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Improved Air Engine.

The force derivable from the expansion of atmospheric air by heat, although it has, down to the present time, failed to compete successfully with steam in cases where much power is required, has, within a few years, established itself as practically successful in furnishing a convenient motor where small power is required. There are at this moment, in practical operation, hundreds of engines deriving their power solely from this source. The great and important considerations of safety, both to human life and to the building in which it is operated, and the little skill and labor required of its attendant have established for the hot air engine, or rather for hot air motors of some kind, a demand which must increase. A steam engine, of necessity, requires a boiler, and this dangerous adjunct, however small it may be, involves either a necessity for competent, and, consequently expensive, attendance, or a risk of explosion. Usually, both these evils attend in a greater or less degree the employment of steam power, and both become more serious as the size or power of the apparatus is diminished.

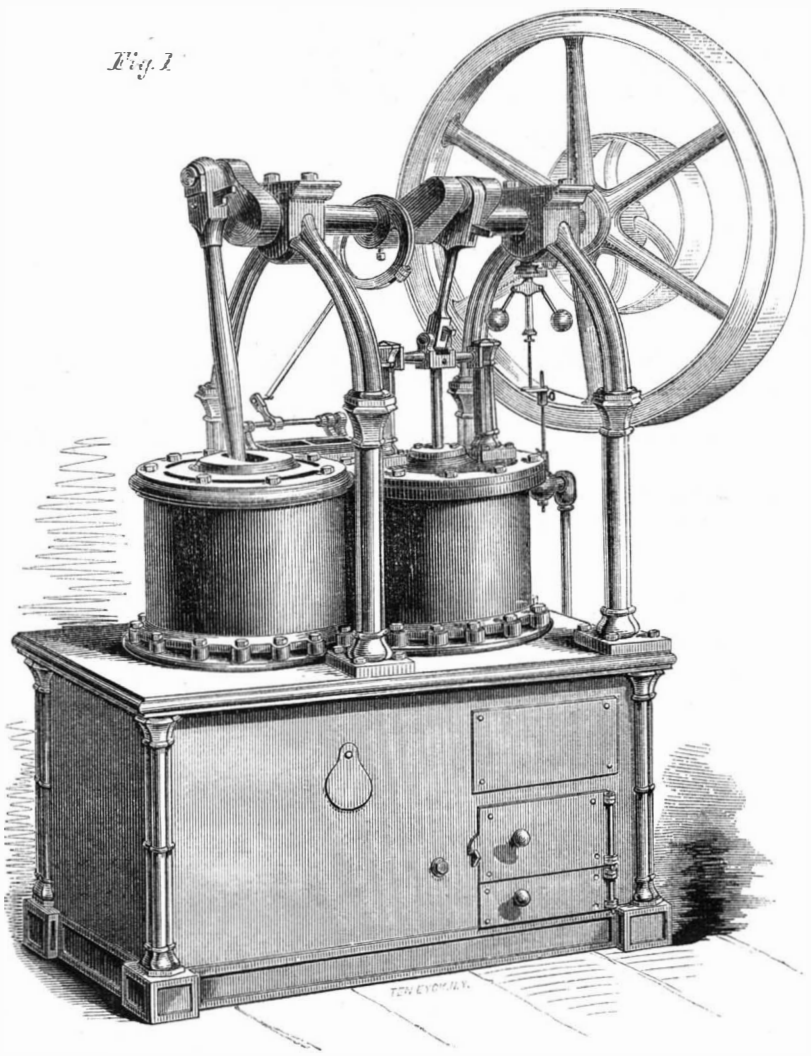
These evils are avoided by the use of hot air engines. Objections to the hot air engines in general use are the clatter while operating, slowness of motion and great bulk.

The engine which forms the subject of these illustrations has been developed within the last two years, and is measurably free from these objections. It is already in practical use in a considerable number of printing establishments and small manufactories, making its revolutions with uniformity equal to the best steam engines, while the only noise emitted is due to the induction and exhaustion of the air.

Robert Stirling, a Scotch clergyman, succeeded, some twenty years ago, in producing an air engine, which was the first practically successful one, and which forms the basis of the invention we are about to describe.

Fig. 1 is a perspective view of the engine, with its furnace complete. Fig. 2 is a vertical section, with the parts somewhat differently arranged, the better to show their peculiar action.

Fig. 1



WILCOX'S IMPROVED AIR ENGINE.

A is a working cylinder, and *a* a single-acting working piston. B is the changing and supply cylinder, and *b* the piston working therein. C is the main shaft, supported by the arches, *r r*, and having two cranks, C^1 and C^2, set nearly at right angles with each other, and connected to the two pistons, *a* and *b*, as represented. H is the flywheel. D is the valve box communicating with the cylinder, B, and with the external atmosphere through three ports, *d* d^1 d^2. M is a valve to open and close these ports at pleasure. E is a small chamber communicating freely with D, and with the lower end of both cylinders, and containing the regenerator or economizer, F, composed of thin metal plates.

A and B are attached by a flange near their centers to the bed plate, L. The lower portion of both the cylinders and of the chamber, E, are cast in one piece, and project into the flue below forming the heating surface. The bottoms of the cylinders are concave and extend a considerable distance upward, thereby greatly increasing the extent of heating surface and also rendering them less liable to spring under the internal pressure.

The upper end of the cylinder, A, communicates freely with the external atmosphere through openings in its cover, N, while the upper end of the cylinder, B, is closed by a tight head, and is made to communicate alternately with the atmosphere and the regenerator chamber, E, by the action of the valve. Pistons, *a* and *b*, are made somewhat longer than their stroke, and are filled with a non-conducting substance, to prevent the heat, to which their lower sides are exposed, from being communicated to their upper sides. A long rod, *a'*, connects the piston, *a*, directly with the crank, C^1, while the piston, *b*, has a rod, S, passing through a stuffing box, *s*, and keyed to a crosshead, T. A short rod connects T with the crank, C^2. The valve, M, has a hollow throat of sufficient width to span ports, *d'* and *d''*, and the space between, and receives an oscillating or partially rotating motion from the eccentric, G.

K is the furnace. The firebrick, J, extends over the furnace, allowing the hot products of combustion to rise through a liberal opening in the center. This construction protects the edges of the cylinder bottom from the destructive effects of the intense radiant heat, but involves no ultimate loss of calorific effect; the heat thus retained being found in an increased temperature of the products of combustion. These latter flow around the whole base and apply the heat uniformly, and then pass to the chimney through the flue, O.

This matter—the uniform application of heat—is one of great practical importance, tending materially to promote the durability of the metal. As a further preventive of over heating any part, an automatic regulator, by which the expansion, or rather the vaporization of mercury contained in a vessel in the heater is caused to correspondingly close a damper in the flue, has been applied and found to maintain a very uniform temperature, preventing the heat of the metal from rising under any circumstances above a proper moderate degree.

The piston, *a*, is made with arms somewhat like a pulley, and a space, V, left between it and the filling below, so that the cool air in the top of A circulates around the joint by which the connecting rod, *a'*, is attached, and thereby keeps it and the metallic packing at so low a temperature as not to burn the oil used for lubrication. As a further means of effecting this object, a cover, N, is placed upon A, having openings, *v v*, through which the air above *a* is forced out as the piston rises, and a fresh supply drawn in as it descends. By this simple means the temperature of the rubbing parts is kept so low that they may be readily and perfectly lubricated.

Fig. 3 shows the valve motion. D is the end of the valve box, and *m* a slotted arm keyed on the end of the axis of the valve. I is an arm fixed upon a rockshaft, W, which receives a reciprocating motion from the eccentric, G, Fig. 2, through the rod, *g*, and arm, *w*. A steel roller, *i*, carried on I, plays within the slot in *m*, and the proportions and motions are so arranged that the valve is thrown very quickly from one position to the other, and retained for a period nearly stationary at the end of each movement. This is accomplished by the peculiar action of the roller, *i*, working in the slotted arm, *m*.

The function of the cylinder, B, and the piston, *b*, working therein, is to take in a supply of cool air from the atmosphere through the valve, and then, when it rises, transfer this air through the regenerator into the hot end of B, where it is expanded and its pressure is much increased. The piston, *a*, being exposed to the atmospheric pressure on its upper side, and to the increased pressure obtaining in B on its underside, is forced upward, and imparts motion to the shaft, C, and flywheel, H. When *a* has been driven to the extent of its motion the valve, M, is changed, and the heated air now filling both B and A is allowed to flow through the regenerator, where it parts with much of its caloric, and escape through the port, *d*, into the atmosphere. The momentum of the flywheel then returns the piston, *a*, to its former position, and in the meantime *b* has taken in a fresh supply of air, to be changed over and propel *a* through another stroke.

This action and the relative motions of the two pistons and valve will be seen by means of Figs. 4, 5, 6, 7, 8, 9, 10 and 11. The circular diagram over each figure shows the corresponding position of the cranks,

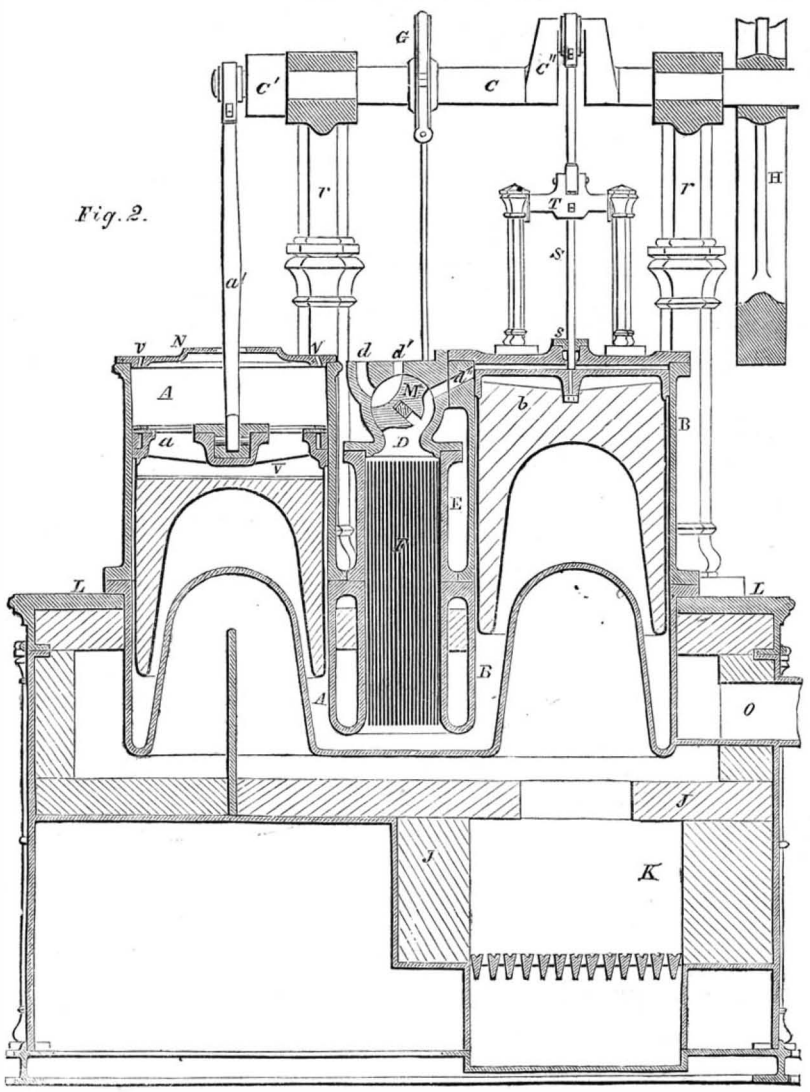


Fig. 2.

and the arrows indicate the direction in which the pistons are moving. In Fig. 4 the piston has completed its up-stroke and imparted motion to the engine; the valve is in position to allow the heated air to escape, and maintain a communication between the atmosphere and the space above the piston, *b*, which has made half its down stroke, the space above it being filled with cool air and the hot air below escaping through the regenerator. This action continues through the next quarter of a revolution, as is

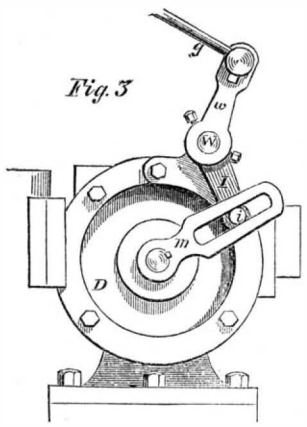
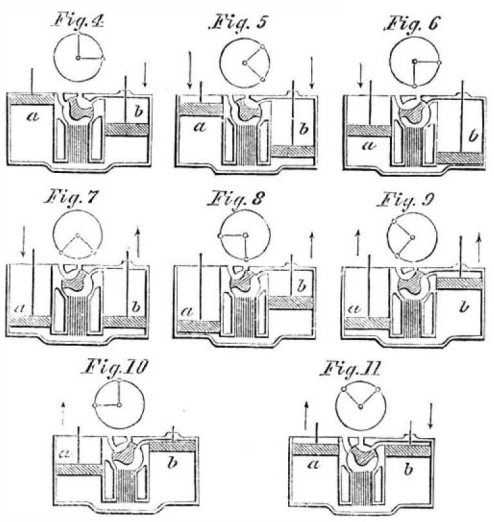


Fig. 3

shown by Figs. 5 and 6. It will be seen that no power is expended in this operation, excepting that required to overcome friction, both sides of both the pistons being in free communication with the atmosphere, and consequently exposed to atmospheric pressure. At the position shown in Fig. 6, the piston, *b*, having taken in a full supply of cool air, and *a* having made half its down stroke, the valve is changed so as to cut off the communication with the external air, and open a passage between the space above and below *b*. As *a* continues to descend, it compresses the warm air beneath it and that contained in the regenerator, forcing a portion over into the space above *b*. The piston, *b*, commences to ascend, but encounters no resistance, as there is a free communication between its two sides. At Fig. 8 the piston *a* has been forced to the end of its stroke by the momentum of the fly-wheel, against the increasing pressure of the air within, which pressure acts the same as "cushioning" in a steam engine; *b* continues to rise and has changed one half the air above it around through the regenerator into the space beneath, by which process the air is heated and its pressure greatly increased. It will be seen that at this point *b* is moving at its highest



velocity, while *a* is nearly stationary or at its "dead point"; the air above *b* is therefore mostly changed to the hot end, while *a* remains within a short distance of the end of its stroke; and therefore, when *a* commences to ascend, it has a pressure beneath it much greater than that which resisted its descent. This pressure forces it up and imparts motion to the engine, while the pistons are alternately assuming the position shown in Figs. 9, 10 and 11. At this latter point the valve is changed as shown in the figure, and the heated air allowed to escape, the piston, *a*, perform ing the remainder of its stroke in equilibrium. One revolution is now complete, and this process is repeated at each revolution. In practice, this revolution is made in one half of a second, or one hundred and twenty in a minute.

Fig. 12 is a diagram of energy calculated for this engine from the following data, which are found in practice to be very nearly attained:—

Temperature of cool air.....100°
Temperature of heated air.....600°
Proportion of lost space to volume of working air..... 0.5
Angle of cranks..... 90°
Area of *a*=area of *b*.
Compression=one half stroke.

Under these conditions it is found in practice that

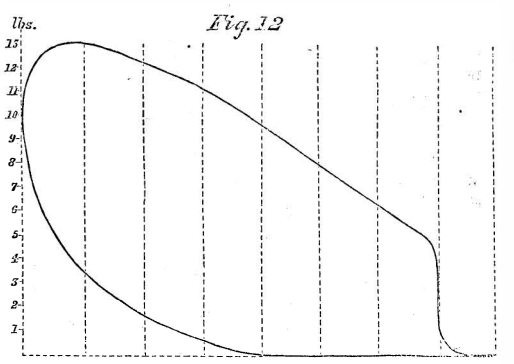


Fig. 12

the escaping air is 260° temperature, and as that is the highest to which the valve, M, is ever exposed, there is found to be no difficulty in keeping this valve properly lubricated.

The advantages claimed for this engine are—

First, Smoothness of motion and little noise. These arise from the fact that the two pistons have the same stroke and are driven by crank motions, and from the absence of puppet or other noisy valves.

Second, The high speed and consequent increase of power. This is due to the smoothness of motion, the use of the regenerator and the large amount of heating surface, by which the air is heated with sufficient rapidity. The power of air engines is limited by the amount of heating surface, in the same manner as is that of steam engines.

Third, Durability. This arises from the smoothness of motion, absence of percussions, the use of only one valve, and the protection of the heating surface from the direct action of the fire.

Fourth, Economy of fuel and attendance.

This invention is the subject of several patents issued to Stephen Wilcox, Jr., of Westerly, R. I., which bear the following dates: May 3, 1859, Feb. 16, 1860, and Nov. 20, 1860. The first patent was reissued in two separate patents, Nov. 20, 1860. It has also been patented in Great Britain and France. For further particulars address Messrs. Wilcox, Denison & Taylor, Westerly, R. I.

Cultivation of the Willow.—A correspondent of the Pennsylvania *Farmer and Gardener* gives the following advice about the cultivation of the osier willow. He says:—"There is nothing more profitable to be grown on land that is wet, and not susceptible of being drained, than osier willows. They grow readily from cuttings stuck into the ground, and the great advantage is that they can be grown on land that will produce nothing else of any value. Large tracts of land in every section of our country, now lying idle, might with great advantage be planted with osier willows. They grow very luxuriantly. I have a kind that produces sprouts from eight to ten feet long in a season, often cutting from sixty to eighty from a single stool or stump. These are not more than from four to six years old. They should be set close, as the sprouts will not then be so thick at the butts, and consequently, of a more uniform thickness, and better adapted for basket work. Many farmers have from one-half to several acres of land that brings them nothing, which, if it were planted with willows of the proper kind, would produce them as much as the best land on their farms, acre for acre, with no labor but the gathering of the sprouts annually."

"Oreide of gold," of which so many cheap articles of jewelry are now made, is simply a very beautiful brass, without a single grain of gold in its composition

THE CHEMICAL HISTORY OF A CANDLE.

By Professor Faraday.

A Course of Six Lectures (adapted to a Juvenile Audience) Delivered before the Royal Institution of Great Britain.

LECTURE III.—(Continued.)

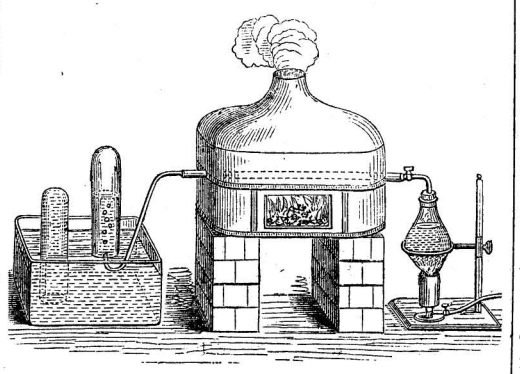
Products: Water from the Combustion—Nature of Water—A Compound—Hydrogen.

To return to our quiet philosophy. We shall not in future be deceived, therefore, by any changes that are produced in water. Water is the same everywhere, whether produced from the ocean or from the flame of the candle. Where, then, is this water which we get from a candle? I must anticipate a little, and tell you. It evidently comes, as to part of it, from the candle, but is it within the candle beforehand? No. It is not in the candle; and it is not in the air round about the candle which is necessary for its combustion. It is neither in one nor the other, but it comes from their conjoint action, a part from the candle, a part from the air; and this we have now to trace, so that we may understand thoroughly what is the chemical history of a candle when we have it burning on our table. How shall we get at this? I, myself, know plenty of ways, but I want *you* to get at it from the association in your own minds of what I have already told you.

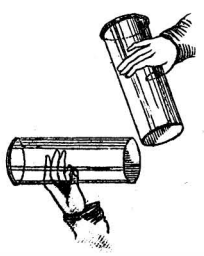
I think you can see a little in this way. We had just now the case of a substance which acted upon the water in the way that Sir Humphry Davy showed us, and which I am now going to recall to your minds by making an experiment upon that dish. It is a thing which we have to handle very carefully, for you see if I bring a little splash of water near this mass, it sets fire to part of it; and if I set fire to a part, and there was free access of air, it would set fire to the whole. Now, this is a metal—a beautiful and bright metal—which rapidly changes in the air, and, as you know, rapidly changes in water. I will put a piece on the water, and you see it burns beautifully, making a floating lamp, using the water in the place of air. Again, if we take a few iron filings or turnings and put them in water, we find that they likewise change. They do not change so much as this potassium does, but they change somewhat in the same way, they become rusty, and show an action upon the water, though in a different degree of intensity, to what this beautiful metal does; but they act upon the water in the same manner generally as this potassium. I want you to unite these different facts together in your minds. I have another metal here, and when we examined it with regard to the solid substance produced from combustion, we had an opportunity of seeing that it burnt; and I suppose if I take a little strip of this zinc and put it over the candle, you will see something half way, as it were, between the combustion of potassium on the water and the action of iron—you see there is a sort of combustion. It has burnt, leaving a white ash or residuum, and here also we find that that metal has a certain amount of action upon water.

By degrees we have learned how to modify the action of these different substances, and to make them tell us what we want to know. And now, first of all, I take iron. It is a common thing, in all chemical reactions, where we get any result of this kind, to find that it is increased by the action of heat; and if we want to examine minutely and carefully the action of bodies one upon another, we often have to refer to the action of heat. Now you know, I think, that iron filings burn beautifully in the air; and I am about to show you an experiment of this kind, because it will impress upon you what I am going to say about iron in its action on water. If I take a flame which I make hollow—you know why, because I want to get air to it and in it, and therefore I make it hollow—if I take a few iron filings, and drop them into the flame, you see how well they burn. That combustion proceeds from the chemical action which is going on when we ignite those particles. And so we proceed to consider these different effects, and ascertain what iron will do when it meets with water. It will tell us the story so beautifully, so gradually and regularly, that I think it will please you very much.

