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Improved Horse-power Fire Engine.

The several parts of this invention, in themselves, contain but slight elements of novelty, yet the combination of these parts, which is covered by the patent, constitutes, in our opinion, an important and useful improvement, and one which has before it a large field in which it may be advantageously and economically applied.

Our artist has so well delineated the machine that it will be at once understood by all familiar with fire engines. It is a combination of the well-known and extensively used endless apron horse-power machine with a force pump, and reel for a hose; the force pump and reel being placed at the front, as shown. The pump is driven by a crank motion actuated by a pair of bevel gears, the suction and delivery hose being coupled underneath the barrel of the pump, or in any other convenient position, the relative position of the parts not being material to the claims of the inventor. The whole is placed and fixed on a suitable truck, and the weight of the entire apparatus including truck may, it is thought, be brought within 2,500 pounds.

McCARTHY'S HORSE-POWER ENGINE FOR EXTINGUISHING FIRES.

A folding back, when let down as shown in the engraving, forms a bridge whereby the horses mount to the endless apron. The engine is drawn by horses to the place of conflagration, and is ready to operate as soon as the horses can be unhitched from the carriage and led upon the endless apron described.

For rural towns and the suburbs of large cities, this engine possesses many advantages, coming, as it does, between the hand engine and the expensive steam fire-engine. Its lightness enables it to be rapidly drawn to a fire, and the cost of fuel is saved. Its cost is much less than a steam engine, and its working efficiency may be made much greater than that of a hand engine as the number of horses is not limited to two, but three or four may be used in machines of large capacity. It thus has, in proportion to the working power of the horses, the advantages of steam fire-engines, without the defects of hand engines, not the least of which is the generally admitted demoralizing tendency of volunteer fire-company organizations upon the youth who for the most part compose them. Extra hose-carts are not needed. The machine may be placed in charge of some responsible person in small towns, and when required two or three men may effectually operate it. Where the water has to be raised only a short distance through the suction pipe it is claimed that two horses will, through two hundred feet of hose, throw a three-quarter-inch stream to a hight of from sixty to seventy feet.

We think this machine peculiarly adapted to the wants of far-western towns. In such cases it might be placed in the care of the postmaster, merchant, or other responsible party centrally located, and would be an important safeguard against those disastrous conflagrations which have so frequently ravaged our border settlements.

Patented, through the Scientific American Patent Agency, Nov. 2, 1869. For further information concerning rights, etc., address John C. McCarthy, patentee, 131 Barrow street, New York.

Novel Trout Fishing.

The *Virginia City* (Nevada) *Enterprise* states that trout are taken at Carson in the following unique manner:

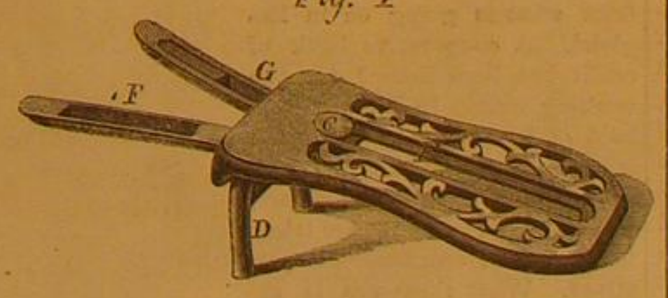
"They take a cartridge of 'Giant' powder, weighing about a quarter of a pound, insert into it a piece of fuse, properly capped, about six inches in length, then, lighting the fuse, the cartridge is thrown into any deep hole supposed to contain trout or other fish. After the cartridge has been thrown into the water, smoke and bubbles of gas are seen to rise to the surface, then in a few moments comes the explosion—a dull, heavy report. The surface of the water is seen to bulge up, and the ground can be felt to shake for fifteen or twenty feet back from the water.

"Immediately after the explosion, all the fish that happen to be within a circle of twenty-five or thirty feet of the spot where the cartridge fell, come to the surface, either killed outright or so badly stunned that it is some minutes before they recover. Our informant says that with two cartridges he saw over fifty pounds of fish killed, counting trout, white fish, and chubs. In places, after a blast, the whole surface of the water would be covered with minnows from an inch to three or four inches in length. At Elko they are practicing the same style of fishing, only that out there they tie the cartridge to the end of a long pole and thrust it into the water, holding it until the explosion occurs. This is the most destructive mode of fishing we have ever heard of; it is a regular wholesale slaughter of great and small, good and bad. Should the practice gain ground it will be necessary for the Legislature to put a stop to it by making it a criminal offense to fish with Giant powder. Parties have already been talking of trying this process in Lake Tahoe, where, by using large cartridges, they expect to bring up hundreds of trout at a single shot."

SEYMOUR'S PATENT POCKET BOOT-JACK.

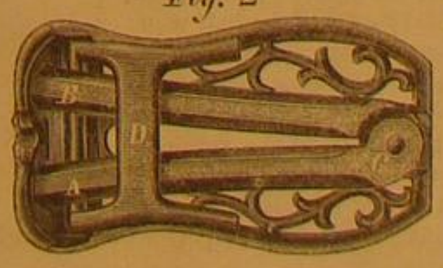
This convenient little implement is made of cast iron, and is so contrived that it may be folded into a very small space, as shown in Fig. 2, or extended for use as shown in Fig. 1.

Fig. 1



The jaws, F G, are pivoted together at C, the head of the pivot sliding in a rib of a slot, E, in the foot plate. The jaws have grooves in their upper surfaces, as shown in Fig. 1, the groove of one being placed further back than the groove of the other. The support, D, of the foot plate, is pivoted to the foot plate, and folds down, as shown in Fig. 2, when the jaws are thrust back; thus making a very compact arrangement for carrying in the pocket or carpet bag. The folding and unfolding of the support, D, is effected by lugs cast upon the portion of the support, D, which passes between the jaws and the foot plate. These lugs lie directly under the points of the jaws indicated by the letters A and B, Fig. 2. The outer end of the groove which lies nearest to the foot plate, Fig. 1, striking against the lug which plays in that groove folds down the support when the jaws are thrust in; while the inner end of the groove in the other jaw, striking the lug which slides in that groove, unfolds it when the jaws are thrust out. The jaws slide in ways which force them together when they are thrust in, and open them when they are thrust out.

Fig. 2



This implement will draw any sized boot from a lady's gaiter to the largest men's wear. Its convenience to travellers, as well as others, is obvious.

Patented through the Scientific American Patent Agency, Oct. 29, 1867, by Albert P. Seymour, of Hecla Works, Oneida county, N. Y., who may be addressed for the entire right for the United States or for State rights.

The East River Bridge.

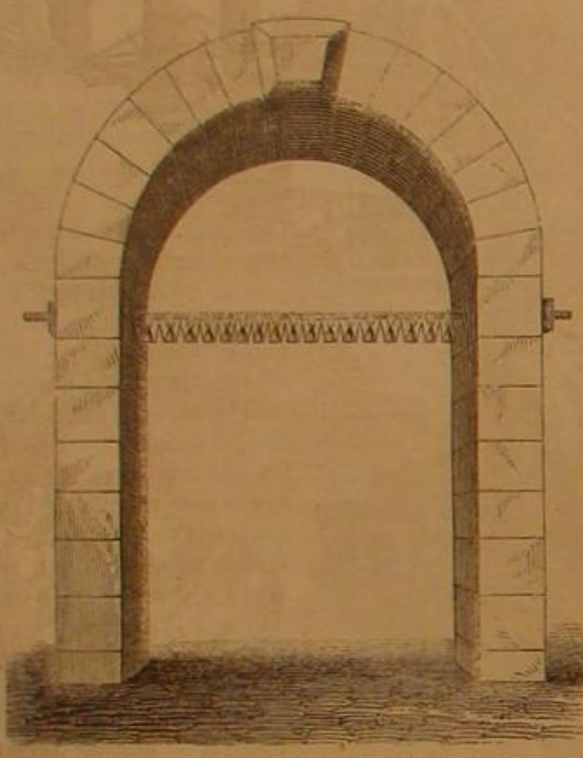
We learn from the Brooklyn *Times* that the construction of the caisson which is to be sunk at the base of the Brooklyn tower of the East River Bridge, is begun, and is now well under way. Colonel Wm. H. Paine is present at Messrs. Webb's yard every day, superintending the work on behalf of the Bridge Company. It is expected that the caisson will be ready to launch some time in March. It will then be floated to the location of the Brooklyn foundation of the tower. The river shore will be dredged out to low water line, and the caisson floated into its position on a high tide; on the water receding, it will be anchored or "seated," and excavating to sink it the required depth will be carried on in its interior. Through the roof will be six shafts, or funnels, made of half-inch boiler iron. The two supply shafts through which the workmen descend and ascend, and by which the excavated soil is removed, will be twenty-one inches in diameter each. Each of the two air shafts, by which air is supplied to the workmen, is forty-two inches in diameter. Each of the two water shafts, in which the water oozing through the soil will be conducted, so as to keep clear of the workmen, is seven feet square. On top of this caisson will be piled timber to the hight of fifteen feet, and the whole mass filled in with concrete; and on this bed of wood and stone will be placed the masonry for the towers.

The caisson is in shape a parallelogram, 168 feet long and 102 feet wide on the outside, and is about 15 feet high. The sides are V-shaped, the bottom being eight inches thick, and the top eight feet three inches, and ten feet high, and the roof, which rests on these sides, is five feet thick. The whole is constructed with yellow pine a foot square, with the seams caulked. Between the outside layers of timber is a sheathing or layer of tin, between two of felt, intended to prevent the atmosphere from working into the interior of the caisson. The sharp edges of the structure, are to facilitate the sinking of the box thirty feet beneath low tide level, and accordingly this portion is strongly made. The first layer of timber is of oak; on this is bolted a cast-iron shoe, eight inches wide, oval on its face, being three inches thick in the center. Around the shoe is placed an armor of boiler iron, extending three feet above the shoe, on both sides of the wall, the whole strengthened by heavy angle irons on the interior, sixteen feet long. As the pressure of air on the caisson will increase as it sinks, it is estimated that the atmosphere resting on the surface will vary from 18,000 tuns to 40,000 tuns. Consequently, careful and accurate calculation is made to give strength to the box. The timbers are all bolted together, perpendicularly, horizontally, and diagonally, with the heaviest and longest bolts ever used. These bolts are, on an average, eighteen inches apart throughout the structure, and the ends are made air-tight by rubber washers. The immense number of bolts may be imagined, when it is expected that one hundred tuns of them will be used. The interior of the caisson will be a room one hundred and sixty-six feet long, one hundred feet wide, and nine feet high. There will be about one million five hundred thousand lineal feet of timber used in constructing the caisson, and when ready for launching it will weigh three thousand tuns. In order to launch it, there will be seven ways or keels underneath, and a water-tight compartment, or air-chamber, in the interior, thirty-eight feet wide, extending lengthwise. In addition to this there are ten heavy supporting frames to sustain the roof.

As regards the negotiations for obtaining the site for the tower on the Brooklyn side, it appears that they have so far made but little progress. This tower will, it is understood, be built in the third or upper slip of the Fulton ferry. The Ferry Company lease their ferry property from the City of New York, and the Commissioners of the Sinking Fund of that city are vested with the power of leasing and selling public property. The Brooklyn *Eagle* states that when negotiations were opened by the Bridge Company to obtain possession of the upper slip and section of the adjacent land, the Sinking Fund Commissioners referred the matter to a Commission of Estimate and Assessment, consisting of Wilson G. Hunt, and Thomas R. Agnew, who have not yet made their report. It is understood, however, that this will be forthcoming without much further delay, after which the preparations for the reception of the caisson will be at once proceeded with.

The Force of Contraction Applied to Repairs of Buildings.

The force of contraction is equal to that of expansion, and quite as irresistible. Its immense power was strikingly illustrated some years since in Paris. The two sides of a large building, the "*Conservatoire des Arts et Métiers*," having been pressed out by the spreading of the arched ceilings and the immense weights supported by the floors, M. Molard undertook to remedy the evil by boring holes in the wall at the base of the vaulted ceilings, and opposite to each other, through which strong iron rods were introduced, so as to cross the interior of the building from one side to the other. On the projecting ends of the bars on the outside of the building were placed strong iron plates, which were screwed, by means of nuts, tightly against the walls. The rods were then heated by means of rows of lamps placed under every alternate bar, and being lengthened by the expansion, the



nuts and plates were pushed out to the distance of an inch or more beyond the walls. While in this condition, the nuts were screwed a second time tightly against the wall. The lamps were then extinguished, and the rods, contracting as they cooled, drew the walls together with a force almost irresistible, and to a distance as great as that to which they had been lengthened by expansion. These bars being then left in their new position, the *alternate* bars, which had remained unheated, and by the contraction of the others had been also made to project beyond the walls, were again tightly screwed against the building. These were in turn expanded and lengthened by the application of the lighted lamps, and once more screwed up tightly against the walls. The lamps were then extinguished, and by the contraction of the second set of bars the walls were drawn still further toward each other. These were then left, in turn, to hold the building in its new position, and the first set of bars a second time brought into requisition. And thus the process was continued until the walls were drawn into their proper vertical position; and the bars being left in their places, they have remained firm and upright ever since. In this manner a force was exerted which the power of man could scarcely have applied by any other means. The same process has since been applied to the restoration of other buildings which were threatening to fall.—*Pynchon's Chemical Forces.*

Air in Illuminating Gas.

Professors Silliman and Wurtz have been investigating the effects of atmospheric air upon the illuminating power of gas, with, according to the *Chemical News*, the following results:

"For any quantity of air less than 5 per cent, mixed with gas, the loss in candle power due to the addition of each 1 per cent, is a little over six tenths of a candle (0·611 exactly); above that quantity the ratio of loss falls to half candle power for each additional 1 per cent up to about 12 per cent of air; above which, up to 5 per cent, the loss in illuminating power is nearly four tenths of a candle for each 1 per cent of air added to the gas. With less than one fourth of atmospheric air, not quite 15 per cent of the total illuminating power remains, and with between 30 and 40 per cent, it totally disappears.

A Belgian report on the preservation of telegraph posts decides that chloride of zinc is the best and cheapest agency to employ, though it does not work equally well in all soils

Railway Bridge Across the Seine.

Our illustration annexed represents a railway bridge which crosses the Seine, below Paris, at the Point du Jour, on the Chemin de Fer du Ceinture. The bridge, which is rather a remarkable structure, is built in two stories, the lower one consisting of five elliptical, and the upper one of thirty semicircular arches. The span of the lower arches is, in each instance, 99·2 feet; and that of each of the upper arches 15·5 feet. The intermediate piers of the lower arches are each 15·5 feet thick in the direction of the length of the bridge, and those of the upper series of arches measure at the springing of the latter 3·36 feet in the same direction. The upper arches carry the Chemin de Fer du Ceinture, the roadway being 29·5 feet wide, the width of the lower being 131·7 feet, thus affording ample room on each side of the upper viaduct for a carriage and foot-way, the carriage roads being each 24·6 feet wide. The materials used in the erection of the bridge are cut stone and rubble, the parapets and balustrades being of Jura marble. In the large spans the stones are set in cement. The river bed beneath is of clay, chalk being reached under the left abutment, at a depth of about 26 feet, while on the sides of piers and right abutment, sand was met with. In making foundations for the piers, large bottomless wooden caissons were sunk nearly to the chalk, and were then partially filled in with beton, on which the masonry was built by the aid of coffer dams. The ends of the centers of the large arches were supported by dried sand contained in suitable boxes, and they were struck by allowing the sand to escape; the centers were only lowered about one fifth of an inch at one time. The lower story was entirely completed before the upper one was commenced. The bridge was erected about four years and a half since, at a cost of $650,000, from the designs of M. Bassompiere, engineer to the Chemin de Fer du Ceinture.

RAILWAY BRIDGE ACROSS THE SEINE, BELOW PARIS.

Co-operation in Italy.

A Naples correspondent of the London *Times* says:

"One of the most striking features in modern constitutional Italy, is the disposition to form associations. This, of course, is one of the natural results of political liberty, but in the last week or so, we have had a development of it on the co-operative principle, which has probably received an impulse from what is going on in England. A co-operative bank of credit has been formed for the working classes in Naples. One half of its shares have already been taken. The remaining shares are offered to the working classes, and as soon as two fifths are taken the bank will commence its operations. What these are is explained as follows: Limited loans on word of honor, prudently restricted to seventy-five lire; discounting work; discounting bills; receipt of savings, even so low as ten centesimi; deposits in running accounts; advances on public property. Many even of the half who have already taken shares, it is said, are working men, not heads of establishments; and, as this is the first instance of the application of the co-operative principle to credit in Southern Italy among the working classes, the experiment is regarded with much interest.

"A bank of the same kind exists in Padua, and has met with considerable success, having with a capital of 30,000 lire conducted affairs in the first year to the amount of 300,000 lire; but without meaning to throw cold water on any effort in a right direction, still it remains to be seen whether the social atmosphere of Southern Italy is as favorable to the growth of such institutions as that of Northern Italy. At all events, the working classes are daily becoming a more important element here; partly, no doubt, from the increased demand for labor, which has been created by private and public enterprise, and as much from the instruction they have received during the last nine years.

"The labor market, I may add, is not sufficiently supplied in this country, and the rate of wages has risen within a few years, in some trades, one half higher than it was before. Another and a novel instance of the application of the co-operative principle, is announced as having been made, not by workmen, but by masters—that is, by the architects of Caserta, with whom those of the neighboring town of Maddaloni have united themselves. Under the title of the 'Association of Architects of the city of Caserta,' they undertake, in their common interest, any commission connected with their profession, and to resolve all questions of art in the meetings of the society. While, therefore, not paying more than would be demanded by a single engineer, it is pointed out as one of the great advantages offered by the association that any person entering on a building or engineering enterprise would here have the benefit of the united study, intelligence, and activity of many. I do not say a word as to the merits or prospects of success of these associations, but report them merely as an indication of that awakening of the public

Italian mind which in many directions and forms is so evident."

Correspondence.

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

Proposed Industrial Fair at Washington.

MESSRS. EDITORS:—There is now in the Treasury of the United States more than $500,000 of money received through the Patent Office in excess of expenses. The average amount of such surplus that may be calculated upon hereafter will not be less than $200,000 per annum. All the other bureaus are maintained entirely at the expense of the Treasury. But Congress intended that the Patent Office should be in the main self-sustaining, and to the special tax necessary for that purpose the inventors of the world—for whose benefit the Office was created—consent. It seems reasonable, however, that the taxes thus paid by them should be appropriated for their benefit, and that they should not be diverted to other uses, so long at least as there were wants of their own to the relief of which the money might properly be applied.

Now the models which are required by law are of great and daily importance, and should not be dispensed with unless from necessity. But the space provided for them is already mainly occupied, and about 5,000 square feet of additional shelf surface is required every year. It would also be of great advantage to the supporters of the Patent Office if opportunity were afforded to exhibit working machinery as well as manufactures and other products.

