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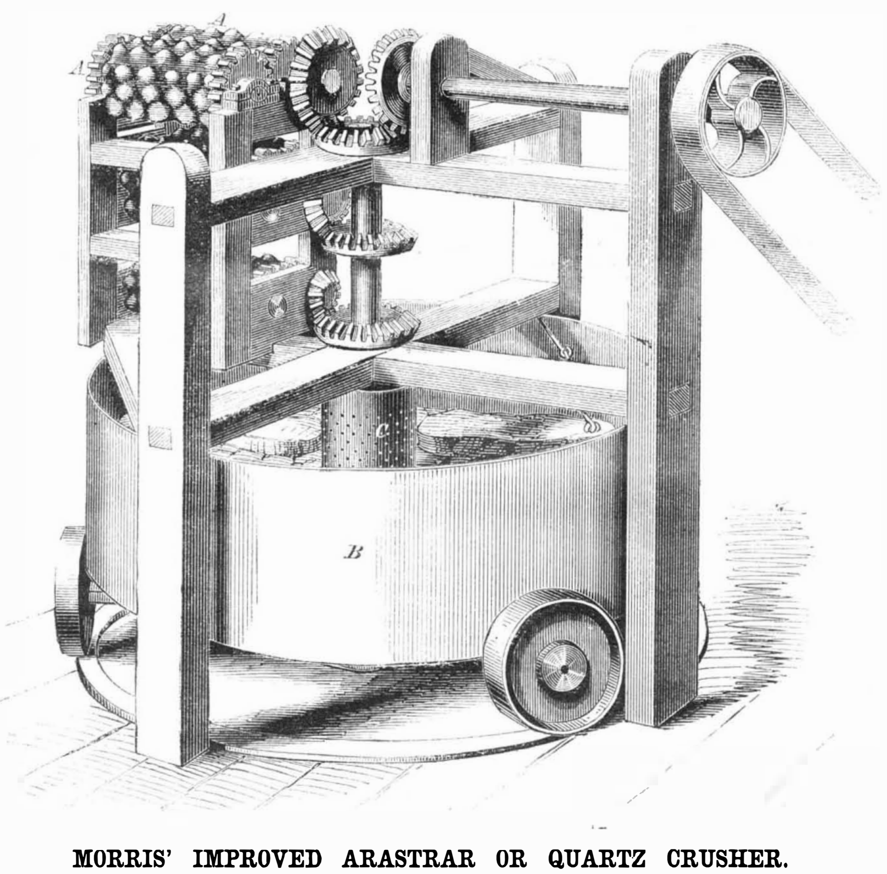
Improved Arastrar or Quartz Crusher and Pulverizer

Gold occurs in quartz rock generally in very minute particles, and to separate it it is necessary to reduce the quartz to a very fine powder, and then to collect the almost invisible particles of gold by amalgamating them with mercury. It is found that many of the particles of gold are covered with iron pyrites which will not amalgamate with mercury, and which consequently operates to protect the pieces of gold, and thus prevent them from being collected and saved. We recently noticed an offer in the papers of San Francisco of $2,500 reward for some substance which would remove this protecting coating of pyrites. The quartz mill which we here illustrate, recently invented by Thomas A. Morris, of Green Bay, Wis., beside crushing the quartz and amalgamating the gold, removes the pyrites from the particles of the precious metal by rubbing them between two hard stones.

The accompanying engraving is a perspective view of the mill, in which the several parts are clearly shown. The quartz, previously broken into pieces of moderate size, is passed between the cast iron rollers, A A. The surfaces of these rollers are formed with grooves around their peripheries, and with longitudinal grooves at rightangles to the former extending the whole length of the rollers. The effect of these grooves is to cover the surfaces of the rollers with a series of protuberances, which are rounded at their summits, and so arranged that those upon one roller shall fit into the hollows in the other, and *vice versa*. If necessary, one or two more similar pairs of roller may be placed directly below these to farther pulverize the quartz before it falls into the cylinder, B.

The cylinder, B, rests upon wheels which run upon a circular railway, and it is made to revolve by gearing its axle in connection with the driving power. The bottom of this cylinder is paved with a plane surface of quartz rock, firmly imbedded in suitable cement, and a number of heavy blocks of quarts rest loosely upon this bottom, but are prevented from being carried along with the rotary motion of the cylinder by being attached to the framing of the machine by means of ropes or chains. Around the spindle in the middle of the bottom of cylinder, B, is an opening for the discharge of the water, in a constant flow of which the quartz is ground, and this opening is surrounded by a small cylinder or pipe, C, which is made water tight in its connection with the cylinder, but has its upper portion perforated with numerous small holes, thus serving as a strainer through which the water escapes, while the quartz is retained unless very fine. A supply of mercury is placed in the cylinder, which is filled with water to the hight of the holes in the pipe, C, and as the quartz becomes sufficiently fine to be floated up by the water, it is washed out by the current through the holes in this pipe. As the cylinder revolves, the pieces of quartz and gold are rubbed between its floor and the loose blocks of granite which are held in place by the chains, thus grinding the quartz to a very fine powder, and rubbing the coatings of pyrites from the particles of gold.

The patent for this invention was granted, through the Scientific American Patent Agency, Oct. 23, 1860, to Thomas A. Morris and T. R. Schettler, to whom the invention has been assigned, and to whom inquiries for the purchase of machines or rights, or for any further information may be addressed, care of Wing & Mitchell, bankers, Chicago, Ill.



MORRIS' IMPROVED ARASTRAR OR QUARTZ CRUSHER.

War Terms.

The Columbiad or Paixhan (pronounced pay-zan) is a large gun, designed principally for firing shells—it being far more accurate than the ordinary short mortar.

A mortar is a very short cannon with a large bore, some of them thirteen inches in diameter, for firing shells. Those in use in our army are set at an angle of 45 degrees, and the range of the shell is varied by altering the charge of powder. The shell is caused to explode at just about the time that it strikes, by means of a fuse, the length of which is adjusted to the time of flight to be occupied by the ball, which, of course, corresponds with the range. The accuracy with which the time of the burning of a fuse can be adjusted by varying its length is surprising; good artillerists generally succeeding in having their shells explode almost at the exact instant of striking. In loading a mortar, the shell is carefully placed with the fuse directly forward, and when the piece is discharged, the shell is so completely enveloped with flame, that the fuse is nearly always fired. The fuse is made by filling a wooden cylinder with fuse powder, the cylinder being of sufficient length for the longest range, to be cut down shorter for shorter ranges as required.

A Dahlgren gun is an ordinary cannon, except that it is made very thick at the breech for some three or four feet, when it tapers down sharply to less than the usual size. This form was adopted in consequence of the experiments of Captain Dahlgren, of the U. S. navy, having shown that when a gun bursts, it usually gives way at the breech. The *Niagara* is armed with these guns, and at the Brooklyn navy yard there are sixty, weighing about 9,000 pounds each, and six of 12,000 pounds weight each, the former of which are capable of carrying a nine inch shell and the latter, a ten inch shell a distance of two or three miles; and there is one gun of this pattern which weighs 15,916 pounds, and is warranted to send an eleven inch shell four miles!

A casemate is a stone roof to a fort made sufficiently thick to resist the force of cannon balls, and a casemate gun is one which is placed under a casemate.

A barbette gun is one which is placed on the top of the fortification.

An embrasure is the hole or opening through which guns are fired from fortifications.

Loop holes are openings in walls to fire musketry through.

To Restore Scarlet Cloth.—Scarlet facings of military uniforms can be partially restored thus: Boil a quarter of a pound of powdered cochineal in a pint of water down to half a pint, then strain the decoction, and repeat the process with fresh water, but the same cochineal, twice; reducing by this means the whole quantity to a pint and a half of red liquor, to which, when so hot that the hand can be just borne in it, add one ounce of muriate of tin, to enhance the brilliancy of the color and give it a tendency to fix in the cloth. To restore the faded cloth, the dye must be applied with a sponge; but, at best, this is but an indifferent remedy, as, to get a fine color, the cloth must be boiled in the liquor itself; and this, of course, involves tailor's work over again. It is probable that the aniline and rosealine made by Messrs. Perkins, of River terrace, Islington, London, will be found very useful for this purpose. The extent to which the rosealine is used may be judged of by the numerous red stockings worn in winter, all of which are dyed with rosealine.—*Septimus Piesse.*

It has been ascertained by a Swedish philosopher, experimenting on a healthy man about thirty-five years of age, confined in a small chamber into which air entered by a hole on one side, and was examined after it passed through at the other, that the carbon ejected per hour was 105 grs. fasting; 190 grs. after breakfast; 130 when hungry; 165 two hours after dinner; 160 after tea; and 100 sleeping; making about 7 oz. daily. As a curious result of the chemical inquiries of the present age, it has also been ascertained, that the quantity of solid carbon breathed in twenty-four hours is 63 oz. by a cow, and about 70 oz. by a horse.

In the months of September and October last, 6,428,000 bushels of wheat were exported from the United States to England.

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 I.

A Candle—The Flame—Its Sources—Structure—Mobility—Brightness.

I purpose thanking you for the honor you do us in coming to see what are our proceedings here, by bringing before you the Chemical History of a Candle. I have done so on a former occasion, and if I had my own will, I should do it almost every year; so abundant is the interest that attaches itself to the subject, so wonderful are the varieties of outlet which it gives into the various departments of philosophy. There is not a law under which any part of this universe is governed which does not come into play and is touched upon in these phenomena. There is no better, there is no more open door by which you can enter into the study of natural physical philosophy, than by considering the phenomena of a candle. Therefore I believe I shall not disappoint you in choosing this for my subject rather than any newer form, which could not be better, if it were so good.

And having said so much to you, let me say this also: that though our subject be so great, and our intention that of treating it honestly, philosophically and seriously, yet I mean to pass away from all those here who are seniors. I claim the right of speaking to juveniles as a juvenile myself. I have done it on former occasions, and, if you please, I shall do it again. And though I know that I stand here with the knowledge of having the words I utter given to the world, yet that shall not deter me from speaking in the same familiar way to those whom I esteem nearest to me on this occasion. You know that though we make no publication of our proceedings—neither I nor the authorities—we give all facilities to those who honor us by supposing that what they hear here is worth conveying further—we give them every facility to hear us and write about us, but it is entirely their own act. You have here the original, in whatever shape it appears anywhere else.

And now to my boys and girls.

I must first tell you what candles are made of. Some are very curious things. I have here some bits of timber, branches of trees particularly famous for their burning. And here you see a piece of that very curious substance taken out of some of the bogs of Ireland, called *candle-wood*, a hard, strong, excellent wood, evidently fitted for good work as a resister of force, and yet withal burning so well that when it is found they make splinters of it and torches, since it burns like a candle, and gives a very good light indeed. And here in this wood is one of the most beautiful illustrations of the general nature of a candle that I can possibly give. The fuel provided, the means of bringing that fuel to the place of chemical action, the regular and gradual supply of air to that place of action—heat and light—all produced by a little piece of wood of this kind, forming, in fact, a natural candle.

But we must here speak of candles as they are in commerce. Here are a couple of candles commonly called "dips." They are made of lengths of cotton cut off, hung up by a loop, dipped into melted tallow, taken out again and cooled, then re-dipped, until there is an accumulation of tallow round the cotton. In order that you may have an idea of the various characters of these candles, you see these which I hold in my hand—they are very small and very curious. They are, or were, the candles used by the miners in coal mines. In olden times the miner had to find his own candles, and it was supposed that a small candle would not so soon set fire to the fire-damp in the coal mines as a large one; and for that reason, as well as for economy's sake, he had candles made of this sort, 20, 30, 40, or 60 to the pound. They have been replaced by the steel mill, and then by the Davy lamp, and other safety lamps of various kinds. I have here a candle that was taken out of the *Royal George*, it is said, by Sir George Pashley. It has been sunk in the sea for many years, subject to the action of salt water. It shows you how well candles may be preserved, for though it is cracked about and broken a good deal, yet when lighted it goes on burning regularly, and the tallow resumes its natural condition as soon as it is fused.

Mr. Field, of Lambeth, has supplied me abundantly with beautiful illustrations of the candle and its materials; I shall, therefore, now refer to them. And, first, there is the suet—the fat of the ox—Russian tallow, I believe, employed in the manufacture of these dips, which Gay Lussac, or some one who entrusted him with his knowledge, converted into that beautiful substance, stearine, which you see lying beside it. A candle, you know, is not now a greasy thing like an ordinary tallow candle, but a clean thing, and you may almost scrape off and pulverize the drops which fall from it without soiling anything. This is the process he adopted:—The fat or tallow is first boiled with quicklime, and made into a soap, and then the soap is decomposed by sulphuric acid, which takes away the lime, and leaves the fat re-arranged as stearic acid, whilst a quantity of glycerine is produced at the same time. Glycerine—absolutely a sugar, or a substance similar to sugar—comes out of the tallow in this chemical change. The oil is then pressed out of it; and you see here this series of pressed cakes, showing how beautifully the impurities are carried out by the oily part as the pressure goes on increasing, and at last you have left that substance which is melted, and cast into candles as you here see them. The candle I have in my hand is a stearine candle, made of stearine from tallow in the way I have told you. Then here is a sperm candle, which comes from the purified oil of the spermaceti whale. Here also is yellow beeswax and refined beeswax, from which candles are made. Here too, is that curious substance called "paraffine," and some paraffine candles, made of paraffine obtained from the bogs of Ireland. I have here, also, a substance brought from Japan since we have forced an entrance into that out-of-the-way place—a kind of wax which a kind friend has sent me, and which forms a new material for the manufacture of candles.

And how are these candles made? I have told you about dips, and I will show you how molds are made. Let us imagine any of these candles to be made of materials which can be cast. "Cast!" you say. "Why, a candle is a thing that melts, and surely if you can melt it you can cast it." Not so. It is wonderful, in the progress of manufacture, and in the consideration of the means best fitted to produce the required result, how things turn up which one would not expect beforehand. Candles cannot always be cast. A wax candle can never be cast. It is made by a particular process which I can illustrate in a minute or two, but I must not spend much time on it. Wax is a thing which, burning so well and melting so easily in a candle, cannot be cast. However, let us take a material that can be cast. Here is a frame with a number of molds fastened in it. The first thing to be done is to put a wick through them. Here is one—a plaited wick, which does not require snuffing—supported by a little wire. It goes to the bottom, where it is pegged in, the little peg holding the cotton tight and stopping the aperture, so that nothing fluid shall run out. At the upper part there is a little bar placed across, which stretches the cotton and holds it in the mold. The tallow is then melted, and the molds are filled. After a certain time, when the molds are cool, the excess of tallow is poured off at one corner, and then cleaned off altogether, and the ends of the wick cut away. The candles alone then remain in the mold, and you have only to upset them, as I am doing, when out they tumble, for the candles are made in the form of cones, being narrower at the top than at the bottom, so that what with their form and their own shrinking, they only need a little shaking, and out they fall. In the same way are made these candles of stearine and of paraffine. It is a curious thing to see how wax candles are made. A lot of cottons are hung upon frames, as you see here, and covered with metal tags at the ends, to keep the wax from covering the cotton in those places. These are carried to a heater where the wax is melted. As you see, the frames can turn round, and as they turn, a man takes a vessel of wax and pours it first down one, and then the next, and the next, and so on. When he has gone once round it, if it is sufficiently cool, he gives the first a second coat, and so on until they are all of the required thickness. When they have been thus clothed, or fed, or made up to that thickness, they are taken off and placed elsewhere. I have here, by the kindness of Mr. Field, several specimens of these candles. Here is one only half finished. They are then taken down and well rolled upon a fine stone slab, and the conical top is molded by properly shaped tubes, and the bottoms cut off and trimmed. This is done so beautifully that they can make candles in this way weighing exactly four or six to the pound, or any number you please.

We must not, however, take up more time about the mere manufacture, but go a little further into the matter. I have not yet referred you to luxuries in candles (for there is such a thing as luxury in candles). See how beautifully these are colored; you see here mauve, Magenta, and all the chemical colors recently introduced, applied to candles. You observe, also, different forms employed. Here is a fluted pillar most beautifully shaped; and I have also here some candles sent me by Mr. Pearsall, which are ornamentrd with designs upon them, so that, as they burn, you have, as it were, a glowing sun above, and a bouquet of flowers beneath. All, however, that is fine and beautiful, is not useful. These fluted candles, pretty as they are, are bad candles; they are bad because of their external shape. Nevertheless, I show you these specimens sent to me from kind friends on all sides, that you may see what is done and what may be done in this or that direction, though, as I have said, when we come to these refinements, we are obliged to sacrifice a little in utility.

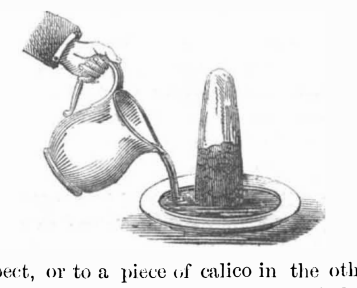
Now as to the light of the candle. We will light up one or two, and set them at work in the performance of their proper functions. You observe a candle is a very different thing from a lamp. With a lamp you take a little oil, fill your vessel, put in a little moss or some cotton prepared by artificial means, and then light the top of the wick. When the flame runs down the cotton to the oil, it gets extinguished, but it goes on burning in the part above. Now, I have no doubt, you may ask, how is it that the oil, which will not burn of itself, gets up to the top of the cotton where it will burn? We shall presently examine that; but there is a much more wonderful thing about the burning of a candle than this. You have here a solid substance with no vessel to contain it; and how is it that this solid substance can get up to the place where the flame is? How is it that this solid gets there, it not being a fluid? or, when it is made a fluid, then how is it that it keeps together? This is a wonderful thing about a candle.

We have here a good deal of wind, which will help us in some of our illustrations, but teaze us in others; for the sake, therefore, of a little regularity, and to simplify the matter, I shall make a quiet flame, for who can study a subject when there are difficulties in the way not belonging to it. Here is a clever invention of some costermonger or street-stander in the market-place for the shading of their candles on Saturday nights, when they are selling their greens, or potatoes or fish. I have very often admired it. They put a lamp-glass round the candle, supported on a kind of gallery, which clasps it, and it can be slipped up and down as required. By the use of this lamp-glass, employed in the same way, you have a steady flame, which you can look at and carefully examine, as I hope you will do, at home.