I have here a furnace with a pipe going through it like an iron gun barrel, and I have stuffed that barrel full of bright iron turnings, and the part that is so stuffed is put into the fire and is made red hot. We can either send air through the barrel to come in contact with the iron, or else we can send steam from this little boiler at the end of the barrel. Here is a stopcock which shuts out the steam from the barrel until we wish to admit it. There is some water in these jars, which I have colored blue so that you may see what happens. Now you know very well that any steam I might send through that barrel, if it went through into the water in the form of steam, would be condensed; for you have seen that steam cannot remain as steam if it be cooled down; you saw it here [point-



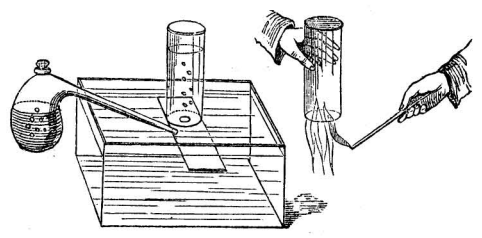
ing to the tin flask] crushing itself into a small bulk, and causing the flask containing it to collapse. So that if I were to send steam through that barrel, it would be condensed—supposing the barrel were cold—it is, therefore, heated to perform the experiment I am now about to show you. I am going to send the steam through the barrel in small quantities, and you shall judge for yourselves, when you see it issue from the other end, whether it still remains steam. Steam is condensible into water, and when you lower the temperature of steam you convert it back into fluid water; but I have lowered the temperature of the gas which I have collected in this jar, by passing it through water after it has passed through the iron barrel, and still it does not change back into water. I will take another test and apply it to this gas. (I hold the jar in an inverted position, or else I should lose my substance.) If I now apply a light to the mouth of the jar, it ignites with a slight noise. That tells you that it is not steam, steam puts a fire out, it does not burn; but you saw that what I had in that jar burnt. We may obtain this substance equally from water produced from the candle flame as from any other source. When it is obtained by the action of the iron upon the aqueous vapor, it leaves the iron in a state very similar to that in which these filings were when they were burnt. It makes the iron heavier than it was before. So long as the iron remains in the tube and is heated, and is cooled again without the access of air or water, it does not change in its weight; but after having had this current of steam passed over it, it then comes out heavier than it was before, having taken something out of the steam, and having allowed something else to pass forth, which we see here. And now, as we have another jar full, I will show you something most interesting. It is a combustible gas; and I might at once take this jar and set fire to its contents, and show you that it is combustible; but I intend to show you more if I can. It is also a very light substance. Steam will condense; this body will rise in the air and not condense. Suppose I take another glass jar, empty of all but air; if I examine it with a taper I shall find that it contains nothing but air. I will now take this jar full of the gas that I am speaking of, and deal with it as if it were a light body; I will hold both upside down, and turn the one up under the other; and that which contains or did contain the



gas obtained from the steam, what does it contain now? You will find it now only contains air. But look! Here is the combustible substance [taking the other jar] which I have poured out of the one jar into the other. It still preserves its quality, condition and independence, and therefore is the more worthy of our consideration, as belonging to the products of a candle.

Now, this substance which we have just got by the action of iron on the steam or water, we can also get by means of those other things which you have already seen act so well upon the water. If I take a piece of potassium and make the necessary arrangements, it will produce this gas; and if I take a piece of zinc, I find, when I come to examine it very carefully, that the main reason why this zinc cannot act upon the water continuously as the other metal does, is because the result of the action of the water envelopes the zinc in a kind of protecting coat. We have learned in consequence, that if we put into our vessel only the zinc and water, they, by themselves, do not give rise to much action; and we get no result. But suppose I proceed to dissolve off this varnish—this encumbering substance—which I can do by a little acid; the moment I do that I get the zinc acting upon the water, exactly as the iron did, but at the common temperature. The acid in no way is altered, except in its combination with the oxyd of zinc, which is produced. I have now poured the acid into the glass, and you would think I was applying heat to cause this boiling up. There is something coming off from the zinc very abundantly, which is not steam. There is a jar full of it; and you will find that I have exactly the same combustible substance remaining in the vessel, when I hold it upside down, that I produced from the experiment with the iron barrel. This is what we get from water, and this is the substance which is contained in the candle.

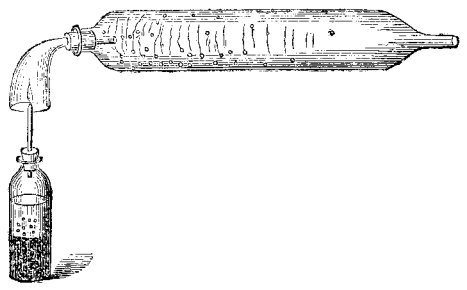
Let us connect these two points clearly and distinctly together. This is hydrogen—a body classed among



those things which, in chemistry, we call elements, because we can get nothing else out of them. A candle is not an elementary body, because we can get carbon out of it, we can get this hydrogen out of it, or at least out of the water which it supplies. And this gas has been so named hydrogen, because it is that element which, in association with another, generates water. Mr. Anderson having now been able to get two or three jars of gas, we shall have a few experiments to make, and I want to show you the best way of making these experiments. I won't be afraid to show you, for I like you to make experiments, if you will only make them with care and attention, and the assent of those around you. As we advance in chemistry we are obliged to deal with substances that are rather injurious if in their wrong places; the acids and heat, and combustible things we use, might do harm if used carelessly. If you want to make hydrogen, you can make it easily from bits of zinc, and sulphuric, or muriatic acid. Here is what in former

times was called the "philosopher's candle." It is a little phial with a cork and a tube or pipe passing through it. And I am now putting a few little pieces of zinc into it. This little instrument I am going to apply to a useful purpose in our demonstrations, for I want to show you that you can prepare hydrogen, and make some experiments with it as you please, at your own homes. Let me here tell you why I am so careful to fill this phial nearly, and yet not quite, full. I do it because the evolved gas which, as you have seen, is very combustible, is explosive to a considerable extent, when mixed with air, and might lead to harm if you were to apply a light to the end of that pipe before all the air had been swept out of the space above the water. I am now about to put in the sulphuric acid. I have used very little zinc and more sulphuric acid and water, because I want to keep it at work for some time. I, therefore, take care in this way to modify the proportions of the ingredients so that I may have a regular supply—not too quick, and not too slow. Supposing I now take a glass and put it upside down over the end of the tube, because the hydrogen is light I expect it will remain in that vessel a little while. We will now test the contents of our glass to see if there be hydrogen in it—I think I am safe in

saying we have caught some [applying a light]. There it is, you see. I will now apply a light to the top of the tube. There is the hydrogen burning. There is our philosophical candle. It is a foolish, feeble sort of a flame, you may say, but it is so hot that scarcely any common flame gives out so much heat. There is the flame, and the heat of the flame, and you see it goes on burning regularly, and I am now about to put that flame to burn under a certain arrangement, in order that we may examine its results and make use of the information which we may thereby acquire. Inasmuch as the candle produces water, and this gas comes out of the water, let us see what this gives us by the same process of combustion that the candle went through when it burnt in the atmosphere, and for that purpose I am going to put the lamp under



this apparatus, in order to condense whatever may arise from the combustion within it. In the course of a short time you will see moisture appearing here in the cylinder, and you will get the water running down the side, and the water from this hydrogen flame will have absolutely the same effect upon all our tests, being obtained by the same general process as in the former case. This hydrogen is a very beautiful substance. It is so light that it carries things up; it is far lighter than the atmosphere, and I dare say I can show you this by an experiment which, if you are very clever, some of you may even have skill enough to make. Here is our generator of hydrogen, and here are some soap suds. I have an india-rubber tube connected with the hydrogen generator, and at the end of the tube is a tobacco pipe. I can thus put the pipe into the suds, and blow bubbles by means of the hydrogen. You observe how the bubbles fall downward when I blow them with my warm breath; but notice the difference when I blow them with hydrogen. [The lecturer here blew bubbles with hydrogen, which rose to the roof of the theater.] It shows you how light a thing this must be in order to carry with it not merely the ordinary soap bubble, but the larger portion of a drop hanging to the bottom of it. I can show its lightness in a better way than this; larger bubbles than these may be so lifted up; indeed, in former times balloons used to be filled with this gas. Mr. Anderson will fasten this tube on to our generator, and we shall have a stream of hydrogen here, with which we can charge this balloon made of collodion. I need not even to be very careful to get all the air out, for I know the power of this gas to carry it up. [Two collodion balloons were inflated and sent up, one being held by a string.] Here is another larger one, made of thin membrane, which we will fill and send up; you will see they will all remain floating about until the gas escapes.

What, then are the comparative weights of these substances? I have a table here which will show you the proportion which their weights bear to each other. I have taken a pint and a cubic foot as the measures, and have placed opposite to them their respective figures. A pint measure of this hydrogen weighs three-quarters of our smallest weight, a grain, and a cubic foot weighs one-twelfth of an ounce; whereas a pint of water weighs 8,750 grains, and a cubic foot of water weighs almost 1,000 ounces. You, therefore, see what a vast difference there is between the weight of a cubic foot of water and a cubic foot of hydrogen.

Hydrogen gives rise to no substance that can become solid, either during combustion or afterward as a product of its combustion; but when it burns it produces water only, and if we take a cold glass and put it over the flame of it, it becomes damp, and you have water produced immediately in abundance; and nothing is produced by its combustion but the same water which you have seen the flame of the candle produce. It is an important point for you to consider that this hydrogen is the only thing in the world, that, by combustion, gives such a substance as this as its sole product.

And now we must endeavor to find out some fresh proof of the general character and composition of this water, and for this purpose I will keep you a little longer, so that at our next meeting we may be better prepared for the subject. We have the power of arranging the zinc which you have seen acting upon the water by the assistance of an acid, in such a manner as to cause all the power to be evolved in the place where we require it. I have behind me a voltaic pile, and I am just about to show you, at the end of this lecture, its character and power, that you may see what we shall have to deal with when we next meet. I hold here the extremities of the wires which transport the power from behind me, and which I shall use to act on the water.

We have previously seen what a power of combustion is possessed by the potassium, or the zinc, or the iron filings; but none of them possess such energy as this. [The lecturer here made contact between the two terminal wires of the battery, when a bright flash of light was produced.] This light is, in fact, produced by a forty-zinc power of burning, it is a power that I can carry about in my hands through these wires at pleasure, although if I applied it wrongly to myself, it would destroy me in an instant, for it is a most intense thing, and the power you see here put forth, while you count five [bringing the poles in contact and exhibiting the electric light] is equivalent to the power of several thunder storms, so great is its force. And that you may see what intense energy it has, I will take the ends of the wires which convey the power from the battery behind me, and with it I dare say I can burn this iron file. Now, this is a chemical power, and one which, when we next meet, I shall apply to water, and show you what results we are able to get.

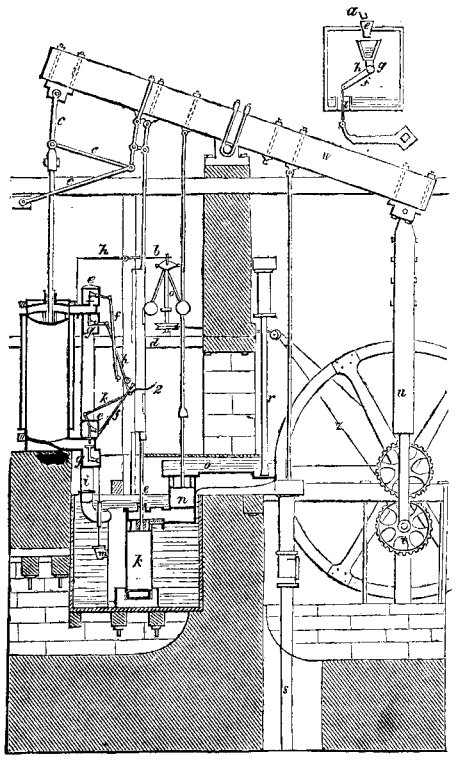
ROMANCE OF THE STEAM ENGINE.

Article XIV.

JAMES WATT.—(Continued.)

The inventions of Watt are so numerous and important that it will require considerable space to do them justice; nevertheless we believe these essays will be found both entertaining and instructive to our readers.

After Watt had made the great discovery of producing a vacuum under a piston in a steam cylinder, without cooling the latter, it was some years before a



capitalist was found possessing genius to comprehend the value of the invention, and sufficient enterprise to engage in the construction of a large engine for practical purposes. The first person who did enter into such an engagement with Watt was the celebrated Dr. Roebuck, an English gentleman and chemist, who owned extensive chemical works, coal and iron mines in Scotland. His connection with the inventor, however, was of little avail, as his affairs soon became embarrassed, and, although he did all in his power to fulfill his engagements, "misfortune drove him to the wall," before a large and suitably constructed engine was finished. After this Watt suffered many vexations and disappointments before the "right man for the right place," was found; but he turned up at last in the person of the large-hearted and enterprising Bolton, of Soho, near Birmingham, England. A partnership with this gentleman, who was a large manufacturer of metallic articles, was formed in 1773, and Dr. Roebuck resigned all claims to an interest in Watt's patent. The inventor then removed from Scotland to Bolton's large works, and in the year afterward, with very poor tools and an indifferently-bored cylinder, an engine was finished, and it operated really better than had been expected; but it was not so perfect as to be universally available to the public, according to the ideas of Watt, for he was a most fastidious mechanic. But the patent under which it was protected had now only one year to run, and as great sums had already been expended in making experiments, it was deemed prudent, before expending more money, to apply to the British Parliament for an extension of the patent. This was done in 1775, and the patent was extended for 25 years, in spite of the powerful influence and eloquence of Burke, which were arrayed against it. This was perhaps a dangerous legislative precedent, but it was a fortunate one for the whole world. Watt and Bolton then set heroically to work, and very soon they had several large steam engines in operation, the economical working of which astonished the whole country. At this juncture a great number of copper mines in Cornwall were about to be abandoned for the want of a sufficient pumping engine, as Newcomen's was no longer capable of doing the work; and there were a large number of coal mines also in the same predicament. The engine of Watt redeemed them, and since then it has done more to promote civilization, increase the wealth of the world, and promote commerce and the arts, than any other invention whatever.

The engine illustrated in our last issue had an outside condenser, but the surface of the metal soon corroded and became inefficient as a conductor. Watt therefore applied the inside condenser to the second engine, and permitted cold water to be injected among the steam, exactly as is now done in most all our northern steamboat engines. The first engine was only single-acting, that is, it took steam only during the upward stroke. The piston rod was also maintained in a straight line by a chain which passed over the vertical arc of the beam head.

The accompanying engraving represents Watt's double-acting engine, in section, with its parallel motion at the beam head, its inside condenser, and governor, and it contains nearly all the parts of the condensing beam engine now in use.

The piston and cylinder are similar to those formerly represented; *c* is the parallel motion, which is a most scientific and beautiful substitute for the chain; *d* is the plug frame; *e e*, steam valves; *f f*, their levers; *g g*, exhausting or eduction valves; *h h*, their levers or spanners; *i*, pipe to condenser; *k*, condenser pump; *l*, its piston; *m*, injection valve; *n*, second condenser and air pump; *o*, governor or conical pendulum; *p*, lever connecting it with the throttle valve; *r*, hot water pump for supplying boiler with the water heated by the injection; *s*, cold water pump for supplying condenser cistern; *t*, planet wheel; *u*, sun wheel; *v*, rod connecting the planet wheel with the great lever, *w*.

From the ample description that has been given of all the parts as they were invented, a brief account of the action of this exquisite machine will suffice to make it clearly understood. In the figure, a communication is open between the under side of the piston and condenser, and between the upper portion of the cylinder and the boiler, and the piston is at the instant of beginning its downward stroke. When it has moved through nearly three-fourths of its whole course, the fall of the plug frame makes the tappet, 1, on the spanner, 2, and this shuts off the further supply of steam from the boiler, and the piston is carried downward by the expansive property of the steam within the cylinder; as the piston reaches to nearly the limit of its stroke, the plug frame disengages the catch (not shown) which retained the shut exhaustion valve in its position, and allows the fall of the plunger

weights to open it; a communication is thus formed between the upper side of the piston and the condenser. At the same moment that the catch was unlocked from one valve, the other exhausting valve was shut and retained in this position by the other end of the catch, while the steam valve connected with it opens at the same moment. The pressure of the steam is now under the piston, and the vacuum above it; the motion is thus reversed, and the piston is pressed upward, and so on alternately. The action of the air pumps is the same as that in the single engine; and the impulse, both upward and downward, is transmitted to the balanced lever by the parallel motion. The alternate action of the lever would also produce a reciprocating action at the end of the planet wheel rod; but this wheel is prevented from moving in any part but in the orbit of the sun-wheel, and the impulse which the fly-wheel has received during the movement of the working beam in either direction, carries the planet-wheel beyond its neutral or inactive points, and thus not only equalizes the motion but makes it a continuous rotary one. A cord or strap, *z*, proceeds from a pulley on the axis of the flywheel, and goes round another pulley on the spindle of the governor; as the motion of the flywheel is fast or slow, so is also that of the governor, the balls fly outward as the speed increases, the lever, *b*, is depressed, and this being connected with the lever that moves the throttle valve, which is adjusted to diminish the area for the steam, when the balls fly outward, and it is opened or enlarged when, in their revolution, they fall nearer to their spindle.

The small figure at the right is Smeaton's "Cataract," a self-acting fountain for regulating the flow of injection into the condenser, so as to produce a cernumber of strokes per minute. It was at first used by Watt, but he soon discarded it. A small stream of water flowed from a pipe, *a*, into a cup, *e*, on a vibrating lever, which opened and closed the pipe that fed the injection water.

This engine was put up in the Albion Flour Mills, in London, in 1786. It was 50-horse power, and drove 10 run of stones. Two engines of similar form were erected, the total number of stones being 20 pairs. It was in this mill that geer wheels entirely made of iron were first used, and the workmanship was said to surpass all that ever before had been executed for large machinery in England. The success of these engines in the Albion Mills soon spread far and wide, and orders poured into the Company, from France and from every section of England, for new engines.

Inventions Before Congress---Interesting Discussion.

In the House of Representatives, on the 19th of February, the following discussion took place, which, as it concerns the purchase of inventions for the use of the government, cannot fail to interest our readers:—

On motion of Mr. Sherman, of Ohio, the House proceeded to the consideration of the amendments of the Senate to bill No. 914, making appropriations for the naval service for the year ending June 30, 1862.

First amendment of the Senate:

For the purchase of the right to use in the navy, if, in the opinion of the Secretary of the Navy, it shall be deemed expedient, Davison's boat-lowering, attaching, and detaching apparatus, a sum not exceeding $10,000.

The Committee of Ways and Means recommended a concurrence.

The amendment was agreed to.

Second amendment:

For the purchase of the right to use by the United States Brooke's deep-sea sounding apparatus, $5,000.

The Committee of Ways and Means recommended a concurrence.

The amendment was agreed to.

Fourth amendment:

Strike out the following:

"For the purchase of the right to use in the United States Navy, on steamships and propellers, a governor to a marine steam engine, provided the Secretary of the Navy shall consider it expedient, $25,000."

And insert in lieu thereof, as follows:

For the purchase of the right to use in the United States Navy, on steamships and propellers, in navy yards or otherwise, wherever the government of the United States may choose to use the same, Sargeant's steam engine governor, $10,000, provided the Secretary of the Navy shall consider it expedient.

Mr. BARR—I hope this amendment will not prevail. It is simply to indorse some man's patent.

Mr. COX—The matter has been investigated thoroughly in both Houses. The amendment of the Senate cuts down the House appropriation $15,000.

Mr. BARR—But why give this privilege to one man only? I presume there are twenty other as good inventions in use in the country.

Mr. COX—No, sir; this invention has been examined and fully approved by the Department.

Mr. BARR—There have been plenty examined, and perhaps many of them are as good as this.

Mr. COX—Not at all, sir.

Mr. BARR—I move to amend the amendment, by striking out the name of "Sargeant," and inserting the words, "the best;" so that the Secretary of the Navy shall adopt the best steam engine governor. This is merely to fasten some man's patent on the government.

Mr. COX—There is no such object contemplated. I explained to the House, and shall now explain to the Committee, what this proposition is. This House appropriated $25,000 for a steam engine governor. It went to the Senate. The Naval Committee of the Senate examined it fully, and consulted the chief engineer. This steam engine governor was examined by the Navy Department and was favorably reported on. That report was sent to the House. This invention was tested on the *Pocahontas* steamship, and it was found that it worked admirably, and that it supplied a desideratum long sought for in the navy. The calculations made by the Naval Committee in the Senate showed that this steam engine governor would save from breakage at least $1,200,000 worth of machinery in steamships. We have thirty-seven steamships in the navy, and in each of them there is, on an average, $40,000 worth of machinery liable to breakage from not having a marine governor. Experiment after experiment has been tried; and finally, engineers were appointed in Philadelphia, who came on here, examined the marine governor, and reported favorably upon it; which report I have here in my desk. The young man who has made the invention comes from the State of Ohio, and has had many misfortunes. His invention has been examined by the Navy Department, by the Naval Committee of this House, and by the Naval Committee and Finance Committee of the Senate. The Senate cut down the appropriation to $10,000. This young man's shop has been recently burned, and this appropriation will give him a start.