Two years ago it occurred to me that this surplus, which was then said to be of about half its present amount, might with propriety and advantage be applied to the commencement of a structure that would meet present wants and be capable of indefinite expansion. An eminent architect expressed the opinion that such an undertaking would be perfectly feasible. It was believed that from moderate beginnings the present wants of the Office and its patrons might thus be supplied by an institution that would grow into proportions commensurate with the growing requirements and capabilities of the American people, that international rivalries might also be invited—that it might thus at length become developed into a permanent world's fair, at the same time that it subserved the legitimate purposes of the Patent Office.

Circumstances prevented an effort to carry out that project then, but other circumstances have revived the intention now. At least it has seemed proper that the idea should be presented and discussed, and, if deemed expedient, adopted and urged to its consummation.

An effort is now being made by the people of this district to hold a World's Fair in this city at no distant day. Nearly half a million of dollars have already been subscribed for that purpose, and it is confidently believed that this amount may be increased to $1,000,000. Especially if, instead of being a temporary undertaking, it is made one which contemplates permanency.

Now if these two projects were united, could they not be worked up into what might prove a great mutual as well as general advantage? There is competent authority for saying that with $1,500,000 a permanent structure of iron and glass might be made of a capacity at least equal to that of the entire Patent Office building. Sufficient space for the arrangement and preservation of models would thus be provided as well as for manufactures and machinery of all descriptions. A permanent temple would thus be erected to human ingenuity to which men of genius from all quarters would resort to give and receive new inspiration.

I hope the thought will not be deemed extravagant that under the united influence of the Smithsonian Institution, the Patent Office, and the Agricultural Department, this establishment might at length become the chief center of the arts and sciences of the civilized world.

As far as has been yet ascertained the matter as thus presented meets with favor among those under whose auspices the project of a World's Fair here has been inaugurated. Before making any serious effort on the subject, however, it is thought expedient to know the views of inventors and their friends on this subject. Your position and character render your opinions of great moment, and on that account I now address you.

It is not proposed to ask the appropriation of a single dollar by Congress. All that would be expected from that quarter would be a permission to appropriate funds which rightfully belong to the Patent Office to aid in carrying out the common enterprise which is mainly for its benefit.

I am fully conscious of the fact that, in a mere financial point of view, the "Exposition" would prove a much greater success, if held in some large commercial city. But that is not the question now. The enterprise is already undertaken. It will be carried through, as I am assured. Whether it prove a financial success, or otherwise, to the stockholders is not an element in our present calculation. It is only here that the Patent Office could, with any propriety, connect itself with such an undertaking, for it is only here that this undertaking could yield those advantages that would justify the connection and expenditure. Besides, Washington is not the commercial rival of any other city, and the jealousy that might be excited against most other plans of like magnitude would interpose no obstacle here.

Washington, D. C. CHAS. MASON.

Magnetic Action of Wind Currents.

MESSRS. EDITORS:—I have been making some experiments for the past three months, which, I think, will interest some of your readers. The instrument used consists of a wind vane made of a thin board some four inches long by one twentieth wide, and as thick as a sheet of commercial note paper. In one end are placed four magnets, so arranged that the south poles point down and perpendicular to the vane, which turns freely on a pivot. The instrument is placed in a box so that the air cannot disturb it.

It sounds singular to hear of a wind vane protected from the wind, but, so it is, and I have never, during the entire course of my experiments, found it at fault in indicating the quarter the wind comes from, and that some little time before it comes. The final experiment was made to-day. I placed the instrument at right angles to a meridian traced on the floor, and left it to itself for one hour. When, on returning, I found it had changed its position, and pointed to the southwest. I timed it, and found that in fifteen minutes the wind came from the southwest (number 1 of the Smithsonian table). There had been nothing of note, in a meteorological point of view, for over one week, so that the magnetic currents could not have influenced the vane. ERNEST TURNER, C. E.

Philadelphia, Pa.

Suggestions about Steam Navigation and Steam Boilers.

MESSRS. EDITORS:—One of the greatest benefits your valuable journal confers is, that its columns afford a means of ready communication between all classes of inventors—those of the hand as well as those of the brain; and thus the floating, useless visions of the theorist meet, fructify, and utilize the barren though vigorous growth of the man of practice alone. The mechanic sets his wheels and gear, and calls for assistance; a spirit is breathed upon them which animates the mass. Encouraged by such reflections, I venture to send you some of my random ideas for publication. They *might* be flint to some ones steel. Concisely and briefly, then, in regard to steam navigation:

Robert Stevenson said, the problem here was how to diminish the friction of the vessel and the water; not how to increase the power of engines. Among others, two systems might accomplish this: The discovery of a new instrument, or new application of the old; or a change of naval construction.

First—taking it for granted, I am not quite sure, that the resistance is as the square of the depth, then a lessening of depth in the water, with same power, would increase speed. We need, therefore, as it were, to raise the vessel. If gas raises a balloon, it should raise a ship, and naturally suggests itself as the means. A ship, contrived by the aid of gas, to draw only one, or a few feet of water, with a powerful engine, would seem, in theory, to solve Stevenson's problem. My objection is, the vast bulk of gas; but my calculations may be wrong. I suggest the use of gas, in this manner, as a subject for reflection.

I believe ships are now modeled after the fish because nature is supposed to have suggested it. They are made sharp and deep. I suggest, ships do not go through the water like a fish, but over the water like a duck. The water fowl is nature's model for those things which go over the water, flat, broad, and rounded. The objection of the effect of waves is futile. The center of gravity is at our disposal.

Another problem is to lessen the consumption of fuel. Now, a steam boiler consists of water in a metal vessel. When fire is applied, the metal absorbs a vast amount of heat, radiates, deflects, and otherwise destroys the effect of the fuel on the water. This is entirely due to the material of the boiler. What we want, then, is some agent which will hold the steam and water, while it will allow the direct action of the fire on the water—a substance which shall pass rays of heat as fully as glass does the rays of light—a heat-glass. Rock salt does so perfectly, so far as the heat is concerned, but is soluble and combustible. Can not some chemist give us a silicate of sodium which will answer? GEO. R. PHELAN.

Memphis, Tenn.

The Tidal Wave.

MESSRS. EDITORS:—The SCIENTIFIC AMERICAN, of November 13th, contains an article on this subject, copied from the London *Spectator*, and your readers are admonished editorially against overwhelming you with remarks on the same. It is, therefore, with hesitancy that I venture the following.

The drift of the paper quoted, is to show that by the tidal action, the rotation of the earth on its axis is retarded in consequence of the friction of the water, following the wave in its westerly and opposing direction to the earth's rotation. This is substantially the sum of the proposition.

Since the friction of the water is the retarding cause, how would the case stand if there were no water, or if solidified, and itself became friction, leaving a dry earth.

Trivial as this assigned cause, friction, appears, to disturb the precision of the earth's rotation, remaining undetected for ages, does it even exist, in an appreciable degree, or if so, is not its tendency to accelerate the rotation?

If we start with a swell or wave under the moon, the western course of her attraction would keep up the swell from the advancing or western side, and the eastern side would be constantly receding, *i. e.*, the source of renewal to the swell would be drawn from the advance and its decline eastward, by the retiring attraction of the moon. Hence, the friction of the water, both to and from the swell, would be in favor of acceleration. THOS. W. BAKEWELL.

Pittsburgh, Pa.

RAT POISON.—Recent experiments have shown that squills is an excellent poison for rats. The powder should be mixed with some fatty substance, and spread upon slices of bread. The pulp of onions is also good. Rats are very fond of either.—*Journal de Chimie.*

[For the Scientific American.]

THE SPECTROSCOPE AND AURORA BOREALIS.

BY DANIEL KNODE WINDER.

In a report of the proceedings of the Royal Astronomical Society, published in May last, there is a record of several interesting observations, concerning the spectrum lines of Aurora, which it is interesting to compare with several observations made on this side of the Atlantic Ocean. These observations promise to be useful in aiding us to determine the nature of the Northern Light.

In the report alluded to, Mr. Plumber tells us, that in the spectrum of Aurora, he saw one bright line in the green, near E.

Mr. Angström saw it as one bright line in the yellow, near D, and several faint bands, near F.

Mr. Struve observed one bright line, near D, and traces of two others in the green.

Professor Winlock has seen six lines, the brightest of which was near E.

The writer has frequently seen one bright line in the yellow, near D (coincident with one of a group of lines which appear in the solar spectrum, when the sun is near the horizon), and one faint line in the green. On one occasion there was visible one additional line in the red.

It has always proved a difficult task to determine, with certainty, the position of the spectrum lines of Aurora, and as the value of observations with the spectroscope rests principally upon our ability to do so, I am glad to find that the locations of eight lines have been announced.

The wave length of M. Angström's bright line is 556·7.

The lines seen by Mr. Winlock, he determines, micrometrically to be as follows: the bright line 1474, the other five lines, 1280, 1400, 1550, 1680, 2640, Kirchoff's scale.

The bright line seen by myself I found to be very nearly 557.

Now we learn from these observations: First, that the light of Aurora gives a spectrum consisting of bright lines; secondly, that the same number of lines are not always seen; thirdly, that the lines are fixed in their positions; fourthly, that the same line is not always the brightest; lastly, that one line in the spectrum of Aurora is coincident with a dark line, which appears in the solar spectrum, when the sun is near the horizon.

I was much pleased to find in No. 15, current volume, SCIENTIFIC AMERICAN, an interesting letter from Professor Vander Weyde, criticising the conclusions reached by M. Angström, and, also, those resulting from my own observations. To the objections which he urges against my hypothesis I will reply briefly, and, I trust, in the same kind spirit which he has shown in his criticism.

First, he objects because the spectrum seen by me is different from the spectrum of oxygen.

I reply, that this is a weighty objection to the opinion I have expressed, that Polar light is principally incandescent oxygen. But I have been led to this conclusion from the coincidence of the bright line in Aurora, with a line in Solar light, which, I think it probable, is produced by oxygen, because of the density of that gas. The difference between the spectrum of oxygen and that of Aurora, does not seem necessarily to prove my opinion incorrect, for it is a well-known fact, that the spectra of elements vary according to the circumstances under which they are produced. For illustration, potassium usually gives a spectrum of only three of the seventeen lines of which it is known to consist. Again, the position of the hydrogen line, F, in the spectrum of Sirius is changed by the movement of the star, as it recedes from the earth. Again, carbon gives six differing spectra, according to the circumstances under which they are produced, and in these the same line is not always the brightest.

Secondly, Professor Vander Weyde objects, because of the presence of a line, in the spectrum, that has not been identified. I confess that I am at a loss to comprehend this argument, as I have only expressed the opinion that Auroral light is, principally, not exclusively, incandescent oxygen.

Lastly, he objects to my explanation of the change of the bright line to a black one. I reply, that I accept the common theory, explaining the change of solar lines from bright to dark ones; I never, for a moment, doubted it; but the line under consideration is not an ordinary solar line, but one that is seen only when the sun is near the horizon, and, therefore, seems to require a different explanation, and as it is not seen at midday, I conclude that it is darkened by absorption in its passage (morning and evening) through the earth's atmosphere.

I am happy to find so many distinguished scientific gentlemen interested in the subject of the nature of Aurora Borealis, and I entertain a hope that the observations made before the present season of Auroral displays shall have passed away, will enable us to explain more fully the nature of its phenomena.

Toronto, Ont., Nov. 15, 1869.

A NEW WHITEWASH FOR WALLS, recommended by the Boston *Journal of Chemistry*, is as follows: Soak one fourth of a pound of glue over night in tepid water. The next day put it into a tin vessel with a quart of water, set the vessel in a kettle of water over the fire, keep it there till it boils, and then stir until the glue is dissolved. Next put from six to eight pounds of Paris white into another vessel, add hot water and stir until it has the appearance of milk of lime. Add the sizing, stir well, and apply in the ordinary way while still warm.

"Paris white" is *sulphate of baryta*, and may be found at any drug or paint store.

AMERICAN INVENTIONS IN EUROPE.

It is a fact exceedingly gratifying to the pride of every true American, that American inventors and manufacturers are to-day supplying the Old World with many of its best implements. In the matter of improved firearms, we are so far ahead of the nations of Europe, that many of them are sending large orders to our manufacturers, and where they have attempted to get them up themselves they have almost invariably adopted American inventions.

A writer in the *N. Y. Tribune*, mentions the fact that the Snider alteration of the Enfield, in England, was an American invention; the Henry Martin is but a very slight modification of the Peabody gun, and the Swiss gun is the Winchester (formerly known as the Henry) magazine rifle, altered very much for the worse. At the various trials abroad, the American guns have invariably come out ahead, and the English Commission reported as to magazine guns in favor of, first, the Winchester, and, second, the Ball guns. The Messrs. Remingtons, of Ilion, N. Y., have furnished to the Danish Government 25,000 of their celebrated breech-loading rifles, and to the Swedish Government, 25,000; while this year they will send to Europe generally fully 100,000. These rifles have been sold to Austria, France, Italy, Spain, Egypt, and Cuba, in smaller quantities, with a prospect of much larger sales in the future. Colt's Company is completing 30,000 Berdan rifles for Russia, and it is rumored that the order has been increased to 100,000. At the same time Col. Berdan has gone to Russia to superintend a factory there, probably for altering their present arms. Turkey has bought 200,000 of our rifles, and sent them home, and has just completed the purchase of over $60,000 worth of machinery, with which to convert them into breech-loaders, on the plan, probably, of those altered at Springfield. Sharp's Company have been converting 30,000 of their rifles and carbines into metallic cartridge guns for our Government. At the same time the Winchester Company is turning out over 100 per day of its repeating rifles, and is increasing its works. It has also bought out the Spencer Company, of Boston, including the Spencer and Fogarty patents, thus combining and controlling all the prominent magazine guns, except the Ball, which is owned by the Windsor Company, of Vermont, and of which quite a number have been recently sold in Persia. The Winchester and Remington rifles are being sent to China and Japan, and the former are also sent to Australia, as well as all over the West, the Plains, and the Pacific coast. Nearly one-half of the entire product of Smith & Wesson's pistol factory, employing some 300 hands, is sold in Europe, mainly in France, notwithstanding their cheaper labor. This result is of course due to the fact that they are mainly the product of *machine* labor, which machines are themselves of American invention and manufacture, and which produce an accuracy of work and finish that their hand labor cannot equal. But not only are we furnishing Europe and the Old World generallywith arms,but we are also supplying them with ammunition. The Union Metallic Cartridge Company of Bridgeport, under the control of Hobbs, of lock fame, is furnishing metallic cartridges—far superior to any ever before seen—to nearly all the world. They had one order of 25,000,000 from the Russian Government, and it is reported that the order has been increased to 100,000,000. They make them of every variety and size, their sale of one small size for pistols averaging 45,000 per day, a large portion going to Australia. And these, too, are all made on machines invented by Americans, the like of which do not exist elsewhere in the world. In addition to all this, the Windsor Company, of Windsor, Vermont, are just completing an order for $80,000 worth of milling and screw machines, to be shipped to Edinburgh, Scotland, to establish there a large factory for the manufacture of the Singer sewing-machine. Not content with shipping the sewing-machines themselves—of which large numbers of the leading kinds are constantly sent—they intend making them there, and that, too, with American machinery. Already, the Windsor Company has sent one or two lots of similar machinery to Canadjo for the same purpose; but sending machinery from here to Great Britain is bearding the lion in his den to some purpose. It is also specially worthy of note that the milling machine—one of the most important and useful of all metal-working machines—and the screw-making machine are purely of American origin.

Steam Boiler Incrustations.

According to *Cosmos* a series of experiments, made on purpose, and continued for a sufficient length of time to yield a reliable result, has fully proved that the addition to the feed water of steam boilers of fatty clays, especially the kind known as fuller's earth, entirely prevents boiler incrustations, even where, of necessity, very hard water has to be used as feed water. A loose, soft mud is deposited as soon as the motion of the water, due to the boiling, ceases on cooling. This mud readily runs off on opening the sludge valve of the boiler.

The *Annales de Génie Civil* informs us that these incrustations may be prevented by the use of raw potatoes, which cause all solid matters to be precipitated at the bottom of the boiler in a fine powder, leaving the sides perfectly free. The experiment was tried with an engine of 8-horse power, into the boiler of which ten kilogrammes of potatoes per week were introduced through the safety valve. Every week, when the fires were extinguished, the deposit was removed previous to the introduction of a fresh supply of potatoes. On examining the boiler after fourteen consecutive months of work, no traces of incrustation were perceptible; the appearance of the plates was blackish and slightly greasy, and the corners of the joints were in the same state as when first made. Refuse leather-cuttings from the tanneries will answer the purpose equally well.

These prescriptions for a bad complaint are not new, unless it be the use of fuller's earth. They have, in common with others of the same nature, the important drawback that they are not applicable to all cases. There is no doubt, however, of their utility in some cases.

The Maddening Mechanism of Thought.

Our brains are seventy-year clocks. The Angel of Life winds them up once for all, then closes the case, and gives the key into the hand of the Angel of the Resurrection. Tic-tac! tic-tac! go the wheels of thought; our will cannot stop them; they cannot stop themselves; sleep cannot still them; madness only makes them go faster; death alone can break into the case, and seizing the ever-swinging pendulum, which we call the heart, silence at last the clicking of the terrible escapement we have carried so long beneath our wrinkled foreheads. If we could only get at them, as we lie on our pillows and count the dead beats of thought after thought and image after image jarring through the over-tired organ! Will nobody block those wheels, uncouple that pinion, cut the string that holds these weights, blow up the infernal machine with gunpowder? What a passion comes over us sometimes for silence and rest—that this dreadful mechanism, unwinding the endless tapestry of time, embroidered with spectral figures of life and death, could have but one brief holiday? Who can wonder that men swing themselves off from beams in hempen lassos?—that they jump off from parapets into the swift and gurgling waters beneath?—that they take counsel of the grim fiend who has but to utter his one peremptory monosyllable, and the restless machine is shivered as a case that is dashed upon a marble floor? Under that building which we pass every day there are strong dungeons, where neither hook, nor bar, nor bed cord, nor drinking vessel from which a sharp fragment may be shattered, shall by any chance be seen. There is nothing for it, when the brain is on fire with the whirling of its wheels, but to spring against the stone wall and silence them with one crash. Ah, they remembered that—the kind city fathers—and the walls are nicely padded, so that one can take such exercise as he likes without damaging himself. If anybody would really contrive some kind of a lever that one could thrust in among the works of this horrid automaton and check them, or alter their rate of going, what would the world give for the discovery? Men are very apt to try to get at the machine by some indirect system or other. They clap on the brakes by means of opium, they change the maddening monotony of the rhythm by means of fermented liquors. It is because the brain is locked up and we cannot touch its movements directly, that we thrust these coarse tools in through any crevice by which they may reach the interior, alter its rate of going for a while, and at last spoil the machine.—*Oliver Wendell Holmes.*

Spontaneous Combustion of the Human Body.

In a former number, we spoke of the belief in the spontaneous combustion of the human body as "a vulgar superstition." A correspondent calls our attention to articles in cyclopedias, which refer to "well authenticated instances" of such combustion. Let us examine this matter in the light of what is actually known.