You see then, in the first instance, that a beautiful cup is formed. As the air comes to the candle, it moves upward by the force of the current which the heat of the candle produces, and it so cools all the sides of the wax, tallow or fuel, as to keep the edge much cooler than the part within; the part within melts by the flame that runs down the wick as far as it can go before it is extinguished, but the part on the outside does not melt. If I made a current in one direction, my cup would be lop-sided, and the fluid would consequently run over—for the same force of gravity which holds worlds together holds this fluid in a horizontal position, and if the cup be not horizontal, of course the fluid will run away in guttering. You see, therefore, that the cup is formed by this fine, uniform, regular ascending current of air upon all sides which keeps the exterior of the candle cool. No fuel would do for a candle, which has not the property of giving this cup, except such fuel as the Irish bog wood, where the thing is like a sponge and holds its own fuel. You see now, why you would have had such a bad result if you were to burn these beautiful candles that I have shown you, which are irregular, intermittent in their shape, and cannot, therefore, have that nicely-formed edge to the cup which is the great beauty of a candle. I hope you will now see that the perfection of a process, that is, its utility, is the better point of beauty about it. It is not the best looking thing, but the best acting thing, which is the most advantageous to us. This good-looking candle is a bad burning one. There will be a guttering round about it because of the irregularity of the stream of air and the badness of the cup which is formed thereby. You may see some pretty cases (and I expect you to think of these things) of the action of the ascending current when you have a little gutter run down the side of a candle, making it thicker there than it is elsewhere. As the candle goes on burning, that keeps its place and forms a little pillar sticking up by the side, because as it rises higher above the rest of the wax or fuel, the air gets better round it, it is more cooled and better resists the action of the heat at a little distance. Now, the greatest mistakes and faults with regard to candles, as with regard to other points, often bring with them instruction which we would not receive if they had not occurred. We come here to be philosophers, and I hope you will always remember that whenever a result happens, especially if it is new, you should say, "What is the cause? Why does that occur?" and you will, in the course of time, find it out.

Then there is another point about these candles which will answer a question—that is, as to the way in which this fluid gets out of the cup, up the wick, and into the place of combustion. You know that the flames on these wicks burning in candles made of beeswax, or stearine, or spermaceti, do not run down to the wax or other matter, and melt it all away, but keep to their own right place. They are fenced off from the fluid below, and do not encroach on the cup at the sides. I cannot imagine a more beautiful and more compact thing than the condition of adjustment under which a candle makes one part subserve to the other to the very end of its action. A combustible thing like that, burning away gradually, never being intruded upon by the flame, is a very beautiful sight; especially when you come to learn what a vigorous thing flame is—what power it has of destroying the wax itself when it gets hold of it, and destroying its proper form even before it gets hold of it, if it come too near.

Now, how does it get hold of it? There is a beautiful point about that—*capillary attraction*. "Capillary attraction!" you say, "the attraction of hairs." Well, never mind the name; it was given in olden times, before we had a good understanding of what the real power was. It is by what is called capillary attraction that the fuel is conveyed to the part where combustion goes on, and is deposited there, not in a careless way, but very beautifully in the very midst of the center of action, which takes place around it. Now I am going to give you one or two instances of capillary attraction. It is that kind of action or attraction which makes two things that do not dissolve in each other still hold together. When you wash your hands you wet them thoroughly; you take a little soap to make the adhesion better, and you find your hands remain wet. This is by that kind of attraction of which I am about to speak. And what is more; if your hands are not soiled (as they always are by the usages of life) if you put your finger into a little warm water, the water will creep a little way up the finger, though you may not stop to examine it. I have here a substance which is rather porous—a column of salt—and I will pour into the plate at the bottom, not water as it appears, but a saturated solution of salt which cannot absorb more; so that the action which you see, will not be due to its dissolving anything. We may consider the plate to be the candle and the salt the wick, and this solution the melted tallow. I have colored the fluid that you may see the action better. You observe that now I pour in the fluid, it rises and gradually creeps up the salt higher and higher; and provided the column does not tumble over, it will go to the top. If this blue solution were combustible, and we were to place a wick at the top of the salt, it would burn as it entered into the wick. It is a most curious thing to see this kind of action taking place, and to observe how singular some of the circumstances are about it. When you wash your hands you take a towel to wipe off the water, and it is by that kind of wetting, or that kind of attraction, which makes the towel wet with water, that the wick is made wet with the tallow. I have known some careless boys and girls (indeed, I have known it happen to careful people as well) who, having washed their hands and wiped them with a towel, have thrown the towel over the side of the basin, and before long it has drawn all the water out of the basin and conveyed it to the floor, because it happened to be thrown over the side in such a way as to serve the purpose of a siphon. That you may the better see the way in which the substances act one upon another, I have here a vessel made of wire gauze filled with water, and you may compare it in its action to the cotton, in



one respect, or to a piece of calico in the other. In fact, wicks are sometimes made of a kind of wire gauze. You will observe that this vessel is a porous thing, for if I pour a little water on to the top, it will run out at the bottom. You would be puzzled for a good while, if I asked you what the state of this vessel is, what is inside it, and why it is there? The vessel is full of water, and yet you see the water goes in and runs out as if it were empty. In order to prove this to you I have only to empty it. The reason is this—the wire being once wetted, remains wet; the meshes are so small that the fluid is attracted so strongly from the one side to the other, as to remain in the vessel although it is porous. In like manner, the particles of melted tallow ascend the cotton and get to the top; other particles then follow by their mutual attraction for each other, and as they reach the flame they are gradually burned.

Here is another application of the same principle. You see this bit of cane. I have seen boys about the streets, who are very anxious to appear like men, take a piece of cane and light it and smoke it, as an imitation of a cigar. They are enabled to do so by the permeability of the cane in one direction, and by its capillarity. If I place this piece of cane on a plate containing some camphene (which is very much like paraffine in its general character), exactly in the same manner as the blue fluid rose through the salt will this fluid rise through the piece of cane. There being no pores at the side, the fluid cannot go in that direction, but must pass through its length. Already the fluid is at the top of the cane, and now I can light it and form it into a candle. The fluid has risen by the capillary attraction of the piece of cane, just as it does through the cotton in the candle.

Now, the only reason why the candle does not burn all down the side of the wick is that the melted tallow extinguishes the flame. You know that a candle, if turned upside down, so as to allow the fuel to run upon the wick, will be put out. The reason is that the flame has not had time to make the fuel hot enough to burn, as it does above, where it is carried in small quantities into the wick, and has all the effect of the heat exercised upon it.

The Future of Patents.

Professor Page, formerly connected with the Patent Office, publishes in the *National Intelligencer* the following views upon the future value of patents:—

Much unnecessary anxiety is felt by inventors and patentees as to the effects of the present political disturbances upon patent property. As the most thorough believers in the frangibility of the Union, and those who have labored most to demonstrate this principle, seem all determined to cling to the constitution of the United States, as the "ark of safety," inventors and patentees are safe so long as this disposition continues, whatever political or social adversities may befall us. Such property may, indeed, better survive the shocks of political and social strife than property of a more tangible nature; and come what may, the inventor's rights will always be respected and protected in the exact proportion in which such encouragement is deemed material to the welfare of the community at large. The remunerative value of patent property must rise and fall with fluctuations in general business, but the patentee should have no fears of inadequate protection, and inventors should not in the least relax their efforts to prosecute inquiry and secure, by Letters Patent, those rights which even the worst ephemeral anarchy could not wrest from them. Indeed, arguments might now be adduced why inventors should *make haste* to secure their patents; but as these would be founded on the bold assumption of the frangibility of the United States government, I refrain from offering any such premature and illusory stimulation to that worthy and useful class of citizens, who will, despite the times, work on, unswerved in their belief that for them, at least, the Union is perennial.

These views are in accordance with those published by us on page 393 of our last volume.

Labor for Cotton Lands.

The London *Times* publishes a letter from a Paris correspondent which purports to describe the views of the French government as to the results to be obtained from the clause of the treaty with China legalizing the exportation of labor :—

"It will be seen by the late advices from China that this government, in their treaty with the Chinese, have legalized the exportation of coolies.

"This has been done, no doubt, in reference to obtaining a supply of labor for the cotton lands in Algeria.

"The great immorality of the Chinese adults heretofore imported has caused the subject to receive a careful and earnest attention, and a plan has been proposed to import boys and girls brought out under the care of priests and sisters of charity, who, on receiving them in China, will cleanse and clothe them, and begin immediately a religious and secular education.

"On arrival in Algeria, and being distributed among the planters, they will retain their teachers, and be ready with their little fingers to pick the cotton balls as they ripen. The cultivation of the land is to be effected with steam plows and horse hoes, as in this way an enormous area can be kept under culture at a small expense. The yield of cotton (as in the United States) being limited only by the number of pickers, cotton may be thus grown at half the cost of the American, owing to the difference in the value of land and slaves.

"In the year 1855, five bales of cotton were brought to Paris from Algeria, of the best quality; but the want of an organized system of labor similar to the slave system of the States, caused the culture to be abandoned for a time. The great improvements in agricultural machinery have now removed this difficulty in part, and the importation of Coolie children will supply all that is required to insure success at the present time.

"The children are to be apprenticed for twenty years, and to be always under supervision. When the picking season is finished, they are to be employed in raising their own food, and in weaving and making their clothing. At the end of their apprenticeship they can marry and become citizens, with an allotment of land, or return to China, as they please."

"Such," says the *Times*, "is the scheme, which will be carried out in British Guiana, and the other cotton lands in her extended colonies. That there is not a scarcity of cotton lands in the world, the application of the steam plow with the coolie emigration will soon prove. Within five years France and England will raise at least half the cotton they use; promoted not only by the independence that this supply will give them, they will be urged on to the work by the great missionary enterprise which it will inaugurate."

Big Lift.—In Chicago recently, there was a grand display of muscular science by "resident and foreign talent." Dr. Windship lifted 9 kegs of nails, weighing 1,000 lbs. Next, with harness on his shoulders, he raised 1,517 lbs. William Thompson, of the Chicago Gymnasium, did the same. The latter then went on adding weights and lifting, with harness on shoulders and hips, until the number stood successively 1,530, 1,636, 1,736, 1,836, 1,936, 2,036, 2,106—a very remarkable lift, the latter, to be sure. Then Thompson swung the 100 lb. dumb bell and Curtis did the same, and Dr. Windship lifted himself with his little finger, and Thompson experimented with a 165 lb. dumb bell, and Windship shouldered a 229 lb. barrel of flour, and put it down carefully, and Curtis "pushed" 130 lbs. in each hand, with the pulley, and then 150 lbs. in each hand, and, then lying down on his back, put up 110 lbs. in each hand. But the feat of the evening was the great lift of Thompson, and the judges so considered it in the award of the $200 prize to him.

The Manchester Cotton and Woolen Manufacturing Company (located in Manchester, Va., opposite Richmond) have decided to continue during the present year its operations, with very slight dimunition of the number of operatives (the usual complement is 250) in its employment. The proprietors of the Crenshaw Woolen Manufacturing Company, who also employ a large number of persons, have determined on a similar course of action.

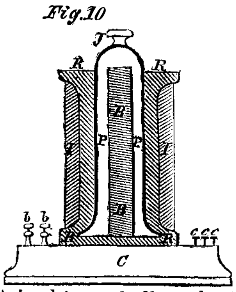
ELECTRICITY AND SOME OF ITS PRACTICAL APPLICATIONS.

ARTICLE VI.

Having stated the principles upon which most machines for the induction of electric currents are constructed, we shall proceed to a description of the "Ruhmkorff Coil."

The cut represents a section of the coil. B B is a bar of soft iron; immediately overlying it is a coil of thick copper wire, P P, and outside of this electro-magnet is a heavy bell jar, J. The induction coil, I I, is wound upon the reel, R R R R, and this is fitted nicely to the bell glass. The battery wires are attached to the binding screws, *b b*, and the current, before passing through the electro-magnet, is carried through the condensers, which are contained in a shallow chest, C, and are regulated by the screws, *c c c*. The condensers, which form a distinctive feature of the apparatus, are analogous in their action to an electroscope condenser, and their object is to secure a sudden rush of the current through the primary coil. The best current for working this machine is one of considerable quantity and of moderate intensity.

Fig. 10



The original machine of Ruhmkorff has been greatly improved by Mr. E. S. Richie, of Boston, and he now manufactures three sizes of the coil, the smallest of which throws a spark four inches long, and the largest nearly twelve. The chief characteristic of the current or wave produced by this machine is its extremely high tension, which is greater, if possible, than that of ordinary machine electricity. The greater part of the wave induced by this machine passes, if at all, between the two extremities of the induction wire, and, in this respect, it differs from the ordinary machine current, which passes from the prime conductor to the earth or any other negative body. Advantage has been taken of this fact, and a device for lighting gas by the induced current has been recently patented, and it is in use for lighting the gas in the large hall of the Cooper Institute, in this city. We have been informed that in this way all the burners, 170 in number, have been lighted twenty-six times in a minute!

The spark produced by a discharge of the Ruhmkorff coil through the air appears to be about one-fourth of an inch in width, and pursues a very crooked path, throwing out forked branches, and presenting all the appearance of a small flash of lightning, which, in fact, it is. Some idea may be formed of the power of the machine, from the fact that by it a Leyden jar of large size may be charged and discharged *several hundred times in a minute!* When this charging and discharging of a jar is carried on with rapidity in a dark room, the deafening *crack, crack* of the discharge, together with the fitful and lurid glare which lights up the apartment, and the ghostly appearance of the bystanders, creates a mingled feeling of wonder and awe in the spectator, which is not removed until, the lights being turned on and the motion of the crank stopped, he sees before him only a modest looking velvet covered cylinder. By a touch of the finger, there is developed within it a mysterious current, which, traversing its many miles of wire, flashes out in an instant with a force which tells that there is within an unseen but tremendous power, waiting only to be called into action. There are many beautiful experiments which may be performed with this apparatus, but the want of space forbids our describing them, and we shall proceed to the description of magneto-induction machines.

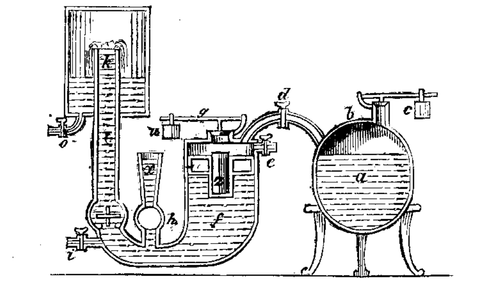
A great number of such machines have been invented, one of the first of which was that of Mr. Saxton. This was brought forward soon after Faraday made known his discovery of magneto-electric induction, and continues in use to the present time. It consists of a powerful horseshoe magnet, across the poles of which a U-shaped armature revolves; upon this are wound several hundred feet of fine insulated wire. When the armature is revolved, twice in the course of each revolution its poles must come opposite those of the magnet, when it will become temporarily magnetic, and a current induced in the fine wire coil; this current is conveyed by means of springs, which press upon the shaft of the armature, to two binding screws, and thence through any conductor desired. When the armature is revolved with sufficient rapidity, the induced currents succeed each other with such rapidity that they are, for all practical purposes, merged in one continuous stream.

ROMANCE OF THE STEAM ENGINE.

ARTICLE IX.

THE HESSIAN STEAM ENGINE.

The accompanying figure represents a section of a peculiar steam ram invented by Denys Papin and his great patron, the Elector of Hesse: *a* is the boiler, having a pipe, *b*, closed with a lever valve, through which it is supplied with water; the pipe, *d*, connects it with the cylinder, *f*; a heated iron bolt, *z*, is placed in the cavity of a hollow float piston; an orifice made in the top is closed with a valve, *g*, which is kept in



position by the weight, *u*, hung on the end of the lever; *x* is a funnel through which water is introduced; it is closed by a cock, *h*; the pipe, *k*, is a continuation of the forcing vessel, *f*; and is inserted in the reservoir; *o* is a pipe for conveying the water which has been forced into the cistern.

The steam from the boiler, *a*, flowing through the pipe, *d*, presses the floating piston downward, when the water beneath it is forced up the pipe, *k*, into the reservoir. When the floating piston has reached the limit of its stroke, the cock, *d*, is turned to shut off the further flow of the steam, and the vapor is allowed to escape from the cylinder, *f*, by the cock, *e*. The valve, *h*, is turned at the same moment, and the water in *x* flows into *f*, and raises up its floating piston. The water in the pipe, *k*, is prevented from descending by the valve placed near its bottom. The opening in the lid of the cylinder, closed by the lever valve, *g*, was provided to insert the iron cylinder, *z*, a red-hot iron for the purpose of increasing the heat of the steam—to superheat it. There was no practical necessity for the reservoir at the end of pipe, *k*; it was simply designed as an air vessel and tank to allow the water a full and steady flow through the discharge pipe, *o*.

An engine of this description was built at Marpurg in 1708, and was placed in the court of the Hessian Academy of Arts and Sciences. It forced water into a cistern at a hight of 70 feet; thence it flowed down by a pipe and played from a fountain in the court.

This was a steam ram, somewhat similar in the principle of its operation to the hydraulic ram. Although steam was employed in this engine for forcing up water, it was applied in a very different manner from that of Savery's engine. In the Hesse motor the steam was made to act upon the water by pressing upon a floating piston, while in Savery's the pressure of the steam was applied direct to the surface of the water. English writers have given the highest praise to Savery's engine; we think it was inferior to this one, not in ingenuity but in one point of real practical utility. Much of the steam, in Savery's engine, was condensed when it was brought into contact with the water, and its elastic force was thereby destroyed; but with a floating piston intervening between the steam and the water to be forced up, the condensation of the steam was prevented. It will be understood that this was a high pressure steam engine, not dependent upon the production of a vacuum for its action. Savery's engine combined the features of raising water from considerable depths by vacuum, and a most ingenious mode of feeding the boiler—provisions not secured in this engine of Hesse.

In our next article, we shall enter upon a description of a new class of steam engines.

Burning glasses have been made by Sir David Brewster, Sir John Herschel, and others, by which the diamond and several metals were melted in a few seconds.

THE SCIENCE OF COMMON THINGS.

NUMBER VI.

SOME FACTS ABOUT METALS.

"Potash contains a very peculiar metal—potassium. It is so light that it will float upon water, being just about as heavy as ice. But its most remarkable property is its strong affinity for oxygen. This is so great that, when a piece of potassium is thrown upon water, it immediately begins to decompose the water, combining with the oxygen of the water and setting the hydrogen free. During this burning of the metal it swims about on the surface of the water in the most furious manner, throwing off light and heat. The water is also consumed at the same time, and thus we have a substance that can actually set the river on fire."

"Is the water really set on fire?"

"Scientifically and strictly speaking, it is not. It is consumed with all the appearance of burning, but as it does not combine with oxygen, it could not be said to burn. The metal potassium is set on fire by throwing it into the water. It combines with the oxygen that it takes from the water, forming an oxyd of potassium, which is called potassa. Now, if this potassa is combined chemically with carbonic acid it will form the carbonate of potassa, which is potash. The potash of commerce contains many impurities, and if it is calcined and these are removed, we have pearlash. A combination of a still further supply of carbonic acid gives us saleratus."