Mr. BARR—The gentleman from Ohio, himself, has let the cat out of the bag. He makes an appeal to us because this man's shop has been burned down.

Mr. COX—Not at all.

Mr. BARR—Now, I contend that there has been but one examination of a steam engine governor by the Navy Department, and that was this man, Sargeant's, while there are a dozen at least of such inventions in use. I hope, therefore, that my amendment, to strike out the name, and to insert "the best" steam engine governor, will be agreed to.

Mr. CAREY—I desire to submit a few remarks in regard to this matter. I was requested, last spring, to examine into this patent, and to inquire into its character and usefulness; and therefore I have spoken to several Navy officers about it, and I found that they all approved highly of it. A trial was had, as my colleague says, and a very favorable report was made of it. Since I have been here this session, I have made further inquiries, and have learned that it is far superior to any other marine governor that has been invented.

Mr. HOARD—Will the gentleman state what new principle it introduces?

Mr. CAREY—I do not pretend to understand the principle on which it works.

Mr. HOARD—It would be somewhat remarkable to find a new principle in marine governors.

Mr. CAREY—But it is recommend highly by experienced men.

Mr. HOARD—It is known to the Committee that there was a law passed by Congress adopting a certain safety steam gage for use on Mississippi steamboats. That was Evans' patent, and it turned out to be a humbug. It is no safety steam gage at all. This, in my opinion, is an attempt of the same kind; and I think that the amendment of my colleague (Mr. Barr) is entirely correct. It does seem to me that no particular patent should be named.

The question was taken on Mr. Barr's amendment to the amendment; and it was adopted.

The question recurred on the Senate amendment as amended.

Mr. SHERMAN—I desire to suggest that inasmuch as the Committee has struck out the name of the inventor, its best course now is, to disagree to the Senate amendment. The only difficulty between the House proposition and that of the Senate is, that the House provision leaves the matter open for the Secretary of the Navy, while the Senate amendment specifies the particular invention.

Mr. BRANCH—The gentleman from Ohio is mistaken. There is another very essential difference. The House proposition appropriated $25,000, while that of the Senate only appropriates $10,000. Now I think that we had better hold on to that much of it.

Mr. SHERMAN—Yes; but there is this difficulty about that. If we limit the amount to $10,000, the Secretary of the Navy may not be able to buy the best governor at that price, and may be compelled to buy this very one. I think it better to leave the matter open. I presume we will have an honest Secretary of the Navy, to whom so much discretion may be intrusted.

Mr. COX—I desire to say a few words in explanation of this matter. I have just procured a memorandum of the printed reports sent to this House from the Secretary of the Navy. Both the Naval and the Finance Committees of the Senate thought that they ought not to subject this young man, who made so meritorious an invention, to the risk of coming on to Washington city and competing here with men who are known to make combinations to break down honest inventors. They said that, when the model was here, when this young man was brought on to explain it, when committees had examined it, when the chief engineer had reported on it and advised it, when the Secretary of the Navy had recommended its introduction into the navy, they should not, in such a case, subject the inventor to the trouble of coming here and spending as much money as would be sufficient to buy the patent. The machine is peculiar in its character, and somewhat simple in plan, as nearly all good inventions are. The old governors used in the navy are not at all satisfactory. This one operates by the mode of a small engine being attached to a large one; and, as the report says, it controls, in a quarter of a second, every part of the machinery of a steamboat on the ocean; so that, in fact, a steamer running in a heavy sea, is as much under control as if she were in smooth water. There was a trial had of Silver's marine engine governor, but it was unsatisfactory; and it was rejected. This young man came on here three years ago. The Secretary of the Navy examined the model, and directed him to place it at the navy-yard here. It was there examined by a board of engineers. They would not let him take it away; and there it is to-day. They then requested him to put it on to a steamer. He went to Norfolk, made the machine with his own hands, and placed it on board a vessel. I have here the printed report of the engineer of the *Pocahontas*, and also of the captain of that boat, stating that it performed its work with wonderful accuracy; that it was all that could be desired for that purpose. To gentlemen who may not understand precisely the operation of this machine I will explain in half a dozen words, so that it will be perfectly understood. We all know that in the case of a propeller steamship, when the wheel is lifted out of the water there is no resistance to the engine except the mere weight of the atmosphere, and the wheel will instantly commence revolving at racing speed; then when the wheel comes again into the water, there is a strain upon the engine, which will very likely result in breakage and in serions damage to the steamer. I am told that there is a liability of loss to the government in these steamers to the amount of $40,000 each, on the average, from this cause, which may be avoided by the use of this governor. So says the report of the chief engineer, which I have before me. That was the conclusion of the Finance Committee in the Senate, and of the Naval Committee in the Senate—that $40,000 worth of machinery could be saved on each of these vessels by the application of this steam marine governor. Now, sir, there are in the navy of the United States thirty-seven steam vessels, making, by the application of this invention, a saving of $1,480,000, for the mere sum of $10,000, which is proposed to pay for this invention. I ask, gentlemen, if it is not a matter of economy that we should purchase it? But gentlemen ask, Why not let this man go in and compete with others, if his invention is the best? Sir, as I have stated, he is a poor

man; and I do not desire to require him to come before the Secretary of the Navy in competition with all the men who may come here to oppose him, when his invention has already been investigated, and has met the entire approbation of the Navy Department, after it has been proved beyond all doubt that it is a valuable invention which ought to be used in the war steamers of the government. Now, Mr. Chairman, I am afraid I am taking up, perhaps, more time than is necessary; but it is a matter in which I have felt considerable interest, both in respect to the advantage the government will derive and in respect to this young man. I do not believe a better case can be presented. The gentleman across the way from Ohio (Mr. Carey) knows more of this gentleman even than I do. He has known him perhaps from his youth; and has also taken a special interest in him. He believes the invention is an important one, and is not willing that he shall be required to come here and subject himself to all the expense of going into competition with all the combinations that may be presented, when the value of his invention has already been recognized by the Department, and they are fully satisfied with its merits.

Mr. Carey—I desire to say just one word. My colleague is mistaken in supposing I have known this young man long.

Mr. Cox—I believe, on reflection, that I should have said my other colleague (Mr. Gurley) has been acquainted with him a long time.

Mr. Carey—So far as I am concerned, I never saw him in my life until last spring. As I said before, I was to a certain extent acting as agent for him. If I have been unduly influenced in his favor, it has been by the officers of the Navy, men of genius and mechanical skill, who have all spoken very highly of the invention. The individual himself seems to be an intelligent and respectable man, and from what I have seen, I have no doubt he is a very ingenious man. The officers of the navy have all spoken in the highest terms of this governor. They all say it is better than anything else of the kind known to them. I have no feeling upon the subject, but I think it is my duty to say what I know upon a question of this kind.

Mr. Hoard—If this steam governor is so very valuable, as these gentlemen represent it to be, there is certainly no danger of the government taking any other, if the matter is left open to fair competition. If the gentleman from Ohio has not overstated its value, I am willing, for one, to pay more than $10,000 for the use of such an invention. I am willing to adopt the suggestion of the chairman of the Committee of Ways and Means, and leave the amount at $25,000, placing in the Secretary of the Navy the discretion of adopting the best device that is presented. I think we can afford to trust him in a matter of this kind.

Mr. Cox—The gentleman from New York is, perhaps, not aware that this amendment leaves it in the discretion of the Secretary of the Navy to purchase this invention or not, as he may see proper.

Mr. Hoard—I am aware of that.

Mr. Branch—I would like to ask some gentleman whether the Navy Department has stated to Congress, or to any committee, that it is necessary to buy any governor at all?

Mr. Sherman—The Navy Department has requested the purchase of this particular governor, as I understand; but we did not think it proper to confine the Secretary of the Navy to the purchase of any particular governor; because the next Secretary may think some other is better. We thought it was better to make the appropriation, and leave the whole matter in the discretion of the Secretary of the Navy. He may not see fit to pay more than $5,000 for such a governor as he shall decide to adopt.

Mr. Branch—I can very well see that the Secretary of the Navy, when asked which of the governors was best, might say that Sargeant's was best, or that somebody else's was best; but the impression made upon my mind is, that under the present circumstances, it will be well for us not to purchase any governor at all, but to leave it with the Navy Department, as it has heretofore been left, to purchase the best they can find in market. Let them try such as may be presented, and it may be found unnecessary to purchase any patent right. I believe they have thus far been supplied upon this principle.

Mr. Sherman—Under the existing law, the government has no right to purchase any patented article at all unless they purchase the right itself. It is therefore necessary to furnish the Secretary of the Navy with the power, as well as the means, to purchase a patented article. The Committee of Ways and Means, however, as I have said, thought that, while they were willing to permit the Secretary to purchase some new marine steam governor, they did not think it prudent to specify by law any particular patent.

Mr. Branch—I confess that I did not know of the existence of a law prohibiting the Secretary of the Navy from purchasing a patented article. If such a law be in existence, I must say that, in my opinion, it is a very unwise law, if it is in order to argue against a law after it has passed; because new inventions and improvements are being made from year to year, and they have been especially numerous in respect to steam engines; and the government should have the power to keep up with the improvements that are being made in respect to steam governors, as well as every other species of machinery. I object, however, to specifying this particular invention by law; for it may happen that, before this law shall go into operation, some other invention may take place in steam governors which may be more valuable than this, and which the government should therefore be able to avail itself of.

Mr. Sherman—That is the law now. It was enacted last winter. The government is precluded from purchasing any patent or patented article.

Mr. Branch—In that state of the case, I will not submit the amendment I designed.

Railroads of the United States.

The *American Railroad Journal* of January 5th, has a statement of the length and cost of every railroad in the United States, with the following recapitulation, showing the actual length and cost of railroads in each State:—

States, &c.	Total length of line.	Miles in operation.	Cost of roads and equipment.
Maine	639.36	475.86	$16,233,261
New Hampshire	684.29	657.88	22,676,234
Vermont	555.37	575.37	23,240,097
Massachusetts	1,386.63	1,314.35	59,777,878
Rhode Island	136.82	104.32	4,138,388
Connecticut	762.90	607.76	20,948,380
North Eastern States	4.185.37	3,715.54	$147,014,238
New York	3,455.37	2,808.96	$145,259,792
New Jersey	844.76	627.28	30,385,031
Pennsylvania	3,972.26	2,943.22	151,529,629
Delaware	170.69	136.69	4,370,766
Maryland and Dist. of Col.	701.81	405.81	19,979,284
Middle Atlantic States	9,144.89	6,921.96	$351,534,492
Virginia	2,483.62	1,805.04	$69,580,696
North Carolinia	1,212.04	886.92	17,084,500
South Carolina	1,074.47	978.47	22,045,435
Georgia	1,724.20	1,401.50	27,632,690
Florida	736.50	326.50	6,561,000
South Atlantic States	7,230.83	5,398.43	$142,904,321
Alabama	1,438.90	643.40	17,261,487
Mississippi	870.80	797.80	22,986,370
Louisiana	831.00	327.75	12,193,124
Texas	2,667.00	294.50	9,200,000
Gulf States	5,807.70	2,063.45	$61,640,981
Arkansas	701.33	38.56	$1,800,000
Missouri	1,430.60	813.10	35,398,093
Tennessee	1,412.63	1,283.54	30,793,180
Kentucky	763.90	531.20	16,551,600
South Interior States	4,308.46	2,666.34	$84,542.873
Ohio	4,133.25	3,057.03	$117,353,116
Michigan	1,412.10	807.30	33,615,761
Indiana	2,522.27	2,058.17	71,973,669
Illinois	3,551.90	2,924.60	106,975,581
Wisconsin	2,272.09	937.09	37,580,881
Iowa	2,021.80	548.80	17,257,905
Minnesota	1,167.00	—	2,000,000
North Interior States	17,080.41	10,332.99	$386,756,913
California	343.23	70.05	$3,600,000
Total in the United States.	48,100.89	31,168.75	$1,177,993,818

The following table exhibits the progress of railroads for the 30 years ending on the 1st of January, 1861—the figures for each year being the mileage of roads in operation at its commencement:—

1832	121	1842	3,877	1852	10,878
1833	576	1843	4,174	1853	13,315
1834	762	1844	4,311	1854	15,511
1835	918	1845	4,522	1855	18,153
1836	1,102	1846	4,870	1856	21,440
1837	1,421	1847	5,336	1857	24,290
1838	1,843	1848	5,682	1858	26,210
1839	1,920	1849	6,350	1859	27,857
1840	2,197	1850	7,475	1860	29,401
1841	3,319	1851	8,856	1861	31,179

From the above table we deduce the following, which exhibits the actual and relative increase of mileage in periods of five years—the length of road in 1831 having been 54 miles:—

Five years, ending	Miles open Jan. 1st.	Increase each five years—Actual.	Relative.
1836	1,102	1,048	1,940.74 per cent
1841	3,319	2,217	201.18 "
1846	4,870	1,551	47.21 "
1851	8,856	3,986	81.85 "
1856	21,440	12,584	142.09 "
1861	31,169	9,729	45.37 "

The exports of Chicago in flour, grain, and other products, in 1860, amounted in value to $33,737,480.

Our Correspondence.

Steam Experiments at Erie, Pa.

Messrs. Editors:—I have read Mr. Merriam's report, on page 6 of the present volume of the Scientific American, upon the steam experiments at Erie, and I must confess my inability to discover anything to warrant the conclusion to which he arrives; neither can I discover the bold outlines of candor and fairness that such an experiment ought to have shown us.

I was in hopes that before this time Mr. Isherwood would have given us something tangible and pertinent upon the experiments, upon which we could have framed an opinion for ourselves; but as yet, nothing has appeared in your paper, or elsewhere, that I have seen. I must say that we are yet as much "in the dark" upon the *real* result of the experiment as we ever were.

I feel that Mr. Merriam's report is calculated to do much injury if allowed to go forth without contradiction. I cannot believe the experiments were conducted fairly, nor with that degree of skill and judgment that we had a right to expect from a person of Mr. Isherwood's ability.

In the first place, a steamer is not a fit subject to try an accurate experiment with, as the careening of the vessel, the condition of the lines, the water in the hold, and any little difference in the speed of the wheels, tend to complicate and render uncertain any experiment, however honestly intended to be conducted.

That there is an important gain by using steam expansively, I have not the slightest doubt; and unless Mr. Isherwood, or somebody else, can show something more reliable than I can see in Mr. Merriam's table or report, I shall not change my opinion, which has been built upon long practical experience. I do not wish to be considered captious, nor do I intend to find fault with a report because it is above my capacity to understand its true import, when it appears to be so satisfactory and conclusive to *some* others; but I would ask why it was that Mr. Isherwood took only a pressure of 20 lbs. of steam for this experiment when the boilers were perfectly safe at 100 lbs., and, in fact, guaranteed by the maker at that? Why did he select a pressure so very low that there could be but little benefit from expansion, if any? Surely, there was no necessity for reducing the pressure to the lowest point where a full stroke could barely turn the wheel, and then expect, in all fairness, one-third to work with the same economy. To give an apparent promise of fairness for the experiments, the public were invited to be present; the result of such invitation was perhaps well expressed (though it may be a little rough-edged) in a letter to the writer of this by a gentleman who visited Erie, and who, I believe, is quite as competent an engineer as any member of the Board. He writes as follows:—"There is no use of my staying here, for I am satisfied, by conversation with some members of the Board, that a 'mare's nest' has been discovered, and therefore I shall not remain over."

I have seen two diagrams of Mr. Merriam, and I think it will be plain that Mr. Isherwood could have made the result *against* expansion a great deal more decisive by having reduced the pressure still more than he did, and then cutting off shorter and shorter, until, in fact, all benefit by expansion would have been entirely annihilated or frittered away—and the steam also.

I presume it will be again urged, as before, that although, theoretically, there is a gain by expansion, yet the condensation being so considerable, the gain is shorn of its advantages. To this let me answer, in the words of Mr. Merriam, "it is a fallacy;" and I believe I am fully prepared to show most conclusively there is not any condensation in the cylinder of the least moment when talking of the value of expansion.

A. Guthrie.

Chicago, Ill., Feb. 24, 1861.

[Mr. Guthrie seems to have overlooked the fact that the engines were condensers, so that not much more than 20 lbs. pressure could be used.—Eds.

A Pertinent Fact in the Expansion Question.

Messrs. Editors:—As steam expansion and cut-offs are subjects exciting much discussion among scientific men, I will, with your permission, make a few remarks on the subject. It is, I believe, universally conceded that, at least on loc motive engines, cut-offs

are of great utility. This point I do not propose to discuss.

What I wish to ask is this: how does any one know that steam *does* expand to any useful extent in a cylinder after it is cut off? I know it has been taken for granted, and accepted as the truth by all parties until very recently, but I think that experiments show that such is *not* the case. On the contrary, it is shown that there is a vacuum behind the piston as soon as the valve is closed, caused by the moving forward of the piston; and upon inquiring of many practical men, I find that this statement is supported by a large amount of testimony.

Any one can satisfy himself of the truth or falsity of this statement by leaving the cylinder cocks open, and he will find that the moment the valve cuts the steam off, there is a "sucking in" of air through the cock, where, the moment before, the steam was rushing out.

The question now arises: what is it that causes an engine to quicken its speed with a light train when the cut-off is put on? for the fact that it *does* quicken is known to every locomotive engineer in the country. Is not this the explanation? In working full stroke, the momentum of the engine is deadened to a great degree by the back pressure of the dead steam which has to be forced out of one end of the cylinder at each stroke of the piston. Now, when an engine is under motion, the power required to keep it moving is much less than was necessary to start it; consequently, by cutting off a portion of the steam, there is less back pressure, and the momentum assisting the steam in the pushing end, the engine moves with less resistance and more speed. How is this, gentlemen?

C. H. Haskins.

New Albany, Ind., Feb. 23, 1861.

[This is in accordance with facts heretofore published in the Scientific American, as it relates to the vacuum of the cylinder. If our correspondent means that the chief benefit derived from the cut-off in locomotives is due to a decrease of resistance in overcoming inertia in reversing the piston of the engine, then he will find quite a number of locomotive engineers who will agree with him. This principle, however, is different from a simple decrease of back pressure in the cylinder, the amount of which can be ascertained and a remedy provided.—Eds.

Hair Snakes in a Cricket's Stomach.

Messrs. Editors:—I read A. G. Bisbee's article on "Hair Snakes," published on page 86 of the present volume of your journal, and his knock-down argument about them. You say that you are still skeptical; and well you may be, for who can believe in such absurd notions as hair turning into snakes? I will tell you what I know about the matter.

About fifteen years ago, I saw a black cricket, with a very large belly, going very slow, and apparently sick. I stopped to look at him, and saw that he was dragging something like a hair by the side of his body. I took him up, and saw that it was a hair worm; he had bored a hole through the cricket's body, and was coming out. I opened the cricket, and found ten more worms in his body, in several stages of growth, and from three to seven inches in length. Since that time every cricket that I found with a large belly I opened, and found more or less in them. I think that they grow in the black cricket just as worms grow in our body, and that when the cricket dies, they get to the water and feed on dead animals.

J. Pluche.

Cape Vincent, N. Y., Feb. 26, 1861.

Seeds, Roots, Vines and Slips Wanted.

Messrs. Editors:—I am a great lover of all the beautiful works of Nature, and am rousing up a spirit of emulation here for the culture of rare fruits, flowers and vegetables, having divided all I bought last year with the people here.

I would be greatly obliged to you should you think proper to make me the recipient of a package of your Patent Office seeds, roots, vines or slips, or whatever you usually send. I will take great pleasure in distributing them among careful cultivators.

I wish to take your Scientific American, but I never hear again from money sent.

Mrs. E. H. Yerger.

Bahala Station, Miss., Feb. 16, 1861.

[It would afford us the greatest pleasure to aid our fair correspondent in carrying out her laudable project, and thus stimulate the zeal which she is manifesting in a noble cause. It so happens, however, that we are barren of seeds, roots, vines and slips, and are therefore unable to comply with her wishes. Will not the gallant Colonel Clemson, of the Agricultural Bureau, or the bland and dignified Mr. Shugert, forward a few packages of seeds to Mrs. Yerger, and thus encourage her efforts to beautify and adorn the region round about Bahala? We are sorry to hear that, owing to the pilfering habits of some post office *attaché*, she is deprived of the reading of our journal.—Eds.

A Modern Goliah.

Messrs. Editors:—In a recent issue of your paper, I noticed an article under the caption of "A Big Lift," referring to the astonishing strength of Dr. Windship and Wm. Thompson. I herewith send you a description of one of our big fellows; it is copied from a Florida paper:—

Professor Day is just 6½ feet high in his stockings. His weight is 310 lbs., and he measures 7 feet in the girth; he is the tallest and biggest man in the regiment, and is noted for his great strength as well as his huge proportions. He has been known to shoulder a 600 bale of cotton, and has frequently taken a whiskey barrel by the chines, raised it at arms' length, and drank at the bunghole. On one occasion he threw a mustang pony and his rider over a ten-rail fence. For this offence he was tried and convicted in the Circuit Court of Lauderdale county, and fined $500. This remarkable man is the youngest and smallest of seventeen brothers; his father is 2½ inches taller than he is, but not so thick set; his brothers are taller, but none of them are so stout as the Professor. It is necessary to remark that his father has been twice married, and has eight children by his first wife and nine by his present wife.