We must, in the first place, carefully distinguish between the notion of "a *preternatural combustibility*" of the body under certain abnormal conditions, and that of its *spontaneous combustion*. The former is not impossible; indeed, there are tolerably "well authenticated instances" of the kind. The latter, if not absolutely inconceivable, is in the highest degree improbable, and eminent physiologists who have carefully investigated all the cases in which it is alleged to have occurred, do not find a single one established beyond a doubt.

The earliest case of the kind which has a semblance of authority to sustain it, is said to have happened in 1725, and from that time down to the year 1847, when the last alleged case occurred, some fifty instances are recorded. Liebig made an analysis of all these cases in 1851, and found that they nearly all agree in the following points:

1. They took place in winter. 2. The victims were hard drinkers, and were drunk at the time. 3. They happened where the rooms were heated with fires in open fire-places or pans of glowing charcoal. Cases where rooms are heated by means of closed stoves are exceedingly rare. 4. It is admitted that no one has ever been present during the combustion. 5. No one of the physicians who collected the cases, or attempted to explain them, has ever observed the process, or ascertained what preceded the combustion. 6. No one has known how much time had elapsed from the beginning of the combustion to the moment when the consumed body was found.

Out of forty-five cases collected by Frank, of Berlin, in 1843, there are only three in which it is assumed that the combustion occurred when there was no fire in the neighborhood; and Liebig clearly shows that these three cases are totally unworthy of belief. The conclusion to which he comes is that "spontaneous combustion in a living body is *absolutely impossible*." Flesh which has been saturated with alcohol for a great length of time, as anatomatical preparations, is not combustible; if ignited, the alcohol burns off, scarcely charring the flesh. The corpses of drunkards have never been found to be combustible.

M. Duvergie has opposed Liebig's views, and has expressed the opinion that molecular changes may take place in the living body by which it becomes more combustible from the absorption of alcohol, or from its conversion into more inflammable compounds; but he admits that the combustion is probably never spontaneous. Dr. Marc has suggested that inflammable gases, and possibly even phosphoreted hydrogen, which, under certain circumstances, inflames on contact with the air, may be generated in the living body, and may thus give rise to its spontaneous combustion; but this is merely a theory to account for such cases of combustion, *if* they *have* occurred.

On the whole, this idea of spontaneous combustion appears to be one of those old medical delusions which, having once gained a sort of credence, are not readily given up. It is easy to see, as Liebig observes, that it arose at a time when men entertained entirely false views on the subject of combustion, its essence, and its cause. It is only since the time of Davy, or for about half a century, that combustion has come to be thoroughly understood. After people had once got it into their heads that the body might take fire of itself, it is not singular that when a man happened to be burned up, the case was explained in that way if it could not readily be accounted for in any other way; just as hundreds of fires caused by carelessness, not easily detected, are charged to the mysterious "incendiary." Then again, other things being equal, the more marvelous explanation of strange phenomena is usually the more popular one. The Latin proverb *omni ignotum pro magnifico est* might be read *omni ignotum pro mirifico est*, with everybody, whatever is unknown passes for a marvel. We need not be surprised, therefore, that this idea of human combustibility, which was not inconsistent with the scientific knowledge of the age in which it had its origin and which consequently came to be accepted by the scientific men of the time, should still live as a popular superstition and even find an occasional defender among the *savans* of this more enlightened day.—*Boston Journal of Chemistry.*

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING DEC. 7, 1869.

Reported Officially for the Scientific American

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97,470.—LUBRICATOR.—David Adamson, New York city.
97,471.—BALING PRESS.—J. L. Albertson, New London, Conn. Antedated Nov. 25, 1869.
97,472.—SAFETY VALVE.—Henry Ashfield, Chicago, Ill.
97,473.—STEAM GENERATOR SMOKE STACK.—W. F. Beecher, Morristown, N. Y. Antedated Nov. 24, 1869.
97,474.—SNOW PLOW.—Gottlieb Beer, Grafton, Wis.
97,475.—CONSTRUCTION OF PRESERVING-HOUSES.—Harrison Blackburn, Bedford county, Pa. Antedated, Nov. 20, 1869.
97,476.—PLANING MACHINE.—J. B. Brown (assignor to himself and N. F. Libby), Lowell, Mass.
97,477.—STOVE GRATE.—Edward Card, Pawtucket, R. I.
97,478.—BOOT JACK.—Wheeler Case, Russia, assignor to himself and J. H. Read, Jr., Utica, N. Y. Antedated Nov. 27, 1869.
97,479.—BUGGY TOP.—A. M. Cory, New Providence, N. J. Antedated Nov. 20, 1869.
97,480.—PUSHING JACK FOR RAILROAD CARS.—R. A. Cowell (assignor to himself and E. N. Keys), Cleveland, Ohio.
97,481.—SEWING MACHINE TABLE.—Henry Cowgill, Fredonia, Del., administrator of the estate of J. H. C. Cowgill, deceased.
97,482.—BASIN TRAP.—H. H. Crigie, New York city. Antedated Nov. 25, 1869.
97,483.—POST OFFICE LETTER BOX.—B. C. Davis, Binghamton, N. Y. Antedated Nov. 22, 1869.
97,484.—CLAPBOARD MACHINE.—C. S. Davis, Orono, assignor to himself and T. N. Egery, Bangor, Me.
97,485.—SAFETY VALVE.—Walter Dawson, Scranton, Pa.
97,486.—COMPOUND FOR LINING TEXTILE HOSE.—Julius Dollmann and F. W. Claessens, Boston, Mass.
97,487.—HOISTING APPARATUS.—William Dyatt, New York city.
97,488.—ORE CONCENTRATOR AND SEPARATOR.—James Edgar, New York city.
97,489.—ELEVATOR.—William Edson (assignor to E. H. Ashcroft), Boston, Mass.
97,490.—SULKY PLOW.—C. A. Edwards, Chatfield, Minn.
97,491.—SAW-SET.—A. R. Fenner, Cold Brook, N. Y.
97,492.—WIND WHEEL.—Leonard Fischer, Sonora, Cal.
97,493.—FRUIT BOX.—J. H. Fisher, Chicago, Ill.
97,494.—MACHINE FOR POLISHING STONE.—Calvin H. Fitch, Syracuse, N. Y.
97,495.—DEODORIZING APPARATUS FOR WATER CLOSETS.—B. A. G. Fuller, West Roxbury, Mass.
97,496.—LIGHTNING ROD AND CONDUCTOR.—Theodotus Garlick, Cleveland, Ohio.
97,497.—PROCESS OF DYEING BLACK.—James Gee, West New Brighton, N. Y.
97,498.—LATCH.—Rudolph Geselbracht and Frederick Frey, Galena, Ill.
97,499.—BORING MACHINE.—F. M. Gibson, Chelsea, Mass.
97,500.—GANG PLOW.—D. H. Gleeson (assignor to himself and Dennis Gannon), San Leandro, Cal.
97,501.—WELL AUGER.—J. Y. Goode, Water Valley, Miss.
97,502.—SASH HOLDER.—A. F. Gregory and C. H. Ensign, Bridgeport, Conn.
97,503.—COAL ASH SIFTER.—Abram Hagadorn, Canajoharie, N. Y.
97,504.—DITCHING MACHINE.—H. L. Hall, Buffalo, N. Y.
97,505.—ELECTRO-MAGNETIC RAILROAD SIGNAL.—T. S. Hall, Stamford, assignor to Hall's Patent Electric Railway Switch and Drawbridge Company, New Haven, Conn.
97,506.—BORING MACHINE.—Joseph Hampson, Newburg, N. Y.
97,507.—TWEER.—J. F. Harly, Kipton Station, Ohio.
97,508.—GARDEN PLOW AND MARKER.—Henry Haynsworth, Sumter, S. C.
97,509.—STEAM GENERATOR SMOKE STACKS.—William Holdcraft and David McLaughlin, Philadelphia, Pa. Antedated Nov. 20, 1869
97,510.—MACHINE FOR TESTING SPRINGS.—George Hopson, Bridgeport, Conn.
97,511.—CLOTHES DRYER AND STOVE-PIPE SHELF.—G. E. Hoyt, Hebron, N. H.
97,512.—SHOT AND BULLET MACHINE.—E. A. Hyde, Ann Arbor, Mich.