"Then saleratus contains that curious light metal which takes fire on being thrown into water."

"Yes; potash saleratus. There is another saleratus made from soda. Soda is the oxyd of a metal—sodium—which is very similar in its properties to potassium. It is lighter than water, and, on being thrown upon water, decomposes it very rapidly, but not with sufficient rapidity to produce flame as in the case of potassium. The overland emigrants to California tell of finding the ground covered in some places with saleratus. This, I suppose, is the sesquicarbonate of soda, as this salt occurs in Egypt and other places in similar position. The metal sodium combined with chlorine, forms common table salt."

"I had no idea that there was a metal in common salt."

"You will find metals in almost everything. Every brick in our buildings contains a portion of aluminum, a metal that is worth now about nine dollars per pound. Potassium, sodium and aluminum enter largely into the composition of granite and other rocks; all marbles and limestones are the carbonate of lime, and lime is the oxyd of the metal calcium. In short, with the exception of silex, nearly all of the rocks, clays and earths which form the crust of the globe are metallic oxyds, that is, consist of some metal in combination with oxygen. The degree of affinity which any metal has for oxygen determines many of the uses to which it is applicable in the arts. When a metal oxydizes so rapidly as to produce flame, the process is called burning, but when the process is very slow it is called rusting. A thin ribbon of iron, with a little fire at the end to kindle it, put into a jar of pure oxygen gas, burns with the most intense brilliancy and more rapidly than a piece of pine wood in the atmosphere. But if a ribbon of iron is placed in damp air it combines with oxygen very slowly, rusting as we say. The heat given off by any substance is just in proportion to the oxygen with which it combines, and it has been ascertained by delicate tests that the amount of this heat is the same whether the process be slow or short—the same in rusting as in burning. Potassium has the strongest affinity for oxygen of any of the metals, and at the other end of the scale are the precious metals, gold silver, platinum, &c. It is partly owing to their small affinity for oxygen that these metals are so precious; they do not rust—they are incorruptible."

CURING HAMS.—At a late Fair of the Maryland State Agricultural Society, the first premium was awarded to hams cured as follows: "To 150 pounds of ham, take $1\frac{1}{2}$ lbs. saltpetre, 4 quarts of fine salt, with molasses enough to make it a paste; rub well on the flesh side; let it lie four weeks; make a pickle strong enough to bear an egg, let the hams lie in it four weeks; then hang and smoke. Two days before removing from the smoke-house, paint with black pepper and strong cider vinegar, after which bag them.

AMERICAN ENGINEERS' ASSOCIATION.

[Reported for the Scientific American.]

On Wednesday evening, January 16th, the regular weekly meeting of this association was held at its room, No. 24 Cooper Institute, this city—Thomas B. Stillman, Esq., President; Benj. Garvey, Esq., Secretary.

REPORTS.

The Special Committee appointed by the Association to re-examine and report upon the operation of Messrs. E. H. Ashcroft & Co.'s "Low Water Detector," submitted their report at this meeting. It will be found annexed:—

The Special Committee appointed, &c., &c., to examine Messrs. E. H. Ashcroft & Co.'s Low Water Detector, respectfully report:—

That they have been provided by Mr. Ashcroft with proper means for making accurate experiments, viz.: an instrument having a thermometer attached to it on a level with the fusible plug, and a glass tube connected with the top and bottom of the air ball. The thermometer enabled them to ascertain the temperature of the water in contact with the plug, and to try whether the water circulated within the instrument. By the aid of the glass tube, they could see what became of the air which was in the instrument at the beginning of the experiment, and could observe the degrees of rapidity with which the water fell when it became low water in the boiler.

Having had this instrument attached to the boilers in the Park Hotel, the Committee observed its operation with care. At the first experiment, no sooner was the connection with the boiler opened than the temperature began to rise rapidly in the whole instrument. The water in the glass tube was violently agitated for about a minute, when it disappeared, and the alarm was given. On inquiry, it was found that the engineer had allowed the water to get low, supposing that the object was to see if the instrument would operate.

The pump having been set going and the plug replaced, the Committee commenced their observations anew. Before the connection with the boiler was opened, the mercury stood below 80°—the lowest graduation on the thermometer—and there was no water in the glass tube. When the cock was turned, the mercury rose until it reached 95°, when it became stationary. On causing a minute leak at one of the joints to test the effect of a circulation, the mercury was immediately affected, and rose to 97°; but on stopping the leak, it again sunk, and became stationary at 95½°.

The air in the instrument was forced by the ascending water into the ball and glass tube, and was there compressed until the water stood within three inches of the top of the glass. There was very little fluctuation, but the water gradually ascended until, in the space of an hour, it got to within two inches of the top, when its ascent became so slow that it could not readily be observed.

There being now thirty pounds of steam and two cocks of water, the pump was stopped, and in three minutes there was low water, and the alarm was given; and in two minutes afterward, the lower cock gave steam and water mixed. As the water left the bottom of the instrument, there was considerable agitation in the glass tube, the temperature rose rapidly, and, as soon as the water left the instrument, the plug began to fuse.

From these experiments it is clear that there is no circulation in the instrument, or so little that its heating effect is neutralized by the radiation from the surface; also, that the air which is in the instrument at first is gradually absorbed; that the water is rapidly replaced by steam when the end of the upright tube is uncovered; and that the plug fuses readily when in contact with steam. As to the liability of the plug to change or have its fusibility affected by age, the Committee have had to rely upon the testimony of Dr. Vanderweyde and other eminent chemists, who state that the alloy of which the plug is composed is not changed by age or by the action of water.

The Committee are therefore of opinion that this instrument is simple in construction, correct in principle and reliable in operation, and that it is a valuable auxiliary to an engineer; but that it cannot be employed in place of a competent man.

(Signed) Benjamin Garvey, John C. Merriam. } Committee.

After the reading of the above report, it was accepted, and adopted as the opinion of the society.

The Committee on Accidents presented, through their chairman, the subjoined report:—

A letter calling attention to the substitution of the sanitary police for a regular Board of Inspectors was placed in the hands of your Committee. In the absence of other members of this Committee, we would respectfully submit:

1. That it is not, as has been proved by the action of the present sanitary police, the state of the boilers in the metropolis that requires attention, but the kind and quality of engineers employed.

2. That it may be true that the police may do this duty more economically, inasmuch as they receive but small wages; but that they are as good is very doubtful, it being impossible to find men entirely competent for this duty who would be willing to serve at so small a salary.

3. It is very doubtful that the present course is the most economical, as, if a proper board were appointed, their fees would be paid by the owners of boilers, and thus be of no expense to the city.

4. It is possible that the present system will receive the sanction of employers, but will it receive that of engineers and the community?

In view of the above facts, your Committee would suggest that the law proposed at the last session of the Legislature was a good one, and should be sustained; and that, in order to have it receive the attention it merits, a committee should be appointed to draw up a petition to the Legislature, setting forth these views, and calling for a law that will protect engineers as well as owners.

We would further state that the said law will probably be brought forware at this session, and that quick action is imperative.

(Signed) John C. Merriam, Joel W. Hopper. } For the Committee.

The consideration of this report was postponed for one week.

At this period, the report upon Messrs. Warren & Banks' "Low Water Alarm," as given in full in the last number of this journal, was then taken up, and, upon motion, unanimously accepted as the sense of the Association.

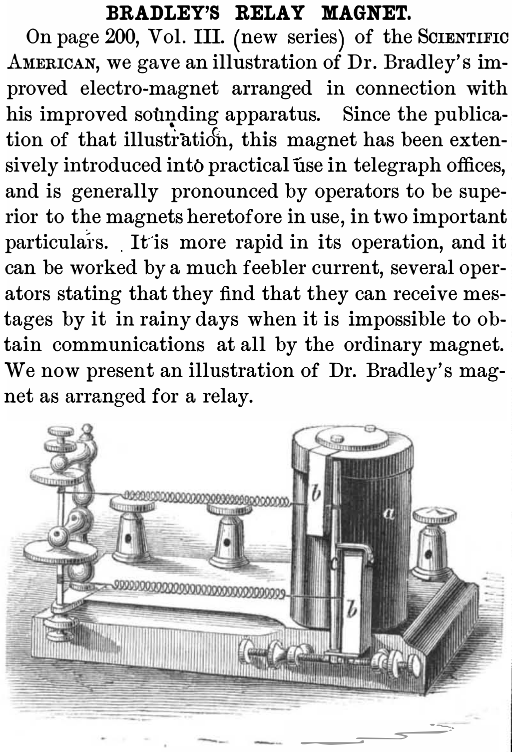
The deferred business of the evening—"The Consideration of Cut-offs"—being in order, was then taken up, and a paper, giving the results of the experiments at Erie by the Naval Commission, as far as made, was read by Mr. John C. Merriam. Upon the questions advanced in this paper, a spirited, but short discussion ensued, in which Messrs. Stillman, Roeder, Garvey, Rowell, Merrick, &c., took part. The further consideration of it was then postponed until the next meeting.

A committee of five was appointed by the president to nominate officers for the ensuing year.

The meeting then adjourned.

BRADLEY'S RELAY MAGNET.

On page 200, Vol. III. (new series) of the Scientific American, we gave an illustration of Dr. Bradley's improved electro-magnet arranged in connection with his improved sounding apparatus. Since the publication of that illustration, this magnet has been extensively introduced into practical use in telegraph offices, and is generally pronounced by operators to be superior to the magnets heretofore in use, in two important particulars. It is more rapid in its operation, and it can be worked by a much feebler current, several operators stating that they find that they can receive messages by it in rainy days when it is impossible to obtain communications at all by the ordinary magnet. We now present an illustration of Dr. Bradley's magnet as arranged for a relay.



By inspection of the cut it will be seen that but a single helix is employed. The soft iron core passes through the helix, *a*, and is bent at right angles over the end of the helix and down its sides, terminating in the two poles, *b*, *b*. These poles are arranged at sufficient distance apart, laterally, to permit the vibrating armature, *c*, to be suspended vertically between them. The armature is suspended at its middle upon a very delicate spring, which, without any friction, offers the least possible resistance to a vibrating motion, horizontally, of the two ends of the armature. As the upper pole of the magnet, while the current is passing through the helix, attracts the upper end of the armature to the left, and the lower pole attracts the opposite end to the right, the full power of the magnet is exerted to tip the armature from its vertical position, which position is instantly resumed on the cessation of the current. The spiral spring which draws the armature back to its vertical position is kept in a state of constant tension by a weaker counteracting spring; it having been discovered by Dr. Bradley that a spring thus arranged is more prompt in its action than one which returns in its operation to a state of relaxation. At the lower extremity of the armature is a platinum plate, which, as the armature is drawn from the perpendicular, is brought in contact with a platinum point in one of the adjusting screws, thus closing a second circuit in the usual manner.

The outer elbows of the core are, in their whole length, in close proximity to the outer surface of the helix, and are consequently directly under the influence of its magnetizing power; the arrangement embracing the principle of the helical ring.

The following explanation of the prompt action of this magnet, as compared with those heretofore in use, is offered by the inventor. It is plausible, and will be found to suggest a new idea in the science of electro-magnetism :—

"By careful observation, in a long series of experiments, I have discovered and satisfactorily demonstrated that, in this form of magnet, the magnetic force developed in the soft iron is more instantaneously and fully established and discharged, and consequently capable of producing more instantaneous and rapid movements of the armature, than it is possible to obtain by the form of magnet in which two helices are employed. The *rationale* of this interesting and important phenomenon, aside from the arrangement of the parts, by which all friction is avoided, the inertia to be overcome reduced to the lowest point, and the poles brought so near together as mutually to react upon each other, I conceive may be found in an explanation of the two principal modes in which magnetism is induced, and the operation of the laws under which it is developed.

"If we place a bar of soft iron in the interior of a helix, and a current of electricity be made to traverse the helical wire, the iron becomes magnetized. If the length of the bar coincide with that of the helix, the modification in its molecular construction attending magnetization is wrought, upon each and every one of the particles composing it at the same instant of time; and, if the current be intermitting, the demagnetizations are equally instantaneous. If the bar be placed along the outside of the helix, the same effects are produced, though in a degree less marked. If we now take the bar from the helix, and apply to one of its extremities a pole of either an electro-magnet or of a permanent one of steel, magnetization is effected as before; but the order in which the molecular derangement takes place among its particles, is essentially different. In this case, the particles constituting the first layer at the end touched are first magnetized; these induce magnetism in the particles of the next layer, and these in the next, and so on until the opposite end is reached. This consecutive induction along the inner movable particles, of which the bar is composed, requires appreciable time for its full development—a time somewhat dependent upon the power of the inducing magnet, as well as on the softness and purity of the iron.

"By a moment's inspection of the cut, it will be seen that in this form the mode of magnetization first described prevails throughout; whereas, in the magnet with two helices, the portion of iron that serves to connect the two cores, as well as the armature itself, are magnetized by the latter or consecutive process."

The patent for this invention was granted August 28th, 1860, and further information in relation to it may be obtained by addressing the inventer, Dr. L. Bradley, New York City.

The Sea Qualities of Iron-cased Ships.

In the voluminous discussions of the qualities of iron-cased vessels of war which have occupied so large a portion of space in the English journals, the most important doubt that we have seen expressed is in regard to their probable behavior in a heavy sea. If the following statement by a Paris correspondent of the *Scotsman* is to be relied upon, it would seem that there will probably be no difficulty in this respect. The *Gloire* is a wooden ship, and would be less light on the waves than an iron one:—

But, while giving these facts, your readers may suppose that I have entirely overlooked that gem of the French marine, the iron-plated, invulnerable *Gloire*, about which all the scientific minds of Britain have been hazarding all sorts of opinions. Whatever notions may exist in England regarding the strength or sea-going qualities of this vessel, people in this quarter of the globe have no misgivings on the subject. The *Gloire* was admirably tested in the recent Algerian trip of Napoleon III. I have spoken with men who assisted in the working of that ship to the African coast, and they declared that not even the imperial yacht itself, light and trim cut as she is, behaved so well during the heavy gales which the squadron encountered as soon as it had left the French coast. I know that, during those gales, the steamers from Cette were unable to leave the port in consequence of the frightful state of the sea, and that no fishing squadron in any of the Mediterranean ports durst attempt to leave its moorings. The *Gloire*, heavily charged with her full amount of ammunition, with all her guns, with provisions for some months, with her tremendous engines, and her 4¾-inch coat of mail; the *Gloire* cut through those giant billows with a steadiness little less than the *Great Eastern* herself, when she breasted the gale in the English channel during her first sea vorage.

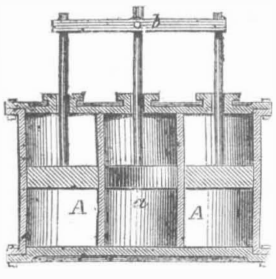
Application has been made to the Massachusetts Legislature, by Charles S. Storrows and others, of Lawrence, for an act of incorporation as a manufacturing company, with a capital not to exceed $1,000,000. It is their intention to erect the mill between the Atlantic and Washington Mills in Lawrence, and to start with a capital of $750,000.

Our Correspondence.

Expansion of Steam.

MESSRS. EDITORS:—Allow me space in your valuable journal for some statements, different from the "Eric Experiments," on the expansion of steam. I have selected a double annular expansion cylinder for my illustration, but the advantage of expansion is precisely the same in one single cylinder, if employed to the same extent.

This figure represents the annular expansion double cylinder The. outer cylinder, A A, is annular, the



same as that made by Maudsley, of London; but in this case it is employed only for expansion, and the inner cylinder, *a*, is used for high pressure. It is so arranged, by steam valves and ports, that the high pressure steam is acting the whole stroke on the small piston, *a*, after which it is conducted to the annular cylinder where it acts expansively on the large piston, A A. The two pistons being connected by rods to one common crosshead, *b*, from which motion is given by a connecting rod to the crank. Engines of this kind are now made in Europe with a view to economize fuel and to extend the utility of expansion. Mr. Taegerfelt, in Nykoping, Sweden, I believe, was the first engineer who successfully carried out this plan.

The inner cylinder can be considered an ordinary high pressure engine, where steam is set free into the atmosphere at the end of each stroke; but, in this case, the exhaust steam accomplishes a second engagement in the annular cylinder, which, according to the grade of expansion, may greatly exceed the original effect imparted in the small cylinder during the first engagement. By this means, I will endeavor to prove the utility of expansion, which is now under discussion by engineers in this country.

Let us assume the area of the high pressure cylinder piston, a=254.4 square inches, the annular cylinder piston, A=763.2 square inches stroke of pistons=3 feet; the high steam pressure including the atmosphere=60 lbs. per square inch, and 12 lbs. vacuum, we shall have the grade of expansion$=1-\frac{763}{254}.\frac{2}{4}=\frac{2}{3}$, for which the mean pressure during the expansion on the annular piston will be 32.62 lbs.

The effective pressure on the annular piston will then be 763.2 (32.6+12—14.7)=22834.9 lbs. On the small piston, the effective pressure will be 254.4 (60—32.62)=6965.4 lbs.

By this, we find that the effective pressure of the expanded steam on the annular piston is greater than that on the small piston, even if we omit the back pressure of 32.62 lbs. per square inch. The collective pressure on both pistons will be 22834.9+6965.4=29,800 lbs.

Suppose the pistons to make 65 double strokes per minute, we shall have the actual horse-power, deducting 25 per cent for friction and working pumps: H=(29800×3×65)÷22000=264 horses.

Now we will reject the annular expansion cylinder, and take the effect of the steam without expansion, when the effectual pressure on the small piston will be 60—14.7=45.3 lbs. per square inch, and the actual horse power, deducting 13 per cent for friction and working pumps, will be H=(254.4×3×45.3×65)÷19000=118 horses.

If we consider the last result as a unit, we shall have 264—118=146 horses, or nearly 124 per cent gained by the expansion.

In the first case, about 11 per cent was gained by vacuum, but that advantage is rather in favor of the utility of expansion, because the high steam cannot so well be introduced into the condenser. I do not mean to maintain that this high per centage of economy is always fully realized in practice, as I am well aware of cases where expansion is of little use, owing to misconception and carelessness in its employment.

I will now refer to a case which happened in Russia with a steamer which I built for the river Dnieper and the Black Sea. The packings of the pistons were not tight; the valves were set to cut off the steam at one-fourth of the stroke; and, when the piston reached half-stroke, most of the steam had leaked through into the condenser, and the engine would hardly go around; and it was then reported that expansion would not answer. When the slide valves of an engine are not right, or when the air pumps are too small, or other things of that kind, they play the mischief with engineering practice. Without expansion, the leakage of the pistons in the engine would not have been noticed, because steam is supplied throughout the stroke; but then the steamer could not have come up to its intended performance.