The Professor is the Principal of the Marion High School, and is a learned man in every sense of the word. He is master of six languages, and as a mathematician, he has no superior. *He is, beside, one of the best men living, and is noted for his good nature. He never had but one fight in his life, and then he killed a horse and nearly murdered a man.*

The Professor is now serving as a private in a military company.

J. E. V.

Rome, Ga., Feb. 14, 1861.

A Great Meteor.

Messrs. Editors:—On last evening (Feb. 8th), about ten minutes before eight o'clock, I beheld a large meteor in the southwest, at an angle of about 45°. The evening was rather dark, but was intensely lighted up; the meteor was about as large as the moon, with a long greenish-yellow tail; the head resembled a ball of fire. It passed down vertically till it nearly reached the horizon, when it burst, throwing out a thousand silvery scintillations, and all was dark. There was no sound accompanying the phenomenon.

David D. Hall.

Norwalk, Ohio, Feb. 9, 1861.

Cotton by Railroad.—Great quantities of cotton continue to arrive in this city by railroad. This is a novel and remarkable mode of transit for such bulky freight. Formerly all the cotton used to be sent down the Mississippi to New Orleans from Tennessee, &c., thence to be shipped East; now it goes up the Mississippi to Alton, Ill., and from thence it comes all the way by railroad to New York. Great piles of cotton bales may now be seen at Jersey City which have come from the West by the New York and Erie Railroad, and like quantities have also come by the way of the New York Central Railroad; thence down the Hudson River and Harlem Railroads. Heavy, bulky freight cannot be carried from great distances so cheaply by railroad as by water, but the inducements of greater safety and dispatch in transit have operated to create this cotton railway traffic. Our railroads have done a very large and profitable business this winter.

An Ingenious Way of Destroying a Crocodile.—The river Indus, in the East Indies, was infested by a large old crocodile, who carried off two or three natives, one of them being a woman. Its skin was so thick that no ball penetrated it, so some young artillery officers formed the following plan for destroying it. They killed a sheep, and in its body placed a bag filled with gunpowder and some other combustible matter, to which a long wire was attached, with detonating powder at the end. Presently the crocodile saw the prey and seized it, and carried it to a hole which he was known to frequent. Time was allowed him to swallow the sheep, when the wire was pulled, the water then became violently agitated, a loud report was heard, and up came the crocodile, dead, and his stomach blown open.

Column of Varieties.

Scotch pig iron is $2.50 per tun lower at present than it was this time last year.

The King of Bavaria is having executed, at his own expense, a magnetic chart of Europe.

The tobacco crop of the United States for 1860 amounted to 195,000 hogsheads valued at $10,000,000.

A very free flowing black varnish is made with 1 pint of Canada balsam, 4 of bitumen (Judea), and 4 of chloroform.

Nitrate of silver is made by dissolving metallic silver in nitric acid. Silver coin generally contains a considerable portion of copper.

In Chicago white corn sells for 3 cents per bushel more than yellow. Farmers should know this in season, and plant the quality which is most highly prized.

In the museum of Copenhagen, Denmark, there is a mass of amorphous native silver weighing about 500 pounds. It was obtained from a mine in Norway.

The glass pendants for chandeliers are made by fusing glass in a suitable furnace, then squeezing them in brass dies which are kept very hot.

The Lake Superior *Miner* says that raising copper in the great Minnesota mine costs about $152 per tun, or about 7½ cents per pound.

To distinguish steel from iron let fall a drop of dilute nitric acid upon the surface of the metal; it produces a dark gray spot on steel, and a green one on iron.

There is one machine for printing delaines in the Pacific Mills, Lawrence, Mass., which puts on sixteen colors at one continuous operation. There is only one other like it in the world.

A thick wash composed of lime, some salt, a little molasses and some fine sand, applied to shingle roofs render them nearly fire-proof and far more durable.

A small quantity of the carbonate of soda mixed with cast iron broken into small pieces, and smelted in a crucible, converts the metal into good malleable iron.

During the past winter Paris was visited with several fogs as dense as those which sometimes bless the citizens of "famous London town;" it is said they were thick enough to be cut with a cheese-knife.

A beautiful varnish for paper is made by melting 100 parts of white wax in a clean vessel, then adding an equal amount of the essence of lavender. It should be rubbed on with a piece of white merino.

At Attleborough, Mass., the manufactory of Messrs. Evans has been in operation for 20 years making brass and gilt huttons for boys' jackets and military uniforms. Most of the work is done by hand, especially the chasing. The polishing is executed by machinery.

The Society of Pharmacy, at Paris, offer a prize of 6,000 francs for the discovery of the artificial production of quinine, or in default of this, for a substitute possessing equivalent anti-febrile properties. The prize is open to scientists of all nations, and the time is limited to July, 1861.

The light artillery guns in the French army are 4-pounders, and one of them can be easily carried by six soldiers. They are all rifled; the balls are conical, shells, instead of solid shot, are more commonly used and have rings of lead around them. Percussion with them. They not only kill when they strike, but also scatter destruction around when they burst.

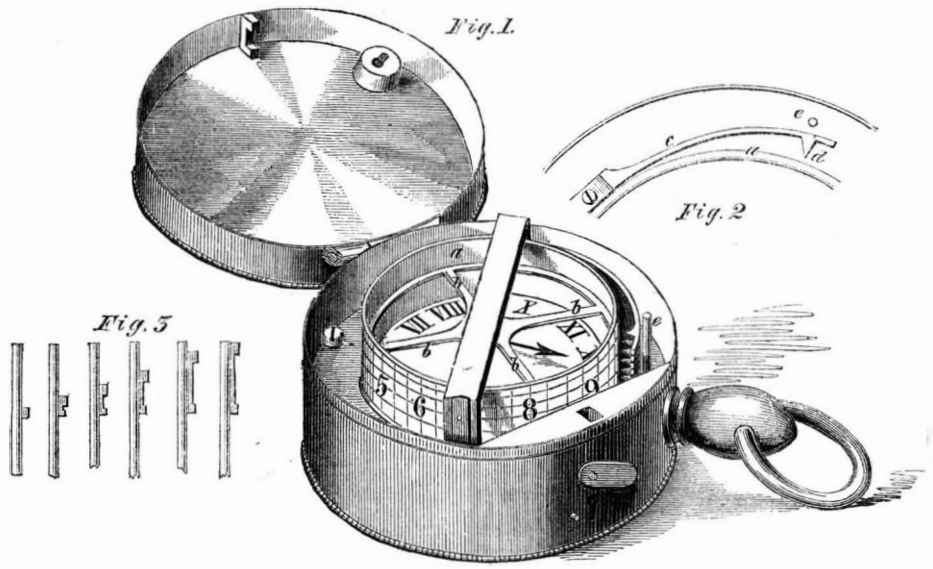
The price of cotton at the present moment averages half a cent per pound more than it did at the same period last year. Ordinary qualities range from 9½c. to 9⅝c. per lb., and "middling fair" from 13⅛c. to 14¼c. per lb. About 12,200 bales arrived in New York last week, of which only 5,000 were sold. By the latest news from Europe, we learn that there has been a decline of about half a cent per pound on cotton, and the Manchester manufactories were very dull.

Porcelain is now ornamented with gold, in Paris, by hydrofluoric acid and electroplating, as follows:—The porcelain is first covered with a varnish, upon which the drawing is made with a fine point. The subject is then eaten out by the acid vapors, and the vessels afterwards plunged into silver or gold baths, when a deposit of these metals is determined, in the parts corroded by the acid, by means of galvanism. In some cases, certain colored mineral powders are rubbed into the tracings left by the hydrofluoric acid, and fixed there by the action of heat, so that any design can thus be produced.

Improved Watchman's Time Detector.

In cotton, woolen and other manufactories, it is customary to employ watchmen to guard the property, especially from fire, through the night. In order that the employer may be satisfied that the watch is faithfully performed, a plan has been adopted of placing "watch or tell-tale clocks" in the several rooms of the building. These clocks are arranged with a revolving disk behind the face which, by its revolution, brings pin holes periodically opposite to a hole in the face, and if the watchman is at the clock at the proper instant he can insert a pin through the opening in the face into each hole in the disk; but if, from falling asleep or from any other cause, he is not present when each hole in the disk is opposite to the opening in the face, the hole will not be filled, and will thus preserve till morning the record of his delinquency.

We here illustrate an invention by which each clock is superseded by an inexpensive key, the watchman carrying a portable watch into which he inserts the key in each room as he visits it, the watch preserving a record of the time when each key was inserted. The device will be readily understood by an inspection of the engravings, of which Fig. 1 is a perspective view, and the others representations of some of the parts.



BUERK'S WATCHMAN'S TIME DETECTOR.

A watch, made as simple as possible, with a single hour hand, is placed in the brass box, Fig. 1, and a light brass ring, *a*, supported on a hub in the center by the arms, *b b b b*, rests upon the face of the watch so as to be carried around by the hand; a notch in the hub fitting upon the hand for this purpose. Around the outside of the ring, *a*, is wrapped a strip of paper graduated to spaces of ten minutes each, and marked with the hours. Just outside of the ring, *a*, are six springs, *c*, Figs. 1 and 2, each furnished with a sharp point, *d*, projecting inward, so that, when the spring is pressed in, the point, *d*, will pierce the paper. A spindle, *e*, Figs. 1 and 2, for a key is fixed outside the springs, *c*. Six keys of the form represented in Fig. 3 are provided, and one is secured and sealed in each room in the building. When a key is inserted in the bar, the projecting stud upon its side or ward is in a position directly opposite one of the springs, and by giving the key a turn, a prick is made in the paper, of course in that portion of the paper which is opposite to the point, *d*, on the spring at the time the key is turned. The watchman passes from one room to another of the establishment throughout the night, and each time that he visits a room he inserts the key that he finds there into the box and gives it a turn, thus registering the time of his visit. The watch is closed each evening by the proprietor or superintendent, and locked with a key which he keeps, so that the register shall be out of reach of the watchman.

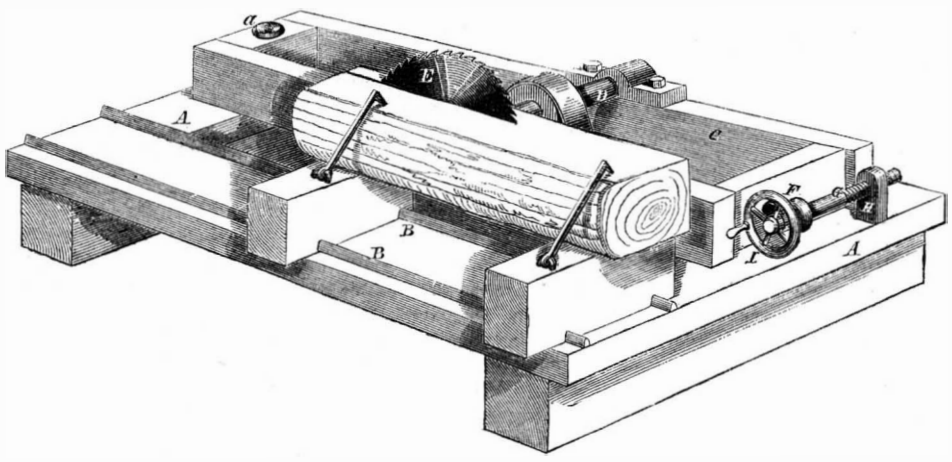
A flange upon the side of the key prevents it from being turned unless it is inserted quite into its place, so that the key in one room cannot be used to make a mark for a key in another room. By making two wards upon a portion of the keys, 15 keys or more may be used for one watch; and thus the apparatus may be used for two or more buildings. Any effort on the part of the watchman to evade his duty by counterfeiting the keys may be checked by occasionally changing the position of the keys in a portion of the rooms.

The patent for this exceedingly neat, simple and effective detector was granted, through the Scientific American Patent Agency, Jan. 1, 1861, and further information in relation to it may be obtained by addressing J. E. Buerk, Box 1,042 Post-office, Boston, Mass.

ANOTHER TYRANT DETHRONED.—The steamship *Canadian* brought the cheering intelligence last week that Gaeta, the stronghold of the Bourbon King of Naples, has fallen, and that the king had fled in a French vessel, while the place was surrendered to the victorious Sardinians. The King of Naples was a bigot and a tyrant, and it is only a few years since some of the most learned men and noblest spirits in Naples were first cruelly imprisoned and then banished from their native land for soliciting equable and just reforms of government. Another tyrant dynasty has passed away before the march of liberal ideas and the advancing power of popular freedom.

Impoved Mode of Hanging Circular Saws.

In sawing thin boards with a circular saw, it is desirable to have the forward or cutting edge of the saw slightly inclined toward the log, as this prevents the saw from touching the log except with the cutting teeth; and by wedging off the board, that may also be kept clear of the saw. But in ripping a log, the saw must be kept parallel with the carriage, or it will bind and heat. Again: in sawing cross-grained stuff, the saw is inclined to follow the grain, and should therefore be set slightly in the opposite direction. All of these considerations make it desirable to have a circular saw so hung that it may be adjusted in a position parallel with the carriage, or be readily inclined at a slight angle with it while in operation. The invention here illustrated accomplishes this end very simply and effectually; it is the invention of a practical sawyer, and he says that it works very satisfactorily to himself and to several other sawyers who have had it in operation.



IMPROVED MODE OF HANGING CIRCULAR SAWS.

The axle, D, of the saw, E, has its bearings in the stiff frame, C, which is secured at one end by the pivot, *b*, to the timbers, A, of the sawmill, while the opposite end has a lateral motion. At this movable end is secured the staple, F, through which passes the screw, G. This screw works by its thread in the standard, H, which is firmly secured to the solid timbers, A. Thus, it will be seen that, by turning the screw, G, by means of the hand wheel, I, the plane of the saw may be brought to a position parallel with the ways, K K, of the carriage, or it may be inclined at any desirable angle with them. This inclination may be changed at any time, whether the saw is in operation or not.

The inventor states that this simple device makes a considerable saving, not only of power in running the saw, but also of time and expense in repairs.

The patent for this invention was granted, through the Scientific American Patent Agency, Jan. 22, 1861, and further information in relation to it may be obtained by addressing the patentees, W. H. Auld and R. C. Brown, at Fairfield, Iowa.

MUSPRATT'S CHEMISTRY.—Mr. C. B. Russell, of Boston, who is acting as agent in this country for the publishers of Muspratt's "Chemistry," requests us to say that the several parts of the work are not issued at stated times like the numbers of a periodical, and that they will be distributed just as fast as they are received. Mr. Russell is now taxed to answer a great many inquiries from subscribers who fear that they will be neglected.

THE LARGEST HORSE IN THE WORLD.—Wilkes' *Spirit of the Times* says that a gentleman named Potter recently exhibited a horse at Newcastle, Pa., that weighs 1,777 lbs. He is a bright bay horse of the Clydesdale breed, and was bred in Cumberland, England, by a farmer named Reed. In 1855, he took a prize of $250 at Glasgow, in Scotland, and since his importation he has had no less than twenty-six prizes conferred upon him here. The Clydesdale breed make the largest and best heavy draft horses in the world, but very few persons know anything about them. They were first obtained by the Duke of Hamilton, as a distinctive breed, by a cross with a Flemish mare and the native stock of the vale of Clyde, in Scotland. They are found in large numbers at the fairs held in Rutherglen, where several thousand horses are annually sold, dealers in draft horses coming from all parts of England to purchase.

AN AMERICAN STEAM ENGINE FOR SCOTLAND.—The Corliss Steam Engine Company, of Providence, R. I., have just completed an engine of 120-horse power for Messrs. Alexander Pirie & Son, Aberdeen, Scotland. This fact is highly significant, as the most celebrated manufactories of steam engines in Europe are located in Scotland.

MODELS AT THE PATENT OFFICE.—Many of our readers erroneously suppose that Congress has recently passed a law to dispense with models at the Patent Office. Such is not the case. No law of this kind has been enacted, and there is no probability of any such change being made for many years to come.

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VOL. IV. NO. 11.....[NEW SERIES.]....*Seventeenth Year.*

NEW YORK, SATURDAY, MARCH 16, 1861.

THE NEW COMMISSIONER OF PATENTS.

The interest felt by inventors in reference to the appointment of a Commissioner of Patents continues unabated, and letters are pouring in upon us from various quarters, evincing the greatest anxiety that the choice should fall upon a reliable and trustworthy man—one who can be depended upon—to assume the *control* of the office, and infuse new life and vigor into its every department. The impression is rapidly gaining ground that the choice will fall upon the Hon. Thomas C. Theaker, of Ohio, as stated in our last number. We learn from reliable sources that he is the most prominent candidate, and most likely to receive the appointment. He is recommended by about ninety members of the House and a large number of Senators, and is indorsed by a large majority of both branches of the Ohio Legislature, as well as by the present Governor of that State, together with a great number of Judges and other distinguished men in various parts of the country. It is also gratifying to know that the patent lobby influence and patent speculators are not among those who support Mr. Theaker's claims to the office. These cliques and cabals have their own man well sugar-coated, so as to hide the drug; and, if there is the slightest hope of success, they will do all in their power to induce the President to appoint the eminently proper object of *their* choice; and it is excessively amusing and ridiculous that there are one or two obscure patent agents who are aspiring to this high position, their chief recommendations being that they have fared hard in Washington, and suffered a sort of business, social and political martyrdom. If the President should chance to disappoint their expectations, which he is most likely to do, they will have to raise funds to publish a pamphlet in order to let the world know that Fox's "Book of Martyrs" has not been brought down to this generation. But we dismiss these lachrymose candidates.

Mr. Theaker, who seems to have attracted most attention, is a native of the great State of Pennsylvania, but has resided in Ohio for the last 30 years. He is about 40 years of age, and is possessed of high social and moral qualities. He has studied law, especially patent law, and has risen by the force of his own character and efforts from a hard-working mechanic to the position of a member of Congress from Ohio, from which he retired on the 4th inst. He was regarded as one of the most useful members of that body, being a working instead of a talking member. He has, moreover, a most thorough practical and theoretical knowledge of science and mechanics, and has had an extensive experience in connection with various branches of mechanical industry. Just such a man is wanted for this office, and we trust that the President will not hesitate to appoint him, as it would be an earnest of his intention to encourage the inventors of our country, and assure them that the policy of the administration will be to welcome them to the Patent Office, as did Mr. Holt, "not as strangers, but in free and frank intercourse." The great State of Ohio is thronged with inventors, and if we mistake not, she has had (with a minor exception) no official connection with the Patent Office. The Patent Office, since Commissioner Bishop retired from it, has retrograded into old habits that ought to be abandoned, and has so far lost the confidence of inventors that, *to our certain knowledge, there are many who are now anxiously waiting for a new order of things before they will seek its protection.* There are many worthy men in the Patent Office whose places, if made vacant, could not easily be supplied, but there are others who have hung upon the Office long enough, and ought to be removed unless they can show a more proper appreciation of their duties.

We believe there is no office under government that requires a more prompt and judicious exercise of the appointing power than the Patent Office.

STEAM ON CANALS.

Not many years ago, canals were the principal and almost the exclusive artificial avenues of internal national commerce. They were links which united distant lakes, rivers and seas together, and they furnished the best modes of conveying articles of traffic through regions unprovided with navigable waters. Such is not the case now, however, a complete revolution having been effected in the modes of inland transit by the introduction of railways, which have superseded canals almost entirely for passenger traffic, and which are now competing with them in carrying heavy freight. As a consequence of this, those State governments which owned canals, and obtained a revenue therefrom, have become alarmed and are almost at "their wit's end" what to do under the circumstances. The New York Central Railroad—the greatest competitor of the State canals—carried 199,231,392 tuns in 1860, and from this a revenue of $4,095,933 was derived. We learn by the late annual report just received from N. S. Benton, Esq., the canal auditor, that although there was a considerable reduction in the freight charges on this railroad in 1860, the receipts had increased $758,785 over those of 1859. The complaint is now made that the railway carries freight for lower prices than the canal, and to make up for the loss of State revenue in this direction the imposition of tolls on the railroad is advocated.

On former occasions we have expressed opinions condemnatory of such legislation, and need not now repeat them; but we would direct attention to what appears to us a reasonable and certain mode of enabling the canals to compete with railroads in carrying heavy freight—we mean the general substitution of steam for horse power in propelling the boats. The application of steam as a substitute for animal power has been economical in every department of industry, and why should it not be so in canal navigation? We are well aware that statements have been placed before the public, such as were published on page 39 of the present volume of the SCIENTIFIC AMERICAN, taken from the Buffalo (N. Y.) *Courier*, to show that the steamboats on the New York and Erie canal had been more expensive than boats towed with horses; but we remarked at the time that such statements were unsatisfactory, and we suggested a thorough discussion of the subject by those best acquainted with it, prior to the opening of canal navigation in the Spring.

The Ohio Legislature appears to be in as great a quandary about the canals of that State as the *wise men* of New York at Albany are about theirs; but an intelligent correspondent of the Cincinnati *Commercial* of the 14th ult., gives them some light upon the subject. He tells the legislators of that State that the cost of steam for current expenses on canals is just about "half as much as horses, while the expense for towing paths is all dispensed with. He gives certain facts to "back up" his opinions, and says, "We are coming into a new era of the value of our canal property, which will at least double it."