97,513.—ALARM LOCK.—B. F. Irvine and T. A. Hitchcock, North La Crosse, Wis. Antedated Nov. 27, 1869.
97,514.—WINDOW BLIND.—A. A. Jaqua (assignor to himself and David Parker), New York city.
97,515.—SADIRON HEATER.—James Jenkinson, Williamsburgh, N. Y. Antedated Dec. 4, 1869.
97,516.—CHAMBER PAIL.—J. S. Jennings, Brooklyn, N. Y.
97,517.—GAS BURNER.—W. L. Jukes (assignor to himself, F. McLewee, P. H. Putnam, and Bronson Murray), New York city
97,518.—SEWING MACHINE FOR SEWING SHOES.—Jeremiah Keith, Brooklyn, N. Y.
97,519.—DETACHABLE TIPPING BAIL.—J. Keith, Brooklyn, N. Y.
97,520.—SHAKER FOR THRASHING MACHINES.—M. A. Keller, Littlestown, Pa.
97,521.—SPRING BED.—S. P. Kittle, Newark, N. J.
97,522.—FOLDING BOX SPRING MATTRESS.—Sam. P. Kittle, Brooklyn, N. Y.
97,523.—COMBINED SHOVEL AND TONGS.—Henry Kliperd and Benjamin Newbury, Clarksville, Ohio. Antedated Nov. 30, 1869.
97,524.—MODE OF ATTACHING SEATS TO CARRIAGES.—Chas. Krebs, West Springfield, Mass.
97,525.—ATTACHING CALKS TO HORSESHOES.—Perley Laflin, Warren, assignor to himself and Z. E. Cary, West Brookfield, Mass.
97,526.—KNITTING MACHINE NEEDLE.—J. H. Lane and C. D. House, Lake Village, N. H.
97,527.—MACHINE FOR DRILLING AND PREPARING WATCH CASES FOR SPRINGING.—Jacques Laurent, New York city.
97,528.—MODE OF PREPARING PAPER FOR PRINTING POSTAGE AND REVENUE STAMPS.—Samuel Lenher and H. H. Spencer, Philadelphia, Pa.
97,529.—BASE BURNING STOVE.—G. W. Lewin, Worcester, Mass.
97,530.—BRODCAST SEEDER.—J. S. Lewis, Elkport, Iowa.
97,531.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,532.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,533.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,534.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,535.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,536.—GRAIN BINDER.—S. D. Locke, Janesville, Wis.
97,537.—METALLIC CARTRIDGE.—John Logan and D. W. Eldredge, Boston, Mass.
97,538.—PORTABLE FENCE.—Arthur Love, Saxonburg, Pa. Antedated Nov. 22, 1869.
97,539.—SAWING MACHINE.—Patrick Magee (assignor to Felix Thibodaux), Assumption parish, La.
97,540.—COOLER FOR BEER AND OTHER LIQUIDS.—John J. Märki, Richmond, Ind.
97,541.—MACHINE FOR WIRING BLIND RODS AND SLATS.—Godlip Meyer (assignor to himself and Jacob Wagner), Cleveland Ohio.
97,542.—GARDEN IMPLEMENT.—Henry Miller, Roadside, Va.
97,543.—COMBINED HAY RAKE AND TEDDER.—John C. Mills, Palmyra, N. Y.
97,544.—TUCK-CREASER FOR SEWING MACHINE.—John H. Mooney, San Francisco Cal.
97,545.—FOLDING BEDSTEAD.—John Muller, Philadelphia, Pa.
97,546.—ROTARY STEAM ENGINE.—H. Olney (assignor to himself, Robert A. Delong, and Lucius R. Townsend), Malone, N. Y.
97,547.—SHEET-METAL KEY.—Emery Parker, New Britain, Conn.
97,548.—WINDOW AND DOOR CAP MOLDING.—Joseph Parkin and James H. Smith, Cleveland, Ohio.
97,549.—DEVICE FOR FORMING BOILERS.—George S. Pierce, Wilkesbarre, Pa.
97,550.—PERMUTATION LOCK.—Oliver E. Pillard (assignor to Frederick H. North), New Britain, Conn.
97,551.—MACHINERY FOR MAKING PIANO-FORTE CASES.—Sawyer Porter (assignor to himself and Levi W. Porter), Leominster Mass.
97,552.—RAILWAY CAR WHEEL AND AXLE.—Perley Putnam, Laconia, N. H.
97,553.—MACHINE FOR PREPARING PAVING BLOCKS.—Wm. O. Robbins and Charles W. Stafford, New York city. Antedated November 30, 1869.
97,554.—MACHINERY FOR PREPARING WOODEN BLOCKS FOR PAVEMENT.—William O. Robbins and Charles W. Stafford, New York city.
97,555.—COMPOUND FOR DESTROYING INSECTS.—N. T. P. Robertson and Thomas Niles, Fairbury, Ill.
97,556.—HARVESTER.—A. Sheline and E. Burke, Edon, Ohio.
97,557.—SUSPENDERS.—Abraham Shenfield, New York city.
97,558.—BOOT CONFORMATOR.—Samuel W. Shorey, Galesburg, Ill.
97,559.—COMBINED UMBRELLA AND CANE.—Addison Smith, Perrysburg, Ohio.
97,560.—SAFETY LAMP.—Cyrus Smith, Hermon, Me.
97,561.—MANUFACTURE OF CARTRIDGE SHELLS.—Dexter Smith, Springfield, Mass.
97,562.—GARMENT SUSPENDER.—E. N. Snow, Chicopee, Mass.
97,563.—TRACK-CLEANER FOR MOWING MACHINE.—Pratt A. Spicer, Marshall, Mich.
97,564.—PISTON PACKING.—Edward Sullivan, Pittsburgh, Pa.
97,565.—CHURNING MACHINE.—D. G. Taylor, Campbellsville, Ky.
97,566.—EXPLOSIVE COMPOUND FOR USE IN FIREARMS, BLASTING, ETC.—Thomas Taylor, Washington, D. C.
97,567.—GUNPOWDER.—Thomas Taylor, Washington, D. C.
97,568.—COMBINATION PADLOCK.—M. P. Thatcher, Pontiac, assignor to Julius A. Foster, Adrian, Mich.
97,569.—CHECK HOOK.—George Theobalt, Springfield, Mass.
97,570.—VENTILATOR.—Wm. F. Thoms, New York city.
97,571.—INSTRUMENT FOR DESCRIBING SPIRAL LINES.—Lewis W. Truesdell, Owego, N. Y. Antedated November 30, 1869.
97,572.—TRUNK HASP.—Cornelius Walsh, Newark, N. J.
97,573.—CULTIVATOR.—Hiram J. Wattles, Rockford, Ill.
97,574.—SURCINGLE.—Martin Wesson, Springfield, Mass.
97,575.—SHAFT COUPLING.—Seth Wheeler, Albany, N. Y.
97,576.—VENTILATOR.—Charles F. Whorf, St. Louis, Mo.
97,577.—RAILWAY TRACK CLEANER.—M. F. Wickersham, Springfield, Ill.
97,578.—TRACE-LOCK FOR WHIFFLETREE.—Samuel P. Williams, Rutland, Vt.
97,579.—SEAT FOR CHAIRS, SOFAS, ETC.—Frederick Wittram, San Francisco, Cal.
97,580.—GENERATING HYDROGEN AND HYDROCARBON GAS.—Joseph S. Wood (assignor to himself and John J. Carberry), Philadelphia, Pa.
97,581.—LOCK.—Thomas B. Worrell and Thomas Walker, Philadelphia, Pa., assignors to Thomas B. Worrell.
97,582.—MANUFACTURE OF STEEL.—John Amsterdam, New York city.
97,583.—DRINKING CUP.—Bernhard Adler (assignor to himself and W. N. Drescher), New York city.
97,584.—GRAIN SEPARATOR.—J. R. Allen, Edinburg, Ind. Antedated November 27, 1869.
97,585.—PACKING FOR STUFFING BOXES.—Wm. W. Allmand, East Boston, Mass.
97,586.—DRIVING MECHANISM FOR SEWING MACHINES.—James B. Ayer, Elizabeth, N. J.
97,587.—HORSE COLLAR.—W. M. Baker, Greenwich Station, Ohio.
97,588.—FRUIT JAR.—Thomas J. Bargis and John C. Underwood, Richmond, Ind.
97,589.—SPRING FOR HORSE COLLARS.—Benjamin J. Barton and Roswell J. Stanley, Washington, Iowa.
97,590.—HOLLOW AUGER.—H. T. Beam, Joseph C. Freeman, and D. B. Mills, Palestine, Ill.
97,591.—WATER WHEEL.—E. R. Beardsley, Aroma, Ill.
97,592.—HORSE COLLAR.—A. Beckwith, New Orleans, La.
97,593.—RAILWAY RAIL.—Henry Belfield, Philadelphia, Pa.
97,594.—ALARM FAUCET.—Thomas M. Biddle, Fort Wayne, Ind.
97,595.—STEAM GAGE COCK.—Samuel Blackman, Reading, Pa.
97,596.—MACHINE FOR PREPARING TOBACCO STEMS.—Nicholas H. Borgfelt, New York city.
97,597.—PROCESS OF TREATING ASPHALTUM TO OBTAIN COLORS AND DYES.—Julius Bronner and Hermann Gutzkow, Frankfort-on-the-Main, Prussia.
97,598.—DUMPING WAGON.—J. G. Burwell and J. J. Walls, Crystal Springs, Miss.
97,599.—CORN HARVESTER.—John F. Byland, Walton, Ky.
97,600.—APPARATUS FOR DRESSING FLOUR.—Henri Cabanes, Bordeaux, France.
97,601.—RAILROAD TICKET.—C. A. Chamberlin, Pittsburgh, Pa.
97,602.—DEVICE FOR TURNING LOGS IN SAW MILL.—Bela L. Churchill and George Z. Vandersilice, Philipsburg, Pa.
97,603.—WOODEN TRUNK.—D. J. Clark, W. F. Doggett, and S. M. Burr, Columbus, Ohio.
97,604.—DISH-WASHER.—Frances E. Clarke (assignor to Thos. D. Clarke), Flint, Mich.
97,605.—FOLDING CHICKEN COOP.—George Edward Cleeton, New Haven, Conn.
97,606.—DITCHING MACHINE.—William Cline, Jr., Clayton, Ind.
97,607.—PROCESS FOR DECORATIVE OIL PAINTING.—Paul Cousin and Pierre Oury, Paris, France, assignors, for one third, to N. Washauer, New York city.
97,608.—RAILWAY CAR.—Walworth D. Crane, New York city.
97,609.—PLOW.—Charles Crow (assignor to himself and Williamson D. Kerr), Covington, Ind.
97,610.—WATER WHEEL SCROLL CHUTE.—Homer H. Cummings, Enfield, N. H.
97,611.—MACHINE FOR SEWING THE SOLE AND UPPER OF BOOTS AND SHOES.—John Cutlan, Moorestown, N. J.
97,612.—MUSICAL GAME.—George W. Dawson (assignor to Willis M. Smith), New Haven, Conn.
97,613.—APPARATUS FOR TREATING CROUP AND OTHER DISEASES.—Gilbert Déclat, Paris, France.
97,614.—MACHINE FOR IRONING AND STIFFENING LINEN AND OTHER FABRICS.—Jules Decoudun, Paris, France. Patented in France, May 16, 1868.
97,615.—METALLIC CARTRIDGE.—A. C. Depew and J. Slatcher, Bridgeport, Conn.
97,616.—TOBACCO MACHINE.—J. H. Dickason, Hannibal, Mo
97,617.—COMBINED CALL BELL AND TABLE CASTER.—H. A. Dierkes, New York City.
97,918.—CARRIAGE JACK.—W. S. Douglass (assignor to W. O. Douglass and A. S. Douglass), Richmond, Vt.
97,619.—BEDSTEAD.—D. E. Dugan, Springville, Pa.
97,620.—CAR COUPLING.—Joseph Dunott (assignor to himself and Geo. Gibson), Philadelphia, Pa.
97,621.—SAWING MACHINE.—Samuel Fletcher, Hollis, N. H.
97,622.—AXLE FOR CARRIAGES.—Samuel Forrester, Allegheny, Pa.
97,623.—CARRIAGE AXLE.—Samuel Forrester, Allegheny, Pa.
97,624.—KNIFE HANDLE.—James D. Frary, New Britain, Conn.
97,625.—MACHINE FOR JOINTING STAVES.—L. R. Fulda and Martin Fulda, San Francisco, Cal.
97,626.—SAWING MACHINE.—Samuel A. Gardner, Round Hill, Pa.
97,627.—GAS-BURNER REGULATOR.—Robert Gill, New York city.
97,628.—CORRUGATED REFLECTOR.—Bernard Goetz, Philadelphia, Pa.
97,629.—ATTACHMENT FOR FASTENING OVERLAPPING PARTS OF GARMENTS.—B. J. Greeley, Boston, Mass.
97,630.—POTATO DIGGER.—Wm. Green, Holly, Mich. Antedated Nov. 27, 1869.
97,631.—COTTON AND HAY PRESS.—Robert Greene, Greenville, N. C.
97,632.—MODE OF GENERATING ILLUMINATING GAS.—Alexander Hamar, Philadelphia, Pa.
97,633.—PUMP.—Michael Hanstine, Waynesborough, Pa.
97,634.—PORTABLE FURNACE.—John H. Harper, Pittsburgh, Pa.
97,635.—GRAPPLING HOOK.—Henry H. Hatheway, Clockville, N. Y.
97,636.—SPARK ARRESTER.—W. E. Hayes, Durand, Wis.
97,637.—FASTENING FOR NECKTIE.—Harry M. Heineman, San Francisco, Cal.
97,638.—MACHINE FOR TRIMMING THE HEELS OF BOOTS AND SHOES.—C. H. Helms, Poughkeepsie, N. Y.
97,639.—WATER CLOSET.—J. B. Hobson and J. Middleton, Jr., San Francisco, Cal.
97,640.—SAW MILL.—J. R. Hoffman, Fort Wayne, Ind.
97,641.—SADIRON HOLDER.—Egmont Inger, New York city.
97,642.—BRICK MOLDS.—Stephen Inman, Rockford, Ill.
97,643.—FASTENING FOR CORSETS.—Ludwig Jarchow, New York City.
97,644.—COFFEE ROASTER.—John Jay, Jonesborough, Ind.
97,645.—CAR SPRING.—C. T. Jeffries, Philadelphia, Pa.
97,646.—GANG PLOW.—Byron Jennings (assignor to himself and Henry W. Briggs), Gilroy, Cal. Antedated Dec. 1, 1869.
97,647.—ARTIFICIAL LEG.—S. B. Jewett, Laconia, N. H.
97,648.—SASH BALANCE.—Chas. Kanzler and Albert Nega, St. Louis, Mo.
97,649.—STAY FOR TRUNKS.—Chas. Kellermann and P. W. Stauff, Chicago, Ill.
97,650.—GRAIN DRYER.—S. C. Kenaga, Kankakee, Ill. Antedated Nov. 27, 1869.
97,651.—OILING CARRIAGE AND CAR AXLES.—Wm. Kenworthy and J. H. Pollitt, Buchanan, Pa.
97,652.—GAS BURNER.—A. M. Laevison, Quincy, Ill.
97,653.—SHOT CARTRIDGE.—Chas. Wm. Lancaster, London, England.
97,654.—ATTACHING KNOBS TO DOORS.—Chas. F. Langford, Brooklyn, N. Y.
97,655.—CENTRIFUGAL PUMP.—N. H. Lebby, Charleston, S. C.
97,656.—TOOL HOLDER FOR GRINDSTONES.—Philip Leonard, Sharon, Pa.
97,657.—MODE OF PREVENTING CORROSION IN PIPES, BOLTS, AND SIMILAR ARTICLES OF IRON IN SEA WATER.—Reuben Lighthall, Brooklyn, N. Y.
97,658.—WATER WHEEL.—A. W. Lloyd, North Adams, Mass.
97,659.—ARTIFICIAL NIPPLE.—H. D. Lockwood, Charlestown, Mass.
97,660.—COOKING STOVE.—Zephaniah Lockwood, Saratoga Springs, N. Y.
97,661.—SLED BRAKE.—C. M. Lufkin, Alstead, N. H.
97,662.—COCKEYE FOR HARNESS.—Thomas J. Magruder, Marion, Ohio.
97,663.—BUSH HAMMER.—J. W. Maloy, Boston, Mass.
97,664.—MACHINE FOR GRINDING NEEDLES.—Clark Marsh (assignor to Wheeler & Wilson Manufacturing Company), Bridgeport, Conn.
97,665.—WATER WHEEL.—H. P. McCleave, Tomales, Cal.
97,666.—WAGON STANDARD.—Jas. McCullough, Quincy, Ind. Antedated Dec. 4, 1869.
97,667.—CUTTER FOR CARD-SETTING MACHINE.—D. McFarland, Worcester, Mass.
97,668.—DRAIN-PIPE MACHINE.—Peter McIntyre, Norwich, Conn.
97,669.—FRUIT CAN.—A. J. McMillen, Ravenswood, West Va.
97,670.—PUMP.—C. L. Merrill, Watertown, N. Y.
97,671.—ABRADING AND POLISHING WHEEL.—E. C. Merrill, Charleston, Vt.
97,672.—PATTERN FOR LAYING OUT GARMENTS.—Wm. M. Michael, Indiana, Pa.
97,673.—MACHINE FOR OPERATING PUMPS.—R. E. Moore, Navasota, Texas.
97,674.—CHURN.—Ezra Morgan, French Creek, N. Y.
97,675.—CLAMP FOR EMBOSSING HARNESS LOOPS.—O. H. Morris, New Haven, Conn.
97,676.—PEN.—W. A. Morse, Philadelphia, Pa.
97,677.—HAY TEDDER.—M. D. Myers (assignor, of one fourth, to G. W. Gates), Frankfort, N. Y.
97,678.—HEATING ATTACHMENT FOR COOKING STOVES.—R. W. Meyers (assignor to himself, Geo. Gardiner, Wm. Gardiner, and O. L. Gardiner), Glen Gardner Station, N. J.
97,679.—MECHANISM FOR OPERATING THE SHUTTLE BOXES IN LOOMS.—Archibald Nimmo (assignor to himself and Thomas Moran), Philadelphia, Pa.
97,680.—HARROW CULTIVATOR.—Frederick Nishwitz, Brooklyn, N. Y
97,681.—INTERCHANGEABLE BOOT AND SHOE HEEL.—John Norburn, Pittsburgh, Pa., assignor to J. C. Woodhead and J. Holmes, trustees for Universal Manufacturing Co.
97,682.—MACHINE FOR WASHING WOOL.—Emile Nougaret, Newark, N. J. Antedated Dec. 1, 1869.
97,683.—VELOCIPEDE.—Rene Olivier, Paris, France.
97,684.—CENTRIFUGAL MACHINE FOR EXTRACTING HONEY FROM THE COMB.—H. O. Peabody, Boston, Mass.
97,685.—SPRING.—Wm. Pearson, Windsor Locks, Conn.
97,686.—PIANOFORTE ACTION.—A. W. Perry, St. Joseph, Mo
97,687.—FEED CUTTER.—Hans Peterson, Red Wing, Minn.
97,688.—APPARATUS FOR CLEANING BARRELS.—Immanuel Pfeiffer (assignor, for one half, to H. M. Brsem), New York city.
97,689.—VENTILATOR.—W. L. Phillips, Normal, Ill.
97,690.—DRAFT REGULATOR FOR PLOWS.—Martin Prillaman (assignor to himself and Elizabeth Ressler), Tipton, Ind.
97,691.—MACHINE FOR SWAGING THREADS ON SCREWS.—T. T. Prosser, Chicago, Ill.
97,692.—MANUFACTURE OF SOAP.—Wm. P. Pugh, High Point, N. C.
97,693.—GUN HARPOON.—J. P. Rechten, New York city.
97,694.—PRIVY SEAT.—Frank Reed, Fitchburg, Mass. Antedated Nov. 30, 1869.
97,695.—PISTON VALVE.—A. F. Reeder, Normal, Ind.
97,696.—TUBULAR REFRIGERATOR.—Adam Reid, Buffalo N. Y.
97,697.—LAND ROLLER.—Hermann Retzlaff, St. Louis, Mo.
97,698.—ATMOSPHERIC AND CONDENSING HYDRAULIC ENGINE.—A. J. Reynolds, Chicago, Ill.
97,699.—FLEXIBLE PIPE COUPLING.—Quartus Rice, Nevada, Cal.
97,700.—MACHINE FOR MAKING BUCKLES.—Julius Robbins, Auburn, N. Y.
97,701.—KNIFE SHARPENER.—Z. C. Robbins and H. A. Robbins, Washington, D. C.
97,702.—TOBACCO ELEVATOR.—G. Robinson, Louisville, Ky.
97,703.—MACHINE FOR ROLLING, PRESSING, AND CUTTING TOBACCO.—G. Robinson, Louisville, Ky.
97,704.—TRACE BUCKLE.—Wm. A. Robinson, Grand Rapids, Mich., assignor to O. B. North & Co.
97,705.—COIL SPRING AND ITS ATTACHMENTS.—Timothy Rose, Cortland, and P. S. Buell, Windsor, N. Y.
97,706.—SPRING BED BOTTOM.—Ira M. Russell, Lewiston, Me.
97,707.—APPARATUS FOR LAYING OUT STAIR RAILS.—A. Schollars, Leavenworth, Kansas.
97,908.—HORSE HAY RAKE.—Wm. Sharkey, Chico, Cal.
97,709.—PROCESS FOR MANUFACTURING CHEESE.—Mary A. Sheaffer, Elizabethtown, Pa.
97,710.—BOOK HOLDER.—Hamilton Sherman, Waverly, Pa.
97,711.—PLATE FOR HOLDING THE LIDS OF TRUNKS IN PLACE.—J. W. Shubert and Norval Douglas, New Haven, Conn.
97,712.—VISES FOR WOOD WORKING.—J. Simpson, Cleveland, Ohio.
97,713.—KEY GUARD.—P. G. Smith (assignor to himself and Robert Donahue), Brooklyn, N. Y.
97,714.—BRIDGE.—R. W. Smith, Toledo, Ohio.
97,715.—HAMMER.—S. B. Smith, New Haven, Conn.
97,716.—BOOT AND SHOE CLEANER.—W. H. Smith, Newport, R. I.
97,717.—SIGHT FOR FIREARMS.—C. E. Sneider, Baltimore, Md.
97,718.—MANUFACTURE OF IRON AND STEEL.—H. Spencer and L. K. Saylor, Philadelphia, Pa.
97,719.—TOY HARPOON GUN.—Ebenezer Sperry, St. Louis, Mo.
97,720.—SPRING BED BOTTOM.—Jost Stengel, Croton, Mich.
97,721.—PLEATING MACHINE.—Simon Sterns, New York city.
97,722.—BEDSTEAD FASTENING.—William Stevens, Tarentum, Pa.
97,723.—TOOL REST FOR LATHES.—J. G. Stowe, Providence, R. I.
97,724.—HAY LOADER.—W. H. Straub, Danville, Pa.
97,725.—WASHING MACHINE.—T. H. Tatlow, Jr., Newark, Mo.
97,726.—HANGING WINDOW SHADES.—J. I. Tay, Oakland, Cal.
97,727.—MEANS FOR HANGING WINDOW SHADES.—J. I. Tay and L. L. Sawyer, Oakland, Cal.
97,728.—BREAD SLICER.—Joseph Taylor, Hudson, N. J.
97,729.—GRAIN DRILL.—J. H. Thomas and P. P. Mast, Springfield, Ohio.
97,730.—RAILWAY CAR BRAKE.—J. B. Van Dyne, Nashville, Tenn. Antedated Nov. 30, 1869.
97,731.—COOKING STOVE.—Nicholas S. Vedder, Troy, N. Y. Antedated Nov. 30, 1869.
97,732.—COAL STOVE.—S. D. Vose, Milwaukee, Wis.
97,733.—FASTENING FOR TRAVELING BAG.—C. Walsh and Josiah Walsh, Newark, N. J., assignors to C. Walsh.
97,734.—BREECH-LOADING FIREARM.—Wm. G. Ward, New York city.
97,735.—PEN.—Addison G. Waterhouse, San Francisco, Cal. Antedated Nov. 25, 1869.
97,736.—CLOTHES DRYER FOR STOVE PIPES.—L. B. Waterman (assignor to L. B. Kelly), Chicago, Ill.
97,737.—BOILER FEED AND WATER HEATER.—H. Wigley, New Albany, Ind.
97,738.—ICE CREEPER.—A. Wilke, Brunswick, Germany.
97,739.—CORN PLANTER.—F. L. Wilkens, St. Mary's, Ohio. Antedated Dec. 4, 1869.
97,740.—TIRE HEATER.—Isaiah M. Williams, Clinton county, Ohio.
97,741.—MECHANISM FOR DRIVING SEWING MACHINES.—J. H. Wilson, Philadelphia, Pa., and J. C. Outwater, Newark, N. J.
97,742.—MOLE KILLER.—Joseph Wilson, Little Falls, N. J.
97,743.—CIDER MILL.—Levi Wilson, Springfield, Ohio.
97,744.—APPARATUS FOR TREATING DISEASES BY MECHANICAL MOVEMENT.—A. L. Wood, New York city.
97,745.—GATE.—J. A. Wood and E. V. Marbaker, Crosswicks, N. J.
97,746.—PLOW.—Alex. Wright, Allegheny City, Pa.
97,747.—GAME TRAP.—E. M. Day, Elkhart, Ill.
97,748.—GAS MACHINE.—T. G. Springer, Clinton, Iowa.
97,749.—MACHINE FOR MAKING CANDLE MOLDS.—Moses Burlingame, Garrattsville, N. Y., assignor to himself and J. E. Pilkington, Washington, D. C.
97,750.—HOOP SKIRT.—Gottfried Biering, New York city.

REISSUES.

89,669.—FEED-CUTTING ATTACHMENT TO THRASHING MACHINES.—Dated May 4, 1869; reissue 3,756.—G. W. Lee, Sandy, Ohio.
24,772.—POWDER KEG.—Dated July 12, 1859; reissue 1,383, dated January 6, 1863; reissue 3,757.—Charles Green, Wm. Wilson, Jr., Henry Du Pont, E. I. Du Pont, L. Du Pont, and Eugene Du Pont, Wilmington, Del., and Charles Pratt, New York city, assignees of James Wilson, Charles Green, and Wm. Wilson, Jr.
96,278.—BRIDGE.—Dated Oct. 26, 1869; reissue 3,758.—Smith, Latrobe & Co., Baltimore, Md., assignees of F. H. Smith.

DESIGNS.

3,779.—CLOCK CASE FRONT.—F. Kroeber, New York city.
3,780.—PENDULUM-CLOCK CASE FRONT.—F. Kroeber, New York city.
3,781.—COLLAR.—E. E. Mack, Albany, N. Y.
3,782.—FLOOR OIL CLOTH PATTERN.—James Patterson, Elizabeth, assignor to Richard H. Reeve and Benjamin C. Reeve, Camden, N. J.
3,783.—HARNESS BUCKLE.—D. Schoonmaker, Springfield, Mass.

NEW PUBLICATIONS.

FOR CHRISTMAS.—The children must always have something to make them merry on Christmas. Messrs. Turner & Brother, 808 Chestnut street Philadelphia, have issued a neat and and very pretty book called "Christmas Day," with three poems; viz.: "'Twas Night Before Christmas," "Christmas Day," and "The Night After Christmas," from Punch. It has a beautiful cover, and is sent by mail for fifty cents.

Improved Telegraph Instrument.

The apparatus which we herewith illustrate is a combination of three distinct inventions, upon each of which a separate patent has been granted; viz., the magnet, the sounder, and the key. They, together, constitute one of the most beautiful and efficient instruments of its class we have had brought to our notice. We will notice the parts of the device in the order above specified.

The wire has, previous to this invention, been wound entirely around one spool, after which it was carried to the other, which was wound in like manner; the current consequently passed through the entire coil on one spool before reaching the other.

In this new system of applying the wire, both spools receive the current simultaneously; the current passing alternately from one to the other. Greater power and quicker action are, therefore, secured by a battery of a power which, under the old system, would almost be insufficient to work the instrument.

These advantages are secured by winding both spools at once. The spools are placed with their heads together, and the wire being started at the outer end of one spool is wound in a single layer over that spool, crossed over the heads of both spools, which are placed together, then wound over the second spool, and back, crossed over the heads again and wound over the first spool and back, again crossed over the heads, and so on until both spools are filled. In this way many connections are made between the two coils, and the wire, instead of being wound continuously on each spool separately, is equally distributed between both.

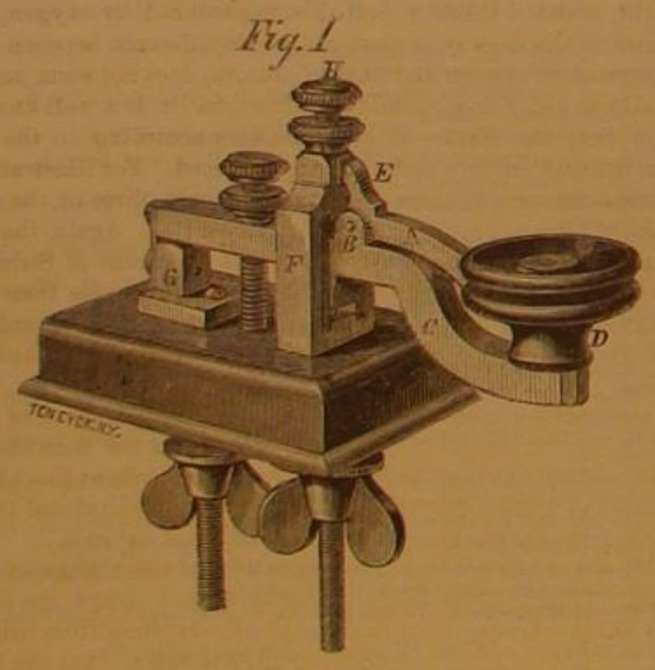
The spools thus wound are set up in the ordinary manner.