There are many circumstances about an engine which are in favor of the expansion; for instance, the steam ports between the main valve and the cylinder, and the clearance between the piston and cylinder heads, contain a great deal of steam which is a total loss for each stroke; but when expansion is used, that steam expands into the cylinder, and is consequently utilized. The expanded exhaust also require a smaller air pump than would be necessary for high steam introduced in the condenser.

I suppose it will now be pronounced by the anti-expansionists that this is all theory; but I will also turn my attention to practice. In the steamers which I built for the river Volga, they were so arranged that, with one single lever placed in different positions, the engines were managed to work ahead and back, with or without expansion, at pleasure. When the engines were started, it was necessary to give one or two double strokes with full steam, and then operate with expansion. It sometimes happened, however, that the engineer neglected to turn on the expansion. If this happened when going against the stream, the steamer soon stopped, and we could not possibly keep sufficient steam in the boilers, so that we were obliged to stop the engines; but with expansion, the steamer went from 20 to 24 versts per hour.

JOHN W. NYSTROM.

Philadelphia, Pa., Jan. 25, 1861.

Preventing Accidents from Machinery.

MESSRS. EDITORS:—In view of the many accidents occurring from carelessness in the use of machinery, I deem it of vital importance that effectual means should be provided to prevent their occurrence. It is common to run machinery with cog gearing and belts, so exposed that the workmen are constantly in danger of being caught and crushed or torn to pieces. The majority of accidents from these causes would be prevented by a little judicious boxing up of belts and wheels. Take, for instance, threshing machines, by which accidents have, within the past few months, occurred among my acquaintances. One was caught by a shaft, and his life saved only by the loss and almost total destruction of his clothing; two lost legs by their pantaloons being caught with couplings on the ground shaft; one lost a foot by getting it in a wheel; and one had his hand so torn that lockjaw and death ensued.

These are but a few of the many cases of this class; but all of these accidents could have been prevented by a little boxing. The expense would be but trifling, while it would really improve the appearance of some machines. Humanity calls loudly for a remedy for such evils, and manufacturers and proprietors of machinery of various classes should be compelled, by an act of Congress, to box up belts, cog gearing, flywheels, &c., whenever practicable. It is surprising that such accidents are not even more frequent.

But a few days ago, a man fell into a large cog wheel in a distillery in Brown county, Ohio, and was literally mashed to a jelly instantly. An outlay of twenty-five cents would have prevented this awful catastrophe. Manufactories, mills and portable machines are full of "man traps." Let us have them covered up; the columns of the SCIENTIFIC AMERICAN are the proper medium to agitate this question and bring about a reform.

JAS. M. GOODWIN.

Felicity, Ohio, Jan. 23, 1861.

[We fully indorse the opinions of our correspondent respecting the humanity of this subject. There should be laws in all the States (Congress has not the jurisdiction), compelling those who run dangerous machinery to box up the exposed parts. Such a law has been in force in England for six or seven years, with the most happy results.—EDS.

Rifles and Rifle Shooting.

MESSRS. EDITORS:—In your article on rifles on page 57, present volume of the SCIENTIFIC AMERICAN, I notice that you approve the use of "close grained cast steel for barrels," and indorse the Wesson and other Eastern makers, whose barrels are not only close-grained cast steel, but are tempered to the hardest possible point. This may all be very well in the abstract, but can you sell one of these rifles to Kentucky marksmen? No, sir; not one. They want, and will have, an ordinary soft steel barrel, and it must be annealed soft enough to enable them to chip the barrel (the under side) with a penknife without dulling the blade; and they often take their pieces to the gunmaker, to have them annealed again and again; to use their expression, they "want a barrel soft as lead." They are very careful in handling their rifles, so as not to "spring them out of true."

There is no doubt that the Kentuckians are the best off-hand shots in the world: this is true of Western men generally, consequently they are the most effective in war. This excellence is due, first, to the peculiar manner of holding their pieces, by which every muscle is taut and steady; second, to the fact that they, in the commencement of training, invariably shoot without rests, at "arms' length;" third, they take a distance (say, first, of ten paces), and confine themselves to it until they can "drive a tack" every shot; then they double the distance, and never allow themselves to vary it until they perfect themselves in it; and so on, to the longest distance, until they reach the point of their ambition.

At their barbecues, it is not uncommon to see middle aged men and boys of sixteen making their mark at ten, twenty, forty, eighty, and one hundred and sixty paces.

B.

New York, Jan. 26, 1861.

[Our Western riflemen may be prejudiced in favor of soft rifle barrels, but they may be in error. It is by constant practice, as described by our correspondent, that they attain to such proficiency as marksmen. A hard steel barrel takes a finer polish, we think, than a soft one, and this is an advantage. There may be reasons on the other side, with respect to soft steel for rifle barrels being the best, but we have yet to learn what they are.—EDS.

More About Hair Snakes.

MESSRS. EDITORS:—As the subject of hair snakes has been before the public of late, perhaps I can add something that may be of interest and, by the way, throw some light on the subject, thereby helping to remove the doubts of the skeptical, or rather to offer something that may be positive testimony, provided my word be taken as proof. I have seen several animals that had been thrown into a brook or a bay or piece of quiet water adjoining the brook, where they had apparently lain from one to three weeks, when every hair was seen waving. Upon examination, I found that every hair on the animal (a cat, in particular, I have in mind) was a hair snake, with his head fast in the cat's skin. This I regard as a knock-down argument. I don't know what these snakes make of themselves or what becomes of them. I have examined them with the microscope, but find no eyes; they have a mouth, merely a round hole, somewhat tunnel-shaped, and every side alike. The head is flat, and very broad at the extreme end. Their skin is without scales, like the trout or sturgeon. Many suppose that the fleshy matter collected in the hair is but a mass of small insects or animalcula, clinging to the sides of the hair. But if so, how can they give the snake-motion to the hair? and why do they make the hair run head first (or always the same way) in the water? and why do these water insects clinging to the hair, leave the water with the hair, and make their appearance on dry land as I have seen them.

A. G. BISBEE.

Chester Cross Roads, Ohio, Jan. 19, 1861.

[We are still skeptical. We have no doubt of the existence of little worms resembling hairs, but do not yet believe that they change from hairs.—EDS.

The Force of Steam Explosions.

MESSRS. EDITORS:—I have read several times in the SCIENTIFIC AMERICAN of large pieces of metal being thrown to considerable distances by explosions, still I am of opinion that but very few persons are really aware of the great force of some steam boiler explosions. I will relate one to which I was an eye-witness, and the facts which I will give have never before appeared in print. When the steamboat *Moselle* blew up near Cincinnati, about 25 years ago, I was in plain sight of the disaster, being only about 60 rods distant. After the explosion, the air was at once filled for several hundred feet around with fragments of the wreck. I instantly started on a run, hoping to render some assistance. Having looked up hurriedly to see if anything was above me, I saw what seemed a mere speck nearly overhead, and very high, coming down. After running two or three rods I looked up again, and saw another thing of nearly the same appearance as the first coming down, and then both fell but a few rods apart. The first object I saw proved to be a piece of boiler, which weighed about 330 lbs.; it struck the brick sidewalk, in which it made a very large hole. This piece was taken to a museum in the city, where it remained several years. The other was also a piece of boiler, but much larger; I think it was 9 or 10 feet by 12 or 13, nearly square, but very much bent up. It fell on the gable end of a stone stable, and demolished the wall. I concluded that the second piece had gone up so high that it was out of sight when I first looked up, otherwise I must have seen them both at once. The weather was clear, and I don't remember seeing any clouds overhead. It was said at the time that the engineer of the steamboat was drunk, and had allowed the water to get down while the fires were kept up. The persons said to be scalded did not look so to me; their skin was quite brown and crisp, and it looked more like a burn from gunpowder. Query, was it steam or gas that exploded? There were five boilers, all burst with one deep, heavy sound, and not as if several explosions had taken place in rapid succession. I suppose no other human eyes but mine saw the phenomenon described.

Daniel Edwards.

Little Genesee, N. Y., Jan. 20, 1861.

Inflating Balloons.

Messrs. Editors:—In looking over my file of the Scientific American, I noticed, on page 280 of your last volume, an article headed "A French Apparatus for Lighting Cities with Hot Wire." I intend building a machine on this principle for the purpose of manufacturing hydrogen gas, provided I can gain sufficient knowledge to insure me some success. Can you give me any more information than what I have already found in this article? I wish to ascertain the figures and proportions of a machine capable of manufacturing 2,000 feet of gas per hour, and also any other information which will aid me in building such a machine. My intention is to manufacture gas for inflating balloons on this principle.

John La Mountain, Aeronaut.

Lansingburgh, N. Y., Jan. 24, 1861.

[It is a curious fact that the article which we translated did not give the dimensions of the apparatus though it did give the amount of gas which it would produce. We are not surprised that our aeronauts are making arrangements to use hydrogen gas instead of illuminating gas to inflate their balloons, as a balloon for the same lifting power will require to be only about half the size; 100 cubic inches of atmospheric air weighs 31.01 grains, being 14½ times heavier than hydrogen, and not quite twice as heavy as illuminating gas. Hence, it would require about 14 cubic feet of hydrogen to raise 1 lb. in the air, and about 28 feet of illuminating gas.—Eds.

Chemical Analysis by Spectrum Observations.

Messrs. Editors:—This is one of the most important inventions of the present century.

Professor Robert Bunsen, of Heidelberg, one of the most ingenious chemists of our cotemporaries, has now published the first precise investigations in this direction, the consequences of which can scarcely yet be realized; their beginning though is sufficient to indicate that they may probably lead to the solution of hitherto inaccessible problems.

The following experiment speaks best for the sensitiveness of the reaction:—3 milligrammes of nitrate of soda were exploded with a little powdered charcoal in the corner of a large room, while in the other corner was placed an apparatus containing a lamp and a camera, for the production of the spectrum. In a very short time, the smoke of the soda-saltpeter reached the flame and exhibited in its spectrum the peculiar lines and colors which result from the burning of this substance. From the weight of the deflagrated salt and the size of the room could be calculated what quantity of it was contained in the air, and as the reaction was observed every consecutive second, and calculating the access of the air to the flame, *only the three-millionth part of a milligramme of sodium* could therefore have penetrated and be indicated by the flame. This minimum, then, can yet be recognized! To give a better definition, it might be added that a milligramme is somewhat less than the thirty-fourth thousandth part of an ounce. Similar experiments demonstrated that chloride of sodium (common salt) is a scarcely-ever-failing ingredient of the atmospheric air—a fact very easily understood when we consider that two-thirds of our globe is covered with salt water, which, by evaporation as well as mechanical force, is scattered through the air. We may, with right, expect that by spectral analysis of the air we shall yet succeed in acquiring information on the progress of epidemic diseases, as they are perhaps due to the absence or presence of such substances as have hitherto escaped our observation. The incandescent luminous vapor of lithium combinations gives two very distinct and sharply defined lines; the one very feeble yellow—the other of a red shining color. By the aid of this process, the unexpected fact was demonstrated that lithium, which was believed to be one of the rarest elements, pertains to the most distributed substances of nature, as small particles of it were found in many minerals, in sea and spring waters, in the ashes of plants, in the air, &c. We possess already the full assurance that substances which have hitherto been unknown to us are present in water as well as in the air, and only by these means we are enabled to discover their presence. Once the cause of certain injurious influences on the organism is discovered, the second step, their separation, gives comparatively little trouble.

A. L. Fleury.
Fr. Ruschhaupt.

24½ Third-avenue, New York.

A Subscriber for Life—Singular Proposition.

We have received a letter from a correspondent in Georgia, saying that, from the peculiarities of his position, it is very inconvenient for him to mail his subscription money every year, and that he should like to make one job of it, so that it will give him no further trouble for the remainder of his days. He therefore proposes to send us $20, to be received by us as payment for his subscription for life. [He is 50 years of age, and probably a bachelor, for he says he would not like our lady readers to be informed upon this point; but as we omit his name, we trust he will pardon us for this breach of confidence.] We have written, accepting his proposition, on condition that he will write to us every year to let us know that the term of his subscription has not expired. Among all the thousand newspapers in the country, is there any, except the Scientific American, that has a subscriber for life?

It will be observed that this proposal, coming from the heart of the secession movement, shows the most absolute faith in the continued friendly and business intercourse between the North and the South, whatever may be the fate of our political connection. We are happy to state that it is only one of innumerable evidences which we are constantly receiving of the same feeling, and which are the most gratifying of anything that is occurring in the present eventful period of our history.

Alleged Cure for Hydrophobia.—The *Presse Médicale Belge* states, on the authority of Father Legrand de la Liray, late interpreter to Admiral Rigault de Genouilly, one of the oldest and most venerable missionaries in Tonquin and Cochin-China, that in those countries hydrophobia is cured with complete success by boiling a handful of the leaves of datura stramonium, or thorny apple, in a litre of water, until reduced to one-half, and then administering the potion to the patient all at one time. A violent paroxysm of rage ensues, which lasts but a short time, and the patient is cured in twenty-four hours. For the benefit of our readers we may state, that the leaves of the stramonium are highly narcotic, and, as such, are recommended in asthma under the form of cigars, to be smoked as usual; but that the same leaves, taken in large quantities, whether in powder or under the form of decoction, will produce temporary idiotcy. As to its efficacy in confirmed hydrophobia, it seems to be earnestly recommended by Father Legrand, who declares that he has tried it several times, and invariably with success. The great difficulty will, of course, consist in administering the remedy to the patient, which probably must be done by main force, with the aid of a horn; but on this subject the *Presse Médicale* is silent.

Column of Varieties.

The immense appetite of London is fed every year by about 270,300 oxen, besides 30,000 calves, 1,500,000 sheep, and 30,000 swine.

The enduring odor of musk is astonishing. When Justinian in 538 rebuilt what is now the mosque of St. Sophia, the mortar was charged with musk, and to this very day the atmosphere is filled with the odor.

On the river Clyde, Scotland, 88 iron vessels were built during 1860, the gross tunnage of which was 47,700 tuns, and there are now on the stocks 46 vessels, the tunnage of which will amount to 44,900 tuns.

The Massachusetts Arms Company's manufactory at Chicopee Falls, was consumed by fire on the night of the 18th ult. The loss was $60,000, of which $30,000 was covered by insurance.

Take an ordinary paint-brush or sponge, and run over the glass once or twice a day a little alcohol, and it will keep the glass as free from ice as in the middle o summer, and it will also give as good a polish as can be got in any other way.

A portable sundial, recently patented in Berlin, consists of a hollow metallic hemisphere, representing in its shape the visible firmament. By means of a pendulum and a sort of meridian circle, it may be so placed at any moment, in the sunshine, as to indicate the hour and minute of the day.

Among the curiosities of London life is the appearance of Lord Caithness in that metropolis, guiding his steam carriage. He has driven through the most crowded parts without frightening the horses, and threaded the vehicles, thickly strewn as they are in the city, with ease and elegance.

Our country has increased in size more than three-fold since the close of the Revolutionary War. The United States have a territorial extent nearly ten times as large as that of Great Britain and France combined. The American republic is one-sixth only less in extent than the area covered by the fifty-nine empires, states and republics of Europe.

The sensibility of the nerve of smelling is blunted and perverted by all irritating odors and substances. Hence those who would preserve all the senses which God has given them should avoid snuff, smelling-salts, &c., as is manifest to those who have been troubled much with cold in the head.

Along the coasts of the Atlantic and Pacific Oceans and the Gulf of Mexico, the United States have 223 lighthouses, exhibiting 369 lights, and 42 lightboats, with 55 lights, making a total of 365 stations and 421 lights. The whole number of stations 466, number of lights, 539.

M. Duroy, of Paris, announces the discovery of a new neutral colorless iodide of starch. When iodine and starch are mixed together they form an iodide of starch of a blue color. Iodine has therefore been considered a chemical test for the presence of starch in any substance. By bringing a starch iodide into contact with yeast, it is deprived of its blue color, and becomes sweet, gummy, and very soluble in water.

Col. Foster, the head of the land department of the Illinois Central Railroad Company, estimates the wheat crop of Illinois last year at not less than 25 millions of bushels. At a low estimate the corn crop of Illinois will amount to 110 millions of bushels, worth at least $25,000,000 to the producers, being of wheat and corn more than ten times the quantity produced by the whole of New England. The value of live stock is estimated at one hundred millions of dollars.

Tin is increasing in value yearly. The British exports last year amounted to 2,804 tuns, and the mean average price for the year has been £130 18s. ($634.46.) There has been an increased speculation in the tin mines of England. The whole of the metallic tin trade of the world is in the hands of the Dutch and English, but the latter control the former.

The produce of Scotch pig iron during the past year was 1,000,000 tuns, being an increase of 50,000 over the previous year. This augmentation has not been due to an increase of furnaces, but intrinsic improvements in the process of manufacture. Our molders have not yet found a true substitute for this kind of iron for castings, but it appears that some of the American iron ores—for they are very numerous—should yield similar iron if heated with the hot blast and coke fuel. The shipments to the United States of Scotch pig iron amounted to 77,632 tuns in 1860.

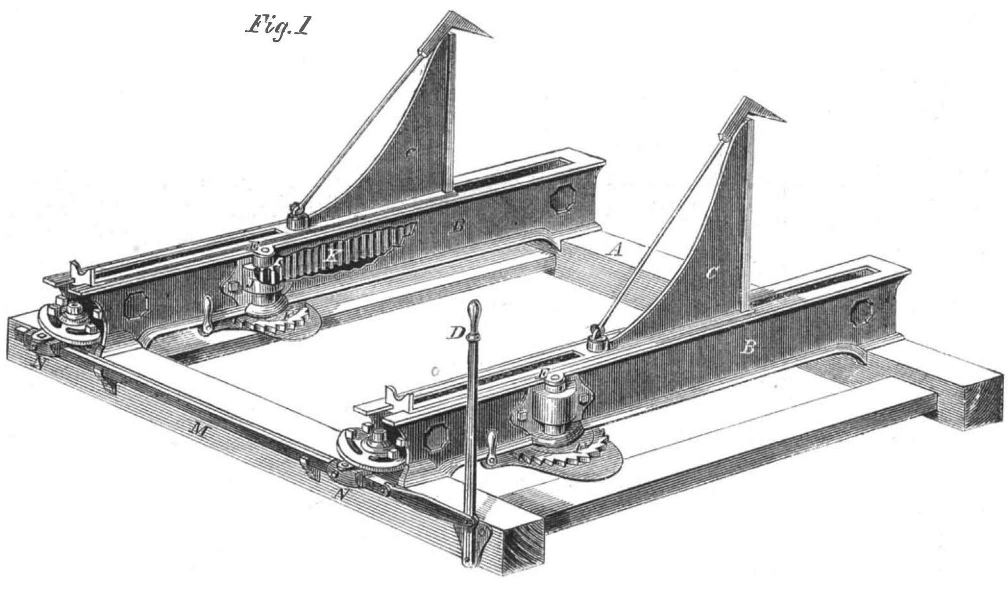
Improved Sawmill Head Blocks.