We have also letters of the same import respecting the economy of steam power on the southern end of the Ohio canal. Messrs. Welsh, Ireland & Co., of Chillicothe, inform us that last summer they put steam engines into three boats—the *Bostona*, passenger, of 30 tuns, and the *Sweden* and *Robin*, 60 tun freight boats—and they proved quite successful and more economical than horse boats. The engines are fifteen-horse power, the screw propeller is employed, and the entire cost of machinery for one boat is $800. Captain Williamson, of the boat *Bostona*, states in a letter that, in sixty days, his boat ran 3,030 miles, at a cost for fuel of only $1.61 per diem, and but 65 cents for repairs in three months. He asserts that steam is much less expensive on canals than horses, and he has had experience to enable him to form a very accurate opinion. Let not those who have charge of canals throw up their hands in despair at the increasing competition of railroads. Their duty is to adopt every improvement to maintain a fair competition, and the most promising way of doing this is by the general adoption of steam propulsion.

Holley's Railroad Practice—A Valuable Work for Railroad Companies and Engineers.

American and European Railway Practice in the Economical Generation of Steam, including the Materials and Construction of Coal-burning Boilers, Combustion, the Variable Blast, Vaporization, Circulation, Superheating, Supplying and Heating Feed Water, &c., and the Adaptation of Wood and Coke-burning Engines to Coal-burning; and in Permanent Way including Road-beds, Sleepers, Rails, Joint Fastenings, Street Railways, &c., &c. By ALEXANDER L. HOLLEY, B.P. With seventy-seven plates, engraved by J. Bien. New York: D. Van Nostrand, No. 192 Broadway. London: Sampson Low, Son & Co. 1861.

This is an elaborate treatise, by one of our ablest civil engineers, on the construction and use of locomotives, with a few chapters on the building of railroads. In his introduction the author acknowledges the assistance of Messrs. Colburn, D. K. Clark and J. K. Fisher.

The first two chapters are devoted to a discussion of the proper materials for locomotive boilers. After a full examination of the properties of copper, iron and steel, the conclusion is arrived at that steel is the most suitable in every respect.

In the chapter on the joints of boilers an earnest protest is made against abandoning the efforts to form these by welding. The fact is cited that scarf welded joints are quite as strong as the entire plate, while riveted joints have only 60 to 80 per cent of this strength. The riveted and lap-welded joints diminish in proportional strength so rapidly, with increased thickness of plate, that a boiler of three-eighths inch plates is as strong as one of one-half inch plates, if not stronger, when riveted in the ordinary way. Several plans have been proposed for welding boiler-plates. Mr. J. C. Cooke, of Middletown, Conn., has recently patented the employment of the oxyhydrogen blow pipe, in connection with a portable apparatus, consisting of hammers or rollers, to be clamped to the plates, and both the fire and compressing machinery to move along, over the joint, completing the operation as they move. This process is intended chiefly for iron shipbuilding.

Among the conclusions of our author, we compile the following summary:—Steel rivets occupy a less section of plate than iron, and make a proportionately stronger joint, with a given thickness of plate. Conical and countersunk holes make the best rivet-heads and decrease the oblique strain due to the lap. Snap rivets are quite as strong as those headed by hammers, and are set about twice as fast. Gas-welding by Bertram's process, appears likely to become cheap and reliable; if not, thick-edged plates will make a sufficiently strong joint.

Steel flues are recommended for locomotive boilers. "Neilson, of Glasgow, has put Russell & Howell's homogeneous (cast steel) flues, $1\frac{1}{8}$ inch outside diameter, into several locomotive boilers with a $\frac{3}{8}$ inch steel flue-plate."

The philosophy and chemistry of combustion is gone into at great length. The rule is laid down that a tun of coal is equal to at least $1\frac{3}{4}$ cords of average wood, and a large part of the space is devoted to a discussion of the most economical mode of burning coal.

After a very thorough inquiry into the science and mechanism of the construction and working of the several parts of a locomotive, five chapters are devoted to the permanent way. Earthwork, drainage, ballast, sleepers, rails and rail joints are examined, each under several sections; and a chapter is given to miscellaneous matters.

All these subjects are treated by Mr. Holley, who is a first class railroad engineer, in both an intelligent and intelligible manner. The facts and ideas are well arranged, and presented in a clear and simple style, accompanied with beautiful engravings, and we presume the work will be regarded as indispensable by all who are interested in a knowledge of the construction of railroads, and rolling stock, or the working of locomotives.

IT is better to keep children to their duty by a sense of honor and by kindness than by the fear of punishment.

BANKING.

There is nothing simpler than a bank. A number of persons who have money to lend on interest find several advantages in clubbing together and putting their money into a common fund, they consequently form an association with this aim, and such an association is called a bank. The management of the fund is intrusted to experienced business men who are acquainted, or who can make themselves acquainted, with the wealth or poverty of persons applying for the use of any part of the fund, in order that it may be loaned to those who are able to repay it again with the interest agreed upon for its use.

These associations generally have money coming in and going out daily, and it is necessary to provide iron boxes or strong stone closets for its safe keeping, and when these are provided, any person in the community who has a sum of money which he does not want to use immediately, is apt to ask the favor of having it placed in the bank vault till he wants it. The number of persons who thus have money which they do not require for immediate use, and the sums which are consequently left with the various banks for safe keeping, is surprisingly large. The managers soon find by experience that as a portion of these deposits are withdrawn others are brought in, and there is thus a large amount constantly on hand. As business men of property, who can make safe notes, are constantly calling for more money than the capital of the bank amounts to, the directors loan a portion of these deposits, taking care always to keep enough money on hand to pay any depositors who are likely to call for it. As the bank pays nothing to the depositors for the use of their money, and as they get interest from those to whom they loan it, they are generally able to make a profit in this way more than enough to pay the expenses of rent, clerk hire, &c.

Besides the interest obtained for money which is left with them for safe keeping, the banks have another source of profit in their circulation. After the credit of certain banking companies became thoroughly established, the discovery was made that they could buy gold and silver, or other articles of value with their notes, and if they made these notes in small amounts, they would pass from hand to hand in exchange for merchandise, the same as coin, and that a certain amount of them would remain constantly in circulation. Banks accordingly exchange their notes not on interest with merchants and other business men for their notes on interest, and thus make a considerable profit. Of course the banks must keep some specie on hand to pay any of these notes that may be presented for payment, as they are all constantly due, being payable on demand. As the bank obtains no interest for the specie which is in its vaults, there is a constant temptation to diminish this below a safe sum, and the numerous failures of banks to pay their notes when they were presented, prompted the legislature of this State to require every bank issuing notes to deposit security for their payment with an officer of the state. As the security required consists of state stocks, mortgages, &c., which draw interest, and as the bank notes draw no interest, the banks make the profit on their circulation in the same way that they did before the passage of this useful law.

When a banking company loans money to a merchant, it is customary to take out the interest at the time of making the loan, counting out the interest, or *discounting* it as it is called; hence the term discounting has come to be applied to the transaction of making the loan, and the whole amount of money out at interest is embraced in bank returns under the term of discounts. The banks of this State are required to publish a statement weekly of their average deposits, circulation, discounts and specie, for the week. The statement for the week ending Feb. 23, of the condition of the banks of this city, is as follows:

Capital.	Loans.	Specie.	Circulation.	Deposits.
$69,143,632.	$119,236,290.	$38,044,299.	$8,128,792.	$91,628,626.

A portion of the deposits are fictitious or nominal merely, as we shall show in a subsequent article.

THE *Great Eastern* is now getting ready to make a second voyage to New York, as a regular trader. It is expected that she will start on the beginning of next month (April). This second voyage, if she has anything like a tolerable cargo, will afford a better criterion of her speed and capacity than her former trips across the Atlantic.

CALIFORNIA WAKING UP TO INVENTIONS.

We believe California, at the present time, to be the best State in the Union for the introduction of new and improved machines and implements of utility, and that the day is not distant when she will surpass many of the New England States in the number of her inventions.

Within a year past, quite a number of very excellent improvements have been patented by the residents of the Golden State, and we have observed in our large correspondence with her citizens that their tastes and interest in mechanical matters are rapidly increasing. Almost every mail from California brings to this office alone, from five to ten orders to prepare applications for Letters Patent, and most of the models sent us show as much perfection in their make and finish as those got up in our Eastern cities, while the inventions which they illustrate compare favorably with those from any section of our country.

It augurs well for the prosperity of any State to have her people interested in mechanical and manufacturing pursuits; and the rapid development of this class of industry, in connection with the native resources of this young State, will make it in a very short time the most prosperous, as well as the richest, of any in the whole Union.

Patents in the Southern States.

At the Southern Congress, now sitting at Montgomery, Ala., on the 16th ult., Mr. Brooke, Chairman of the Committee on Patents, offered the following resolution:—

Resolved, That J. M. Waldron, a citizen of the State of Georgia, be and he is hereby authorized to file with the Attorney General, a caveat, accompanied by suitable drawings and explanations, setting forth the design and purpose thereof, for the protection of an improvement claimed to have been made by him in railroad switches; and that said caveat, when so filed, as aforesaid, shall be effectual from this day to protect his right to said invention, until a Patent Office shall be established: *Provided*, That as soon as said office is established, said caveat shall be filed, with the commission thereof, and such proceedings had thereon as may be authorized by law.

Mr. CONRAD said he did not know whether it was the understanding of the Committee on Patents, or the understanding of Congress, that the cognate subject of copyrights is included in the consideration of the Committee on Patents. If it be not so, he moved that the committee be denominated the Committee on Patents and Copyrights. He made that motion, because he had a document about copyrights which he desired referred to that committee.

The PRESIDENT asked the committee to state whether they regarded that matter as under their supervision.

Mr. BROOKE, the chairman, replied that the committee regarded the subject of copyrights as under their cognizance.

The communication presented by Mr. CONRAD was then referred to the Committee on Patents.

Mr. BROOKE also reported a bill, which was only read by its title, as follows:—"A bill to establish a patent office, and to provide for the granting and issuing of patents for new inventions and improvements" The bill was ordered to be printed.

CORROSION OF STEAM BOILERS.—By order of the Secretary of the Navy, a board has just convened at the Smithsonian Institute, consisting of Professor Henry, Engineer-in-chief Archbold, and Chief-Engineers Isherwood, Long and Shock, to investigate the causes of the sudden corrosion of the boilers of the U. S. steamer *Dacotah*. The corrosion is singular and extraordinary. The vessel is one of the latest sloops constructed; and her engines are fitted like those of other steamers, with condensers. The corrosion has so rapidly progressed that, in three months, the most important parts have been eaten one-third through. As this corrosion has not appeared in the boilers of the other steamers constructed of the same iron, as nearly as can be ascertained, and with surface condensers, the problem has been deemed sufficiently important and complicated to require for its solution the employment of a most able board of investigation.

THE HARD WINTER IN EUROPE.—The *Presse Scientifique des Deux Mondes*, in speaking of the unparalleled hard winter in Europe, says that the snow caused great obstruction to the railroads, and produced many accidents in England as well as in France. It then goes on to give a minute history of all the accidents on the English roads, without saying another word about those which occurred in its own country!

AMERICAN ENGINEERS' ASSOCIATION.

[Reported for the Scientific American.]

On Wednesday evening, February 13th, the regular weekly meeting of this association was held at its room, No. 24 Cooper Institute, this city—Thos. B. Stillman, Esq., President; Benj. Garvey, Esq., Secretary.

MISCELLANEOUS BUSINESS.

The collection of the dues owing to the association was taken up and commented upon by the members present. There were on the books of the society the names of many persons who had not paid their initiation fee nor their regular dues, and as it was very probable they never intended to do so, it was resolved that the names of such persons as had been enrolled as members for three months, and had failed to pay their dues or any other indebtedness, be stricken off the list of members of the association.

The signatures obtained to the memorial (as published in the SCIENTIFIC AMERICAN of March 2d) were handed in to the secretary. A special committee was selected by the association to take charge of this memorial, and present it, with suitable suggestions, &c., to the Legislature. That committee consists of Messrs. Stillman (President), Roeder and Garvey. Considerable discussion ensued in regard to the propriety of submitting this memorial to the present Legislature, as there was already a similar bill before them, and it had been favorably received and reported upon; the passage of this bill would appoint Messrs. Faron, Boardman and Birkbeck as Inspectors of Engines, Boilers, &c., in this city; but as these gentlemen were in no wise connected with the Engineers' Association, or, at least, did not represent them, it was thought eminently proper that they should be heard upon the enactment of such a law, and consequently their original resolution of immediately submitting it to the Legislature was adhered to, together with the names of several engineers whose competency and character could not be assailed, with their unqualified recommendation as suitable men to be appointed as inspectors; they did not presume to dictate to whom the Legislature should give these offices, but presumed that, from such a list as they would present, the necessary number could be selected. This method would certainly insure the appointment of men whose qualifications could not be questioned.

The names of Messrs. Charles W. Copeland and J. H. Lieman were referred to the Committee on Admission of Members.

Upon the balloting for the election of members, Messrs. Wm. Smith, J. H. Quick, John King, Edward Marslen, A. L. Fleury, James Van Riper and R. Hutchinson were duly elected.

REPORTS.

The TREASURER submitted his annual report to the association. It was accepted, and referred to a special Auditing Committee, the President appointing as such committee Messrs. Gray, Simpson and Koch.

The SECRETARY submitted an abstract of his annual report. The document exhibited a very satisfactory condition of affairs, and represented that the names of one hundred and nine engineers, mechanics, &c., were on the books of the society. This document was also referred to the above committee, to whom was given the power of taking charge of and examining all the books, papers, &c., belonging to the society, and reporting to the members the entire proceedings of the association during the past year.

On motion of Mr. C. F. HOLDEN, a vote of thanks was awarded to Mr. John C. Merriam for the gratuitous publication, in the *American Engineer*, of the constitution and by-laws of the society.

On motion of Mr. SIMPSON, it was resolved to authorize the Committee on Printing and Publication to have the constitution, &c., immediately printed in pamphlet form.

ELECTION OF OFFICERS.

At this juncture, it was resolved to proceed to the election of officers for the ensuing year. Messrs. Holden, Koch and Merriam were appointed tellers. There were nineteen votes cast, and the result, upon counting, was found to be as follows:—

For President.....	Thomas B. Stillman.
For Vice-Presidents.....	Charles Barnard, Charles H. Haswell, J. B. Kierstead.
For Secretary.....	H. E. Roeder.
For Treasurer.....	Robert J. Gray.

Chairmen of the several committees :—

Science and New Inventions.Louis Koch.
Library and Cabinet.....C. C. Greenough.
Accidents and their Causes..John C. Merriam.
Statistics.....T. D. Stetson.
Printing and Publication...Richard M. Lockwood.
Admission of Members.....John K. Simpson.

The meeting at this period adjourned.

THE POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported for the Scientific American.]

The usual weekly meeting of the Polytechnic Association of the American Institute was held, at their room, in the Cooper Building, this city, on Thursday evening, Feb. 28, 1861, Professor Mason in the chair.

ORIGIN OF THE GULF STREAM.

Mr. C. W. Denison, as the result of eight years investigation, submitted the following propositions :—

1. The Gulf Stream is of subterranean origin.
2. Its progress, in a certain direction and rate, is caused by the shape and revolutions of this planet.
3. It is heated by interior volcanic fires, supplied from the igneous portions of the globe.
4. The Gulf Stream is fed from beneath by a constant flow of waters. Some of these are the Mediterranean and other adjacent seas.
5. The color, heat, current, motion, *animalculæ*, sedges, taste, odor and all the other peculiarities of the Gulf Stream, prove it to be subterranean in its origin and progress.
6. The trade winds and the formation of the shore of the Gulf of Mexico, have nothing to do with the origin, characteristics and progress of the Gulf Stream.

The color of the Gulf Stream, he said, is deep blue. That this is not caused by its saltness is evident, first, because salt would not make it blue ; and, second, because it is no more salt than the adjacent waters which are not blue. The color is caused by the sulphate of copper which the water contains in solution. The water enters the Mediterranean sea from the ocean at the rate of three miles an hour, and this is exactly the rate of the Gulf Stream, indicating a connection between the two. His explanation of the phenomenon is that the water of the Mediterranean sinks into a vast chasm in the earth at Scylla and Charybdis, and thence passes westward through the interior of the earth, becoming heated by volcanic fires, and charged with the sulphate of copper, until it finds vent in a vast chasm along the American shore. The water of the Gulf Stream is in perpetual eddies, as though boiling up from below. The *animalculæ* of the Gulf Stream are not found in the Gulf of Mexico or the Bay of Campeachy, but are identical with those found in the Mediterranean sea. The sedges found in the Gulf Stream are identical with the fuci of Egypt, and are probably derived from the Nile. The odor and taste, derived from the sulphate of copper, are found only in our Gulf Stream, and in similar streams. The reason of the failure of the Atlantic Telegraph was probably, that there is a deep chasm opposite the coast of Ireland, the bottom of which no cable could reach. The geysers of Iceland rise and fall with the tides, indicating a connection with the ocean, while warmed by volcanic fires.

COTTON AND SUBSTITUTES THEREFOR.

The President said that having procured samples of the six best cottons, and subjected them to microscopic examination, their peculiarities were these :—The fiber at first appeared knotted ; but more careful examination disclosed that these were bends in the ribbon, which were fixtures, and had probably occurred in the ripening of the fiber. With one exception, it was found that in proportion as the fibers are larger or longer the bends were further apart. The cotton with the small fiber and infrequent bend, was from Texas, and was worth 15 cents per lb., the average being 11 cents. The width of the fiber of the Florida cotton was certainly three times that of the Texas cotton. The cottons appeared to be good just in proportion as they approached the South sea air. While the width of the cotton fiber varied from 1-1200th to 1-3000th of an inch, over 300 of these bends were found to the inch. The joints of fine wool proved to be far more numerous than the bends of the cotton, nearly double. In the length of fiber, the cotton from the best districts was almost uniform. Cotton is valuable in proportion as its growth is so mature that all the fibers in the boll are very nearly of the same length ; for then it comes into fair comparison with wool from the same flock of well-kept sheep. The object of spinning-machinery is to straighten the fibers, to cleanse them, and get them into such a relation to each other that they will draw a twist evenly ; and the same force being constantly applied, the more uniform the length of the fiber, the better it will work. At least nineteen-twentieths of the value of our cotton fabrics is due to machinery. In 1814, his father, who had established the first cotton factory in the State of New York, carted cotton from Southern Virginia to New York, and then it was carried by sloops to Schodach, and carted to his factory ; and he made a coarse cotton cloth, a considerable part of the weight of which was starch, and sold it at 88 cts. per yard. A far better article can now be bought for 5 cents. The wool machinery sprung up at the same time, and conforms in many particulars to the cotton machinery. The two great provisions of Nature for the clothing of man are the cotton for the warm climates, and the cotton and wool for the cold climates. To bring into use any other fiber for the purpose of human clothing, even if that fiber is in its nature equally valuable for clothing, that space of nineteen-twentieths must be somehow filled up before that new fiber can come into actual and common use. Flax is not a single fiber. We obtain it only by breaking up the natural fibers, not at their places of original joining, not by removing the material that combined them, but by breaking them absolutely into fragments. Having found crystals in wood in proportion to its hardness, he had inferred that the hardness and coldness of flax were due to the metallic and mineral crystals contained in the fiber. An analysis shows that there are from 2½ to 4 per cent of mineral and metallic matter in flax, while cotton is simply cellulose, without a particle of mineral in it ; hence, the flax is unsuited for wearing next the skin. Flax is one of the most tenacious of all fibers, and, in proportion to its width, one of the longest fibers known. So intensely close are the joinings of the fibers that it is almost impossible to separate them ; and when we attempt it, whether by explosion, by the hatchet, by the hammer, or by the swingling knife, it is only split, and the fragments that chance to split unevenly are thrown off in the shape of tow. It is impossible that hands or machinery should spin as even a thread of linen as the machine will spin of cotton. Napoleon offered a reward of $30,000 for the invention of a machine to spin flax as the English machines spin cotton, but all attempts to accomplish it have failed ; and from the nature of things, it seems impossible that it should be otherwise. Until machinery is found to cut the fibers of flax into even lengths, and split them evenly, it seems to be impossible, at any rate, to draw flax into thread with the same machinery now in use for drawing cotton and wool.

Mr. Vedder said that fine cloths had been made of wools of different staples, and wool and cotton were incorporated to a very great extent in the same thread. Although the cotton fiber is so much shorter than that of the wool, yet they work so well together that when the thread is finished, the wool has so completely absorbed the cotton fiber that it requires much skill to detect the cotton.

The President replied that the cotton fiber being but a twentieth part the size of the woolen, is caught upon the hooks of the wool, and wound among the woolen fibers. The machinery acts upon the woolen fiber, and it is necessary that that should be of nearly uniform length.

Mr. Vedder—In England, old garments are cut up by machinery until the material is reduced almost to a powder, and this goes in with the larger woolen staple, and is wound up with it in the process of twisting ; and thus a heavy cloth is produced, which is not so strong, however, as cloth made without this addition.

The President replied that here, also, the shorter fiber was taken up by the wool, while the latter, being acted upon by the machinery, must be of nearly uniform length.

Mr. Babcock said that another substance, called "flock," was more used, which is sheared from the surface of cloth in finishing it, and is put into the fulling mill and felted into the cloth.

Mr. J. R. Haskell said that if the fibers of flax were separated perfectly, and the glutinous matter dissolved, probably no mineral matter would be found in them. Upon using a caustic solution, instead of pure water, in the steam cannon, he had found the flax fiber to be much smaller than that of cotton. If linen is too cold to wear next the skin, wool can be worn next the skin, and linen, which is more durable than cotton, and looks better, outside. He exhibited specimens of clothing manufactured from half wool and half flax.