When the electric current is passed through the coils, it passes simultaneously around both spools, and both, therefore, act at once to attract the armature, instead of, as heretofore, one after the other. The action is thus rendered more sudden and powerful than in the method of winding, as heretofore practiced.

It is scarcely necessary to add that this method is equally applicable to all kinds of electro-magnets for whatever purpose they may be employed, and whether spools, cores, or legs are used.

The principal differences between the key, Fig. 1, and those in ordinary use are, first, the addition of a supplementary lever, A, pivoted to the principal lever, C, at B, the use of which is to make an indirect circuit while the instrument is not in use; and, second, the insulation of the point of the adjusting screw, H, which limits the motion of the principal lever, C. A hard-rubber knob, D, on the principal lever, C, is

Fig. 1



separated by a coiled spring from a button of similar material on the supplementary lever, A. The latter has a foot, E, which rests against the standard, F, when the instrument is not in use, the points of contact being made of platinum. The current then passing through the standard, F, passes through E, and thence through C, and the spring attached to the standard, G, and so out through the wire. In use the knob, D, and the button on the supplementary lever, A, are pressed together, which breaks the indirect current, and the direct circuit, is then made and broken in the usual manner by bringing together a platinum point on the under side of the principal lever, and a similar point on the bottom of the slot in the standard, F, or *vice versa*, as the key is depressed or elevated.

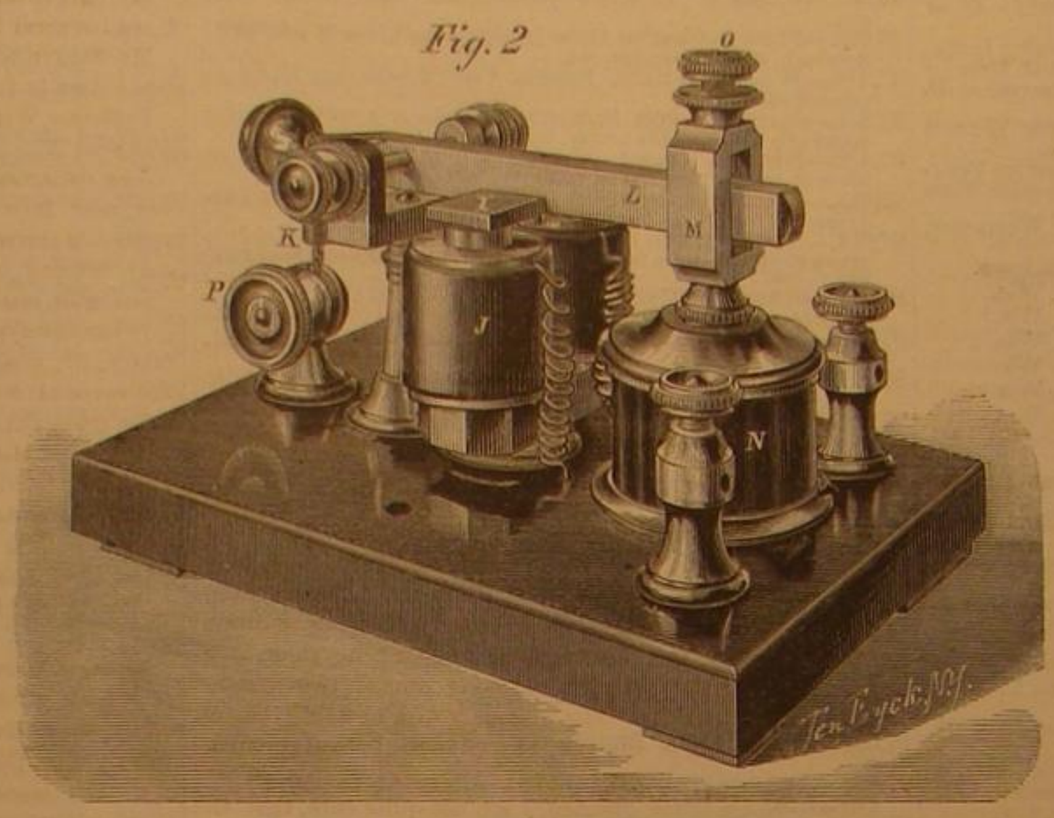
The insulation of the point of the adjusting screw, H, is necessary to prevent the current from passing through it from the standard, F, to the principal lever, C. The sides of the slot in the standard, F, are also insulated by plates of hard rubber, to prevent any danger of making the circuit by accidental contact of the lever, C, with them.

This device, therefore, it will be seen, closes the circuit automatically when not in use.

Fig. 2 represents a combination of an electro-magnet with coils formed as above described, with an improved sounding column.

The armature, I, being alternately attracted to the magnet, J, and withdrawn by the action of the spring, K, through the sounding bar, L, strikes L upon the end of a steel bolt, not shown in the engraving, which passes down through the bottom of the standard, M, and through the center of the hollow hard-rubber cylinder, N. This hollow rubber cylinder is surmounted by a brass cap, and rests on a brass ring, which, in its turn rests on the rosewood stand of the instrument, the whole being firmly held by a nut screwed on the lower end of the central steel bolt. Around this nut are bored sound-holes which communicate from the bottom of the rosewood stand with the interior of the hollow hard-rubber cylinder, N. This cylinder reinforces the sound made by the impact of the sounding bar, L, upon the central steel bolt above described, in a remarkable manner, making it very distinct and

Fig. 2



DAVIS' SOUNDING INSTRUMENT.

clear; the sound waves formed in the interior of the hard-rubber cylinder, N, communicating freely with the external air, through the holes at the bottom of the stand above described. A screw, O, limits the motion of the sounding bar, L, and a winding pin, P, in a double-slotted post, serves to regulate the tension of the coiled spring, K.

The construction of this instrument involves some nice scientific principles, which cannot fail to attract the attention of electricians and practical telegraph operators.

The patents for the three parts of this instrument we have thus described were taken out through the Scientific American Patent Agency; the one on the electro-magnet bearing date Nov. 9, 1869, and the patents on the key and sounding column July 6, 1869. The patentee is Mr. William Edward Davis, of 319 Newark avenue, Jersey City, N.J., where address him for further particulars.

REDUCE THE COST OF PATENTS.

We publish elsewhere an extract from the Report of the Secretary of the Interior, giving a brief *resumé* of the operations of the Patent Office for the past year.

The financial result appears to be gratifying. The applications have been very numerous, and the fees in excess of expenditures some $213,920. The Secretary proposes to use this surplus in printing copies of the drawings—a suggestion which is very good so far as it goes; but we should have experienced additional pleasure if the Secretary had urged upon Congress the importance of reducing the patent fee. The Patent Office is a self-sustaining institution, and can be kept so by a judicious administration of its affairs and upon a reduced scale of fees. We should say that $25 were amply sufficient—$10 payable in advance, and the balance, $15, upon the allowance of the claims. We hope Commissioner Fisher, in his Annual Report, will take hold of this matter and urge a reduction of the costs of granting patents.

Patent Office Affairs.

The report of the Secretary of the Interior furnishes the following interesting facts concerning the Patent Office:

Application for Patents	19,360
Caveats filed	3,686
Applications for extension	153
Patents issued	13,762
Patents extended	125
Patents allowed, not issued	899
Balance appropriation on hand Oct. 1, 1868	$117,249·18
Appropriation since made	722,018·00
Total	$839,267·18
Expenditures since Oct. 1, 1868	$472,462·62
Balance on hand	416,804·53
Fees in excess of expenditures	213,926·02
Expenditures in excess of fees, 1868	171·64
Appropriation asked for	564,420·00

The office now publishes a weekly list of claims, which is furnished to subscribers at $5 per annum. It is believed that by the ensuing year the receipts will cover the entire cost of the work. This list, published simultaneously with the issue of the patents, serves all the purposes of the annual report, which is not issued until two years later.

In order that the public and the examining corps may have access to the drawings of the Office, I recommend an appropriation for printing copies. The expense so occasioned can be reimbursed, if the Commissioner be authorized to make sale of them, and apply so much of the proceeds thereof as may be necessary. If he could sell copies of the patents and of the drawings at cheap rates to those who desire them, and place copies in the State capitals and great commercial centers, more complete information of the action of the bureau than is now furnished by the report would be promptly disseminated, and an annual expenditure of $200,000 of the public money avoided.

My immediate predecessor, in each of his annual reports, urged the repeal of all laws which authorized an appeal from the decision of the Commissioner of Patents on applications for letters patent and in interference cases. The reasons he presented are, in my opinion, clear and unanswerable. It is, indeed, believed that it was the intention of Congress to abolish such an appeal by the act of 1861. No mention is made of it in the provision for appeals, or in the new schedule of fees thereby established. It has, however, been held that prior acts which authorized such an appeal are still in force, and that the right thereto still exists. If their purpose was to secure uniformity in the administration of the patent laws, it has signally failed. The appellants may select either of the four members of the Supreme Court of the District to hear and determine the case, and from his decision no appeal lies to the court in banc.

The Commissioner, in a paper addressed to me, represents that, as a natural consequence of the appeal and of the fee claimed for acting upon it, the judges have, without authority from Congress, assumed to extend their jurisdiction to his purely ministerial duties, and to interfere with the discharge of them. Decisions have been made on the proper date of letters patent, the allowance of amendments, the issue of double patents to an inventor and his assignee, and on other questions of a like character. The practical working of this asserted supervisory control over the doings of the Commissioner has been, upon the whole, injurious. Consistency of decisions and of administration has not been attained. Controversies and litigation as to the extent of relative jurisdiction have arisen, and the usefulness of the Office, in its attempts to protect the public against imposition has been essentially impaired.

Sheepskin Mats.

A correspondent of *The Country Gentleman* gives the following directions for making beautiful sheepskin mats, the recipe being for two skins.

"Make strong soapsuds, using hot water, and let it stand till cold, then wash the skins in it, carefully squeezing out all the dirt from among the wool, then wash them in cold water till all the soap is out. Next dissolve half a pound each of salt and alum in a little hot water, and put into a tub of cold water sufficient to cover the skins and let them soak twelve hours, then hang over a pole to drain. When well drained, stretch carefully on a board to dry. Stretch several times while drying. Before they get entirely dry, sprinkle on the flesh side one ounce each of finely pulverized alum and saltpeter rubbing it in well; then lay the flesh sides together and hang in the shade for two or three days, turning them over every day till perfectly dry.

"Finish by scraping the flesh side with a blunt knife, to remove any remaining scraps of flesh, and then rub the flesh side with pumice or rotten stone and the hands. Very beautiful mittens can be made of lamb skins tanned as above."

The Genesis.

Professor Agassiz denies that he, as has been publicly charged, recently opened a lecture with the statement that he wanted no one to listen to his lectures who believed in the first chapter of "Genesis." This charge bears on its face the evidence of its falsity, yet Professor Agassiz deems it worthy of notice. He says in a letter to a friend:

"I am little in the habit of noticing things of this kind, being convinced that often it is useless, and having become from long habit somewhat callous to misrepresentation. Something in the tone of your letter makes me answer, and unwilling to leave it unanswered, I write to say that the statement you sent me is false. In some opening remarks of a course on geology, which I am now delivering in the University, I said that the 'theological interpretation of the Book of Genesis, giving six thousand years as the age of the world, was a hindrance to the understanding of geological evidence, and no one who started with this idea, and allowed his researches to be influenced by it, could be a geologist.' I do not remember my exact words, the lecture being extemporaneous; but this is the substance, and I know that I did not say what your newspaper extract reports."

THE LEVEL OF THE MEDITERRANEAN AND RED SEAS.—During the celebrated Egyptian campaign of 1798, the difference of level between these two seas was calculated by the French engineers, and found to be 0·85 of a meter. The result obtained in making the survey for the construction of the Suez canal, in 1866, was ·86 of a meter. The accuracy of the earlier survey is very strikingly confirmed by the close coincidence of these results.

A VALUABLE PRESENT.—What more useful present can be made to young mechanics than a year's subscription to the SCIENTIFIC AMERICAN? Employers will be doing their employés a great service by acting on this hint, and we feel sure that at the end of the year they will consider the investment a good one.

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

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NEW YORK, SATURDAY, DECEMBER 25, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

TO OUR READERS.

The day of publication falling one day earlier in the calendar each year, has gradually antedated the issue of our journal, causing thereby a serious inconvenience to ourselves, and one that has been noticed by many of our readers. We prefer in this matter not to be so far in advance of the actual time, and in order to correct the discrepancy between the date of the paper and the day of actual issue, we seize the opportunity now offered at the beginning of the new volume, to defer the issue of the first number one week. By this arrangement none of our subscribers will lose anything, as we have already published two complete volumes, of twenty-six numbers each, for 1869, and before the 1st of January the first number for the year 1870 will be published and mailed to all our subscribers. With the present number we send out a supplement of the SCIENTIFIC AMERICAN to all our readers, which contains a large and fine engraving of the Railway Bridge over the Susquehanna river at Havre de Grace, also a calendar for 1870. This supplement has been printed at considerable expense, and is sent free to all our subscribers. We would regard it as a special favor if they would post it up conspicuously where it may be seen, as it contains our annual prospectus.

Subscriptions are coming in very rapidly, and present indications encourage us to believe that our circulation will be very much increased on the new volume.

ANNOUNCEMENTS FOR THE NEW VOLUME.

The premiums in cash offered by us are as follows: Whoever sends in the largest list of subscribers, according to published terms, on or before the tenth of February, will receive $300; for the second list, $250; third list, $200; fourth list, $150; fifth list, $100; sixth list, $90; seventh list, $80; eighth list, $70; ninth list, $60; tenth list, $50; eleventh list, $40; twelfth list, $35; thirteenth list, $30; fourteenth list, $25; fifteenth list, $20.

Surely these prizes are worth striving for, as either of the sums specified will be handy to have in the pocket. To those who do not compete for the cash prizes we offer the splendid large steel engraving, "Men of Progress—American Inventors," as follows: Any one sending 10 names and $30 will receive one picture; 20 names and $50, one picture; 30 names and $75, two pictures; 40 names and $100, three pictures; 50 names and $125, four pictures. This picture is worthy of the subject, and will grace the drawing-room of any citizen of the land. We are aiming at a large subscription list and we frankly acknowledge that we can only accomplish it by the coöperation of our present patrons, who have always generously responded to our appeals. We urge them now to speak a good word for the SCIENTIFIC AMERICAN. By so doing they can induce some of their neighbors to join in making up a club. If ten or more names are sent, the subscription is $2·50 a year.

STEAM PLOWING IN AMERICA.

The time is coming when in many portions of the United States the steam plow will be permanently adopted. If, in a country of small farms like England, it can be made so useful as to render profitable lands, which, without it, can only be worked at a loss, how much wider is its scope on our broad plantations, wide prairies, and river bottoms which are devoted to grain production.

The period is ripe for the introduction of a Yankee steam plow. Some inventors in this field have had the misfortune to live some years too early. But the inventive genius of the country is now fairly turned to the solution of the problem, and the steam plow of the time to come is now imperatively demanded.

In aiming at the production of a good steam plow, we think inventors have confined their efforts too closely to the imitation of the work of the common plow. Is it not quite possible that some other method of loosening the earth may be found to answer all the purposes of the furrow, without rendering large tractive power necessary.

The early, and still favorite method with gardeners, is forking or spading up the ground, and there can be no doubt that in this way the soil is better prepared for the reception of seed than by the use of the plow.

No mowing machine inventor has ever succeeded in applying other than human strength to the working of swinging blades or scythes, though many have sought to do so. It was not till the shearing principle as used in the common cutter bar was adopted that mowing machines found an abiding place.

But it may be objected that in plowing green sward it is essential to not break the earth to pieces but to turn it over neatly, grass side down, so that the vitality of the grass roots may be destroyed and the turf may rot. We do not think the continuous furrow the only means whereby this may be accomplished, and we believe the plowing machine of the future will demonstrate the truth of our views.

A new locomotive plowing machine, capable of drawing a gang of plows through a stiff soil was recently tried at Rochester, it is said, with highly satisfactory results. The locomotive weighs scarcely more than two tuns, but its tractive power is gained by a series of out-thrusting flukes in the traction wheels, which penetrate the earth, and are withdrawn by machinery inside as the wheels revolve. By this means the flukes only project from the wheels as they approach the earth on the under side of the wheel. There are springs attached to the flukes to relieve them when they come into contact with stones or other impenetrable substances. The plows are attached to this traction engine by chains, and at the trial, three plows, each held in the usual manner by an attendant, were drawn in this way through a stubborn soil.

So much for the Rochester machine.

From New Albany, Ind., we learn of a new steam plow, the invention of a citizen of that place, and which is described at length in the *Daily Ledger*: "The framework, in fact the entire machine, is of pipes. The driving wheels are geared positively, and are driven by vertical cylinders, the pistons of which are attached by an irregular eccentric motion, direct from the engine. In addition to this motion eight toggle joints joining levers, which simulate the motion of a horse's leg, assist the driving wheels when they fail in their traction."

The description given in the *Daily Ledger* is not so clear as to give a very distinct idea of this plow; but we gather that the plows proper are attached to beams, which are raised or lowered at will, and move along with the traction engine.

A California inventor has also recently taken out a patent for a steam plow, the general principle of which, like those described, is the drawing of plows by a traction engine. We are not aware that the English method of drawing gangs of plows across fields by a wire rope and drum finds much favor with American mechanics; but if plows must be drawn through the earth after the old fashion, it seems a more economical plan than the use of traction engines for that purpose.

THE USES OF SNOW.

As we write, a few straggling snow-flakes flutter timidly past our window and quickly melt into oblivion on the flags below. They will soon cease to melt and will gradually fill our streets with the characteristic New York slush, to the utter weariness of overdone horses, and the almost total extinction of good temper on the part of drivers, who will swear that snow is a nuisance, and wish that it were in a place where it would not be long in melting.

Now it is to be admitted that so far as New York city is concerned, the benefits of a "good heavy fall of snow" are rather indirect than otherwise, yet we shall see that even the poorest, who shiver in cellars along dark and gloomy alleys, are interested to have the snow fall, although they, in their ignorance, think it "poverty's curse."

Coal is dear this winter, and for the poor, hard to get, but food costs more than coal, and food must be had at any cost. The supply of fuel may be eked out and supplemented by many a makeshift, imperfect though it be, but hunger cannot be appeased by a subterfuge.

The snow which falls upon the earth is a tender mantle to infant food-plants which would otherwise perish of frost. In what is called an "open winter," you may see whole fields of young rye and wheat and clover, all pulled up by the frost and laid on the top of the ground to wither and die in the spring sunshine. The frost heaves up the earth, and with it the plants; slight thaws permit the earth to settle and renew its hold, and so successive freezings and thawings gradually uproot entire crops. "Winter killed," is the sad verdict of the farmer, as he contemplates the loss of his labor and seed in the spring; and "winter killed," might be appropriately spoken of the suffering and dying victims of starvation prices which follow the destruction of crops.