The advantages of a perfectly accurate, easily and quickly operating, and readily adjusted head block for circular sawmills, will be sufficiently obvious to any one at all acquainted with the operation of these mills and the rapidity with which they can be made to cut lumber, and any improvement calculated to facilitate their operation will be of interest to those either manufacturing or using them.

The cuts, of which Fig. 1 is a perspective view of the carriage with the head blocks as in use, and Fig. 2 a sectional view of the same, showing the arrangement of the working parts, illustrate an improvement for which a patent was granted to E. G. Dyer, of Hamilton, Ohio, on the 13th of November, 1860.

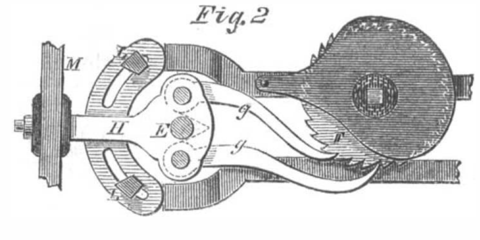
The improvement consists in producing a continuous forward movement of the knee (against which rests the log) by both the forward and back motion of the hand lever, D. This is done by means of the two pawls, *g g*, Fig. 2, attached to the vibrating arm, H, so as to act alternately upon the ratchet wheel, F. This wheel is fastened upon a shaft upon which is the pinion, J, working in the rack, K, upon the knee, and imparts to it its proper movement. This movement is regulated by the stops, L, which may be set so as to allow more or less play to the vibrating arm, according to the thickness of the lumber to be sawed. As ordinarily constructed, this arrangement allows the operation to move up the log any desired distance from $\frac{1}{8}$ to $1\frac{3}{4}$ inches at one forward and back throw of the hand lever.

Fig. 1



DYER'S IMPROVED HEAD BLOCKS FOR SAWMILLS.

Fig. 2



Motion is communicated from the hand lever to the vibrating arm, H, by means of the longitudinal bar, M, which, acting endways upon the arms, can have no lost motion by torsion or otherwise between the two head blocks. Upon this bar are clamps, N, fastened to it by set screws, and pivoted to the ends of the vibrating arms, H, so that the head blocks can be quickly moved to any distance apart to suit the length of logs to be sawed. As is easily seen, two or more head blocks upon the same carriage are operated by one lever, and the movement of the knee must be exact upon them all. In moving the knees back, or when it is desired to move one independent of the other, the pawls are thrown out of action by an eccentric plate which is thrown round upon the center of the ratchet wheel, and acts upon the points of the pawls which extend below the face of the wheel. The pawls are held against the wheel by springs fastened to the side of the head block. Thus the movement is certain and exact, and at the same time easily effected.

For the purchase of these head blocks, or the right to manufacture them, information may be had by addressing Owens, Lane, Dyer & Co., Hamilton, Ohio, to whom the patent has been assigned, and who are engaged in the manufacture of them in connection with their patent sawmills.

ANOTHER NAPOLEONIC REFORM.—Whoever has traveled on the continent of Europe is prepared to pronounce an emphatic judgment upon the passport system that so generally prevails. It is, in fact, regarded as an unmitigated nuisance, and the source of imposition, extortion and annoyance to all who travel abroad. As one step in the right direction, the Emperor Napoleon has abolished the passport system, so far as British subjects are concerned. *Punch*, in noticing the event, represents the French emperor approaching the venerable John Bull and tendering to him a night key, whereby he may at all times enter the French dominion without asking permission of the lord of the household.

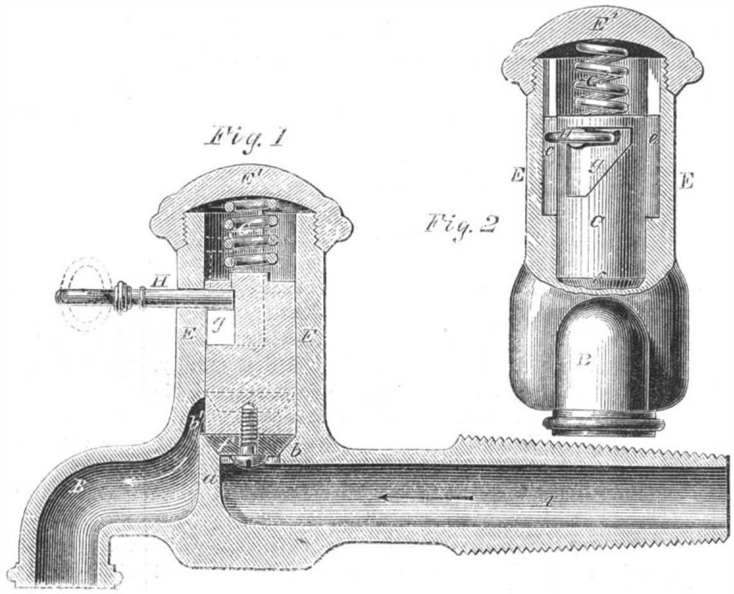
Improved Faucet.

The accompanying engravings illustrate a faucet, invented by Levi L. Alrich, of Carthage, Mo., which is self-closing, and which can only be opened by a key adapted to it; thus effectually locking the cask in which it may be inserted.

Figure 1 represents a longitudinal section, and Fig. 2 a cross section. A is the pipe or tube of the faucet, and B its nozzle. The pipe and nozzle are divided by a partition, *a*, which, with a flange portion, *b*, forms a suitable valve-seat for the plug, C. The communication of the tube, A, with nozzle, B, is thus up through the valve-hole, *b*, and this communication can only be effected by raising the plug, C. The plug, C, fits into a cylinder, E, and is capable of being moved up and down in this cylinder, but it cannot turn in the cylinder on account of the tenons, *e*, *e*, projecting into grooves formed in the inside of the cylinder. A leather valve, E, is secured to the bottom of the plug which is pressed down on its valve-seat by the spring, G, and keeps the whole watertight. The spring, G, acts against the cylinder cap, E, and the top of plug, C. A recess, *g*, of triangular or other suitable shape, is formed in the front of the plug, C, for the key, H, and when it is desired to open the faucet, and let the liquid flow through it, the key is put through a keyhole, made in the front part of cylinder, E, shown in Fig. 1, and by turning the key the plug will be raised and the valve orifice opened. When the key is taken out, the plug will be forced down with its end upon the valve-seat again by the spiral spring, G, and the flow of the liquid will be stopped. It will be seen that a self-closing and self-locking faucet is thus formed, which can be opened only by means of the key.

The patent for this neat and useful improvement was procured through the Scientific American Patent Agency, Sept. 25, 1860, and further information in relation to it may be obtained by addressing the inventor at Linns Mills, Jasper county, Mo.

Fig. 1 Fig. 2



ALRICH'S IMPROVED FAUCET.

MAGNETIC MASKS FOR OUR NEEDLE WORKERS.—In needle manufactories, the workmen who point needles are constantly exposed to minute particles of steel and dust which fly from the grindstones, and are inhaled with their breath. These will produce constitutional irritation, sure to end in pulmonary consumption, insomuch, that persons employed in this kind of work, scarcely ever attain the age of forty years. Many attempts were made to purify the air, before its entry into the lungs, by gauze or linen guards; but the dust was too fine and penetrating to be obstructed by such coarse expedients, until some ingenious person bethought himself of the motions and arrangements of a few steel filings on a sheet of paper held over a magnet. Masks of magnetized steel are now constructed, and adapted to the faces of the workmen. By these the air is not merely strained, but searched in its passage through them, and each obnoxious atom of steel is arrested in its progress.

NEW PROCESS OF SETTING JEWELS.—Among the recent applications of electro-metallurgy, we may instance the happy idea of Mr. Gaudin in employing it in setting jewels. This is a very delicate and expensive branch of jewelry, and so difficult that the setting of a jewel can seldom be fully relied upon. The inventor first takes a mold in wax of the ornament that is to receive the jewels, then places on it, at the proper points, the jewels, imbedded in the wax to a sufficient depth; the wax model, rendered a conductor of electricity by fine plumbago dusted upon it, is placed in the gold solution, and the metal deposit edu pon it. When the deposit is completed, the jewel is found firmly encased in the metal, from which, if the process has been properly conducted, it will be impossible for the jewel to escape. The saving of time effected by this process is also very considerable. the ordinary process, a jeweler can scarcely set 60 jewels a day, but by the new process as many as 1,500 to 2,000.

We notice by the Boston *Commercial Bulletin* that most of the large manufacturing corporations of that State are paying handsome dividends upon the last six months business. It must not be forgotten, even in these dull times, that the consumption of goods in the country is as great as ever.

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See Prospectus on last page. No traveling Agents employed.

VOL. IV. NO. 6......[NEW SERIES.]....*Seventeenth Year.*

NEW YORK, SATURDAY, FEBRUARY 9, 1861.

WORKING STEAM EXPANSIVELY.

The result of the experiments at Erie on the working of steam expansively, a brief statement of which we published on page 6 of the present volume, seems to have led some of our cotemporaries to the conclusion that the long established and universal opinion on this subject is all a delusion. It will be impossible to determine what lesson these experiments really teach until we get a full statement of them from the engineers of the Commission, with the able and learned discussion of the experiments which we have no doubt will accompany their report; but we shall be very much surprised if Chief Engineer Isherwood and his associates draw the broad inference which we have mentioned above. Indeed, it seems to us impossible that this sweeping conclusion can be established by any one series of experiments with one engine or one pair of engines.

The pith of the whole matter of expansion is just here: After the flow of steam into the cylinder is cut off, that which is already in the cylinder will continue to exert a pressure as it expands, constantly decreasing until it comes down to the pressure of the atmosphere; in condensing engines, still lower. Now, a certain amount of pressure on the piston is necessary to overcome the friction and inertia of the engine and its connections, and it is only the pressure above this which is available in driving the machinery. Consequently, a card may show considerable pressure on the piston, and the whole of this pressure may be exerted in overcoming friction, leaving none for useful effect. Of course, the point in the expansion where the useful effect of the pressure ceases will vary with different engines, and with an infinite variety of circumstances. It is manifest, too, that the higher the pressure the greater would be the amount of expansion that would yield profitable results.

From the meager accounts yet published of the experiments at Erie, we draw the conclusion that, with engines constructed precisely like those there used, working with 20 lbs. pressure in the boilers and cutting off at .354 of the stroke, with resistance such as was there overcome, there is no gain compared with cutting off at $\frac{1}{4}\frac{3}{}$ of the stroke. This inference follows by strict necessity from those experiments—this, and no more. It may be philosophical to keep the mind open for further light on all subjects whatever, but the fact that there is economy in working steam expansively has been proved by such a vast mass of evidence that it will take a corresponding amount to overthrow it. The idea of regarding it as overthrown by a single set of experiments seems to us preposterous.

CAST IRON RIFLED CANNON.

The London *Engineer*, of January 4, states that Mr. Bashley Britten had repeatedly made good practice with cast iron cannon which had been rifled, and submitted by him to the British government as far back as 1854. Experiments with such cannon have been recently conducted by Mr. Britten, on a scale of such magnitude as to test the question in the most thorough manner. Two 9 pounders, four 32 pounders, and three 68 pounders have been fully tested. These were ordinary cast iron service guns, taken at random from the military store, and rifled without being strengthened by any addition of bands, &c. The work of rifling one gun can be executed in about ten hours, at a cost of only five dollars. Elongated projectiles, weighing 15 lbs., were fired from the 9 pounders, 48 lbs. were fired from the 32 pounders, and 90 lb. projectiles were fired from the 68 pounders. The charge of powder was only one-half of that employed for common guns, being only 5 lbs. for the 32 pounder, and 7½ lbs. for the 68 pounder. Fifty four rounds were fired from the 9 pounders; three hundred from the 32 pounders, and the same number from the heavy 68 pounders. Four of the guns were submitted to very severe tests, to ascertain what they would stand. The 32 pounders were fired with ten rounds of service shell of 48 lbs.; then ten rounds with shells each 72 lbs.; then ten rounds of solid shot 96 lbs. each. The 68 pounders were submitted to three similar courses of ten rounds each; two of the courses were with shells of 90 and 135 lbs., and one with a solid shot of 180 lbs. Not one of these guns was injured by these trials. An ordinary smooth bore cannon, firing round shot with a charge of 10 lbs. of powder, and having an elevation of 10⅜ degrees, has an average range of 2,700 yards. The same gun when rifled, and firing a 48 lb. shell with a charge of 5 lbs. of powder, at an elevation of 10 deg., had an average range of 3,300 yards. The precision of the rifled gun was also imcomparably superior to the smooth bore; the deviation of the latter ranged from 14 to 40 yards, while that of the former was between 0 and 3 yards. It thus appears, that by rifling common and smooth-bored cast iron guns, their efficiency is more than doubled, with smaller charges of powder. With such guns, the shells and shot must be elongated to obtain the results desired.

FIVE THOUSAND VOLUNTEERS WANTED.

Reader! we ask you to examine carefully the number of this journal which you now hold in your hand. Look at the fine quality of the paper upon which it is printed; look at its superb typographical appearance; look at its spirited engravings; look at the great variety of the useful and entertaining matter which it contains, and then decide whether it is worth four cents or not. If there is any doubt lingering on your mind, put fifty-two numbers together, reckon up the number of pages, and look once more at its costly engravings; then sweep over its solid contents, and figure up once more, and see if the whole volume is not worth almost $2. If you are not satisfied with the investment, call a meeting of your neighbors, open the books and examine the subject a little more in detail, and if $2 is too much, make up a club of 20, and thus procure the paper one whole year for $1.40; or, if you cannot get 20 names, get 10, and you shall have it for $1.50. If it is not worth this sum to read, you can almost get back the whole amount by selling it for waste paper; or, it can be made into bed blankets, and one night's sleep under its warm covering, will fill your head with all sorts of grand discoveries for carrying on the affairs of the material universe, and possibly you may invent some appliance to save the Union. Thus will your pockets be filled with rocks, your head with information worth a great deal to you in all the affairs of life, and millions will rise up and call you blessed.

You say, "These are dull times." Well, admitted; but better times are coming, and you cannot afford, for the sake of a dollar or two, to be ignorant of what is going on in mechanical and industrial pursuits. Blot these elements of power out of existence, and we should speedily sink into the condition of China. What we now propose, is to raise a volunteer company of 5,000, who will come forward and send us their names and subscriptions for one year. Our books are now open, and clerks are ready with pen and ink to enroll the names. Who, among all our readers, will be the first to send in a club of 10 or 20 names? Friends of the SCIENTIFIC AMERICAN! will you not lend us a hand, and thus place us under renewed obligations to you. We mean to keep on working for your edification, instruction and benefit, and shall not relax a muscle in our endeavors to make our journal as good as the times, and, we think, a little better.

WE are indebted to Hon. Warren Winslow, M. C. from North Carolina, for a copy of the Patent Office Reports; also, for a copy of the Report of the Commercial Relations of the United States with Foreign Nations.

WHAT BECOMES OF WEALTH?

A boot and shoe dealer has hanging in his store a pair of boots worth $7. They constitute a portion of his wealth, and a portion of the wealth of the world. A man buys them and begins to wear them; by friction against the pavements, little particles of the leather are rubbed off, and thus separated from the rest of the sole. Every particle that is thus removed takes out a portion of the value of the boots, and when the boots are entirely worn out, the seven dollars of wealth which they formed is consumed. The wheat, corn, &c., which was raised by our farmers last summer is being eaten up. No particle of matter is destroyed by this process, but the value which was in the grain is destroyed.

As, while men are wearing out clothing and eating up food, they are generally busily employed in producing wealth of some kind, the wealth of the world is not usually diminished by this consumption, but it is changed. This applies, however, only to personal property; town lots and farms generally retain their value, but the personal property is in a state of perpetual destruction and renewal. As the several particles of water which constitute a river are forever rolling away to the ocean, while their places are being supplied from the springs and fountains, so the movable wealth of the world is constantly being consumed to gratify human wants, and constantly being renewed by the restless activity of human industry.

Boiler Scale Preventor—Self-acting Blow-off.

The incrustations formed in steam boilers are principally composed of the carbonate of lime, which is held in solution in all hard and sea waters. When hard water is maintained in a boiling condition, its lime slowly separates and comes to the surface in the form of a white scum, which gradually attaches itself to the sides of the boiler and becomes a hard scale. By frequently blowing off the water at the surface, such incrustations can almost entirely be prevented, and a self-acting apparatus for this purpose is certainly far more simple, safe and economical than hand blow-off pipes or chemical substances fed into the boiler at stated intervals. On page 252, Vol. XIV. (old series), of the SCIENTIFIC AMERICAN, we published an illustrated description of the self-acting surface blow-off patented by James H. Washington, No. 36 Fawn-street, Baltimore, Md. At that time it made a very favorable impression upon our mind, and we have since learned that its utility has been fully demonstrated. It is now used in the boilers of Cromwell & Co.'s line of steamers, running between New York and Baltimore; and Mr. John Baird, engineer-in-chief, states that it is a valuable invention for keeping the boilers clean. One has been used on the steamship *Vanderbilt*, and Mr. J. German, chief engineer, has also expressed an equally favorable opinion of its merits. It is employed in several other steamers, including the *Baltimore*, the *Mount Vernon*, the *R. R. Cuyler*, the *S. R. Spaulding*, and the *S. B. Virginia*. The united testimony of the several engineers of those steamers is that it is simple and durable, and is very effective in keeping the boilers clean by preventing the formation of scale. The boilers of every steamship should be provided with some such apparatus for blowing off, as incrustations, being non-conductors of heat, cause a great waste of fuel, which can be avoided by preventing the formation of scale.

EUROPEAN PATENTS.—The proprietors of the SCIENTIFIC AMERICAN have long been engaged in procuring foreign patents, and offer their services to obtain patents in the following countries: Great Britain, France, Spain, Cuba, Belgium, Holland, Denmark, Russia, Prussia, Hanover, Sardinia, Wurtemburg, Lubeck, Baden, Brunswick, Bremen, Frankfort, Hesse Cassel, Homburg, Nassau, Oldenburg, Waldeck, Sachsen Coburg Gotha, Sachsen Weisen, Lieppe Detmold, Schaumberg, Macklenberg, Schwerin, Strelitz, and other departments of the Zollverien—also Norway and Sweden.