Mr. Johnson had found, from the catalogue of the World's Fair, that yarn has been exhibited there as fine as 280 miles to the pound, and small specimens even finer.

Mr. Seely said that the reason why linen can be more readily dyed than cotton, is that it consists of bundles of fibers, which the dye may penetrate. The new and splendid colors from coal tar will dye silk, wool and linen without any mordant ; but in dying cotton, it is necessary to wash the material with a weak albuminous solution. This solution is acted upon by the dye, and becomes insoluble ; so that the fibers of cotton have an insoluble colored covering upon the surface, while wool and linen have the color all through the interior.

Mr. Vedder considered wool cooler in the summer season than cotton, and the cotton warmer in the winter, provided it is close, of sufficient thickness, and has between it and the skin another garment to cut off the direct communication. But, in the latter case, the question of health arises, whether the exclusion of the external atmosphere will not prevent the proper exhalations from the skin. Sheep should be more extensively raised. They can be raised for food ; their hide is of value, and there is no part of the animal which is not useful, independently of the value of the wool.

Mr. Nash said that the English took 4 lbs. of Indian cotton, at 5 cents, and 1 lb. of American cotton, at 15 cents, making 5 lbs. at 7 cents, and spun that into cotton thread, and then they could sell it at 18 cents. The American wool is the best in the world, having from 300 to 400 serrations to the inch ; while the best of European wool would not exceed 250 serrations to the inch. Our cotton and wool combined will make a satinet that the English cannot equal, and one much stronger and more durable than the English cloths of wool alone. In Africa, it is said that there are no less than sixty different trees of cotton, one of which is as tall as the elm, producing cotton with a fiber over a foot long. We are out of the latitude of cotton in the United States ; the plant has been acclimated here, and it is a great question to find what kind of cotton i best adapted to our soil and climate.

Mr. Garbanati considered the question of clothing as one of political economy. It was the question of the production of the best article, in the greatest quantity, and at the lowest price. And the questions of freight and of monopoly are important considerations. Other articles may be applied to this purpose, without materially diminishing the use of cotton. Plants now neglected may be hereafter found invaluable.

Mr. Dibben was of opinion that flax or any other similar material, even if cut into proper lengths, could not be spun upon cotton machinery with the same facility as cotton.

Dr. Van der Weyde said that the cotton from Africa could not be used, on account of its coarseness ; in India, the fiber is too short ; so that the United States have the monopoly of cotton for the whole world.

Dr. Richards had heard, in a lecture upon Iceland, that cotton is one of their productions. We have the same plant—the swamp cotton grass—growing native in most of our swamps, especially in the northern part of the State of New York.

The President said that he had been unable to procure a specimen of the yellow China cotton, which was much prized, and from which nankeen was formerly extensively made. He would bring a specimen of it next week.

NEW SUBJECT.

Mr. Dibben proposed for the next evening, the subject of "The Electric Telegraph and Telegraphing Apparatus," which was agreed to.

On motion, the meeting adjourned.

Recent American Inventions.

The following inventions are among the most useful improvements lately patented:—

SPOON.

Spoons which are cast of soft metal require to have their handles strengthened by a wire, and these wires have hitherto been round and fitted in the mold by means of pliers, the metal being cast round the wire in the mold. The ordinary mode of wiring is attended with some disadvantages. The first is, that the

wire being round or cylindrical weakens the handle at its upper part where it is broad and flat, as the wire allows but a small mass of metal at that point, and nearly divides the handle for a distance of half its width. The second disadvantage is, that the round or cylindrical rod or wire admits of the handle of the spoon bending after being cast, as the metal will slip over or around it, and consequently a cavity will be left or allowed in the handle at its junction with the bowl, and this cavity greatly weakens the spoon at the point specified. This invention consists in having the wire made of a flat form and wider at its ends, and also having it bent in pieces of such shape that each piece will form two wires or answer for two spoons, whereby it is believed that the difficulties attending the ordinary manner of wiring spoons are fully obviated. G. I. Mix, of Wallingford, Ct., is the inventor of this spoon.

CHRONOMETER ESCAPEMENT.

The escapement known as the "chronometer" escapement, commonly used in chronometers and sometimes in watches, possesses the advantage over all other escapements in common use in its having the balance independent of the scape wheel during a greater portion of its vibration, the action of the scape wheel on the balance being continued through but a small fraction of its entire vibration; but in its application to watches it has the disadvantage of the balance receiving an impulse from the scape wheel only in one direction, which renders the watch liable to stop temporarily if shaken suddenly at a certain stage of the operation of the escapement. This invention consists in the construction of the chronometer escapement with two pallets on the cylinder, which in such escapements is attached to the balance, and with two locking pallets on the detent so arranged that the balance receives a double impulse in each complete vibration, that is to say, one impulse in each direction from each tooth of the scape wheel, and that each tooth rests twice in each vibration of the balance back and forth, viz., once against each locking pallet. The credit of this invention is due to Prosper Humbert, of Boston, Mass.

PRINTING PRESS.

The object of this invention is to obtain a printing press which will be simple and cheap in construction, capable of being worked rapidly, and operated with but a moderate expenditure of power. To this end the invention consists, first, in the employment or use of two rotating and traveling pressure cylinders in connection with a stationary form-bed, which is placed between the cylinders for the purpose of giving the impression. Second, in the employment or use of a blanket and tapes, arranged and applied to the press in such a way as to properly conduct the paper to and from the form. Third, in a peculiar operating or driving mechanism for giving the traveling movement to the cylinders. George Gary and Samuel P. Gary, both of Oshkosh, Wis., are the patentees of this invention.

STEAM ENGINE REGISTER.

This improved register consists of a box containing a train of indicating wheels, the first of which is actuated by a pawl or dog carried or moved by a piston or diaphragm which is arranged in a cylinder or chamber provided at one side of the box, and which is to be acted upon to operate the said pawl or dog at every stroke of the engine in one direction, by steam admitted to the said cylinder or chamber from one end of the engine cylinder. Peter L. Weimer, of Lebanon, Penn., is the inventor.

TILE MACHINE.

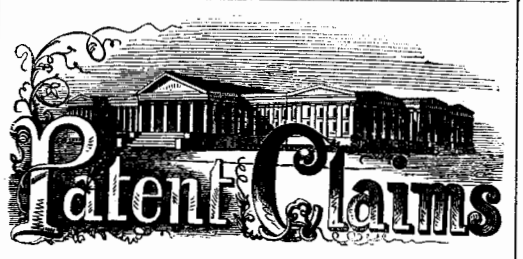
This invention relates to a machine for making tubular tiles, such as are used for draining lands, and for similar or analogous purposes. The object of the invention is to obtain a machine which will mold the tiles very compactly, so that the same may be manipulated or handled as they are discharged from the machine without the liability of being injured or marred, the compactions of the clay also rendering the tiles more substantial and less liable to crack under the baking operation. The invention also has for its object a facile mode of adjusting the gearing for the purpose of varying the speed of the spiral or screw feeders relatively with the feeders of the pug mill, so that the molding box may always be kept properly supplied with tempered clay, the supply being regulated according to the demand. This invention was patented by George J. Tiffany and Henry Ingraham, both of Palmyra, Mich.

GRAIN-MEASURING MACHINE.

This invention is intended for measuring grain in a very rapid and perfect manner, and also for registering the measured quantity or quantities. It consists in a circular measuring box having a desirable number of small cells or compartments arranged around it, which box is mounted an a circular floor which has one or two spouts projecting from it, which are so arranged with relation to each increasing cell, that as these cells are filled and revolved around a central axis, they will each discharge their load through the troughs. It also consists in connecting with the central shaft which rotate with the measuring box, a train of wheelwork and a registering hand, suitably arranged so as to operate with the measuring box and indicate every eighth, tenth, or twentieth revolution of this box, according to the number of cells which it contains. The patentee of this invention is J. A. Cluxton, of Bentonville, Ohio.

STEAM ENGINE.

This invention consists in constructing and furnishing the cylinder of the engine with a system of separate induction passages, ports and valves, by which superheated and ordinary steam are admitted separately to the cylinder, to be mixed therein as required for use, instead of being mixed in the main steam pipe, whereby some important advantages are obtained. The patentee of this engine is Peter Murray, of Detroit, Mich.



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517.—G. C. Albaugh, of Louisville, Ky., for an Improvement in the Manufacture of Cow-bells:

I claim the method shown and described of retaining the melted metal between the lapped portions of the plates during the brazing operation, all as set forth.

[This invention consists in forming a depression along one of the edges of each side of the bell sufficient to allow all that part of the plate which must lap over or under, in order to make the point, to form a plane surface on one side of the bell, so that the flow of melted metal used for brazing the joints will be stopped a much longer time than when the joints are of the form hitherto used, so that the interstices between the plates become entirely filled, and a perfect joint is the result, producing thereby a bell superior in sharpness of tone.]

518.—Samuel Andress, of Chesaming, Mich., for an Improvement in Transmitting Motion:

I claim the combination of the shaft, A a, standards, B C, oscillating lever, D, and rods, E E′ (working at both ends in ball and socket joints) the said parts being constructed and operating in the manner and for the purposes set forth.

[This invention consists in a peculiar application of toggle movement, whereby an oscillating lever is made to communicate a reciprocating rectilinear motion to a shaft with great power applied equally in both directions. It is applicable to a great variety of uses, where a high degree of power is required within a limited range of movement.]

519.—John Andrews, of Brunswick, Me., for an Improved Method of Securing Circular Saws to Arbors:

I claim the adjustabie bush D, placed on the arbor, A, in connection with the recess, a, in the fixed collar, B, of said arbor, arranged substantially as and for the purpose set forth.

I further claim, in combination with the adjustable bush, D, and fixed collar, B, the loose collar, E, and nut, F, as and for the purpose specified.

[In adjusting circular saws on their shafts and arbors, great difficulty is generally experienced in consequence of the variation in the diameter of the eyes of the saws. When too large the eyes require to be bushed in order that they may fit their arbors, and when too small they require to be filed out. The object of this invention is to obviate this difficulty, and to this end a sliding or adjustable bush is employed in connection with a fixed and adjustable collar and nut.]

520.—Lewis Bradley, of Hartford, Conn., for an Improvement in Compensating Pendulums:

I claim the slotted pin, D, and metal frame, E, or their equivalents, when used in the manner and for the purpose substantially as described.

521.—Nathan Brand, of Leonardsville, N. Y., for an Improved Machine for the Manufacture of Hoe Blanks:

In combination with vibrating dies for making hoes, I claim a traversing guide, constructed as described, to hold and traverse the shank of the hoe, rolled substantially as described.

522.—W. W. Burson, of Yates City, Ill., for an Improvement in Grain Binding Machines:

I claim, first, The combination of the jointed arm, A A″, pitman, C, rack, S, segments, P P, and pinion, O, operating substantially as and for the purpose set forth.

Second, The combination of the cord, W, weight, V, slide, J, and arm, A A″, substantially as described.

Third, The platform, K, constructed with opening M, said opening provided with the spikes, d″ d″ d″, and guide, a, substantially as described.

Fourth, The hinged jaws, c c′, shield or guard, k, and the concave H, operating substantially as set forth.

Fifth, The combination of lever, S, and receptacle, h, constructed substantially as described.

Sixth, The lever, y, with spur, n, operating for the purpose of opening and closing the twisting jaws, c c′, as described.

523.—M. L. Byrn and George Clark, of New York City, for an Improvement in Fruit Gatherers:

I claim the fork, d, and knife, e, constructed and acting as specified, in combination with the pole, a, basket, b, and pipe, c, as set forth.

524.—C. Carter, of Franklin Center, Iowa, for an Improved Washing Machine:

I claim the arrangement of the vertical rotary arbor, B, with slots, e, and g, in combination with the rising and falling cross-armed agitator, D, tub, A, and balls, E, constructed and operating in the manner and for the purpose specified.

[This invention consists in the arrangement of a vertically slotted rotary central arbor, in combination with a vertically sliding cross-armed rotary agitator, and with balls floating in a tub with a corrugated bottom and sides in such a manner that said agitator can be raised or lowered during the operating according to the quality of clothes and of water in the tub, and according to the larger or smaller strain which it is desired to exert on the upper or lower sides of the clothes, and that by rotating said agitator the clothes are brought in contact with the corrugated bottom and sides of the tub below and with the floating balls above, whereby the same are cleaned with little exertion in a very short time.]

525.—Robert Cassaday and D. Clark, of Buffalo, N. Y., for an Improvement in Snow Plows:

We claim, first, The cutter bars, E E, with their cutters, d d, and shoes, e e, arranged as described, in combination with the adjustable cutter bars, D D, which form the channels for the shoes. e e, substantially as set forth.

Second, In combination with the above specified parts, the adjustable yielding brooms, 1 1, arranged in the relation to said parts, and operating substantially as set forth,

[This invention is an improvement in clearing snow, ice, dust, &c. from railroad rails. It consists in combining with a cutter of a suitable shape applied to the end of an adjustable lever a pivoted shoe, which serves as a guide for the cutter to keep this cutter in a proper relation to the surface which it is intended to scrape; also, in combining with the aforesaid shoe and cutter and forms a channel for said shoe. It also consists in arranging in rear of and in the same vertical plane as the cutterbars, yielding brooms which are made of steel wire, and otherwise constructed and arranged for sweeping and scraping from the rails, the ice or snow which is loosened and left by the cutters.]

526.—J. A. Cluxton, of Bentonville, Ohio, for an Improveed Grain Measurer and Register:

I claim a grain measurer and register composed of a measuring wheel or board, C, having cells, a a, disks. B G, spouts F D, shafts, F P, and indicating or registering wheels and pointer, f, when said parts are arranged, constructed, and operate together in the manner and for the purpose shown and described.

527.—Cicero Comstock, of Milwaukie, Wis., for an Improve- in Rotary Cultivators:

I claim, first, The stationary cam having the friction wheel forming a part of the groove and arranged in relation to the other parts of the groove, and arranged in relation to the other parts of the machine, as shown.

Second, I claim the guide levers in combination with the stops, as and for the purpose set forth.

Third, I claim the spiral threads and grooves, the slots in the wheels or heads, and the cam groove for giving the motions of the spades or forks, the whole being constructed and arranged in the manner as set forth.

528.—R. J. Converse, of Coventry, N. Y., for an Improved Washing Machine:

I claim the movable and flexible washboard, worked by joints and double levers, substantially in the manner and for the purposes set forth.

529.—A. B. Davis, of Philadelphia, Pa., for an Improvement in Weighing Apparatus:

I claim a series of weighing frames, each having the levers, I and K, and bell crank lever, M, connected and operating as set forth, when the said frames are so arranged along the opposite side walls of a lock that the said levers, I, shall be at right angles to and partly overhang the said walls, as and for the purpose described.

530.—A. B. Davis, of Philadelphia, Pa., for an Improvement in Scale Beams:

I claim a weighing apparatus composed of an upper and lower graduated beam, when the lower beam is suspended at or near both its ends to the upper beam, and when it is entirely dependant upon the said upper beam for its support and for the proper performance of its functions, as and for the purpose set forth.

531.—Peter Fischer, of Fort Adams, Miss., for an Improvement in Cross-cut Sawing Machines:

I claim the arrangement of the saw-driving gearing bar, o, and saw, B, with the adjustable leg, c, and legs, c′, in the manner and for the purpose shown and described.

[This invention relates to a new and improved portable cross-cut sawing machine designed for sawing felled timber into cord or firewood and also into proper sized bolts for cutting into shingles, staves, &c.]

532.—Nelson Ford, of Cambridge, Wis., for an Improvement in Seeding Machines:

I claim the combination of the revolving arms, a, of shaft, G, within the hopper, F, in connection with the slots or openings, b, in the bottom of the hopper and the wheels, H′, below the hopper, the wheels being provided with grooved peripheries, and all arranged substantially as and for the purpose set forth.

[This invertion relates to an improvement in that class of seeding machines which are designed for sowing seed broadcast and in drills. The object of the invention is to obtain a simple and efficient means for distributing the seed, so that the same may be sown very evenly and without any liability of the distributing device becoming choked or clogged.]

533.—Daniel Foreman. of Navarre, Ohio, for an Improvement in Cross-cut Sawing Machines:

I claim, first, The combination of weighted lever, d, claw, b, and support, f, for the purpose of clamping the wood, substantially as described.

Second, The combination of the above devices with the rocking axle, e, for the purpose of feeding the wood to saw, substantially as described.

534.—L. F. Frazee, of Tottenville, N. Y., for an Improved Clothes' Frame:

I claim the arrangement of the frame, 1 2 3 4 6, sliding bar, 9, or its equivalent arms, 6 8 14 15, &c., bars or rods, 16 or 16 and 17, catch 18, and cranked shaft or rod, 19, substantially as described and for the purpose set forth.

535.—Peter Hanes, of Edina, Mo., for an Improved Shoemakers' Clamp:

I claim the arrangement of the arm or bearing. D, roller, b, and band C, with the jaws, A B, and lever, G, as shown and described.

[This invention is a novel improvement in clamps which are used by shoemakers in closing or stitching up boot legs or the edges of two pieces of leather for any purpose, for holding the edges of leather firmly together while they are stitched with the hand. This invention consists in jointing one of the clamping jaws to a fixed jaw, and operating this movable jaw by means of a lever having its fulcrum in the fixed jaw, which lever is attached to the movable jaw by two pulley cords or belts in such a manner that by depressing the lever the jaws will come together, and by raising the lever the jaws will open,]

536.—S. P. Harris, of Mansfield, Ohio, for an Improvement in Binding Attachment to Harvesters:

claim, first, The arrangement of the standards, A a, in combination with the circular tops, B B, substantially as described and for the purpose set forth.

Second, The arrangement of the bars, C D and e, composing the arm, I, with the standard and circular slots, H, substantially as described and for the purposes set forth.

Third, The arrangement of mechanism foroperating the bars, C and D, for expanding and closing the arm, I, substantially as described.

Fourth, The arrangement of the angular spring, 13, shears, 11, and springs, 14, substantially as described and for the purposes set forth.

Fifth, The arrangement of the drivers, b 1 and r, spiral spring, 5, 6 and 7, and wheel, y, substantially in the manner set forth.

537.—B. R. Hathaway, of Mormon Island, Cal., for an Improved Lifter for Stove Covers:

I claim the lifter for stove plates described, consisting of a curved prong, B, and tongue, C, combined and secured into the end of a suitable handle, as set forth.

[This invention is a new and improved tool for moving the circular covers which are used on stove tops, and if desirable, the bridge plate on which one-half of the covers rest may be moved from the stove top or placed on the top either when hot or cold. The object of the invention is to facilitate the removal of these plates when they are hot, and to furnish a tool with which two or three plates may be safely moved from the stove, or placed on the stove, at the same time.]

538.—Henry Hoffman, of New York City, for an Improvement in Steam Boilers:

I claim the particular arrangement of the legs, G G, combustion chamber, c, and tubes, E, with the tube sheets, B C, and flues, D K, in the manner shown and described.

[The object of this invention is to considerably increase the heating surface of a steam boiler with a comparatively small additional expenditure of material, and without increasing the draft or the safety of the boiler.]

539.—Prosper Humbert, of Boston, Mass., for an Improved Chronometer Escapement:

I claim the combination with the two cylindro-pallets, d e, attached to the balance, of a detent, D, with two locking pallets, f g, the whole arranged to operate substantially as described, for the purpose of giving an impulse to the balance in each direction, and locking each tooth of the escape wheel twice during each vibration of the balance back and forth.

541.—Charles Kirchhof, of New York City, for an Improved Method of Integrating Inconstant Electric Currents:

I claim, first, The device called "regenerator," arranged in such manner as to operate on the principles and in the manner as stated.

Second, The arrangements, construction and devices called "translator," and the improvements made for opening and closing the circuits with precision, and for conducting and interrupting the charging and discharged currents as desired, the said translator and improvements to be applied and operated as described.

Third, The combination of said arrangements and devices mentioned n the preceding claim, with the regenerator, as well as with the polarization apparatus.

542.—Bernard Lauth, of Pittsburgh, Pa., for an Improvement in Polishing Iron Bars and Rods:

I claim, as a new article of manufacture, the production of polished bars, rods, plates or sheets of iron or steel, by passing them, cold, between rolls after they have been subjected to the acid bath to remove the scale, substantially as described.

543.—Wm. A. Lighthall, of New York City, for an Improved Refrigerator for Cooling the Condensing Water and Condensed Steam of Steam Engines:

I claim, first, The diaphragm plate, E, in combination with the shell, A, and tubes, D, for the purpose of dividing the interior of the apparatus into compartments, as set forth.

Second, The inlet pipe, G, and exit pipe, G′, located and arranged, in relation to the shell, A, tubes, D, and diaphragm plate, E, as described and for the purpose set forth.

Third, The division plates, H and J, arranged as described, in combination with the diaphragm plate, E, for the purposes named.

Fourth, The chest or trap, K, arranged in relation to the shell, A, and division plates, H and J, as and for the purpose described.

544.—Edward Lindner, of New York City, for an Improved Furniture Castor:

I claim, first, The socket, the concavity of which is formed of an elliptical ovel or other equivalent form, and the orifice or rim of which is of a diameter smaller than that of the globe, whereby the globe may be inserted within the socket by the application of heat, substantially as described.

Second, In combination with the studs or pins in the upper part of the socket, I claim the angular slot in the cap piece, for the purposes described.

Third, In combination with a socket cast in one piece, with the screw or other appliance for fastening the castor to a piece of furniture, I claim forming the concavity of an elliptical, oval or other equivalent form, whereby the globe will have but one point of contact within the socket, which is diametrically opposite to its point of contact with the floor.