True, Nature sometimes in her zeal to protect, covers too deep and smothers the young plants; tucks in the coverlid so tight that the unseasonable warmth of the earth stimulates their vitality into an attempt at growth, which fails for want of air and light. But such disasters are comparatively rare, and open winters are the most deadly to grain crops. It is also true that in the large territories devoted to grain growing in the United States, when a crop fails in one section it succeeds in another, and so the food-supply keeps pretty steady pace with the demand, but it is none the less true that in many sections of the country winter wheat or rye could not be successfully grown without snow to protect these crops from frost.

But snow has another important office to perform. It is a fertilizer. Ask the experienced farmer, and he will tell you that the late snows of spring falling upon the springing crops makes them look green and vigorous, and really nourishes them. It is the bearer of ammonia, an important element of the food of plants, which it collects from the air. We have known thrifty farmers to rise early to plow in a light snow before it melted, being aware of its value, though perhaps not realizing in what its virtue consisted. It is also without doubt true that open winters are more favorable to the spread of disease than the contrary. It is an old proverb that "green Christmases fill churchyards."

So we see that snow has other uses than to make sleighing, though we get so little of this in New York, and the snow so interferes with travel in our crowded thoroughfares that one may well be pardoned for wishing that in the annual distribution our metropolis might be over-looked.

WHAT REMAINS FOR INVENTORS.

A great deal has been done in mechanical invention and chemical discovery. In these respects the world has moved immensely since the beginning of the present century. It is the habit of some short-sighted people to predict that we have, as a race, arrived at the pinnacle of our greatness, so far as relates to the subjugation of the brute forces of nature We have, say they, now harnessed the forces of gravity, heat, electricity, light, and affinity, we have learned how far it is possible to make them work for man, and henceforth, whatever improvement is to be made, must be only in the form of the harness.

It is the habit of this class of men to not only regard the steam engine as capable of improvement only in trivial details, in variations in the form of cut-off, or other subordinate particulars, but to look upon electricity as a necessarily more expensive force to generate than heat, and as consequently, forever debarred from economic use as a generator of motive power for machinery. They consider the application of light as limited to the various kinds of photography now known, and which may hereafter be developed.

They discern no remote possibility in the enormous force of chemical affinity, although it is through one of the commonest manifestations of that force—combustion—that we get the heat for our engines, dwellings, dyehouses, furnaces, and forges.

Although the present era in science has given to the world the great doctrine of the mutual convertibility of these forces, and the cognate and equally important doctrine of the conservation of force, the possibilities which a consideration of these doctrines open to the mind, do not seem to force themselves upon their understandings.

To give a glimpse of some of these possibilities is the object of the present article.

When we, divesting our minds of all preconceptions, examine our relations to the things which surround us, we find all these relations resolving themselves into motion. It is primarily through motion that we get any knowledge of anything, and practically it is motion which feeds, clothes, and warms us. Growth is motion. The changes which take place in the substances which we take as food, is a movement of their molecules and their rearrangement in the tissues of our bodies, where they rest not day nor night until finally eliminated and thrown out as effete matter. Nor even then do they rest. There is no rest in nature. Motion is life: nay, more; it and matter together constitute the whole category of physical existence.

It follows that whatever force can contribute to the physical and mental welfare or the pleasures of mankind—and it is in this only that invention finds a profitable field—must be capable of being converted into mass motion; for the human control of molecular motion depends upon mass motion.

To illustrate this let us consider the growth and preparation of any article of food, as wheat. It is by the mass motion of the plow and the harrow the ground is prepared to receive the seed; in this way the molecular motions concerned in its growth are aided, and the full ear and plump berry obtained. It is by mass motion that it is harvested, thrashed, ground, and kneaded, preparatory to the molecular changes which take place in its conversion into bread. It is by mass motion that it is masticated and mixed with the saliva in the mouth, to facilitate the molecular change it must undergo in the process of digestion.

As in this, so in all chemical processes, mass motion is employed to control the molecular motion, and this mass motion is, to a very great extent, in the present age of the world, communicated through the agency of machinery. But we also find that the mass motion of machines is obtained by the aggregation of molecular motions, so that in a ceaseless cycle these forms of motion flow one into the other

The chief field for inventors must, then, continue to be in the future as it has been in the past, in the employment of machines as intermediate links between molecular motion and other molecular or mass motion, which it is desired to make minister to the wants of mankind.

If we now accept the modern view that light, electricity, and gravity are, as well as heat, but modes of molecular motion, who shall dare to say that machinery may not be made the connecting link between them and other modes of molecular motion, in the future, as successfully as it is now between heat and work.

It sounds odd to speak of a light engine, or a gravity engine, although we are familiar enough with caloric engines, steam engines, and electric engines; and a water wheel is but a gravity engine, although we know that previous to the action of gravity it was, so to speak, "wound up" by the action of heat upon the water of the sea.

There is yet an almost unlimited field for lesser lights in the invention of improvements on present forms and devices, but the geniuses of the future have more glorious work before them. When the vast coal-fields upon which the world at present relies shall have been consumed, there will be just as much carbon as before, only it will exist in another form. The mass motion which it will have produced in assuming that form, will in its turn have been converted into molecular motions of some kind, which will be capable of re-conversion without loss into mass motion again, and the world's great workshop will keep running—no fear about it.

Where, then, shall invention stop? When man ceases to want anything to minister to body or mind, then will invention cease. What is there left to do? So much, which is possible, that the ages to come will never see it all accomplished.

THE CONSTRUCTIVE FACULTY OF THE MIND.

Perhaps no one of the powers of the human mind is more widely and uniformly distributed among mankind than the power to control and guide the muscles in the shaping of crude materials into objects of utility and beauty.

Phrenologists have classed constructiveness as a distinct faculty, and have given its supposed external indication a location upon the skull. It is evident, however, that it is not the simple control of muscle by the will that phrenologists mean by the term constructiveness. As illustrations of the prominent development of this faculty their books contain principally heads of such men as have distinguished themselves by great feats of mechanical skill and genius in invention.

Now we maintain that if what is meant by constructiveness in phrenology be anything more than mere power to guide the muscles in making imitations of existing things (and of course more is meant), it can no more be justly considered a single faculty of the mind than the power to become scientific in the most general sense of the latter term. To be scientific a man must have not one but many "bumps" well developed. To become a skilled constructor in anything but the imitative sense of the term, he must have not merely the bump of constructiveness, deemed necessary by phrenologists, but the rest of his skull must contain some brains, as well. Take away his causality, his calculation, his ideality, his sense of color, form, and weight, and he will never make even a horseshoe, not to mention a steam engine. And though he may possess all the faculties which go to make a skilled constructor, he will never become such without knowledge.

To construct, one must have mental as well as physical materials. To become skilled in the working of any material and fashioning it into that which better fits it for the use of man, it is necessary to know in some measure the properties of that material, and the means by which it may be so fashioned.

Savages perform marvels of imitative skill, when the rude character of their implements are considered, but they invent little. Much invention and a savage state are incompatibles. When man begins to invent he has progressed, and it would not be hard to show that the progress of civilization has gone hand in hand with invention.

We see then that mechanical skill may be reduced to three subjective elements; namely, good natural powers of mind and body, cultivation of those powers, and knowledge.

Brutes have not the first of these elements, they can therefore not have the others, and hence it is absurd to speak of their being skillful in their works. The beaver's dam, the honey-comb of the bee, and the tailor-bird's nest, are often spoken of as works of skill, but they are only so by comparison with the feeble mental and physical faculties of the beaver, the bird, and the bee. To form wax into much more complex forms than a honey-comb, would not be a surprising feat if done by a boy six years old. To build a dam as substantial as it is done by the beaver, or to stitch leaves together like the tailor-bird, is far within the power of the lowest and most ignorant savages on the face of the earth. Savages do even more remarkable things than these, but they are not feats of constructive skill in a broad sense of the term; a watch or a steam engine is, because all the requisites above enumerated are necessary to its construction. True, an ignorant man may imitate, but he could not devise, or improve it. An educated man might invent improvements, but lack the power to construct his improvement, but neither of these could be called skillful.

How absurd, then to consider constructive skill as a peculiar faculty of the mind, like the phrenologist, for mere deftness of the hand like the workman, who will none of books because he esteems most the judgment of practical men, and likely thinks himself a practical man.

Of all absurd terms, this "practical" is most misunderstood. What does it mean? Clearly, it means pertaining to practice, and practice signifies the practice of something, the application of knowledge or theory. Hence, theory precedes practice. A theoretical man may not be practical, but a practical man must be theoretical in spite of himself, and just as he is deficient in theory, in just so much he must be deficient in practice. There is a lesson to be drawn from this, but it must form the subject of a future article.

MEN OF PROGRESS---GREAT INVENTORS.

We continue this week our biographical sketches of the lives of the great inventors whose portraits are offered (see another column) as one of our subscription prizes.

At the extreme left of the picture stands the dignified Dr.

WILLIAM THOMAS GREEN MORTON,

who was born in Charlton, Mass., August 19, 1819. His youth was passed on a farm. At the age of seventeen he spent some time in a publishing house in Boston. In 1840 he commenced the study of dentistry in Baltimore, and eighteen months after established himself as a dentist in Boston. Among other improvements introduced by him was a new kind of solder by which false teeth are fastened to gold plates, preventing galvanic action. In order to render his work complete, it was desirable that the roots of old teeth should be removed. This was a tedious and painful operation, and there seemed little prospect of the success of the invention, unless he could devise means to lessen the pain. He tried by stimulants, intoxication, and magnetism, but in vain; yet still he clung to the idea that there must be something to produce the desired effect. He entered his name as a medical student in Boston in 1844. About this time the idea was suggested to him, in a lecture at the college, that sulphuric ether might be used to alleviate pain in his operations. He studied chemistry, and experimented on animals. Learning from books and lectures that the ether could be inhaled in small quantities, but that in large amount it was dangerous, he experimented on himself, and, satisfied of its safety, he administered it to a man, on September 30, 1846, producing unconsciousness, during which a firmly-rooted bicuspid tooth was painlessly extracted. At the request of Dr. Warren he administered the ether to a man at the Massachusetts General Hospital, from whose jaw was removed a vascular tumor, October 16, 1846, with perfect success. Dr. Morton obtained a patent under the name of letheon, November, 1846, in the United States, and the following month in England. The Paris academicians awarded 5,000 francs to be equally divided between Drs. Jackson and Morton; the latter declined receiving this joint award, but in 1852 received the large gold medal, the Monthyon prize.

From this time Dr. Morton labored incessantly for years to induce surgeons to adopt the ether, and, when its anæsthetic qualities were demonstrated, chloroform in their practice. His efforts secured him small profits, but brought upon him bitter persecution. His claim to the discovery of anæsthesia was disputed, and even the value of his efforts in behalf of its introduction was denied. In 1867, after witnessing a very successful, though severe surgical operation, in which Dr. Morton administered with his own hands the anæsthetic, we listened to an able and eloquent statement of his claims to the discovery of anæsthesia, as applied to surgery, which had the effect to establish in our mind the entire justice of that claim, and which, whether allowed by posterity or not, in our opinion entitles him to head the list of the world's benefactors. The full value of this discovery can only be appreciated by those who know how much suffering is saved by its now general application, and this value cannot be expressed in language, or estimated in dollars and cents. After many fruitless applications to Congress for some pecuniary recognition of his services to the world, some of them made at a time when the agony of thousands of wounded and maimed soldiers on the battle field, was being mitigated by his discovery, to the eternal shame of an ungrateful country be it said, he died July 15th, 1868, a poor man.

Immediately in front of Dr. Morton, stands

COL. SAMUEL COLT,

who was born at Hartford, Conn., July 19, 1814, and educated in his own native city. When a child, he preferred the workroom to the school-room. He remained in his father's factory from the age of ten to fourteen, when he was sent to school at Amherst, Mass., but ran away from the school, and, in July, 1829, shipped as a boy before the mast on as East India voyage. On his return, he served a short apprenticeship in a factory at Ware, Mass., in the dyeing and bleaching department, where he learned something; after which, under the assumed name of Dr. Coult, he traversed every State and most of the towns in the Union and British North America, lecturing on chemistry. In this way he earned considerable money, which he devoted to the prosecution of the invention of his revolver, the germ of which he had already devised while on his voyage to Calcutta. The first model of his pistol, made in wood, in 1829, while a sailor boy, is still in existence. At the age of twenty-one, he took out his first patent for revolving firearms. Before obtaining his patent here, he visited France and England and secured patents there. He returned to the United States and succeeded in inducing some New York capitalists to take an interest in the invention, and a company was formed in Paterson, N. J., in 1835, with a capital of $300,000, under the name of the Patent Arms Company. The revolvers were first introduced into use in the Florida War of 1837. In 1842 the Patent Arms Company were forced to suspend. The Mexican War commencing in 1847, General Taylor sent Captain Walker of the Texan Rangers to procure a supply; there were no arms to be had, not even could he obtain one to serve as a model, so that he was compelled to make a new model, which he did with several improvements. The first thousand were made at Whitneyville, Conn. Other orders immediately following, Mr. Colt procured more commodious workshops at Hartford, and commenced business on his own account. The demand for revolvers greatly increasing, and more room and greater facilities being required, he purchased a tract of meadow land south of Mill River, within the limits of the city of Hartford, surrounded it with a dyke or embankment about two miles in length, one hundred and fifty feet at the base, from thirty to sixty at the top, and from ten to twenty five feet in hight. He erected within this his armory, consisting of two main buildings, with others for offices, warerooms, etc., in which armory he could manufacture one thousand firearms per day. He also manufactured the machinery for making these firearms elsewhere, and supplied a large portion of the machinery for the armory of the British Government at Enfield, England, and the whole of that for the Russian Government at Tula. The entire expenditure upon his grounds and buildings amounted to more than $1,000,000. He did not forget the comfort of his workmen, having good dwellings provided for them, besides a public hall, a library, courses of lectures, concerts, etc. Mr. Colt subsequently invented a submarine battery of great power, and was one of the first to lay a submarine cable. He amassed an immense fortune in his manufacture of arms; and died in 1861.

By his side stands

CYRUS HALL M'CORMICK,

of Scotch descent, though born in this country, in the State of Virginia. The constant employment of his active mind in pursuit of mechanical improvements, has resulted in one of the most important inventions of agricultural machinery. His automatic mowing and reaping machine, was exhibited in the World's Fair, held in Hyde Park, London, in 1851, and like many other pioneers in the van-guard of progress, was greeted with ridicule. The *Times* called it "a cross between an Astley chariot and a flying machine." Its first trial, however, at Tiptree farm, changed the current of public opinion, and even the *Times* recanted. A still more satisfactory acknowledgment of its merits was the award to it of the Grand Prize medal of the year by the jury of the Exhibition. In the New York Exhibition of 1853, it also won a gold medal. Mr. M'Cormick, not content with this great success, continued his investigations and experiments, until he achieved another important improvement in this same machine, the automatic "raker." This machine, called by its inventor the "M'Cormick," attracted a great deal of attention at the last Great Exhibition in London, in 1861; even crowned heads and the highest nobility considered it worthy of their examination. At every trial in all parts of Great Britain and the Continent, it elicited applause by its admirable performance of the operations for which it was constructed. At the Lancashire Agricultural Meeting, at Preston, it triumphed over nine competitors. Mr. M'Cormick has a large factory in Chicago, Illinois, where, as an inseparable result of such indomitable perseverance and inventive genius, his success is firmly established.

In front of Mr. M'Cormick sits, with vulcanite cane in hand, and large vulcanite pin on his shirt-front,

CHARLES GOODYEAR,

who was born in New Haven, Conn., December 29, 1800. He there attended public school. When not studying he assisted his father Amasa Goodyear, who was the pioneer in the manufacture of hardware. He subsequently joined his father in the hardware business in Philadelphia, and made many improvements in agricultural tools. The firm being overwhelmed by the commercial disaster of 1830, Goodyear selected a new business, the improvement in india-rubber. His early experiments were made in New Haven, Conn., Roxbury, Lynn, Boston, and Woburn, Mass., and the city of New York. The first important improvement made by him was at New York, 1836, being a method of treating the surface of native india-rubber by dipping it into a preparation of nitric acid. This discovery enabled the manufacturer to expose an india-rubber surface in his goods, which, on account of adhesiveness, was before impracticable. The nitric acid gas process, as it was called, was introduced into public use and met with great favor, especially in the manufacture of shoes. Sulphur had been noticed as producing remarkable drying effects on rubber, and in 1838 and '39 Goodyear made at Woburn, Mass., many experiments with compounds of india-rubber and sulphur. In the course of these experiments, about January, 1839, he observed that a piece of rubber mixed with ingredients, among which was sulphur, upon being accidentally brought in contact with a red-hot stove, was not melted, but that in certain portions it was charred, and in other portions it remained elastic though deprived of adhesiveness. From 1839 to the day of his death vulcanization occupied Mr. Goodyear's whole attention. More than sixty patents were taken out by him. The first publication to the world of the process of vulcanization was Goodyear's patent for France, dated April 16th, 1844. He was unfortunate both in France and in England, in being robbed of both patents at the Paris Exhibition of 1855. He obtained the grand gold medal and the ribbon of the Legion of Honor, presented by Napoleon III. His whole time night and day appeared to be taken up with improvements in india-rubber. For years he suffered from poor health. He died in the city of Washington 1861.

ELIPHALET NOTT, D.D., LL.D.,

is represented as seated by the right of Professor Morse in the middle foreground. Although for more than half a century President of Union College, he was to a great extent self-educated, having never received a collegiate training. He was born in Ashford, Connecticut, June 25, 1773. He studied divinity in his native county, and at the age of twenty-one was sent out as a domestic missionary to the central

part of the State of New York. On passing through the old settlement of Cherry Valley, he was requested to take charge of the Presbyterian Church at that place; he accepted the call, and in addition to his pastoral duties became the teacher in the Academy. Two or three years afterward he was called to the Presbyterian Church, at Albany, where he took a prominent position as a preacher. In 1804 he was chosen President of Union College, Schenectady, N. Y., which place he continued to fill for 58 years. More than 3,500 students were graduated during his presidency, and in their number may be found some of the most eminent men in the country. Union College was emphatically of his own formation. He came to it in its poverty and infancy, and raised it to wealth and reputation In 1854 the semi-centennial anniversary of his presidency was celebrated, when between 600 and 700 of the men who had been graduated under him came together to do him honor. Dr. Nott was an earnest advocate of the temperance cause, and published "Lectures on Temperance" in 1847. Though he has written much, his other publications are confined principally to occasional addresses and "Counsels to Young men." He gave a great deal of attention to the laws of heat, and besides obtaining thirty patents for applications of heat to steam engines, the economical use of fuel, etc., was the inventor of a stove bearing his name, which has been very extensively used. He died in Schenectady, January 29, 1866.