STEEL BELLS.—Many inquiries have been made of us in regard to these bells, and, so far as we are able to learn anything in regard to them, they are well spoken of. Our readers will find Messrs. Naylor & Co.'s advertisement of these bells in another column.

AN electric telegraph is about to be laid from Beirut to Damascus. The engineers have already arrived. Work on the French carriage road to Damascus has been resumed, and is prosecuted with great vigor.

Making Turpentine.

The great turpentine country commences about thirty miles south of Weldon, N. C., and thence extends to Wilmington, one hundred and thirty miles further south. It again extends from Wilmington, N. C., nearly to Florence, S. C., a distance of one hundred and six miles. In this entire region there are but few cultivated farms, and for miles there is hardly a garden, the turpentine business engrossing the whole attention of those employed in it, and preventing them from cultivating the soil. On this subject, we give the following from a traveler recently visiting that region, addressed to the Boston *Commercial Bulletin* :—

Early in the season, say along in the vicinity of the first of March, the pine trees are boxed and chipped. Boxing is to cut a hole or box in the trunk of the tree, about a foot from the ground, large enough to hold a quart or two of the sap or turpentine, and above that the bark is chipped off two or three feet each season, until the hight of from ten to fifteen feet is reached. From time to time three or four boxes are made in each tree, which is correspondingly chipped. The turpentine is dipped from the tree into buckets, and from thence conveyed to barrels. The ladle is an iron "scoop," which is, however, rather flat in shape than otherwise, but as the turpentine is adhesive there is no difficulty in dipping it. From a pint to a quart is taken out at each dipping, and sometimes seven dippings are made in a season. A tree lives under this process about fifteen years.

The principal labor employed in the dipping (which is always during warm or hot weather) is black, under the direction of white laborers, who superintend the turpentine distilleries, by which the sap of the pine tree is converted into spirits of turpentine and rosin. Tar is made from the light wood or most pitchy part of the wood, melted by burning, over a cauldron.

The pine forests are owned in large tracts, and the principal part of the labor, free and slave, come from sections of the State, where the slave property is still owned, but hired out. It puts a great amount of money into circulation. From $175 to $250 per annum is paid for the slave labor, but the white labor is better compensated.

At Wilmington, in the turpentine distilleries, in the coopering establishments, and in every branch of the turpentine labor, hardly a white man is to be seen. The proportion of white men through the pine forest region is somewhat greater.

Between Florence and Charleston, in this State, the turpentine ambition has doomed many of the forests to be boxed and chipped, though there are some landowners who regard it as the part of prudence to hold back for lumber, and one of them declares that not a tree of his shall be boxed. South Carolina is running close upon the "Old North State" in the turpentine production, but cotton and rice are yet her great staples.

Shoe Manufacture in New Orleans.

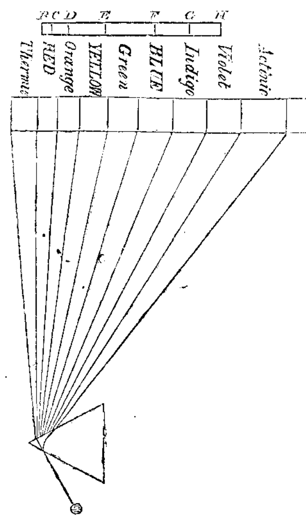
A brogan factory commenced operations in the city of New Orleans about January 1, and although not yet in full blast, turns out now about six hundred pairs a day. Messrs. Rozet & Queyrouze, the originators of this enterprise, expect to be able, within a few weeks, to turn out sixteen hundred pairs per day, of as substantial and elegant brogans as can be manufactured anywhere in the United States, and upon the same terms or less!

Mr. Rozet, though not familiar with the manufacture of brogans, proceeded, about six months ago, to Massachusetts, and posted himself up. Having done so, he proceeded to collect his materials. Some of these he obtained there, others in Richmond, Va., and others in France. The patent right to some of the machinery used has been secured by Messrs. Rozet & Queyrouze. Some of it came from France, and some from various Northern and Southern States. The leather used will come from Tennessee, until it shall be tanned in New Orleans. It is the best white-oak tanned leather, and the manufactured article, when complete, will compare with any made in Massachusetts, and can be afforded at the same price.

Our able cotemporary, the New Orleans *Commercial Bulletin*, "hails this pioneer enterprise in a department of manufactures, as one which promises the most important results, and which will actually do more for 'Southern rights' than half a dozen political conventions, and all the buncombe harangues that may be delivered from now till doomsday."

The Dark Lines in the Sunbeam.

If a beam of light, entering a dark room through a small hole in the shutter, is allowed to pass through a triangular glass prism, it will be bent or refracted out of its straight path and separated into the seven colors of the rainbow, producing a beautiful elongated image on the wall of brilliant and various hues. The color which is refracted least is red, and then in order, orange, yellow, green, blue, indigo and violet. The image thus formed is called the spectrum, and it has been the subject of an immense amount of study. It has been found that, if the light is analysed by a prism of pure flint glass, and a narrow spectrum produced, it will be crossed by numerous dark lines, called, from their second discoverer, "Fraunhofer's dark lines."



Seven of these—more distinct than the others—were named by Fraunhofer, B C D E F G H. The positions of these seven lines are indicated in the cut, in which their relations to the several colors are shown.

If a spectrum is formed with electrical light, or with light coming from any burning substance, it is crossed by bright lines instead of dark ones, and the number and position of the lines vary with the substances which produce the light. For instance, if a light is produced by burning soda, and a spectrum is formed with this light, two bright lines appear in the position of the dark lines, D, in the solar spectrum, while, in the spectrum produced by the burning of potash salts, bright lines take the place of the dark lines, A and B, in the cut. It is this department of investigation which has led to the conclusion that the sun's atmosphere contains potassium and sodium, but does not contain lithium; a discovery which we announced only a few months ago.

It might seem at first thought that the facts above stated could never be of any use to mankind, but every discovered truth, however abstract or remote it may at first appear, is very apt to be drawn into the service of man. It is found that a quantity so exceedingly minute of some substances, introduced into a flame, alters the position of the bright lines in the spectrum, that a test is thus furnished far more delicate than any heretofore known, of the presence in compounds of various substances in inconceivably small quantities. It has long been known that Saratoga water and other compounds contain substances in sufficient quantity to affect their properties, and yet so minute or so subtle as to escape the detection of all known tests. The value of a test so delicate as that furnished by the lines of the spectrum it is impossible fully to appreciate.

In another column we publish a translation from a German publication, by Messrs. Fleury & Reuschaupt, giving an account of some of the eminent Robert Bunsen's experiments in this direction. Some of the statements of the smallness of the quantity of some substances which can be detected by the new test seem absolutely incredible; they are, however, no more wonderful than many other facts in nature.

Faraday's Lectures.—We commence in this number the publication of Faraday's lectures on the "History of a Candle." This is a favorite subject of his, as he delivered a series of lectures on it some years ago. The present series will be found more interesting, if possible, than those of last year. A candle, in its origin, composition and burning, connects itself with the whole field of physical science.

Annual Review of the Lumber Trade of Albany for 1860.

We learn from the Albany *Evening Journal* that the lumber trade of 1860 has been satisfactory to manufacturers and dealers. Although prices have not been high, they have been steady and sufficient for a fair remuneration.

The receipts for the year have been about ten millions of feet of boards and scantling more than in the previous year, and the total amount, 301,022,600 feet, is a larger quantity than has been received at any other market.

The following table exhibits the receipts at Albany during the years named:—

	Boards and Scantl'g, ft.	Shingles, M.	Timber, C. ft.	Staves, lbs.
1850	216,791,890	34,226	28,832	150,515,280
1851	260,238,003	34,136	110,200	115,087,290
1852	317,136,620	31,636	291,714	107,961,289
1853	393,726,073	27,586	19,916	118,666,750
1854	311,571,151	24,003	28,909	135,805,091
1855	245,921,652	57,210	24,104	140,255,285
1856	223,345,545	36,899	14,533	102,548,492
1857	180,097,629	71,004	85,104	153,264,629
1858	267,406,411	31,823	119,497	135,011,817
1859	291,771,762	48,756	70,381	114,570,503
1860	301,022,600	41,222	46,888	148,735,360

The following table exhibits the valuation of the receipts during the years named:—

	Boards and Scantling.	Shingles.	Timber.	Staves.
1850	$3,251,878	$119,791	$4,325	$577,310
1851	4,119,568	121,524	19,010	546,655
1852	5,495,960	110,626	52,509	507,418
1853	6,299,617	99,585	3,386	569,600
1854	4,985,139	86,891	6,649	611,123
1855	4,426,586	228,84	4,854	631,149
1856	3,573,529	129,147	2,717	461,468
1857	2,881,560	248,515	15,218	689,691
1858	4,412,205	111,383	20,314	540,049
1859	4,887,177	170,646	11,965	458,282
1860	5,042,128	144,277	7,971	594,942

The stock on hand to be wintered at Albany is not larger than usual, and is pretty well assorted.

Albany receives this year over three hundred million feet of lumber, the value of which, with staves and shingles, is nearly $6,000,000. The handling of this amount of property gives employment to a small army of men, and the business transactions connected with it are among the largest in that city. Her position at the termination of the canals and on the Hudson river, with the ample slips and basins in the lumber district, gives her unrivalled facilities for receiving, storing, selling and shipping the lumber annually marketed here, and she still maintains her position as the largest lumber mart in the world.

City Savings Banks.

The total aggregate of deposits in the four large savings banks—the Seaman's, Bleecker, Greenwich, and Bowery—is not far from thirty-three and one-quarter million dollars, against twenty-two and one-half million in January, 1858. The comparative condition of these banks for the two periods, in point of deposits, may be stated as follows;—

	Jan. 1, 1858.	Jan. 1, 1861
Bowery	$6,697,393	$10,294,995
Bleecker, about	8,000,000	10,000,000
Greenwich, about	1,000,000	4,000,000
Seaman's, about	6,750,000	9,000,000
Total	$22,447,393	$33,294,995

The other savings institutions in the city have on deposit, at the present time, an aggregate of from eight to ten million dollars.

The following statement shows the general increase of deposits at this time over those of the corresponding periods just after the panic of 1857, in five other banks not included in the previous statement:—

	Jan. 1, 1858.		Jan. 1, 1861.
Broadway	$679,777	about	$1,130,000
Emigrants' Industrial	1,415,281		2,655,902
Manhattan	1,456,000		2,946,000
Mechanics' and Traders'	311,686		542,444
East River	662,589		1,210,151

The majority of the depositors in the Emigrant Industrial are Irish, while in the Bowery and East River Germans preponderate; the depositors in the other banks are made up of all classes and nationalities.

Study the Face.—A story is told of a great French satirist, which finely illustrates his knowledge of human nature. He was traveling in Germany, in entire ignorance of its language and currency. Having obtained some small change for some of his French coins, he used to pay drivers and others in the following manner: Taking a handful of the numismatical specimens from his pocket, he counted them one by one into the creditor's hands, keeping his eye fixed all the time on the receiver's face. As soon as he perceived the least twinkle of a smile, he took back the last coin deposited in the hand, and returned it, with the remainder, to his pocket. He afterward found that in pursuing this method he had not overpaid for anything.

The *Great Eastern* is undergoing repairs at Milford Haven, England.

THE POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported for the Scientific American.]

The usual weekly meeting of the Polytechnic Association was held, at its room in the Cooper Institute, this city, on Thursday evening, Jan. 26, 1861. The President, Professor Mason, in the chair.

NEW SUBJECTS.

Mr. Johnson, in behalf of Mr. John Brown, proposed "Fuel" for a subject for future consideration.

Mr. Garvey offered to read a paper at some future time upon the subject of "Language."

NEW PYROMETER.

Dr. Vanderweyde exhibited and explained a new pyrometer invented by him. The ordinary pyrometer, moving an index by multiplying levers, which he also exhibited, in operation, was suitable only for ascertaining the expansion of metals by heat. In order to ascertain more accurately the heat of a fire, or of metals in fusion, he had contrived a pyrometer capable of measuring temperature up to 1800° Fahrenheit. The principle is that of the compensation pendulum with a reversed application, *i. e.*, the difference in the expansion of different metals under the same change of temperature. A tube of copper (or iron), 4 inches long, incloses a rod of platinum of precisely the same length at a certain temperature, and fastened immovably to each other at one end. The handle consists of a continuation of the tube, and of the rod, but both of iron, so as to expand equally. At the other end of the handle is the circular index, moved by the difference of expansion of the platinum and the copper, the motion being so multiplied as to be easily visible. Dr. Vanderweyde placed the end of his pyrometer, constructed by Becker, of Brooklyn, in the flame of an alcohol lamp, to show its operation. He proposed also to use this apparatus as a pressure-gage for steam boilers, since the pressure and temperature depend upon one another. In order to prove this law, he exhibited an apparatus combining a thermometer with a mercurial pressure-gage, attached to a confined vessel for the generation of steam. When the steam was formed and allowed to escape freely, the thermometer stood at 212°. Stopping the escape of the steam, the thermometer rose to 248°, when the mercury had risen so as to indicate the pressure of two atmospheres, *i. e.*, about 15 lbs. above atmospheric pressure. Upon again allowing the steam to escape, the mercury in the thermometer fell simultaneously with that in the other tube, to 212°; showing that the heat immediately becomes latent when the pressure is removed. The principle could be tested for higher temperatures by closing the top of the tubes of the pressure-gage, when filled with atmospheric air, converting it into a manometer, and increasing the pressure by the condensation of the air in the tube. Dr. Vanderweyde exhibited a table of temperatures ranging from the highest to the lowest theoretic temperatures—from 463° below zero to 21,632° above.

Mr. Garvey stated that he had examined this table and been delighted with its accurary.

REFRIGERATOR WITHOUT ICE.

Mr. Garvey exhibited and explained a model of a refrigerator invented by William Simms, of Dayton, Ohio. The principle is that the gaseous vapors from the food are lighter than the atmosphere and septic in their nature. A current of air is passed through the top of the refrigerator to remove these gases. This current may be generated by a lamp, or by a fanwheel running by clockwork for 30 hours, as in the model. If the tube which supplies the fresh air, draws it from near the surface of a well, it will be so cool that it will be unnecessary to use ice.

ASPHYXIATION IN WELLS.

Mr. Stetson, in this connection, stated that the trouble from carbonic acid gas in wells could be easily remedied. It was only necessary to draw a pail or two of water and pour it down the well, the agitation of the air produced mixing the common air with the carbonic acid gas sufficiently to enable a person to go down with safety.

Mr. Garvey, admitting that this might often be sufficient, said that it was not safe to rely upon it, especially if the well is deep, or situated in a valley. The only safe rule is to light a lamp and lower it to the bottom, and unless it will continue lighted for a considerable time, it is unsafe to go down.

Mr. Seely said that there was one fact in relation to this subject which he had not seen stated in the books; that the carbonic acid gas is generated in the wells. Although once and a half as heavy as atmospheric air, it will not for that reason sink, in consequence of the law of the diffusion of gases. In wells in Saratoga county, or where there are many mineral springs, the gas may collect in half an hour, so that it will be dangerous to go down.

PROJECTILES—RIFLING CANNON.

The Association proceeded to consider the question for the evening, "Projectiles for Rifles and Rifled Cannon."

Mr. Stetson said that the subject of rifling cannon was still in its infancy. One reason for this is the increased expense. It had been computed that every discharge of the Lancaster guns at the Crimea, of which so much talk was made, cost $500; but this probably included the expense of getting the cannon there, and all other attendant expenses. Rough balls are expensive from their destroying the cannon; and replacing the cannon is a more serious expense than finishing up the shot. The Whitworth plan seemed to be the type of perfection in this direction. But the great expense had turned attention in this country to the banding of the ball, covering it with soft metal, and similar methods. Mr. Stetson proceeded to illustrate upon the blackboard the various forms for rifle balls. At first they were spherical; then they were prolonged. Then the back of the ball was flattened somewhat. It was soon found that the effect was still better if completely flattened, with square edges. A later plan was to make the back of the ball concave, not only to utilize the expanding gas more completely, but in order that this expansion should spread the thin edges of the back of the ball, so as to completely fill the bore of the gun, and in rifled pieces, so as to fill also the grooves of the twist. There is a plan, upon somewhat the same principle, for rifled cannon. The ball is of iron, with the front so sharpened as to reduce the resistance of the air, and with the back accurately turned to fit the bore. There is a groove around the ball, filled with a lead ring; and beneath this ring are channels communicating with the back of the ball. Upon the discharge of the piece, the expanding gases rush through these channels and force the lead outward, so as to fill accurately, not only the bore of the piece, but the grooves. The objection is, that as soon as the ball leaves the mouth of the cannon, this expansive force causes the ring of lead to fly off at a considerable angle; so that, in many cases, balls cannot be used. Another plan, patented by B. B. Hotchkiss, of Sharon, Conn., is intended to obviate this defect. Mr. Stetson exhibited a drawing of this ball, partly in section, and a small specimen ball. A great friction is required to give the rotary motion to the ball, and this may endanger the piece, if the pressure of the lead is unlimited. The Hotchkiss ball limits the expansion of the lead, and hence the amount of pressure. The back of the ball is a separate piece, with a rim around the edge, which is wedge-shaped. The discharge of the cannon causes this separate piece first to be driven up firmly against the remainder of the ball, the wedge forcing out a certain portion of the lead, and also a little grease so as to smooth the passage of the ball. At the same time this rim, and another on the front part of the ball, so inclose the inner portion of the lead ring, as to prevent it from separating from the ball. And as the expansion of the lead is wholly produced by the wedge, before the ball leaves the gun, there is no residuum of the force for this purpose to cause the ring to separate afterward, as in the former case.

The President made some remarks upon the history of projectiles, referring to the sling and to the ballista of the ancient Greeks and Romans as having probably suggested the use of cannon in modern warfare.

Mr. Garvey explained the theory of rifling firearms. The projectile force is applied to the ball at the center of measurement; but if the center of inertia should be at one side of this, the ball would have a tendency to move in that direction. But if a motion of rotation is given to the ball, whatever tendency to deflection there may be to one side at one instant, it will be compensated for by a corresponding tendency to deflection to the other side at the next instant. It is only by one error correcting another that we arrive at accuracy in anything human. The power required to produce the rotary motion was an element of which he had seen no notice taken in any calculation. If the velocity of rotation were equal to the forward motion, it would take as much force to produce the former as the latter. Another element that had been omitted was the action of centrifugal force in its tendency to separate these lead rings from the balls, especially when the lead is loosened by the tearing of the grooves. When a mass of matter is suspended in space, an infinitely small force will give it motion. If we can add a Barker mill attachment to the ball, so that it shall be made to spin, when free from the gun, by the action of the atmosphere, there will be no need of rifling. Some one has invented an oblong ball, rifled by a hole in the center, so that the passage of the air through the ball causes it to rotate. A cannon once fired becomes dangerous, and every shot fired makes it more dangerous; for we can never ascertain how much effect the concussion has had upon the structure of the iron. He would propose, therefore, to fire away the gun and keep the ramrod—or, in other words, to make the ball a tube closed at the end. A rotary motion could be easily given by any sort of light force attached to it.