545.—D. H. Maloy, of Temperance, Ga., for an Improvement in Plows:

I claim the combination of an adjustable gage, with adjustable handles arranged as described, so that, in adjusting the gage, an adjustment is at the same time effected in the handle.

546.—J. Y. Marsh, of New York, City, for an Improved Curtain Fixture:

I claim the pulley, i, and pointed lever, k, applied in cambination with a spring blind or curtain roller, substantially as and for the purposes specified.

547.—C. E. Martin, of Muscatine, Iowa, for an Improved Ditching Machine:

I claim the use in the described connection with a ditching plow of a V-shoped follower made in two halves, K H K H, connected together by adjustable hinges, with or without crosspieces, J J, so as to adapt the implement to ditches of different width, in combination with two adjustable friction rollers, N N, substantially as set forth.

[This invention consists in the use of an adjustable hinged scraper following a subsoil plow, and operating to impart a smooth and symmetrical finish to the sides of the ditch, with any desired inclination.]

548.—T. J. Mayall, of Roxbury, Mass., for Improvement in Caoutouche Hose Tubing:

I claim a hose or tubing in which the periphery of one or more of its layers is formed by winding upon an inner tube or lining strands of thread, twine, wire, &c., substantially as set forth.

549.—Leander McKee, of Hagerstown, Md., for an Improvement in Mills for Grinding Apples:

I claim, first, The arrangement and combination of cylinder, A, double eccentric, B, concaves or mashers, C; and,

Second, Regulating bar, D, substantially as and for the purpose set forth.

550.—J. R. Mickey, of Waterford, Pa., for an Improved Churn:

I claim the stationary perforated paddles, F, in combination with the rotating perforated paddles, E, when the two sets of paddles, F and E, consist of simple planes, and are arranged obliquely in opposite directions substantially as described, for the purposes set forth.

551.—G. I. Mix, of Wallingford, Conn., for an Improvement in the Manufacture of Spoons:

I claim the employment, in the manner and for the purpose shown and described, of the zigzag wire, A, formed as set forth, in combination with the molds, B, and spoons, f f, all as specified.

552.—T. E. Oliver, of New York City, for a Combined Paper Cutter and Rule:

I claim a combined paper cutter and ruler, having for its peculiar characteristic a paper cutting or tearing blade, and on the opposite edge of the implement to that which forms the cutting edge, a raised and round or round-edged ruler, made either hollow or solid, substantially as set forth.

553.—J. M. Roberds, of Washington, D. C., for an Improvement in Bridle Bits:

I claim, first, A bridle constructed with such a flattened crosspiece in the bit, in combination with the corrugated curb, contrived and operating as shown.

Second, The use of a corrugated curb for a bit, constructed and arranged substantially as set forth.

554.—Sheridan Roberts, of Cleveland, Ohio, for an Improved Method of Making Barrels:

I claim making barrels, kegs, &c., by cutting from a solid piece of wood a scroll of proper thickness and size, the scroll having the usual concave surface inside, and the outer surface correspondingly convex, as described and completed, as specified.

555.—J. M. Rodman, of South Union, Ky., for an Improvement in Plows:

I claim the curved brace, F, handles, E E, bar, G, in combination with the adjustable back brace. H, all arranged and operating substantially as and for the purposes set forth.

[This invention consists in pivoting a regulating bar to the stock of the plow, and in the employment of a curved bar with an adjusting screw for adjusting the regulating bar so as to vary the depth of the plow blade.]

556.—E. Roughton, of Frostburgh, Md., for an Improved Arrangement of Carriage Springs:

I claim, first, The employment of the bars, d d, the rods, a a, and the band, E, arranged in the manner represented, for the purpose of holding the body of the vehicle in position and for shielding and protecting the springs from strain, substantially as set forth.

Second, The combination of the springs, H H, with the bars, d d, rods, a a, band, E, and plates, c c′; the several parts being used as and for the purpose specified.

557.—J. S. Sammons, of New York City, for an Improvement in Roofing for Slate:

I claim the within-described mode of attaching slates to roofs, which consists in preparing the edges of the slates with cement, then applying said edges to a hot iron or other heater, to melt the cement, then pressing the edges of the slates against each other and against the roofing, all as herein set forth and described, so that the slates will be firmly attached to each other and to the roofing by the cement, without the necessity of any other fastening.

[This invention consists in making a perfectly waterproof slate roof by beveling the edges of the slates and cementing the joints with a suitable cement which, when dry, will have three holding surfaces and secure the slates together and down firmly to the roof.]

558.—J. T. Scholl, of Port Washington, Wis., for an Improved Life Boat:

I claim, first, the cylindro-conical life boat constructed of separate slats, a a a a a′ a′, hinged together and capable of folding up as described, in combination with a waterproof fabric, c, and metallic sheathing, d d′ d′ e e and e′ e′ f f f and g g; all arranged and applied substantially as and for the purpose described.

Second, I claim, in combination with the cylindrical part of the boat, the hinged folding heads, A A, arranged and operating as and for the purpose set forth.

Third, I claim the carriage, G, link, p, wheel frame, Z, apertures, S, spring valves, S′, spring and arm, r, levers and propeller wings, t, and the coil springs, j j, when the same are constructed, combined and made to operate as specified.

[This invention and improvement in life boats consists, first, in constructing the body or hulk of the boat in the shape of a cylinder terminating at each end in a cone, said cylinder and cones being made up of slats or staves which are covered on the outside with a suitable waterproof fabric and also with metal plates, all of which are jointed and hinged together so as to be watertight and to admit of being folded up. It also consists in two hinged heads capable of being folded up with the boat, which are within each end of the cylindrical part of the boat, and acted upon by springs, which springs and heads operate to prevent the boat from collapsing while in the water, and to keep the boat in a proper condition to carry passengers. It also consists in a revolving spring arm arranged on the propeller shaft, in conjunction with certain spring valves which cover portholes or ventilators through the cylindrical part of the hull, said arm being made to open the valves when the parts are above water. It also consists in a rolling carriage or platform furnished with seats for passengers, and arranged within the boat in such a manner that the boat or hull thereof will revolve independently of said platform.]

559.—George Seibert and John Seibert, of Ashley, Ill., for an Improvement in Plows:

We claim, first, Arranging the piece, J, with the axle, H, and tongue, x′, in the manner described for the purpose specified, and—

Second, We claim the brackets, b b, set screws, a a, and latch, E, arranged in the manner described, for the purpose specified, and—

Third, We claim the slot, P, the studs, G G, and beam, A′, when arranged in relation to their respective parts substantially in the manner described, for the purpose specified.

560.—C. T. Settle, of San Jose, Cal., for an Improvement in Seeding Cultivators:

I claim the combination with pinion shaft, J, of the arm, p, curved lever, i, and sliding pinion, b′, the shaft, c, connecting rod, e′, vibrating lever, d, and seed slide, e, arranged and operating substantially in the manner set forth.

[This invention combines in one and the same machine the operations of plowing the earth, scattering seed, and harrowing the soil, and forms a very complete machine for the husbandman.]

561.—W. F. Shedd, of Ripley, Ohio, for an Improvement in Plows:

I claim the arrangement of the pivoted bracket, F, stirrup, G, and regulating screws, m and o, to operate in combination with the clevis, E, in the manner and for the purposes specified.

[This invention relates to certain particular means for fastening the shovel to the standard, and to the peculiar arrangement of parts for the purpose of adjusting the clevis, so as to regulate the depth of the plowing or to give more or less land, as may be desired.]

562.—F. H. Smith, of Baltimore, Md., for an Improved Drying Tunnel:

I claim a tunnel, A B C, having a furnace, R, or its equivalent, at the rear end, and a chimney, L, at the front end, in combination with gates, F G H, car, J, trays, I, and inclined rails, E E, the whole being constructed and arranged substantially as and for the purpose set forth.

[The subject of this invention is a tunnel heated to a high degree and operating to dry or bake bricks, or other articles, which are placed in trays stacked upon suitable tracks and passed through the tunnel from end to end, on a railway. The invention particularly relates to certain devices for economizing heat and increasing the efficiency of the apparatus.]

563.—H. W. Spooner, of Erie, Pa., for an Improvement in the Tubes of Artesian Wells:

I claim, in the use of tubes or cases for oil well or other borings, the arrangement of the means recited, substantially as and for the purpose set forth.

564.—L. R. Stone, of Owassa, Mich., for an Improvement in Machines for Raking and Cocking Hay:

I claim the arrangement of the levers, J J, tilting box, K, bars, E1 E2, wheels, B B, rollers, G G, belts, H H, and apron, c, upon the bars, E E, and caster wheels, e; the whole being constructed and operated substantially as and for the purpose shown and described.

[This invention is a self-raking and cocking machine which may follow the mowing machine and rake the hay up into cocks, or spread it out loosely for drying and curing. It may also be used for loading carts or wagons, by attaching it in rear of the cart or in front of it, and the hay may thus be raked up from the windrows and deposited into the cart, which operations will save much time and labor on the farm, and dispense with the ordinary hay-raking and hay-making machines which have hitherto been used.]

565.—H. D. Stover, of New York City, for an Improved Packing Case. Ante-dated Aug. 26. 1860:

I claim the body of the case, A, with the clamp, A′, to secure the ends of the same, arranged and constructed as and for the purposes fully set forth.

Also, the formation of slots, C, in the rings, D, at an angle with the cover surface, when so combined with pins, B, and bars, G, that the act of fixing the cover to the case will draw and retain their surfaces of contact tightly together.

Also, securing the metal ring, D, to the wooden cover, E, by means of the recesses, E′, formed in the sides thereof, substantially as and for the purposes fully set forth.

Also, the cover constructed by crimping a strip of sheet metal, B′, and then forming it into a ring, and into which crimp a disk or cover piece of wood, A′, is sprung or pressed and thus united, substantially as and for the purpose set forth, or the mechanical equivalents thereof.

566.—Thomas Wise, of Boston, Mass., for an Improvement in Stamp Head for Quartz Crushers:

I claim, first, A hammer face, B, composed of a cluster of metallic rods, as explained.

Second, The yielding clamp jaws, A1 A2 A3 A4, and band, C, constructed, combined and operating in the manner set forth to secure a movable hammer face in position.

[The value of this invention consists in providing a stamp head, steam hammer, or analogous instrument with a movable face, to be renewed when worn. By the use of a cluster of steel rods, about one inch in diameter, a durable face is made at a moderate cost.]

567.—J. A. Crandall (assignor to Mary Crandall), of New York City, for an Improved Toy Horse:

I claim the particular arrangement of the spring, D, with the horse, C, and rockshaft, B, when the hind feet of the horse are attached to said shaft, B, and the whole is constructed as set forth.

[This invention consists in the employment or use of a single spring bent in a peculiar form, and placed in such relation with the axis or shaft on which the toy rocks or vibrates, that the axis or shaft will serve as a check for the spring and, to a certain extent, control its action, so that it (the spring) will be made to operate in the most efficient manner.]

568.—P. D. Cummings (assignor to D. H. Furbish), of Portland, Maine, for an Improvement in Sowing Machines:

I claim a rotating, centrifugal discharger for seed and other materials, which is a combination of spouts that diverge from the same axis of rotation at different angles with the radii, drawn respectively through the inner ends of said spouts, substantially as described.

I also claim the combination of the stirrer with mechanism that causes the stirrer to descend and rise in the hopper in a path substantially such as described, the ascent and descent being made in different directions, for the purpose specified.

I also claim the combination of the stirrer with the rotating shaft (or other moving part of the machine) that drives it in such a manner that the stirrer is in gear when the shaft is turned in one direction and out of gear when the shaft is turned in the reverse direction, substantially as described.

I also claim the combination of the stirrer mechanism with the hopper gate in such manner that the closing of the hopper gate throws the stirrer out of gear, substantially as described.

569.—George Gary and S. P. Gary, of Oshkosh, Wis., assignors to themselves and J. E. Gary, of Chicago, Ill., for an Improvement in Printing Presses:

We claim the combination of the pressure roller, F, and reciprocating frame, D, with the impression cylinder, E, and type bed, B, in the manner substantially as shown and described.

570.—J. F. Greene, of Brooklyn, N. Y., assignor to S. B. Tobey, of Providence, R. I., for an Improvement in Machines for Sifting Flock:

I claim the slowly-rotating sieve cylinder, with its open heads and inward-projecting blades or ribs, and its outer casing, substantially as described, in combination with the rapidly-rotating, inner, concentric cylinder having teeth and apertures for air communicating with the hollow shaft, substantially as and for the purpose specified.

571.—A. H. Knapp, of Newton Center, Mass., assignor to himself and G. W. Tisdale, of Walpole, Mass., for an Improved Coal-sifter and Shovel:

I claim, as a new article of manufacture, the two parts, A and B, provided with the pivot, f, and aperture, g, constructed substantially as set forth, for readily hinging and unhinging, in combination with the arrangement and construction of the tines or prongs so as to prevent the clogging of substances between them, substantially as specified.

572.—William Mason (assignor to himself and L. N. Fay), of Warren, Mass., for an Improved Wrench:

I claim the combination of the vibrating nut, F, and spring, G, with the bar, A, and movable jaw, E, in the manner and for the purpose substantially as shown and described.

[The object of this invention is to obtain a screw wrench that will be of extremely simple construction, durable, economical to manufacture, and one that may be properly adjusted to its work with the greatest facility, and also used as a callipers when desired.]

573.—James Matthews (assignor to himself and Henry Egolfs), of Middletown, Pa., for an Improvement in Grain Separators:

I claim, first, The employment of the vertical screen, D, arranged in relation to the fan and the horizontal screens of the shoe, between said shoe and fan, as and for the purpose specified.

Second, The employment of the plate, E, as constructed, the plate, C, and the ball, K, in connection with the shoe, whereby said shoe is hung and allowed to vibrate at its front end, substantially as specified.

574.—W. H. Milliken and John Milliken (assignors to themselves and D. F. Buckley), of Manchester, N. Y., for an Improvement in Machines for Folding Paper:

I claim, first, The combination of the horizontal rolls, E, the inclined rolls, I, and the table, H, so arranged that the sheet of paper, after passing through the first pair of rolls, shall slide down the table to the gages which determine its position for receiving its second fold without loss of register and without the use of tapes, as set forth.

Second, The combination of the inclined rolls, I and P, with the inclined trough, M, with its fingers, a2 b2 d2, so arranged that the sheet shall be guided into the trough after passing through the roll, I, and then slide to the position for receiving its third fold.

Third, The inclined rolls, P and Q, at right angles to each other, in combination with the knife, U, working in a groove in the surface of the rolls, as set forth.

Fourth, The guide plate, q, employed for deflecting the sheet in one direction or the other, for giving it three or four folds, without the necessity of unshipping or stopping the operation of either of the knives or rolls.

Fifth, The dropping finger or folding edge upon the fly, operating as set forth, whereby the folding machine may be applied directly to the printing press, and the folding be completed without the necessity of again handling the sheet.

575.—F. B. Preston (assignor to himself and W. H. Stapleton), of Fayette, Mo., for an Improvement in Corn Planters:

I claim the combination of the three handles, d h i, with the slide, D, tube, A, and hopper, B, one of the handles, h, being attached the slide and the other two being attached to plate, c, as and for the purpose set forth.

[The object of this invention is to obtain a simple corn planter for manual operation that may be worked with facility and not be liable to choke or clog, a contingency of frequent occurrence with the generality of all planters that have passed under observation.]

576.—Isaac Rogers, of Haverstraw, N. Y., assignor to Samuel Daskam, of New York City, for an Improvement in Furnaces for Treating Iron Ores:

I claim the shield or cover, l, in combination with a revolving heated cylinder for deoxydizing metallic ores, whereby the atmosphere, flame or heated gases are excluded from the deoxydizing cylinder, as set forth.

I also claim the arrangement of the chimney, h, over the end of the chamber, d, nearest the hopper, g, and most remote from the entrance of the flues, 7 7, for regulating the heat of the chamber, d, and deoxydizing cylinder, e, as set forth.

577.—G. S. Tiffany, of Palmyra, Mich., and H. C. Ingraham, of Tecumseh, Mich., assignors to G. S. Tiffany aforesaid, for an Improvement in Tile Machines:

We claim, first, The sockets, O, in combination with the cones, P, on the screws, and the thimbles, Q, arranged in relation with the screws, N, to operate as and for the purpose set forth.

Second, The employment or use of the polygonal bearings. l, and boxes, J, in connection with the wheels, n o, of different diameters on shaft, I, and arranged in relation with the wheel, p, as and for the purpose described.

578.—P. L. Weimer (assignor to himself, J. A. Weimer and L. E. Weimer), of Lebanon, Pa., for an Improved Registering Apparatus for Steam Engines:

I claim an engine register composed of a box containing a system of wheel work with dial and indices, having attached to it a cylinder or chamber, B, which contains a piston, L, and diaphragm, J, or their equivalent, carrying a pall, p, suitably applied to act upon the first wheel of the series within the box; the whole so combined, substantially as described, that the connection of the chamber by a pipe with the engine cylinder is all that is required to set the register in operation.

579.—Daniel Derr, of Bellefonte, Pa., for an Improvement in Railroad Car Brakes:

I claim, in combination with the brake-bars and blocks, arranged immediately over the tops of the wheels, the lever, C, rockshafts, D I, and connecting rod, H, when united by the link and pivoted connections shown, and when arranged and operating as set forth.

RE-ISSUES.

39.—R. B. Burchell, of Brooklyn, N. Y., for an Improved Window Curtain Fixture. Patented Aug. 7, 1860:

I claim the arrangement of the rod, A, pulley, d, and stationary eye, B, in substantially the manner specified, for forming a tightener for the cords of curtains, wherein said cord can be tightened or slackened by sliding the said rod through the eye, as specified.

And I claim, in a tightener for the cords of curtains, forming the rod, A, with ratchet teeth and a smooth surface or surfaces, in combination with a pawl or pawls, substantially as specified, whereby the said rod, A, can be moved in either direction when turned, so that the pawl or pawls are in contact with the smooth surface or surfaces, as and for the purposes specified.

40.—F. A. Ross and W. H. Marshall, of New York City, for an Improvement in Sewing Machine Cases. Patented Aug. 28, 1855:

We claim, first, The combination of a cabinet provided with a proper door or doors with a sewing machine in such manner that the foot pedal of the machine shall be inclosed by the cabinet and the needle stock arm or bar shall be above its upper surface, the combination being substantially such as described.

Second, We claim, in combination with a cabinet and a sewing machine, the former provided with doors and inclosing the foot pedal of the latter, a box or cover substantially such as described, and serving the purposes specified, the combination being substantially such as is set forth.

Third, We claim, combining with a cabinet protecting a sewing machine, side leaves and doors so constructed as that the doors shall support the leaves when raised up, the whole combination being substantially such as specified.

41.—W. T. Vose, of Newtonville, Mass., for an Improvement in Portable Pumps. Patented Nov. 15, 1859:

I claim the combination of a footstand, stirrup or rest, as set forth, with a pump barrel, in manner substantially as described.

42.—J. M. Wood, of Seneca, N. Y., for an Improved Willow Peeler. Patented Aug. 7, 1860:

I claim, first, The circular friction disk, D, with its suitable covering, as and for the purpose described.

Second, The screw cylinder, S, with its conical shaped end and variable thread, and with or without a circular groove, as and for the purpose set forth.

Third, The combination of the disk, D, and screw cylinder, S, with adjusting springs, substantially in the manner and for the purpose specified.

[This invention consists in the arrangement of a circular revolving disk with a superincumbent roller having a graduated screw on its surface, and so arranged in reference to the disk that, when they are both in motion, twigs of willow, or other twigs of a similar nature, will pass between them and be speedily denuded of their bark, leaving the twig in the proper condition for manufacturing purposes.]

ADDITIONAL IMPROVEMENTS.

313.—F. Chamberlin, of Berlin, Wis., for an Improvement in Seeding Machines. Patented April 10, 1860:

I claim the employment of the adjustable regulating rim, a a, as constructed in combination with the hopper, A, box, D, and cover, F, arranged in the manner and for the purpose set forth.

314.—John Hartman, Jr., of Philadelphia, Pa., for an Improvement in Couch Seats for Railroad Cars. Patented Sept. 7, 1858:

I claim the groove or slot, G, and the bolt or pin, H, the same being constructed and applied to operate in combination, substantially in the manner described and for the purpose specified.

I also claim, in combination with the subject of the above claim and the diagonal brace, E, and ring, I, the application of the knee joint brace, F, the same being constructed and arranged to operate substantially as described and for the purposes specified.

315.—A. H. Rowand, of Allegheny, Pa., for an Improvement in Coupling for Railroad Cars. Patented Jan. 1, 1861:

I claim the application and use of the compound metallic springs, supported by the elastic spring pads or cushions, c c, and its socket or bed, m m, operating by lateral resistance or pressure, also elastic spring pads or cushions, o o, near the ends of the main metallic spring, so as to increase the lateral resistance of said spring when the car is drawn forward, the above parts being arranged as shown, and operating in the manner and for the purpose set forth.

316.—G. J. Willson and D. H. Fox, of Reading, Pa., for an Improvement in Gas Meters:

We claim, first, The application and combination of the lower valve, c, and its seat, D, with our open discharge pipe, Q, and open filling tube, R.

Second, The application of a back outlet connection with one or more openings in back of meter at any convenient place, to prevent a direct connection to or with the measuring drum, or the applying of any instrument to pierce or injure the measuring drum of a wet gas meter, as set forth.