Immediately behind Dr. Nott stands

CAPT. JOHN ERICSSON,

whose great genius as an inventor and engineer are universally acknowledged. He was born in the province of Wermeland, Sweden, in 1803. The son of a mining proprietor, his earliest impressions were derived from the engines and machinery of the mines. In 1814 he attracted the attention of the celebrated Count Platen, and in 1820 he entered the Swedish army as an ensign, and was soon promoted to a lieutenancy. His regiment being stationed in the highlands, where government surveying was in progress, Ericsson surveyed upwards of fifty miles of territory, detailed maps of which, executed by his own hands, are yet in the archives of Sweden. He visited England in 1826, with a view of introducing his invention of a flame engine; not succeeding, he abandoned the idea, and numerous other inventions followed. He joined the house of Braithwaite, London, where he introduced several improvements in steam boilers. In the fall of 1829 his invention was applied to railway locomotion on the Liverpool and Manchester Railway. The directors had offered a prize for the best locomotive engine, and within seven weeks of the time of trial Ericsson heard of the offer, planned an engine, executed the working drawings, and completed the machine. The lightest and fastest engine started on this occasion was the "Novelty," which, guided by its inventor, Ericsson, started off at the rate of fifty miles an hour. A similar engine, of great power, he subsequently constructed, for the King of Prussia. For this invention he received the prize medal of the Mechanics' Institute, in New York. In 1833 he reduced to practice his long cherished project of a caloric engine, and submitted the result to the scientific world in London. Ericsson's attention was next directed to navigation; the result revolutionized the navies of the world. He was employed through Capt. R. F. Stockton, of the U. S. Navy, in the construction of the U. S. ship of war, *Princeton*, the first steamship ever built with the propelling machinery below the water line. In the United States division of the great exhibition in London, 1851, Ericsson gained the prize medal for a large number of important inventions there exhibited. In 1852, he was made Knight of the order of Vasa, by King Oscar, of Sweden. The same year brought out his caloric engine in the ship *Ericsson*. It propelled a ship of 2,000 tuns from New York to Alexandria, in the winter of 1853. It was visited there by the President and heads of the departments. His caloric engine has been perfected, and a large number are in successful operation. His greatest triumph was the invention and construction of the *Monitor*. He is still designing and improving naval batteries, and at the same time conducting extensive researches on the subject of solar heat, with a view to its application as a motive power, and also in other scientific fields. Probably no man in America has a better appreciation of the value of time than Capt. Ericsson. He economizes every moment. We are informed, that he has for thirty successive days, worked eighteen hours each day. He rarely leaves his house unless obliged to do so, and allows himself no leisure for social recreation. The speed with which he masters details and throws off designs, is said to be probably unparalleled. His manners are simple and dignified, but, without any assumption, he impresses every one with whom he comes in contact, by his broad views and rich stores of learning. His inventions are numerous and various, but they all bear the true stamp of genius.

FREDERICK E. SICKLES,

seated a little to the left of Dr. Nott, was born in the State of New Jersey in the year 1819. While an apprentice at the "Allaire Works," New York, he invented a "Cut Off," which improvement has become extensively known, not only from its great value in the saving of expense for fuel in the working of steam engines, but also from the litigation that existed during the lifetime of the patent. Although in controversy during the entire fourteen years, for which term the patent was granted, Mr. Sickels could obtain from the courts but partial protection to his rights, and it was not until after the patent had expired, and its extension had been refused by the Patent Office, that he obtained a decision from the highest court that he *was* the inventor of the improvement known as the "Sickels' Cut Off." Mr. Sickels has taken out twelve patents for as many distinct improvements in steam engines, all which have gone into extensive use. His latest invention for steering vessels by steam power has been successfully applied to government and merchant steamers, and was favorably received in England at the great exhibition in London, 1862, where it received the Great Medal.

The most prominent figure in the group occupying the middle foreground of the picture is that of

SAMUEL FINLEY MORSE,

who was born in Charlestown, Mass., April 27, 1791. He graduated at Yale College in 1810, and went to England with Washington Allston in 1811, to study painting under his tuition and that of Benjamin West. In 1813 he received the gold medal of the Adelphi Society of Arts, at the hands of the Duke of Norfolk, for an original model of a "Dying Hercules," his first attempt at sculpture. He returned to the United States in 1815, and in 1824-25 with some other artists of New York, organized a drawing association, which, after two years' struggle against various obstacles, resulted in the establishment, in 1826, of the present "National Academy of Design." Mr. Morse was chosen its first President, and was continued in that office for sixteen years. In 1829 he visited Europe the second time to complete his studies in art, residing for more than three years in the principal cities of the continent. During his absence abroad he had been elected to the professorship of the literature of the arts of design in the University of New York, and in 1835 he delivered a course of lectures before that Institution on the affinity of those arts. While at Yale College, Mr. Morse had paid special attention to chemistry and natural history to such a degree, that, from being subordinate as recreations, they had become a dominant pursuit with him. The electro-magnet on Sturgeon's principle (the first ever shown in the United States) was exhibited and explained in Dana's lectures, and at a later date by gift of Professor Toney, came into Morse's possession, and this same magnet is used in every Morse telegraph throughout both hemispheres. It was on board ship bound for Havre in 1832, and in a casual conversation with some of the passengers concerning recent discoveries in France, regarding the means of obtaining the electric spark from the magnet, that Morse's mind conceived not merely the idea of an electric telegraph, but of an electro-magnetic recording telegraph, as it now exists. The testimony to the paternity of the idea in Morse's mind, and to his acts and drawings on board the ship is ample; so that the court and judges before whom he appeared were satisfied with his claim; the date of 1832 is therefore fixed by this evidence as the date of Morse's conception of the telegraph system which now bears his name. In the latter part of this same year he reached home, prosecuted his studies, and prepared portions of his apparatus. The first instrument was shown in successful operation to many persons in 1835 and 1836, for the purpose of communicating from and to a distant point. In 1837 he completed and exhibited his whole plan at the University of New York. Application was made to Congress in 1842 without success. But in March of 1843 he was startled with the news that Congress, near the midnight hour of the last session, approved his plans and had placed at his disposal the sum of $30,000, to make the experiment between Washington and Baltimore; all know the result. Submarine telegraphy originated also with Professor Morse. He laid the first submarine telegraph lines in New York harbor in 1842, and received a gold medal for that achievement. One of the most prominent figures on the right of the picture is that of

HENRY BURDEN,

an inventor and mechanic, who was born at Dunblane, Scotland, April 20, 1791. His father was a farmer, and it was while a youth engaged on the farm that the son gave evidence of inventive genius, by making with his own hands labor-saving machinery from the roughest materials, and with but few tools and no models. The first marked success was in constructing a thrashing machine. He afterwards engaged in erecting grist-mills and making various farm implements. During this period he attended the school of William Hawley, an accomplished arithmetician; and afterwards, having resolved to try his fortunes in America as a machinist and inventor, he went to Edinburgh and entered upon a course of studies, embracing mathematics, engineering and drawing. Arriving in this country in 1819, he devoted himself to the improvement of agricultural implements. His first effort was in making an improved plough, which took the first premium at three county fairs. In 1820 he invented the first cultivator in the country. In 1825 he received a patent for his machine for making the wrought spike, and in 1835 for a machine for making horseshoes. 1840 he patented a machine for making the hook-headed spike, an article which is used on every railroad in the United States. In the same year he patented a self-acting machine for reducing iron into blooms after puddling. In 1843 he patented an improvement in his horseshoe machinery. In 1849, he patented a self-acting machine for rolling iron into bars. In June, 1857, he patented a new machine for making horseshoes. This may be considered his greatest triumph in mechanics; it is self-acting and produces from the iron bars sixty shoes per minute. He has obtained patents for this machine from every prominent government in Europe. Mr. Burden's suspension waterwheel is another of his inventions. In 1833, he built a steamboat 300 feet long, with paddle-wheels 30 feet in diameter; from its shape it was called the "segar boat." It was lost through the mismanagement of the pilot. In 1836, Mr. Burden warmly advocated the construction of a line of ocean steamers, of 18,000 tuns burden. In 1845, when the steamer *Great Britain* was crippled by breaking one of her screw blades, Mr. Burden went to England for the especial purpose of inducing her owners to adopt the sidewheel, but was unsuccessful. He is now a resident of Troy, N. Y., and is highly esteemed as a citizen.

The remaining portraits are those of Richard March Hoe, Erastus B. Bigelow, and Elias Howe, biographical sketches of whom will be given in a future number.

MICROGRAPHS.

The microscopist often desires to secure in permanent form, the beautiful and curious objects which are revealed to his eye. Recourse is frequently had to the pencil and the prism, success being in direct proportion to the skill. Photography affords the best means, and by its employment we obtain exact copies of the magnified objects. Such pictures are called micrographs, and are produced by combining a microscope with a photographic camera. These combinations are generally expensive; but their operation is simple, and they are easily managed.

Mr. Louis Edward Levy, of Milwaukee, Wis., sends us some micrographs of his own production, which are creditable to him as an amateur, especially when we consider the simplicity and cheapness of the apparatus by which they were produced. Over the eye-glass tube of an ordinary achromatic microscope, he places a sleeve or ferule, to which is attached a small box, having its rear part open so as to receive the plate-holder which fits nicely into the box. The interiors of box and plate-holder are painted black. In focusing, a frame with ground glass takes the place of the plate-holder. With a microscope and camera, thus made, all objects visible by means of the microscope may be readily photographed. Mr. Levy states that his box was made of tin, and the whole expense was only $3.

Report on Steam Boilers Exhibited at the Recent Fair of the American Institute.

THE HARRISON SAFETY BOILER—FIRST MEDAL AND DIPLOMA.—1st. Safety. 2d. Economy of space. 3d. Economy of fuel.—This boiler was the only one which was found reliable and capable of driving the engines at the Exhibition, and which did furnish all the steam for the competition tests of the engines.

Root's Wrought-Iron Sectional Boiler—Second premium and diploma for facility of repairs and economy of space.

If any of our readers have been kept awake by the problem we gave them last week in regard to this report, they may now rest easy—the report is made.

How about the evaporation power of these boilers? How about the quality of steam produced? How about the boilers exhibited, not mentioned in the report? We recommend any who wishes to see how much can be said without saying anything, to put the report on engines and this on boilers side by side, and study them together.

The Gold Hill Fire Still Burning.

The terrible and fatal fire which broke out in the Gold Hill (California) mines on the 7th of April last, and which resulted in the destruction of a large number of lives, is still smouldering. After it had been reduced to close quarters, it was carefully walled in, and work was again started in different directions around it. It was thought to have been extinguished long ago; but such, it appears, is not the case, for a few days since some miners working between the 600 and 700-foot levels of the Kentuck mine suddenly picked through into a space where there was plenty of fire, finding large brands of it. The place was at once closed up again. Being as far as possible shut in and kept from the encouragement of atmospheric air, the fire merely smoulders, but it is there, nevertheless, and may keep on burning for many months to come. It can do no particular harm, however, as it is merely burning out the old timbering where the mine has been worked out.

Obituary---Death of Mr. John Degnon.

We regret to announce the death of Mr. John Degnon, whom our readers will recollect as the engineer who took the locomotive *Best Friend* to Charleston in 1836, and set it running, and therefore claimed to be the first man who ever ran a locomotive in the United States. When we saw him last he appeared in good health, but he died of paralysis, at Boston, on the third of December, aged 59 years. He was a skillful mechanic. He learned his trade at West Point Foundery, and has been successively engineer on the steamships *Arctic* and *Re d'Italia*.

REMITTANCES should be made in money orders, bank checks, or drafts, if possible. When neither of these can be procured, send the money in a registered letter. The present registration system is virtually an absolute protection against losses by mail, and all postmasters are obliged to register letters whenever requested to do so.

AGENTS who receive their weekly supply of the SCIENTIFIC AMERICAN through news companies, are urged to canvass their localities. By a little effort among intelligent mechanics and manufacturers, they can add largely to their lists. We will send specimen numbers, when desired, for that purpose.

SUBSCRIBERS who wish to have their volumes bound, can send them to this office. The charge for binding is $1·50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

CITY SUBSCRIBERS will continue to be served, either at their residences or places of business, at $3·50 a year. Send in your names and the carrier will serve you faithfully.

OUR rule of prepayment of all subscriptions is so rigidly enforced that whoever receives the paper regularly may consider it paid for. No names are entered on the subscription books without advance payment.

Powerful Turbines.

A correspondent of the *American Odd-Fellow*, which, by the way, is a very well conducted and popular magazine, thus describes the turbines used in the Mastodon Mill, in the village of Cohoes, New York.

"The entire number of looms in this mill is fourteen hundred and eighty-six; five hundred of which are located on the first floor." These looms and the other machinery of the mill are driven by three "immense turbine water wheels, made by the Ames Manufacturing Company, which operate the main shaft, and possess an aggregate driving capacity of over eleven hundred horse power. This pit having an extreme depth of forty feet, with a floor twenty-five feet from the surface, which hides the water wheels from a top-view, is in reality an underground two-story building. Three mammoth cast-iron cylinders, eight feet each in diameter, convey the water from the canal on the west side of the building to the wheels; the volume of water being regulated by a sort of tiller located in the pit, and connected with the flood-gates. The perpendicular shaft of each turbine is connected with the main shaft by beveled gear, and the united power exerted, if so applied, would reverse the motion of the great Burden water wheel at Troy, and drive the machinery of a good-sized manufactory besides. The shaft to which this wondrous power is applied is supported by three granite abutments, and forms the axis of six ponderous driving pulleys, twelve feet each in diameter. The immense belts which radiate to all parts of the building are in keeping with the massive pulleys and gearing. These are each two feet wide, and the longest one, reaching to the fifth story, measures nearly two hundred feet. At the north end of the pit, two rotary force pumps are located, which, in case of fire, can be instantly geared to the main shaft by means of a sliding cog wheel, and are jointly capable of throwing six thousand gallons of water per hour."

A Balloon View of a London Fog.

A London paper says:—"On Wednesday afternoon, when London and the suburbs were enveloped in a dense fog, Mr. Coxwell made a balloon ascent from the Hornsey Gas Works. The ascent took place at 2:40, when the atmosphere was clear. Soon after three o'clock the fog extended exactly in the direction the balloon was traveling, and presented a strongly defined line of vapor stretching for miles in an easterly direction. The formation of this fog, as witnessed by Mr. Coxwell from his balloon car, was, we hear, one of the most interesting occurrences in the adventurous life of the experienced aeronaut, and will no doubt be fully described. Over the Forest, near Woodford, Mr. Coxwell and his companion were unable to see the earth at a hight of only fifty feet, and it was only by the aid of a rope trailing on the ground, that a level course could be regulated so as to select an open spot on which to alight. While holding conversation with some men who were following the balloon, and could only hear the rustling of a rope among the bushes and trees, the aeronauts were supposed to be poachers. Keepers, who were in close pursuit, rushed upon the strangers when Mr. Coxwell cast his grapnel in a hedge, and great was their surprise when they discovered what kind of a net and cordage it was trailing over the park. So dense was the fog, that the balloon could not be seen, and the voyagers were supposed to be running along the ground, although Mr. Coxwell proclaimed his balloon, but this was thought to be a ruse to draw off the keeper's attention. Notwithstanding the difficult position, Mr. Coxwell was placed in as to landing, still a safe descent was made."

A PEANUT picker was among the new labor-saving machines exhibited at the Virginia State Fair. Hitherto the nuts have been picked off the vines by hand; four bushels a day being the fair average for a hand. A farmer who raised 1,000 bushels required ten hands for nearly two months to save his crop, at a cost of fifteen cents per bushel. The crop raised on the south side of James river, between Petersburg and Norfolk, is estimated at 1,000,000 bushels a year. To save this crop would require the labor of 6,000 hands for two months, at a cost of $200,000. The new machine is said to save much time and labor.

A RAZOR INDEED!—Mr. J. W. Churchill, of Willkesbarre, Pa., thinks people hone and strop razors too much. He has used one for two years without either honing or stropping it, and it still cuts his beard well, though latterly it begins to pull—a little. He means to use the razor until compelled to sharpen it, but he can still cut a hair held in his fingers with it. Mr. Churchill thinks his razor hard to beat, and we think his beard must be still harder to beat if it has with constant use not dulled a razor in two years. The very thought of it makes our face smart.

CLOTHES WRINGERS.—These indispensable household articles are becoming more generally introduced than almost any other labor-saving machinery. It is but a few years since the first patent was taken out on a clothes wringer and now there are but few families that do not use them. A good article in the clothes-wringer line is advertised on another page.

WATER WHEEL EXPERIMENTS.—We have the promise of a report of the recent trial of water wheels at Lowell, Mass., for publication in our next number.

Answers to Correspondents.

L. B. F., of N. Y.—The power to direct safeguards in the use steam boilers, and to provide for the inspection of stationary steam boilers is vested in the local boards of health by the Statutes of New York. These boards are, we believe, appointed by supervisors, unless the Boards are organized under a special commission like the Metropolitan Board of Health, and have power to enforce their requirements. There is no general law requiring the use of lock-up safety valves on such boilers.

A. F. W., of Mass.—To set the tail-stock of a lathe so as to turn a taper, you must set it off the center half the amount of the taper. A good practical way to do this is to turn down the work at each end to the size you want it before altering the lathe. Then set your tool accurately to the larger end of the work, and run it along opposite the smaller end and use it as a gage in moving the tail stock off the center.

J. A. M., of N. Y.—A wheel intended to roll around a circle eight feet in diameter, would need, in order that it should not grind but roll freely around the circle, to be beveled so as to incline the outer surface one foot from the perpendicular.

W. H. G., of Ohio.—We have no report upon the experiment of carrying fresh meats in the ship *Henry Taber*, constructed for that purpose. If it succeeds we shall certainly hear of it and will publish the fact.

C. P., of N. H.—The light minerals you send are common quartz crystals. The red colored specimens are garnets. They contain silicate of alumina, iron, etc.

J. L. T., of Me., and J. A. B., of Mass.—The Report of the Smithsonian Institute is prepared by Prof Henry, Washington, D. C. You had better write to him on the subject.

E. A. G., of Mass.—"Byrne's Practical Metal-workers' Assistant," contains the exact information you require. Published by Henry Carey Baird, Philadelphia.

D. W. R., of Mich.—Your question cannot be answered without diagrams, and it is not of enough general interest to warrant our doing this.

J. R., of Iowa.—The protoxide of chromium is a compound of 26 parts of the metal chromium and 8 of oxygen.

C. C., of O.—The best food for fishes, in a fresh water aquarium is dried beef cut up very finely.

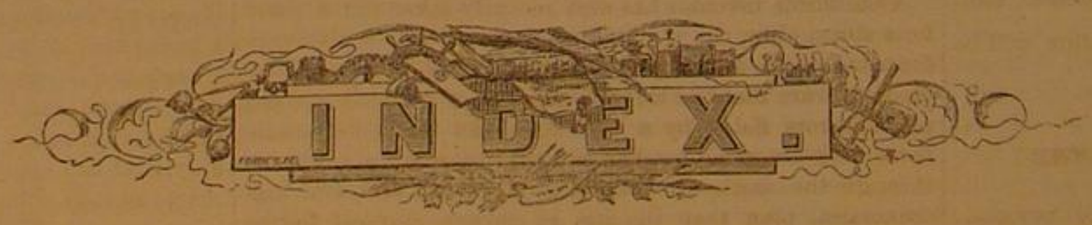
G. B., of Me.—We have had no personal experience in the lumber trade, and cannot answer the point of your inquiry.