M. Haskell described and illustrated a ball invented by Mr. Frederic Newburry, of Albany, consisting of two cup-shaped balls, with an oil patch between them projecting over the inner one. The expansion forces the lead against the oil patch, so as to fit the piece, and the lead does not come in contact with the iron. There is therefore no abrasion.

Mr. Stetson said that one of the effects of rifling which had not been alluded to was that illustrated in the gyroscope, resulting from the tendency of a revolving body to maintain its plane of rotation. The ball being caused to rotate, will not so readily change its course. Mr. S. thought a grave objection to the method of causing the ball to revolve by the action of the atmosphere was that it did not operate at the point where the necessity for it is the greatest, since when the ball first leaves the mouth of the cannon, any deflection produces a greater error than a deflection produced afterward. To avoid the great friction in producing this rotation, he should judge that one turn in 200 or 300 feet would answer, instead of one turn every 20 or 30 feet.

Dr. Vanderweyde said that the law that the tendency of a body to rotate upon its axis is equal to its tendency to move in a right line, and that the law of the plane of rotation had been laid down by an Italian mathematician. If a body revolving around an axis is acted upon by a force which, acting alone, would cause it to rotate around a different axis, the result will be a rotation around an axis between the two; and that is the principle of the gyroscope.

The President inquired what was the practical effect of the "Accelerating gun," which has three successive discharges for one ball.

Mr. Garvey stated that it had a tendency to diminish the concussion, and therefore to avoid the deterioration of the gun; but in the propulsive power, there would be a loss.

Mr. Seely attributed the results attained to the great length of the gun. An ordinary gun is so short that the combustion is seen to continue after the ball has left the gun.

Dr. Vanderweyde said that the reason why chloride of potash and similar substances could not be used was because they burned too rapidly. Gunpowder is the best propelling agent, because it burns so slowly. There is less danger of explosion.

The President inquired how many discharges a cannon would bear.

Mr. Johnson—It varies from 250 to 1,500 for cannons of the same kind of iron and under conditions very much alike. Those that lasted the longest were cooled from the inside.

The President suggested that there might be a resemblance between cast iron and ice. He had found that the strength of ice was chiefly in the upper half inch, where the crystals are horizontal, while the lower ice is formed from vertical crystals. The outer coating of cast iron is extremely tenacious. By cooling the cannon from the inside, there were practically two outer surfaces.

Mr. Bruce desired to say something further upon this subject, and its further consideration was postponed until the commencement of the next meeting.

On motion, it was voted that the hour of meeting should be 7 P. M.

The subject selected for discussion for the next meeting is "Fuel," upon which Professor Hedrick will read a paper.

Recent American Inventions.

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

POWER LOOM.

This invention consists in a novel system of cones of pulleys for supporting and operating the harness, whereby several important advantages are obtained. It also consists in certain means of producing a slower movement of the harness at the time of crossing the sheds as compared with the greater portion of its movement, whereby the loom is enabled to be driven at a higher velocity ; that is to say, to make a greater number of picks per minute, without liability to injury to the warp at the time of crossing the shed. The patentee of this invention is Benjamin F. Knowles, of Providence, R. I.

FIRE BRICK OVEN.

This invention consists in a novel arrangement of a furnace, heating flues and escape flues, in combination with a chamber of arched form, whereby a great saving of time and fuel is effected in the baking process, and, by a quick baking at a regular but not too intense heat, fire bricks or other articles of better than usual quality are produced. Louis Auguste Boisson, of Lyons, France, is the patentee of this invention.

TIRE HEATER.

This invention consists in the employment of a cylindrical furnace with a movable top, having two or more concentric chambers in it for receiving tires of different diameters, and furnished with dampers or valves, whereby the draught of the furnace may be conducted through either one of the concentric chambers from a door in the outer box to an escape pipe diametrically opposite to this door. The credit of this contrivance is due to Alfred Ingalls, of Independence, Iowa.

HOISTING APPARATUS.

The object of this invention is to obtain a simple apparatus which is easy of manipulation, by which barrels or any unwieldy cylindrical vessel may be tiered with very little labor. The invention consists in the employment of a derrick with a movable jointed leg, in combination with a prop, whereby the barrels, &c., will be raised perpendicularly to the desired hight and then rolled over on the first tier with a comparatively short derrick. This invention is patented by G. B. Vroom, of Jersey City, N. J., and Solomon Kenzie, of Brooklyn, N. Y.

MACHINE FOR SEWING BOOTS AND SHOES.

The object of these improvements for making stitched boots or shoes by mechanism is to hold the work done on the table or bed plate of the machine as near the awl and needle as possible, and to keep the channel formed on the outside of the outer sole, open, so that the seam will follow closely in this channel, that the raised lip of the channel may be pressed down after the shoe is finished, and present a neat appearance, as if the stitching had been done by hand. The invention also provides for stitching the shanks of the boot or shoe, in which operation the work can be presented to the awl and needle with great facility ; and it further provides for keeping the upper from the needle, and for guiding the channel to receive the seam, through the machine ; and for sewing light or heavy, large or small work. The patentee of this invention is Francis D. Ballou, of Abington, Mass.

Tempering Steel.

From the large number of inquiries that we have recently received in regard to tempering steel, we think many of our readers will be interested in the following table, which was prepared several years ago by Mr. Stoddart, of England. The steel is to be hardened in the usual way, by heating it to a cherry red, and plunging it in cold water. The temper is then to be drawn by moderately heating the steel again. Different tempers are required for different purposes, and the degree of heat for each of these, with the corresponding color, is given in the table.

Very pale straw yellow	430°.	The temper required for lancets.
A shade of darker yellow	450°.	For razors and surgical instruments.
Darker straw yellow	470°.	For penknives.
Still darker straw yellow	490°.	Chisels and shears for cutting iron.
A brown yellow	500°.	Axes and plane-irons.
A yellow tinged slightly with purple	520°.	Table knives and cloth shears.
Light purple	530°.	Swords and watch springs.
Dark purple	550°.	
Dark blue	570°.	Small fine saws.
Pale blue	590°.	Large saws, the teeth of which require to be set with pliers and to be sharpened with a file.
Still paler blue	610°.	
The same, with a tinge of green	630°.	Too soft a temper for steel instruments.

ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING JANUARY 22, 1861.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

140.—P. J. Ackerman, of Paterson, N. J., for an Improved Combination of Cooking Stove and Air-heating Furnace:

I claim the combination and arrangement of the ovens, C C, fire-pot, B, and chambers, E H, as and for the purpose set forth.

[The object of this invention is to obtain a combined cooking stove and air-heating furnace by a very simple and economical arrangement of parts which renders the stove more desirable than the ordinary ones, while all the advantages of an air-heater is obtained. The invention consists in placing the fire-pot of the stove within the ovens, or having the former in direct communication with the latter, and having the ovens communicate with hot-air pipes.]

141.—Wm. R. Axe, of Beloit, Wis., for an Improved Clamping Machine for Carpenters :

I claim the employment of the ratchet bars, E E, in combination with the rock shaft, b, actuated by a suitable lever and the clamping jaws, I, and G, the former being provided with suitable pawls for engagement with the bars, E, and the whole arranged and operating as described for the purposes set forth.

142.—Louis Bauhoefer, of Philadelphia, Pa., for an Improvement in Gum Shoes and Boots :

I claim the combining of pieces of cork with the heel or sole both of a gum shoe or boot, substantially in the manner set forth for the purpose specified.

143.—A. John Bell, of Ashland, Ky., for an Improvement in Steamboat Staging :

I claim the arrangement of the staging, C, power windlass, E F G H I, and supporting apparatus, J K L, the whole being constructed and operating together, substantially as and for the objects set forth.

144.—G. Bennett and R. Dalzell, of Waddington, N. Y., for an Improved Machine for Tapping Nuts and Cutting Screws :

We claim the combination of the expanding die-box, the revolving plate or blank holder and expanding bolt holder, when the same are arranged and constructed, as shown, for the purpose of cutting screws and tapping nuts by the same machine, as specified.

145.—A. E. Blood and J. B. Blood, of Lynn, Mass., for an Improvement in Sieves :

We claim the arrangement of the shaft, N, and the supports or bearings, c c, of the sieve with respect to such sieve and its case, when the shaft, N, is constructed substantially as described and represented.

146.—L. A. Boisson, of Lyons, France, for an Improvement in Ovens for Baking Fire Bricks:

I claim the arrangement of the furnace or furnaces, B B, heating flues C C, and escape flues, D D, with respect to each other, and the arched chamber, A, whereby the heat is first conducted beneath the hearth of the oven, and thence through the oven, all substantially as described.

147.—Wm. Chesterman, of Peosta, Iowa, for an Improvement in Apparatuses for Evaporating Saccharine Juices:

I claim, first, The arrangement of the train of pans, A B C, the continuous flue, E, running under the whole in succession, and a chimney at the end of each furthest from the fire, substantially as described.

Second, The arrangement of a water vessel, I, float, J, and lever, K, with the pans, flues, and chimney dampers of a sugar evaporator, in the manner substantially as shown and described.

[This invention consists in a certain arrangement of a train of pans in combination with a single continuous flue running under the whole of them, and a separate chimney for each pan, and in a certain system of dampers operated by an automatic regulator applied in connection with the said arrangement of pans, flue and chimneys, whereby a very effective and economical apparatus for evaporating and concentrating cane juice or other saccharine liquids is obtained.]

148.—G. F. J. Colburn, of Newark, N. J., for an Improved Evaporator for Hot Air Pipes :

I claim, first. The arrangement of the reflector, C, in combination with the evaporating vessel, A, and hot air pipe, B, as described, for the purpose of facilitating the evaporation, and to prevent the dust rising into the apartment.

Second, Constructing the vessel, A, of two parts, a and b, the part, a, to be made of porous material, and the part, b, to contain a lamp wick or its equivalent, substantially as and for the purpose set forth.

149.—George Cooper, of Thompsonville, Conn., for an Improvement in Needles:

I claim, as a new article of manufacture, the sewing needle described in the specification, and represented in the drawing.

150.—Reuben Daniels, of Woodstock. Vt., for an Improvement in Machines for Reducing Fibrous Material :

I claim providing the working face of each with pointed teeth, a and c, or their equivalents, secured thereto, and set substantially in the manner described, when operated with a current of fluid passing freely through and towards the periphery, to separate worn out cloths and fibrous material, to reproduce (and not destroy) the longest possible staple in a suitable state for carding, these wheels being made adjustable to, and with each other, substantially as described and for the purposes set forth.

151.—N. E. Doane, of Hannibal, Mo., for an Improvement in Weighing Carts or Wagons :

I claim the lever frames, G G, rod, H, parallel bars, D D, levers, I J, graduated beam, K, and frame, L, combined, arranged and applied to a a cart or wagon, as and for the purpose set forth.

[The object of this invention is to obtain a simple weighing attachment for carts and wagons, one that may be applied at a very moderate cost, and enable loads to be weighed very accurately and with great facility.]

152.—Thomas Earle, of Worcester, Mass., for an Improvement in Sewing Machines :

I claim, first, The combination of the feeding hand and nippers with a connecting adjustable link, constructed and arranged as described, whereby a positive lateral vibratory motion is communicated directly from the nippers to the feeding hand.

Second, The combination of the feeding hand, constructed and arranged substantially as described, with an interior spring so arranged as to act on the hand to draw it down in line with its center of motion.

Third, The combination of the pressure pad with the interior spring and sliding rod and clamps, the whole arranged substantially as described for the purpose set forth.

153.—Lewis Eikenberry, of Easton, Pa., for an Improvement in Iron Bridges :

I claim, first, A side frame for a bridge having its diagonal braces or diagonals and uprights constructed of angle iron, substantially as and for the purposes set forth.

Second, The combination of double angle iron or U-shaped braces with single angle iron uprights or diagonals, substantially as and for the purposes set forth.

Third, A side frame for a bridge which has its uprights or diagonals constructed of U-shaped or double angle iron, substantially as described.

154.—George Esterly, of White Water, Wis., for an Improvement in Harvesters:

I claim, first, The combination with the joint, e d, which allows the finger beam, E, to be adjusted in the path of a vertical circle of a curved slotted standard, G j, the dividing apparatus and a set screw, k, substantially as and for the purposes set forth.

Second, The combination of the angular adjustable bar, M, curved slots, x x, and axial pivots, S3 and y and a, hinged platform, K, substantially in the manner and for the purpose described.

Third, The combination with the slotted curved brackets of the angular supporting bar, M, of a bracket, P, a thrust screw Q, a pivoted lever, H, and the divider, F, substantially as and for the purposes set forth.

Fourth, The employment of the said pivoted lever, H, in combination with the divider, F, and the axle, S3, of the grain wheel, I, arranged substantially as and for the purposes set forth.

Fifth, The employment of the vertical pendant tension rod, S2, in combination with the reel bearer, S, divider, F, and the grain wheel axle, S3, substantially as and for the purposes set forth.

Sixth, The combination with the divider, F G, and inner adjustable wing, J, of an outer adjustable wing, J′, arranged substantially as and for the purposes set forth.

Seventh, The combination of the short angular platform, K, with the continuation, L, and raker support, L′, facing the platform laterally; the continuation, L, forming the raker stand and being located between the sill, A′, of the driving wheel frame, the driving wheel and the axle thereof, and otherwise constructed so that the raker shall be located between the front sill, A′, and the axle of the driving wheel, and be supported by the connections which support the platform, substantially as and for the purposes set forth.

Eighth, The combination with the finger beam, E, and a platform, K, hung on hinges, V V, of an adjusting screw rod, N, which forms a hinge connection, one or more knife edge bearings or pivots, Z, one or more screws or bolts, x′ x′, and a thrust plate or bar, N′, substantially as and for the purposes set forth.

155.—George Esterly, of White Water, Wis., for an Improvement in Harvesters:

I claim, first, The arrangement of the reel and cutting apparatus obliquely to the side of the driving wheel frame and platferm, M P n, when the rear line of the platform is oblique to the driving wheel frame, and its inner corner terminates near the axle of the driving wheel, substantially as and for the purposes set forth.

Second, The arrangement of the thrust or screw rod, I, and curved brace, J, with the dividing apparatus, grain wheel axle, e, and reel support, a, substantially as and for the purposes set forth.

156.—O. C. Evans, of New York City, for an Improvement in Lamps:

I claim, first, The combination and arrangement of the gas chamber, A, constructed with horns, t t, and slitted openings, as described, with the openings of the wick tube, a1 a2 a3, &c.

Second, In combination with the gas chamber and openings in the wick tube of the guards, c c, and petticoat cone, D, the same being arranged in the manner and for the purposes set forth.

157.—I. N. Felch, of Hollis, Maine, for an Improvement in Hub Machines:

I claim the combination lathe attachment, the arrangement of the reciprocating knife frame, and the vibrating swing feed frame, in the manner and for the purposes set forth, and boring the hub while it is being turned by pressing up the auger through the hollow spindle.

158.—F. F. Fowler, of Crane Township, Ohio, for an Improvement in Machines for Gathering Hay:

I claim the arrangement of runners, F, braced as described, with the revolving rake, R, tongue, T, shaft, r, and braces, f, when the several parts have the loose connection described, whereby the machine may conform to the inequalities of the surface passed over, the construction and operation being as set forth.

159.—E. W. Fuller. of Martinsville, La., for an Improvement in Cultivators:

I claim the arrangement of the adjustable bars, E E, plows, G, rotary harrow, B, and roller, C, with the adjustable bars, D D, transverse bars, a, and frame, A, all in the manner and for the purpose shown and described.

[The object of this invention is to obtain an implement of simple construction that will admit of the plows being adjusted both vertically and laterally, and, at the same time, admit of the use of either ordinary wheels or of a roller and revolving harrow, and a seed-distributing attachment, when required; the whole forming a very compact, efficient and economical implement.]

160.—G. G. Gabrion and N. B. Whitney, of Copenhagen, N. Y., for an Improved Stave Jointer:

We claim the combination of the planes, 1 and 2, secured in the frame, 4, and made adjustable, in the manner described, with the carriage, 7, sliding on the rod or shaft, 6, all being constructed, arranged and operated substantially as set forth.

161.—John Griffin, of Louisville, Ky., for an Improvement in Cotton Pickers:

I claim the arrangement for joint operation of the tubes, A F I, valves, C d, and pipes, l m, essentially as and for the purpose set forth.

[This invention relates to certain improvements in cotton picking crops, for which Letters Patent were granted to this inventor, bearing date March 8 and Nov. 22, 1859.]

163.—Robert Heneage, of Buffalo, N. Y., for an Improvement in Hemp Breaks:

I claim the arrangement of the secondary brake, F, with the brakes, C C′, in combination with the dressers, G G′, and the gearing for reversing the motion of the machine, so that the parcel of hemp, as it passes through the brakes, will be bent at right angles (or nearly so) and directed downward to the dressers, the brakes operating and holding on to the parcel of hemp while the dressers are performing their work, substantially as set forth.

164.—C. L. Herring, of St. Louis, Mo., for an Improvement in Gas Regulators:

I claim the application of the currved plates, a a, to the flexible diaphragm, C, substantially as described, for the purpose specified.

165.—Edward Holmes and Britain Holmes, of Buffalo, N. Y., for an Improvement in Stave Machines:

We claim, first, The endless revolving iron bed, A, constructed of jointed links, and having stops, a′, in combination with cams, whose velocity must be increased or diminished according to the length of the stave to be dressed.

Second, The arrangement of the jointers in frame, L, said frame being operated by levers which have a connection to a cam, which cam has a horizontal adjustable movement upon its shaft, so that the revolution of the cam (through the arrangement of the levers) will communicate a reciprocating movement to the jointers, for the purposes set forth.

Third, The combination of the adjustable lever, n, with the frame, L, and hook or rest, V, for the purpose of giving different widths to staves, substantially as described.

Fourth, The arrangement of the frame, R, including the cutter, T, with the other parts of the machine, substantially as described, so that the said frame will have a periodical movement which will cause the stave to be chessed thinner in the middle portions thereof than it is at the ends.

Fifth, The arrangement of the gages, 1 2 3 4, &c., in combination with the lever, u, and rest, v, for the purpose of locating the rest, v, in the proper place to bring the lever, h, to its proper angle, to give the required width of stave.