DESIGN.

Sampson Hainemann (assignor to himself and Julius Negbaur), of New York City, for a Trade Mark Design.

NOTE.—The abovelist of patents, issued during the week preceding Feb. 26th, numbers SIXTY-TWO; out of this number TWENTY-NINE—nearly one-half—were obtained through the Scientific American Patent Agency. Since the 1st of January, TWO HUNDRED American patents, lacking five, have been issued to inventors whose applications were prepared and conducted by this office. This number does not include large number of applications which have been made in England, France and other countries, through our agency.

Notes and Queries

W. W, D. of La.—Rock oil is produced by the decomposition of peat as well as of coal. It is now produced in large quantities, and is getting to be an important article of commerce. You will find articles on the subject on pages 166, 179, 211, 370, and 373 of our last volume, and on pages 35, 66, 113, and 118 of the current volume.

A. F. O., of Vt.—Blanchard's patent for turning irregular forms expires Jan. 20, 1862.

C. S. T., of Mich.—It would require more space than a single number of our paper to describe, briefly, all the different devices that have been proposed as a substitute for the crank. If you wish our opinion on your plan, you must send us a sketch and description of it for examination.

L. M., of Iowa.—There is no society in this country that has for its object the exploration of Africa. Expeditions have sometimes been fitted out by the government to explore certain regions of country, but, so far as we know, none has ever been sent to Africa. You will find a vast amount of interesting information on this subject in the published explorations of Drs. Barth and Livingston.

H. W., of Iowa.—There have been several plans proposed for driving sewing machines by springs, but we do not know of any that has come into use. A patent could not be obtained for the use of a spring to drive any kind of machinery, but must be limited to the arrangement or mode of applying it to, or combining it with the machine.

U. B. V., of N. Y.—The iron cones for the Armstrong gun are coated with lead. A thick lining of india-rubber and ground cork has been tried on some of the British war ships, but with what success we are not informed. A thick lining of india-rubbber for wooden vessels would be very expensive.

T. D. O., of Miss.—We have not seen any specimens of the steel made from New Zealand ore; the description we gave of it was found in our English cotemporaries.

G. J. M., of N. J.—India-rubber dissolved in benzole forms a pliable cement for uniting cloth to india-rubber. Thin brass bands may be cleaned (if free from grease) by dipping them for a few seconds in warm diluted muriatic acid. Wash well afterwards. Lard oil can be deodorized by boiling it with a small quantity of carbonate of soda.

J. C. B., of La —Correspond with Mr. John S. Keyser. No. 2 Bible House, this city, about brick machines. He will give you the information desired.

J. M. L., of Pa.—The number of teeth in a wheel has nothing to do with its diameter. Some wheels not over an inch in diameter have over one hundred teeth, while others, one foot in diameter, have not more than twenty or thirty. The size of the teeth must be in proportion to the strain they are to bear and the velocity to be transmitted from the main driving shaft.

C. C., of Pa.—Benzole manufactured according to the method of the London makers may be obtained of McDonough & Son, corner of Eighth and North First-street, Brooklyn, N. Y. We understand it is made from naphtha procured in London. You can obtain the information you desire on coal oils in the works of Drs. Antisell and Gesner. You can purchase them in your city.

J. R., of ——.—If you are experimenting with a view to perfecting an invention, a caveat would afford you all the protection needed under such circumstances. We are in no way connected with patents except as solicitors. We will not have anything to do with them pecuniarily. We have forgotten what the suggestion of our correspondent was, to which you refer, respecting the resisting power of the atmosphere.

G. M. F., of N. Y.—Levels are not varnished; they are simply rubbed down with a little linseed oil. This prevents the wood from warping, and it does not show white scratches like varnish.

E. R. B., of N. J.—Your plan of forming several balloons one inclosed within the other, the second within a third, and so on, the spaces between them to be filled with gas, would not make a balloon so safe from bursting as to have the several sheets combined in one fabric.

D. B., of Pa.—Some mineral colors, on cotton and wool, are fugitive; and it is the same with vegetable colors. You are mistaken in supposing that there are certain substances capable of rendering any dyed color fast. There are certain modes of dyeing colors whereby they may be rendered more permanent, but it would require a recipe for each color. The other information requested has been sent by mail.

F. B. J., of Iowa.—The best materials to use for dryers in boiled linseed oil are oxyd of lead (litharge), sulphate of zinc (white copperas), and oxyd of manganese. They must be added in very small quantities, and very cautiously, while the oil is boiling. A long-continued and "low" boil should be given to oil designed for painting.

T. W. H., of Ga.—It is stated that malleable iron may be made in twenty-four hours by using oxyd of zinc in place of oxyd of iron, in the furnace, but this all we know about the process.

D. R. S., of Vt.—India-rubber cement is composed of india-rubber cut into shreds and dissolved in naphtha, benzole, or turpentine. We advise you to use benzole as a solvent, for the turpentine cement takes a long time to dry. Pure—not vulcanized—rubber should be used.

L. P., of Va.—Brass is an alloy of copper and zinc, small portions of lead and tin being sometimes added. You would doubtless find it more convenient to buy the quality you want than to make it. The following are some of the various proportions in which the metals are mixed:—

	1	2	3	4	5	6	7
Copper	66·0	65.8	64.6	65.4	82·0	70.1	91.2
Zinc	34.0	31.7	33.7	33.8	18·0	29.9	5.6
Lead	....	2.2	1.5	0.8	....	....	1.5
Tin	....	0.2	0.2		....	....	1.8
	100	100	100	100	100	100	100

C. W., of N. Y.—A low pressure engine is one in which the steam is condensed, and a high pressure engine is one in which the steam is discharged into the air after it has done its work. You will find the two clearly explained on pages 150 and 178 of our last volume.

Money Received

At the Scientific American Office on account of Patent Office business, for the week ending Saturday, March 2, 1861:—

J. J. H., of Ky., $55; E. C., of N. Y., $35; C. F. C., of N. Y., $30; W. L. S., of Cal., $10; W. N., of Mass., $25; F. & G., of Cal., $30; G. H., Jr., of Conn., $30; J. J. & J. McC., of N. Y., $30; J. M. H., of Miss., $55; G. F. J. C., of N. J., $15; C. M., of N. Y., $275; W. J. G., of N. Y., $25; G. T. L., of Pa., $30; S. & E., of N. J., $25; S. McQ., of Ill., $25; T. D., of Ala., $20; J. N., of N. Y., $30; W. J. M., of N. J., $25; B. & B., of Ind., $25; S. G. S., of Mass., $30; G. B. P., of N. Y., $250; J. S. F., of Cal., $25; F. W. Y., of Ohio, $30; A. L., of Cal., $55; G. G., of N. Y., $30; J. A. DeB., of N. Y., $30; C. & S., of N. Y., $30; J. T., of N. Y., $30; C. B., of Ohio, $30; G. B. B., of Conn., $25; J. M. B., of N. Y., $30; B. M., of Ind., $36; T. S. M., of Ohio, $25; J. G., of Mass., $30; J. B. R., of Mich., $60; G. I., of Mich., $30; W. F., of Conn., $25; E. R. W., of Maine, $30; J. L., of N. J., $30; P. W. B., of Cal., $60 J. C. T., of Ill.. $25; K. & B., of Cal., $30; O. H. & W. R. B. of Mass., $30; S. D. L., of Mass., $30; B. T. M., of N. Y., $25; J. D., of Ill., $30; G. S. R., of Vt., $10; G. B. B., of Ill., $30; M. L. B., of N. Y., $30; N. F. M., of R. I., $12; J. H. J., of Ill., $30; D. H., of Md., $30; W. H. B., of N. Y., $30; F. W. A., of N. Y., $25; I. K., of Ill., $25; W. M., of Mass., $25; G. & S. P. G., of Wis., $25; L. R. S., of Mich., $25; H. & H., of Ill., $25; W. S., of Pa., $25; G. C. A., of Ky., $25; D. P., of Ill., $25; E. G., of Conn., $30; P. B., of N. Y., $30; S. & B., of N. Y., $25.

Specifications, drawings and models belonging to parties with the following initials have been forwarded to the Patent Office during the week ending March 2, 1861:—

J. B. R., of Mich.; W. N., of Mass.; J. A., of Conn.; B. & B., of Ind.; B. T. M., of N. Y.; G. B. B., of Conn.; G. I., of Mich.; W. & B., of Cal.; J. C. T., of Ill.; E. C., of N. Y.; W. J. M., of N. J.; F. W. A., of N. Y.; W. J. G., of N. Y.; T. C., of Cal.; J. S. F., of Cal.; W. F., of Conn.; E. B., of N. Y.; G. H., of Ind.; W. C. D., of Cal.; H. B. M., of Pa.; T. S. M., of Ohio: S. McQ., of Ind.; N. F. M., of R I.; S. & B., of N. Y.

Important Hints to Our Readers.

BACK NUMBERS AND VOLUMES OF THE SCIENTIFIC AMERICAN.—Volumes I., II. and III. (bound or unbound) may be had at this office and from all periodical dealers. Price, bound, $1.50 per volume by mail, $2—which includes postage. Price in sheets, $1. Every mechanic, inventor or artisan in the United States should have a complete set of this publication for reference. Subscribers should not fail to preserve their numbers for binding.

PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

BINDING.—We are prepared to bind volumes, in handsome covers, with illuminated sides, and to furnish covers for other binders. Price for binding, 50 cents. Price for covers, by mail, 50 cents; by express or delivered at the office, 40 cents.

are made through our Branch Office, corner of F and Seventh-streets, Washington, by experienced and competent persons. Over 1,500 of these examinations were made last year through this Office, and as a measure of prudence and economy, we usually advise Inventors to have a preliminary examination made. Address MUNN & CO., No. 37 Park row, New York.

CAVEATS.

Persons desiring to file a Caveat can have the papers prepared in the shortest time by sending a sketch and description of the invention. The government fee for a Caveat is $20. A pamphlet of advice regarding applications for Patents and Caveats furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row, New York.

HOW TO MAKE AN APPLICATION FOR A PATENT.

Every applicant for a Patent must furnish a model of his invention, if susceptible of one; or if the invention is a chemical production, he must furnish samples of the ingredients of which his composition is composed, for the Patent Office. These should be securely packed, the Inventor's name marked on them, and sent, with the government fee, by express. The express charge should be prepaid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to the order of Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but if not convenient to do so, there is but little risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN & CO., No. 37 Park-row, New York.

REJECTED APPLICATIONS.

We are prepared to undertake the investigation and prosecution of rejected cases, on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief history of their case, inclosing the official letters, &c.

FOREIGN PATENTS.

We are very extensively engaged in the preparation and securing of Patents in the various European countries. For the transaction of this business, we have offices at Nos. 66 Chancery-lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that THREE-FOURTHS of all the European Patents secured to American citizens are procured through our Agency.

Inventors will do well to bear in mind that the English law does not limit the issue of Patents to Inventors. Any one can take out a Patent there.

Circulars of information concerning the proper course to be pursued in obtaining Patents in foreign countries through our Agency, the requirements of different Patent Offices, &c., may be had gratis upon application at our principal office, No. 37 Park-row, New York, or either of our Branch Offices.

INTERFERENCES.

We offer our services to examine witnesses in cases of interference, to prepare arguments, and appear before the Commissioner of Patents or in the United States Court, as counsel in conducting interferences or appeals.

For further information, send for a copy of **"Hints to Inventors."** Furnished free. Address MUNN & CO., No. 37 Park-row, New York.

THE VALIDITY OF PATENTS.

Persons who are about purchasing Patent property, or Patentees who are about erecting extensive works for manufacturing under their Patents, should have their claims examined carefully by competent attorneys, to see if they are not likely to infringe some existing Patent, before making large investments. Many persons have been ruined from adopting the "penny-wise and pound foolish" maxim, when an an investment of a few dollars, to have been informed of their rights, would have saved them much anxiety and money. Written opinions on the validity of Patents, after careful examination into the facts, can be had for a reasonable remuneration. The price for such services is always settled upon in advance, after knowing the nature of the invention and being informed of the points on which an opinion is solicited. For further particulars, address MUNN & CO., No. 37 Park-row, New York.

EXTENSION OF PATENTS.

Valuable Patents are annually expiring which might be extended and bring fortunes to the households of many a poor Inventor or his family We have had much experience in procuring the extension of Patents; and, as an evidence of our success in this department, we would state that, in all our immense practice, we have lost but *two* cases, and these were unsuccessful from causes entirely beyond our control.

It is important that extension cases should be managed by attorneys of the utmost skill to insure success. All documents connected with extensions require to be carefully drawn up, as any discrepancy or untruth exhibited in the papers is very liable to defeat the application.

Of all business connected with Patents, it is most important that extensions should be intrusted only to those who have had long experience, and understand the kind of evidence to be furnished the Patent Office, and the manner of presenting it. The heirs of a deceased Patentee may apply for an extension. Parties should arrange for an application for an extension at least six months before the expiration of the Patent.

For further information as to terms and mode of procedure in obtaining an extension, address MUNN & CO., No. 37 Park-row, New York.

ASSIGNMENT OF PATENTS.

The assignment of Patents, and agreements between Patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park-row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express (prepaid), should be addressed to MUNN & CO., No. 37 Park-row, New York.

New Color—Indian Red.

By Professor H. Dussauce.

Painters use very few colors of an organic nature. Those which they employ are usually in the state of lake, which are a combination of the coloring principle, with a metallic oxyd. For some time past I have been occupied with chemical researches on the coloring principles of organic origin, and have obtained one from sandal wood, which, by its beauty and its brightness, is nearly equal to carmine, and is of great interest to painters.

This principle is a pure red solid, melts a little below 212°, and is afterward decomposed. It is insoluble in water and fixed oils, but very soluble in alcohol, ether, acetic acid and volatile oils. Dry chlorine has no action on it; wet chlorine destroys it. All acids—except nitric, chromic and others which are rich in oxygen—have no action on it. Sulphohydric acid, which of all the gases is the most redoubtable test for such colors, has no action upon it; and light and air have no action on it. Painters have found it to be a very solid color. It was used to paint the carriages of the Emperor Napoleon about nine years ago, and the color is still as bright as when it was put on. Its preparation is easy, as follows:—Take the sandal wood in powder, and exhaust it completely by alcohol. In the alcoholic solution thus obtained, pour hydrate of oxyd of lead in excess. Collect the precipitate on a filter. Now, wash the precipitate with alcohol and dry it; dissolve it in acetic acid, and to this acetic solution add an excess of water. The coloring matter which is insoluble in water is precipitated, and the acetate of lead stays in the solution; and it may be used to make new oxyd of lead. Now, wash the precipitate well and dry it at a low temperature. Researches on this color—too long to relate here—have shown me that this color is a peculiar principle, and is pure santalin. Its cost will be about $1 a pound. I intend to make a new compound for dyers and calico printers, extracted from santalin, capable of dissolving in water—a thing which has never been done before.

[Sandal wood, under the name of saunders wood, has been long in moderate use among dyers for dyeing brown colors on woolen goods. It has been considered a variety of bar wood by French chemists. It re-acts with salts of alumina, and gives red precipitates. We have never heard of it being used for making paints. Barwood and camwood, its congeners, should also produce such paints when heated in the same manner. —Eds.

The British Reviews.

"That noble literature, the greatest of the many glories of England." When we first read this remark of Macaulay's it confirmed an opinion, which, with far less knowledge, but without any bias of national prejudice, we had long entertained. The modern literature of England we believe to be superior to that of all other lands and times. It is probable that as great intellects have existed in earlier periods as any of the present generation, but since the age of Socrates, and even since that of Shakspeare or Bacon, the world has made an immense progress, not only in the accumulation of facts, but also in the arts of scientific investigation and historical criticism. The free institutions of England have delivered her literature from all government trammels, and have stimulated an industrial activity which has given to quite a numerous class the means of the highest intellectual cultivation. These causes combined have resulted in the production of a literature which, in its comprehensive grasp of all subjects, its patient industry in the mastery of details, its rational spirit, its manly strength, its honesty, its purity, and, above all, its love of truth and sympathy with all that is highest and best in humanity, is not only at the head of all literature, but is the noblest of all the works of the human race.

The very cream of English literature is to be found in the four quarterly reviews, the *London*, *Edinburgh*, *North British* and *Westminster*. The *London Quarterly* is high Church and Tory, the *Edinburgh* is the organ of the Whigs or moderate reformers, and the *Westminster* is radical democratic, while the *North British* is the organ of the Free Church of Scotland. These reviews have been widely circulated in the United States, and, we presume, have done more than any other writings to form the opinions of the most intelligent portions of our people. They continue to be republished at a low price (three dollars a year for any one, or ten dollars for the four), by Leonard Scott & Co., 54 Gold-street, New York.

HOSTETTER'S BAG-HOLDER AND CONVEYER.

Among the implements in use for handling large quantities of grain are little trucks, called conveyers, so arranged that the bag may be moved after it is filled in nearly an upright position. There are also little frames for holding open the mouth of the bag to receive the grain from the half bushel or other measure. We here illustrate an invention in which both these

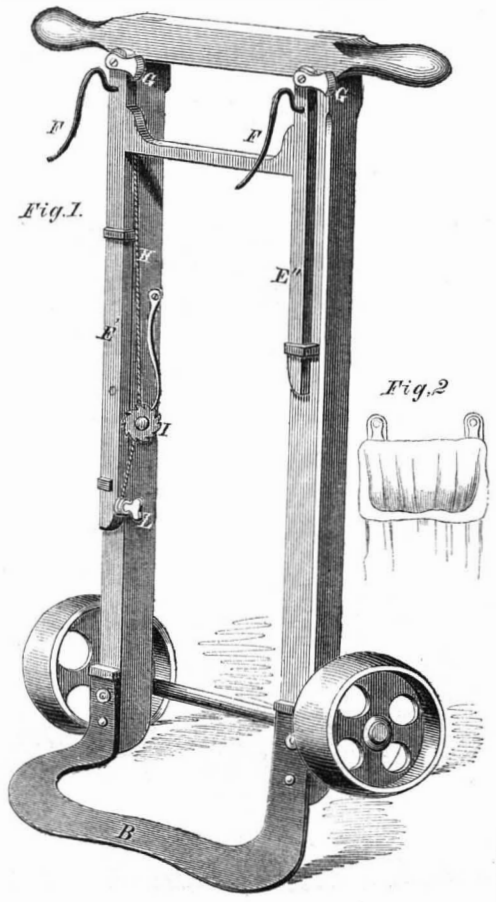

Fig. 1.

Fig. 2

objects are accomplished by a simple combination, and a very good and convenient labor-saving device is provided for all who have much grain to put into bags.

The mouth of the bag to be filled is opened fairly to receive the grain, by slipping it upon the curved rods, F F, (see cut) and securing it in place by the wedge-shaped buttons, G G. The bottom of the bag rests upon the curved plate, B, so that when it is filled it is ready to be wheeled off upon the truck to any part of the building. In order to adapt the implement to bags of different lengths, the rods, F, and the buttons, G, are secured to movable slides, E^1 and E^2, so that these may be raised or lowered to a greater or less proximity to the plate, B. The slides are held in any position desired by means of the cord, H, which is fastened to the long slide, E^1, and passes around the pulley, I; this pulley being provided with a rachet and pawl to keep it in place. The cord, H, is connected to a tightening pin, L, at its lower end.

To farmers, millers, and dealers in grain, a combined bag-holder and conveyer will supply a want constantly felt, and the simplicity and cheapness of the one here described will at once be perceived.

This implement was invented by Christian K. Hostetter, who assigned the entire invention to Jacob R. Hoffer, to whom the patent was granted on the 18th of December, 1860, and who may be addressed for further information in relation to the matter at Mount Joy, Pennsylvania.

The Sugar Crop.—The following is the official statement of the amount of sugar imported into this country from 1851 to 1860 :—

	Value of Sugar.	Duty Paid.
1851	$13,478,700	$4,043,600
1852	13,977,300	4,193,200
1853	14,168,300	4,250,500
1854	11,601,600	3,481,300
1855	13,284,600	3,989,400
1856	21,255,100	6,388,500
1857	41,596,200	12,478,800
1858	18,946,600	4,557,200
1859	28,345,300	6,802,800
1860	28,931,100	6,943,400
Total in ten years	$205,627,800	$57,114,700

The sugar crop of Louisiana, last year, was valued at $24,988,000. The average for five years has been $17,000,000.

The Power of Hearty Laughter.—The *New Haven Palladium* is responsible for the following :—The following incident comes to us thoroughly authenticated, although we are not at liberty to publish any names : A short time since two individuals in this city were lying in one room very sick, one with brain fever and the other with an aggravated case of mumps. They were so low that watchers were needed every night, and it was thought doubtful if the one sick of fever recovered. A gentleman was engaged to watch one night, his duty being to wake the nurse whenever it became necessary to take the medicine. In the course of the night both watcher and nurse fell asleep. The man with the mumps lay watching the clock, and saw that it was time to give the fever patient his potion. He was unable to speak aloud or to move any portion of his body except his arms, but, seizing a pillow, he managed to strike the watcher in the face with it. Thus suddenly awakened, the watcher sprang from his seat, falling to the floor and awakening both the nurse and fever patient. The incident struck both the sick men as very ludicrous, and they laughed most heartily at it for fifteen or twenty minutes. When the doctor came in the morning, he found his patients vastly improved—said he had never known so sudden a turn for the better—and they are now both out and well. Who says laughter is not the best of medicine ?

FROM THE STEAM PRESS OF JOHN A. GRAY.