co., New York city.
292.—KEROSENE.—R. W. Cameron & Co., New York city.
293.—FERTILIZER.—Charleston Mining and Manufacturing Co., Philadelphia, Pa.
294.—CARPET LINING.—George W. Chipman, Boston, Mass.
295.—STOVE.—Comstock, Castle & Co., Quincy, Ill.
296, 297.—FURNISHING GOODS.—Fisk, Clark & Flagg, New York.
298.—GARTER.—Amasa H. Pike, Somerville, Mass.
299, 300.—RAZOR.—Robert J. Roberts, New York city.
301.—WHISKY.—Seltzer & Miller, Philadelphia, Pa.
302 to 304.—AX. Douglas Ax Manufacturing Co., Douglas, Mass.
305.—SOAP.—Charles E. Willetts, Chicago, Ill.

Inventions Patented in England by Americans.

May 9 to May 15, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.

CLEANSING FABRICS.—E. Bacon, New York city.
COFFERDAM.—J. E. Walsh, New York city.
CULTIVATOR.—M. Johnson, Three Rivers, Mich.
FARE COLLECTER.—J. B. Slawson, New York city.
FERTILIZER.—G. T. Lewis, Philadelphia, Pa.
GOVERNOR.—R. K. Huntoon, Mass.
MIRROR.—Florence Manufacturing Co., Florence, Mass.
SELF-RAISING FLOUR.—G. Gray, Boston, Mass.
TRACTION ENGINE.—A. Campbell, R. Clark, Sacramento, Cal.
WEIGHING MACHINE.—F. A. & C. B. Allen, Mansfield, Pa.

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SEPARATING ORE.—Thomas J. Chubb, of New York city, has petitioned for an extension of the above patent. Day of hearing, August 9, 1871.

CULTIVATOR.—Charles H. Sayre, of Utica, N.Y., has petitioned for an extension of the above patent. Day of hearing, August 9, 1871.

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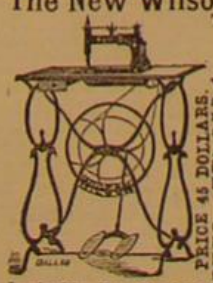
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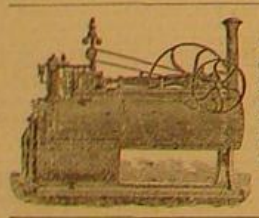
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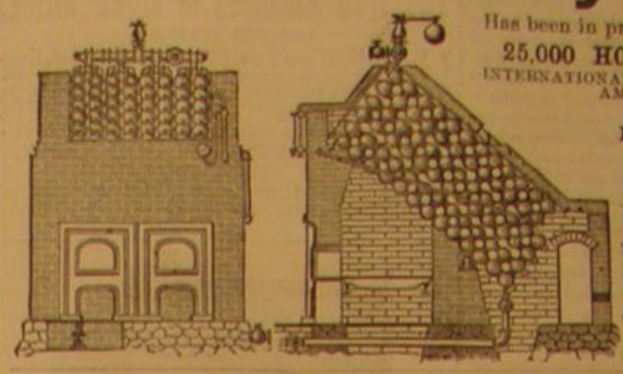
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