F. H. G., of Mass.—The mineral you send appears to be a species of conglomerate. We discover no shells.

F. D., of La.—The red-colored mineral contains iron ore.

S. K. P., of Del.—We cannot explain the phenomenon to which you refer; but your only relief consists in thorough drainage.

C. S. J., of N. Y.—You can render mull or jaconet much stiffer than starch can make it by the use of isinglass size.



ILLUSTRATIONS.

MISCELLANY.

PATENT CLAIMS.

Recent American and Foreign Patents.

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

HORSE COLLAR.—A. Beckwith, New Orleans, La.—The object of this invention is to provide for public use a cheap, substantial, and durable collar for working horses, and which will be easier for the neck than those heretofore employed.

WELL AUGER.—J. Y. Goode, Water Valley, Miss.—The object of this invention is to provide certain improvements in well-boring augers, calculated to make them work more easily, and to facilitate the withdrawal of them from the holes, as required from time to time, without incurring the resistance of atmospheric pressure due to the vacuum commonly produced below.

PUMP.—Chas. L. Merrill, Watertown, N. Y.—The object of this invention is to provide for public use a simple and cheap attachment for pumps, for the purpose of forcing fresh atmospheric air to the bottom of the well during the process of pumping, and thereby to cleanse and purify the water.

HAY LOADER.—W. H. Straub, Danville, Pa.—This invention consists in pivoting the rake heads to the endless elevator chain in such manner that, as the former arrive, in succession, at the point where their loads should be deposited in the hay cart, they shall automatically drop on their points like a trap door, and, afterward, be restored again to their former position.

PIANO ACTION.—A. W. Perry, St. Joseph, Mo.—The object of this invention is to so construct and arrange the several parts, composing the action, that, in playing passages where the same note is repeated with great rapidity, the whole passage can be played, so as to bring out the individual notes with the utmost distinctness, delicacy, and perfection of tone, by an exceedingly slight and rapid depression of the key.

POTATO DIGGER.—Wm. Green, Holly, Mich.—This invention relates to a frame mounted upon two wheels, the central part of the frame being bent downward from the axle, and the rear part sustaining the digging and separating apparatus. The invention consists in a series of narrow spades projecting from the front side of the aforesaid apparatus, each spade rising above and being curved over upon one of the conveying bars, by which the vines are carried to the rear.

LIFTING JACK.—W. S. Douglass, Richmond, Vt.—This invention consists of a forked vertical standard, having a series of notches in its inclined top, and bands placed over such notches in such manner as to form inclined guideways under the bands, of which guideways the notches form part, and in which guideways the pin that forms the lever fulcrum slides, when the pin is not resting in a pair of the notches, such sliding being for the purpose of stationing the fulcrum at a higher or lower point as may be desired, and the lever being so pivoted as to be self-locking.

TIPPING DEVICE.—J. Keith, Brooklyn, N. Y.—This invention relates to as new and useful improvement in a device for tipping pots and kettles for facilitating the operation of pouring out the contents.

COMBINED HAY RAKE AND TEDDER.—John C. Mills, Palmyra, N. Y.—This invention relates to a new and useful improvement in combining in one (or combining a tedder with a hay rake), and it consists in the construction of the tedder and the arrangement of the same in combination with the rake.

SHAKERS FOR THRASHING MACHINES.—Moses A. Keller, Littlestown, Pa.—This invention has for its object to furnish an improved shaker for separating the grain and straw as they come from the thrasher, which shall be simple in construction and effective in operation.

SOLE-SEWING MACHINES.—Jeremiah Keith, Brooklyn, N. Y.—This invention relates to new and important improvements in that class of sewing machines used for sewing soles in the manufacture of boots and shoes, and consists, mainly, in connecting the horn of the machine with the needle bar so that they may be revolved, or partially revolved, simultaneously, in completing the stitch by mechanism detached from the needle and needle bar, and in forming the stitch or chain on the inside instead of on the outside, as is usually done in this kind of sewing, thereby rendering it unnecessary to cut away the outside of the sole any more than would be done in common hand-sewing.

MODE OF LAYING OUT GARMENTS.—Wm. M. Michael, Indiana, Pa.—This invention comprises a mode of laying out the different parts of a garment by lines and measures from a central point within the said parts, by means of patterns for each part of the garments, and a scale bearing the relations to the different measurements of the person.

REAPER AND MOWER.—A Sheline and E. Burke, Edon, Ohio.—The object of this invention is to provide certain improvements in the operating gear of reaping and mowing machines, calculated to furnish more useful and efficient machines than those now in use. The invention consists in an improved arrangement of the drawing gear, and clutching and unclutching devices; also, in an improved arrangement of attaching devices for the mower; and, also, in an improved arrangements of side dropping devices for the reaper, and operating devices for the reel.

WATER WHEEL.—A. W. Lloyd, North Adams, Mass.—This invention relates to improvements in water wheels, such as are used with a draft tube, and has for its object to provide certain improvements in the construction of the same. Also, a draft regulating apparatus for keeping the draft tube full of water whether running or not, to compensate for the loss of water in the said tube, by reason of leaking and accumulation of air therein, set free from the water, which lowers the level of the water therein, and consequently the efficiency of the wheel.

FRUIT CAN.—A. J. McMillen, Ravenswood, West Va.—This invention relates to improvements in cans of tin or other thin sheet metal for putting up fruit; it consists in the application of a strong band or hoop at the center between the ends to prevent the cans from collapsing, and adapted also as a register to designate the name of any fruit which may be put into the can.

TOBACCO MACHINERY.—J. H. Dickason, Hannibal, Mo.—This invention relates to new and useful improvements in machinery for manufacturing tobacco, whereby the labor and expense of preparing plug tobacco for market is greatly lessened.

IRONING MACHINE.—Jules Decoudun, Paris, France.—This invention consists in a fixed, smooth, heated metallic surface, and one or more revolving cylinders, upon which an endless apron of felt is applied with such a tension, that, by engaging the fabric to be operated upon between the fixed metallic surface and the felt, the same is carried around with the latter gliding over the heated surface, whereby it is thoroughly ironed.

SAFETY VALVE.—Walter Dawson, Scranton, Pa.—The object of this invention is to provide a better seat for the valve, and also to secure a more free escape of steam than can be obtained by the ordinary safety valve.

DESIGN FOR CHAMBER PAILS.—John S. Jennings, Brooklyn, N. Y.—This invention relates to an improved design for the form and construction of chamber pails.

MACHINE FOR WASHING AND RINSING WOOL.—Emile Nougaret, Newark, N. J.—This invention has for its object to provide a simple machine for washing and rinsing wool, with the aid of warm or cold water or other liquid. The invention consists chiefly in the arrangement of an annular vessel, in which the wool to be washed is kept in constant motion, by a stream of water falling in an inclined direction upon it, so that the force of the water will serve to move the wool.

SASH LOCK AND FASTENER.—A. F. Gregory and C. H. Ensign, Bridgeport, Conn.—This invention relates to an improved device for retaining window sashes at any suitable hight, and for locking the same, when they are lowered.

WASHING MACHINE.—T. H. Tatlow, Jr., Newark, Mo.—This invention relates to a new washing machine in which the rubber is attached to a lever that can be oscillated, both in a vertical and horizontal direction, to obtain the requisite action on the articles to be cleaned.

ALARM FAUCET.—T. M. Biddle, Fort Wayne, Ind.—This invention has for its object to provide means for automatically arresting the flow of liquid matter of a suitable kind, when the receptacle is filled to the requisite hight.

COAL AND ASH SIFTER.—Abram Hagadorn, Canajoharie, N. Y.—This invention has for its object to so construct a coal and ash sifter, of that class in which a rotary screen is employed, that such screen can be locked stationary, while the coal and ashes are being filled in.

ELECTRIC SIGNAL FOR RAILROAD CROSSINGS, ETC.—T. S. Hall, Stamford, Conn.—This invention has for its object to provide means by which an electric signal, visible or audible, to be operated by a passing train, can be held displayed for a certain length of time, until the train acts on a different magnet, than that at first set in motion.

SNOW PLOW.—Gottlieb Beer, Grafton, Wis.—This invention relates to a new snow plow, which is to be moved ahead by horses, or other draft animals, and which is provided with a steering point, swinging wings, and with a backward projecting pole.

LUBRICATOR.—David Adamson, New York city.—This invention has for its object to provide a lubricator cup, which can be used on all kinds of machinery, but more particularly on high pressure engines, with any suitable viscid lubricating material. The invention consists in the arrangement of a cylindrical cup which contains a piston, to the upper or outer surface of which steam pressure is, or can be applied.

PROCESS OF DYEING BLACK.—James Gee, West New Brighton, N. Y.—The object of this invention is to simplify and accelerate the dyeing and sizing of all kinds of fabrics in black, and refers more particularly to the dyeing of cotton, or the fabrics made of vegetable fiber.

PEANUT PICKER.—W. A. Crocker, Norfolk, Va.—The invention comprises an arrangement in a closed case, through which the vines are supplied at one end, of an endless chain carrier, composed of chains woven together diagonally, making large angular meshes, working between fixed screens, one above and the other below the upper portion of the chains; also, in combination with the above, a rotary spiked vine discharger, a fanning device, and a scouring apparatus.

PAPER FILE.—Benj. F. Herr, Livingston, Ala.—This invention consists in the arrangement of three parallel bars, one of which is provided with hooks and pins for the connection of the other two, and springs for forcing the middle bar against the second outer bar, for clamping the papers placed between them. For disengaging the papers the bars are forced together and the hooks disengaged from the second outer bar and engaged with the middle bar, holding the springs, while the second outer bar is free to be removed.

SPRING FOR HORSE COLLARS.—Benjamin J. Barton and Roswell J. Stanley, Washington, Iowa.—This invention has for its object to furnish an improved spring for horse collars, which shall be so constructed as to strengthen the collar and keep it in position and form, both when on and when off the horse.

CHURNING MACHINE.—D. G. Taylor, Campbellsville, Ky.—This invention has for its object to furnish a simple, convenient, and effective churning machine, which shall be so constructed and arranged as to do its work quickly and well.

HEATING SADIRONS.—James Jenkinson, Williamsburgh, N. Y.—This invention has for its object to furnish an improvement in heating sadirons with kerosene lamps, gas burners, etc., by means of which the sadirons may be readily and conveniently heated.

DITCHING MACHINE.—H. L. Hall, Buffalo, N. Y.—This invention has for its object to furnish a simple, convenient, and effective machine for opening ditches, and which shall be so constructed and arranged that it may be used for making crooked ditches.

COTTON SEED PLANTER.—Matthew McMillian, Caney, Ark.—This invention has for its object to furnish a simple, convenient, and effective cotton seed planter, which shall be so constructed and arranged, as to plant the seed in a narrow channel making it much more convenient for scraping, chopping, and, in fact, for the entire process of cultivation.

GATE AND DOOR LATCH.—Rudolph Geselbracht and Frederick Frey, Galena, Ill.—This invention has for its object to furnish a simple, strong, convenient, and effective latch for gates.

TRACE LOCK FOR WHIFFLETREES.—Samuel P. Williams, Rutland, Vt.—This invention has for its object to furnish an improved lock, by means of which the trace or tug may be effectually guarded against becoming accidentally detached, and which shall, at the same time, be simple in construction and easily applied and operated.

VENTILATOR.—William F. Thoms, M.D., New York city.—This invention has for its object to furnish a simple, convenient, and effective apparatus for ventilating dwellings, offices, churches, halls, and other buildings, and which shall be so constructed and arranged that it may be so adjusted as to introduce into the room warm air in winter and cool air in summer.

MOLE KILLER.—Joseph Wilson, Little Falls, N. J.—This invention has for its object to furnish a simple, convenient, and effective device for destroying moles, which shall be so constructed that it can be set without obstructing the track of the mole and thus alarming him.

BURGLAR-PROOF SAFE.—William McFarland, Williamsburgh, N. Y.—This invention has for its object to improve the construction of an improved safe, patented September 14, 1869, and numbered 94,761, so as to make it more convenient in construction and use, while being equally strong and safe against the attacks of burglars.

MACHINE FOR ROLLING, PRESSING, AND CUTTING TOBACCO, ETC.—G. Robinson, Louisville, Ky.—The object of this invention is to provide a simple and efficient machine for rolling and pressing tobacco leaves and cutting them into plugs or cakes. It consists of a system of tongued and grooved pressing rollers and cutting rollers, together with feeding and delivering apparatus.

TOBACCO ELEVATOR.—G. Robinson, Louisville, Ky.—This invention relates to elevating apparatus for elevating or lowering tobacco in warehouses, whereby it is designed to provide a simple and convenient apparatus, adapted to carrying the tobacco up or down while suspended in bunches or hands on the racking sticks.

BOOK HOLDER.—Hamilton Sherman, Waverly, Pa.—This invention consists of a table hinged to a stand for adjustment to the required angular position in front of the reaver, and provided with means for holding it as required; also, with a spring clamp of peculiar construction.

GARDEN PLOW AND MARKER.—Henry Haynsworth, Sumter, S. C.—This invention relates to improvements in hand garden plows for making and marking furrows or drills for planting, and for plowing between rows of plants for cultivating. It consists of a curved and fork beam, answering for beam and handles; a wheel at the front end of the frame supporting it; a plow or scraper behind the wheel, and a marker supporting arm hinged to the beam, so as to project laterally therefrom, and to be turned to either side for marking the next row by a marking rod supported at a suitable distance from the frame.

TOOL HOLDER FOR GRINDSTONES.—Pallip Leonard, Sharon, Pa.—This invention relates to improvements in tool-holding attachments for grindstones, and consists of a plate, arranged for oscillation in front of the face of the grindstone, and a carriage mounted thereon, to slide back and forth, and carrying an adjustable tool holder mounted on the said carriage, and capable of feeding towards or from the stone, the whole being arranged to hold the tool in contact with the stone, and to move it back and forth across the face in a way to grind the edges truly and at any required level.

SWIVEL COCK EYE FOR HARNESS.—Thomas J. Magruder, Marion, Ohio.—This invention relates to improvements in the construction of swivel cock eyes for harness, and consists in constructing the neck of the eye between the two ends, of a regular concave form, and uniting the cross bar of the frame, to which the tug is connected by casting it around the said neck, previously arranged so as not to project beyond the inside of the cross bar, so formed by casting around the said neck in the mold, whereby the abrupt shoulders commonly formed at each end of the straight necks, which are objectionable because of the weakness of the necks at the junction with the said enlargements, and because of the protruding ends inside of the frames, are avoided, the objection to the protruding ends is that they come into contact with the parts of the tugs looping around the bars to which they are attached and bear them.

APPLICATIONS FOR EXTENSION OF PATENTS.

MACHINE FOR FOLDING PAPERS, ETC.—John Thompson, New York city, executor of Thomas Thompson, late of Brooklyn, N. Y., deceased, has applied for an extension of the above patent. Day of hearing Feb. 9, 1870.

CULTIVATING PLOW.—William E. Wyche, Brookville, N.C., has petitioned for the extension of the above patent. Day of hearing, Feb. 9, 1870.

METHOD OF BOTTLING FLUID UNDER GASEOUS PRESSURE.—Jane Quantin and Henry A. Pintard, Philadelphia, Pa., executors of Alphonse Quantin, deceased, have applied for an exension of the above patent. Day of hearing, Feb. 16, 1870.

HARVESTER RAKE.—Owen Dorsey, of Newark, Ohio, has petitioned for an extension of the above patent. Day of hearing Feb. 16, 1870.

METHOD OF BENDING WOOD.—John C. Morris, Cincinnati, Ohio, has applied for an extension of the above patent. Day of hearing Feb. 23, 1870.

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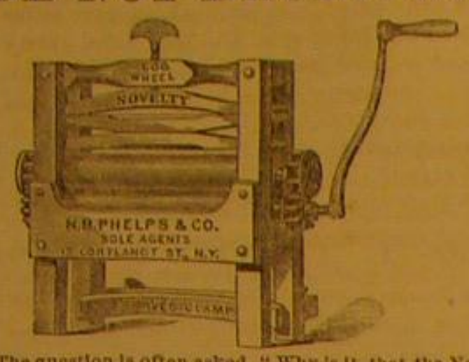

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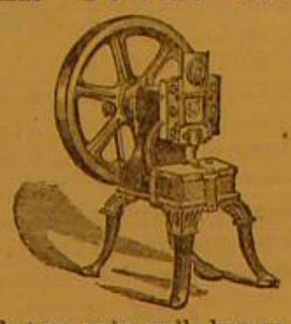

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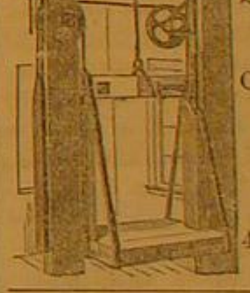

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The plate is 22×36 inches, and contains the following group of illustrious inventors, namely—Prof. Morse, Prof. Henry, Thomas Blanchard, Dr. Nott, Isaiah Jennings, Charles Goodyear, R. J. Saxton, Dr. W. T. Morton, Erastus Bigelow, Henry Burden, Capt. John Ericsson, Elias Howe, Jr., Col. Samuel Colt, Col. R. M. Hoe, Peter Cooper, Jordan L. Mott, C. H. McCormick, James Bogardus, Frederick E. Sickles. The likenesses are all excellent, and Mr. Sartain, who stands at the head of our American engravers on steel, in a letter addressed to us says, "that it would cost $4000 to engrave the plate now," which is a sufficient guarantee of the very high character of the engraving as a work of art.

The picture was engraved in 1868, but owing to the death of Mr. Skirving a few copies only were printed for subscribers at $10 each. A work embracing so much merit and permanent interest to American inventors and lovers of art, deserves to be much more widely known. We propose, therefore, to issue, on heavy paper, a limited number of copies at the original price of $10 each, to be delivered free of expense. No single picture will be sold for less than that price, but to any one desiring to subscribe for the SCIENTIFIC AMERICAN, the paper will be sent for one year, together with a copy of the engraving, upon receipt of $10. The picture will also be offered as a premium for Clubs of Subscribers as follows, to those who do not compete for Cash Prizes:

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JANUARY.						
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SEPTEMBER.						
Su	M	Tu	W	Th	Fr	Sa
. .	. .	. .	. .	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	. .

OCTOBER.						
Su	M	Tu	W	Th	Fr	Sa
. .	. .	. .	. .	. .	. .	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	. .	. .	. .	. .	. .

NOVEMBER.						
Su	M	Tu	W	Th	Fr	Sa
. .	. .	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	. .	. .	. .

DECEMBER.						
Su	M	Tu	W	Th	Fr	Sa
. .	. .	. .	. .	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

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