166.—Alfred Ingalls, of Independence, Iowa, for an Improved Tire Heater:

I claim combining with the horizontal circular furnace described, the inside concentric partitions, D D, movable covers, C C C, the dampers, e e and g, and supporting rods, p p p p, all arranged substantially as and for the purposes described.

167.—Charles Irwin, of Buffalo, N. Y., for an Improvement in Sewing Machines:

I claim the adjustable arm, b. on the front end of the shuttle carrier, in combination with the spring, f, for guiding and protecting the needle and its thread, as set forth.

168.—William Jarrell, of Trenton, Tenn., for an Improvement in Plows:

I claim the combination of the landside, B, sockets, d and f, bolt, e, and nut, g, constructed, arranged and operating in the manner and for the purposes set forth.

[This invention consists in a peculiar manner of securing the landside of a plow, the advantages being facility in casting, perfect security when in position, and ease of removal for repair or substitution.]

169.—Levi Jewell, of Stratham, N. H., for an Improvement in Fire Escapes:
I claim combining with a shade fixture the metal roller, C, hinged caps, E E, set screws, a a, and cords, G H, with the covers, g g, substantially as and for the purposes described.

[The object of this invention is to combine with the roller of an ordinary window shade a means for escaping from the building in case of fire. The invention also provides for removing articles of furniture from the upper stories of buildings in case of fire. The invention consists in the use of a metal roller, furnished with pulleys for rolling up and unrolling the shade, and hung in strong metal brackets, which are so constructed that a brake can be applied to the roller. The fire escape consists in the employment of two ropes of a suitable size, which are wound around the roller, and when not in use, are covered with a metal casing; but when they are in use, one rope will unwind from the roller, while the other winds upon it.]

170.—D. G. Kettell, of Worcester, Mass., for an Improved Harness for Preventing the Fore Legs of Horses from Interfering:
I claim my new method, substantially as described, of preventing a horse while traveling from injuring one fore leg with the hoof of the other, as well as of breaking the horse of such bad habit, the same being accomplished by a guard arranged and suspended near or close to the breast and between the legs of a horse, and to operate as specified.

171.—D. A. King and T. Norris, of Lexington, Ky., for an Improved Dove-tailing Machine:
We claim, first, The boring bits, d d, and sliding bench, I, in combination with the chisel bits, w w, when constructed and arranged to operate together in forming the peculiar mortises on Z, Fig. 4, substantially in the manner specified.
Second, We claim the combination and arrangement of the tenoning bits, e e, the sliding bench, K, and the adjustable stop, y, constructed and operating substantially as and for the purpose set forth.

172.—B. F. Knowles, of Providence, R. I., for an Improvement in Harness Motions for Looms:
I claim, first, The employment for supporting and operating the harness, of cones of pulleys arranged with their axes parallel with the vibrations of the lay and the larger pulleys of the cones toward the rear of the loom, substantially as specified.
Second, In combination with a horizontally vibrating lever, I, connecting with a belt or belts, f f, for driving the harness, I claim a grooved cam, J, so constructed as to produce a slower movement of the harness at the time of the crossing of the shed, as compared with its movement in the earlier and later stages of the opening and closing of the shed, substantially as described.

173.—J. H. La Bau, of New York City, for an Improvement in Machines for Finishing Hats:
I claim, first, The levers, M M′ M″, with the heater, m, brush, n, and sponge, o, respectively attached, the arms, J J′ J″, screw shaft, B, provided with the hat block, C, and the bar, H, provided with the nut, I, arranged for joint operation, substantially as and for the purpose set forth.
Second, The fusee-shaped projection, K′, on the disk, K, rod, P, connected with the shaft, O, on the slide, Q, also connected to said shaft, and provided with the upright projection, a′, the above parts being arranged substantially as shown, to cause the heater, brush and sponge to pass over and act upon the brim of the hat, as set forth.
Third, The arrangement, when used in connection with parts above named, of the pulley, E, and disk, G, the former being fitted loosely on the socket, D, and the latter provided with the pendants, b b, which pass through the pulley substantially as described, whereby the shaft, B, may be rotated and allowed to rise as it rotates, for the purpose specified.

[The object of this invention is to obtain a machine by which silk or fur hats may be finished, that is to say, sponged, brushed and ironed automatically, the whole mechanism necessary to perform the work being put in motion by the rotation of a single shaft:]

174.—A. B. Lefler, of Canton, Ind., for an Improvement in Cultivators:
I claim the described combination of the bent beam, B, reversible shares, E E′, and standards, D D′, with the brace, C, and washer, F, the said parts being constructed, arranged and connected in the manner and for the purposes described.

175.—C. B. Loveless, of Tom's River, N. J., for an Improvement in Vapor Lamps:
I claim the combination with the wick tube, T, of the crescent-shaped gas chamber, C, having the burner, B, and the elongated heat conducting rings, R, performing the double function of generating gas and aiding in the lateral spreading of the flame; the whole being constructed and operating substantially in the manner and for the purpose set forth.

176.—T. J. Mayall, of Roxbury, Mass., for an Improvement in Polishing Tools:
I claim, as a new article of manufacture, the tool described for polishing shafts, rods or other objects of cylindrical or round formation, and capable of revolution, the same consisting of two pieces provided with corresponding cavities, and hinged together to admit of their being separated and brought together for operation, as described, the polishing surfaces being composed of india-rubber or gutta-percha, or of the various compositions of these with which emery, sand, glass, or other suitable gritty substance is incorporated, substantially as set forth.

177.—J. B. McCormick and W. R. Baker, of St. Louis, Mo., for an Improvement in Hemp Brakes:
We claim the combination of the endless belt, k, with the radially sliding armed bars, f, as and for the purpose shown and described.
We also claim giving a lateral movement to the said radially sliding armed bars, f, in the manner and for the purposes shown and described.

[This invention consists in the employment or use of a rotating drum, provided with spiked or toothed bars, and stationary or operated in a novel way, in connection with an endless slatted apron arranged to operate conjointly with the drum, whereby the hemp may be heckled and scutched or cleaned very expeditiously and without injury to the fiber.]

178.—Hiram McDonald, of Union Springs, N. Y., for an Improvement in Wood-bending Machines:
I claim the eccentrics, l m, sliding plates, o p, slides, t u, and the keys, r s, placed at the outer parts of the beds, F F, and arranged substantially as and for the purpose set forth.

[This invention has for its object the bending of steamed wood, such as wagon bows, felloes, &c., into proper shape, by a very expeditious and simple means, and in a perfect manner.]

179.—D. S. Morgan, of Brockport, N. Y., for an Improvement in Harvesters:
I claim the combination of the peculiarly curved reel support, A, with the horizontal arm, E, and supplementary divider, D, when the whole are arranged relatively to each other and to the frame of the machine, substantially as described, for the purpose set forth.

180.—D. A. Morris, of Pittsburgh, Pa., for an Improvement in the Manufacture of Sheet Iron:
I claim the application of carbonaceous material prior to heating the iron (without removing the iron scale or black oxyd from the surface of the sheets), and for the purpose specified.

181. G. C. Munson, of New York City, for an Improvement in Tucking Gages:
I claim an instrument or implement forming a tucking gage for attachment to a sewing machine, essentially as described, and having for its elements the combination of clamping plates, or a clamping plate and bar or roller, or equivalent devices, constructed to hold the cloth at any desired width of tuck with a gentle pressure from the edge throughout the width of tuck, a device or means for regulating the pressure of the clamping plates and varying their width apart, an outside guide to the folded edge of the cloth, adjustable at pleasure, and a device or means for urging the cloth up against said guide, all for operation together, substantially as and for the purpose or purposes set forth.

182.—J. Y. D. Murphy, of Half Moon, Pa., for an Improvement in Corn Planters:
I claim, first, The combination of the reciprocating seed chamber, T, opener, V, and sliding bottom, b, arranged and operating substantially as and for the purposes set forth.
Second, The arrangement of cutter, l, comb, k, horizontal cutter, V, side plates, M, depositing chamber, T, conducting tube, p, shaft, E, spring, a, bar, H, and slide, J, substantially as set forth.

183.—Arthur Neill, of Boston, Mass., for an Improvement in Mold for Shaping India-rubber Pencil Heads:
I claim a mold composed of a core plate, C, with its cores, a a a, matrice plate, B, and a cap plate, A, combined and arranged together substantially as described and for the purpose set forth.

184.—F. H. Purington, of Willimantic, Conn., for an Improvement in Drawer Alarms:
I claim the catches, G, arranged relatively with the springs, D, as shown and used in connection with the slide, F, to operate as and for the purpose set forth.

[The object of this invention is to obtain an alarm for tills and drawers which will give warning when an illegitimate attempt is made to open them, and at the same time will cause the tills or drawers to be locked so as to prevent them being opened except by a key, thereby obviating the contingency of a successful illegitimate result by repeated trials.]

185.—L. C. Rodier, of Springfield, Mass., for an Improvement in Tool Handles:
I claim a handle for awls or other tools having the ferrule, B, and screw cap, C, combined and operating in the manner and for the purpose substantially as described.

186.—T. W. Roys, of Southampton, N. Y., for an Improvement in Harpoon Guns:
I claim, first, Encircling the barrel of the gun with one or more transverse flanges, B, provided with valves, C, for the purpose of protecting the face of the gunner, and at the same time enable him to take his sight.
Second, I claim placing before the rear end of the barrel a stop to receive the back fire of the rocket, substantially as described, for the purpose specified.
Third, I claim the long bar, m, across the top of the link, n, to prevent the harpoon from being forced clear through the whale.
Fourth, I claim the vent hole, v, in the front end of the barrel, for the purpose of closing the valve, C, in the manner described.
Fifth, I claim the channel, K, on the gun barrel through which the hook, J, travels, so as to catch the link, n, in the manner described.

187.—Samuel Schuyler, of Brooklyn, N. Y., for an Improvement in Grain Dryers:
I claim the combination of the series of platforms, B, with the elevators, M and N, as set forth, and for the purpose described.

188.—William Sellers, of Philadelphia, Pa., for an Improvement in Ovens:
I claim, first, The arrangement of the cars or pans in the oven in two series, one ascending and the other descending, substantially as described, in combination with the means described, or the equivalent thereof, for transferring from the ascending to the descending series within the oven, and with means for inserting and discharging at or near the bottom of the oven and on one side thereof, substantially as described, and for the purpose specified.
Second, I also claim machinery or an instrument for measuring time, in combination with the machinery which operates the oven, in the manner substantially as specified and for the purpose set forth.
Third, I also claim, in combination with an oven having the fire chamber at the lower part thereof, and in which the fire is not separated therefrom by any roof or partition, substantially as described, the employment of the blower, or equivalent means, for forcing in a current of air at or near the top, substantially as described, to reduce the temperature when required.

189.—Oliver Sweeney, of Norwich, Conn., for an Improved Knife Cleaner:
I claim a knife cleaner having in combination a clamp, A, and a perforated reversible board, B, constructed and operating in the manner and for the purpose described.

[This invention consists in the arrangement of a clamp, which serves to retain the handles of two or more knives, in combination with a supporting perforated platform, in such a manner that, when the clamp with the knives is placed on the platform, the blades of the knives rest flat on said platform in the proper position for being cleaned. Several dozen of knives can be cleaned by means of this device simultaneously and by one operation.]

190.—Jeremiah Sweitzer, of Mishawka, Ind., for an Improvement in Plows:
I claim the arrangement of the beam, B, handles, a a′, landside, b, standard, o, and brace, c c, with flanges, s, the whole constructed as and for the purposes set forth.

191.—A. C. Teubner, of New York City, for an Improved Composition for Rendering Textile and other Fabrics Air and Water Tight:
I claim the composition made of the ingredients, and prepared in the manner and used for the purposes recited.

192.—H. L. Thistle, of New York City, for an Improved Spring Bed Bottom:
I claim the arrangement of the helical springs or crossbars, substantially as described, in combination with the longitudinal slats above them, substantially as described.

193.—G. B. Vroom, of Jersey City, N. J., and Solomon Kinzie, of Brooklyn, N. Y., for an Improvement in Machines for Hoisting Barrels and Placing Them in Tiers or Rows:
In combination with a derrick resting on four legs or supports, two of which are stationary and the other two supported on wheels, as described, I claim the frame, B and B′, when the whole is constructed and applied substantially as described for the purpose set forth.

194.—Joseph Warner, of New Britain, Conn., for an Improved Kettle Handle:
I claim a handle for lifting vessels that is composed of a curved portion, A, having a tongue and shoulder, a b, at its upper end, which form a slot to grasp the edge of the vessel, the whole made as shown and described.

[To many varieties of metallic kettles or boilers which are used in the culinary department handles are very objectionable, particularly such handles as are soldered or riveted to the sides of the vessels. The object of this invention is to furnish a handle which may be readily attached or detached from such kettles, and which will answer every purpose of the ordinary handles that are fixed permanently to the kettles.]

195.—Sarah Jane Wheeler, of New Britain, Conn., for an Improvement in Curry Combs:
I claim the combination of single sheet metal bars of curry combs, having concave back edges of a sufficient degree of curvature to give the necessary firmness and strength without the assistance of side projections or supports, but having rivet projections thereon, with a back of corresponding curvature, so as to fit the concave back edges of said bars, and either made of a single piece so as to be "close," or of separate pieces so as to be "open" and unobstructed between all the bars, substantially in the manner and for the purposes specified.

196.—H. S. White, of Newport, R. I., for an Improvement in Newspaper Files:
I claim the employment or use of the button, C, and staple, D, attached to one of the strips, in connection with the loop, E, and eye, H, attached to the table or fixture, G, as and for the purpose specified.

[The object of this invention is to obtain a paper and letter file which will admit of papers and letters being readily adjusted in it, and in such a manner that the folios or double sheets will be firmly clamped side by side, precisely the same as if they were bound in a book, thereby avoiding the inconvenience of turning over a number of leaves in order to find consecutive pages, as is the case when the sheets are placed and secured one within the other, in the ordinary paper and letter files.]

197.—W. C. Willey, of Princeton, Ill., for an Improvement in Corn Planters:
I claim the arrangement of the hoppers, F, oscillating perforated shell, G, holes, f, plates, g, vibrating bar, J, and levers, L K, with the seed tubes, H, plates, I, shares, D, jointed frames, A C, bars, b b, uprights, c c, projections, m, and rollers, B, in the manner and for the purpose shown and described.

[The object of this invention is to obtain a simple and efficient machine for planting corn either in hills or drills, and at a greater or less depth, as may be required. The invention also admits of having its seed-distributing apparatus operated automatically or manually, as may be desired, and without the liability of choking or clogging.]

198.—W. H. Auld (assignor to himself and R. C. Brown), of Fairfield, Iowa, for an Improvement in Circular Sawing Machines:
I claim the arrangement of the pivot, a, upon which the adjustable frame, C, turns, in front of the cutting edge of the saw, E, as shown and described, whereby the angle of the face of the saw blade may be varied at pleasure without changing the position of the cutting edge, all as set forth.

[This invention consists in arranging the saw in such a way that the same may be adjusted in the most ready manner to prevent its binding in the kerf or marring its work.]

199.—F. D. Ballou (assignor to himself and J. L. Nash), of Abington, Mass., for an Improvement in Sewing Machines:
I claim, first, The construction of the presser, D, with separately-adjustable foot plates, C C′, as shown and described.
Second, The curved bearing plate, B, with its lip, c, in combination with the presser bar, D, and foot pieces, C C′, arranged as and serving for the purposes set forth.
Third, The arrangement of the separately-adjustable foot plates, C C′, with the curved plate, B, openers, G G′, and disk, E, in the manner shown and described.

200.—W. B. Bartram, of Norwalk, Conn., assignor to A. S. Dodd, of New York City, for an Improvement in Fare Boxes:
I claim the giving of exact change, as desired, by means of tubes, A, adapted to different coins, in combination with the open valves, D, levers, B, and springs, E, constructed and operated substantially in the manner and for the purpose set forth.
And, in combination with the above, I also claim the money box lever, M, movable plate, U X, bell, J, and register, R—the whole being constructed and operated substantially in the manner and for the purpose set forth.

201.—N. S. Bean (assignor to the Amoskeag Manufacturing Company), of Manchester, N. H., for an Improvement in Picker Staff Motion:
I claim the arrangement and combination of the rocker of the picker staff within the link and upon the piece, e, when the rockers and link are hinged and are operated upon by a spring, and the link is provided with guiding ears, g.

202.—Albert Bellingrath (assignor to himself and Leonard Bellingrath, Jr.), of Atlanta, Ga., for an Improvement in Pumps:
I claim the construction and arrangement of the piston, B, cylinder, A, wedge, D, in the manner and for the purposes set forth.

203.—A. H. Brown (assignor to James Burton), of Albany, N. Y., for an Improvement in Machines for Cutting Wooden Moldings:
I claim the arrangement of the sliding tool holders, D E F, cutters, N, springs, G, frame, O, and pattern, P, with the carriage, B, levers, H, bar, K, and bars, L, as shown and described for the purposes set forth.

[This invention has for its object the ready forming of moldings on the face of frames, or similar work of oval or circular form, which may be turned in a lathe. The invention is applicable not only to the cutting or forming of moldings on frames for glasses, pictures, and the like, but also for cutting moldings on segments or sections of ovals and circles, used for architectural purposes.]

205.—J. T. Bruen, of Brooklyn, N. Y., for an Improvement in Sewing Machines:
I claim needle holder, r, jointed by a double joint to the permanent frame moved and held up to its place by the socket joint arm, u, and spring constructed and arranged as described, and the hook, t, combined with the lower needle in the manner and for the purposes set forth.

205.—A. F. Johnson, of Boston, Mass., and J. E. Bartlett, of Stoneham, Mass., assignors to I. M. Singer and Edward Clark, of New York City, for an Improvement in Sewing Machines:
I claim the combination in the same machine of two needles with a shuttle in such a manner that the needles form two parallel rows of stitching, and that the shuttle reciprocates across the line of direction of the feed motion, and connects the two rows of stitching by the shuttle thread, substantially as described, so as to form a compound seam of three threads presenting two separate rows of stitching on one surface of the material sewed.

206.—Josee Johnson, of New York City, assignor to himself and John Ward, Jr., of Brooklyn, N. Y., for an Improvement in Stilts:
I claim a stilt constructed of two pieces, A and B, joined together by a metal socket, C, in such a manner that the part, A, receives the strain in the direction of its length, and the socket, C, also serves for the foot rest or step, substantially as and for the purposes described.

207.—S. W. Langdon (assignor to himself, Hiram Wells and D. G. Littlefield), of Northampton, Mass., for an Improvement in Sewing Machines:
I claim producing tension upon the shuttle thread, by means of the pressure plate, i, and spring, g, constructed and combined substantially as described.

208.—John McMurtry, of Fayette county, Ky., assignor to I. A. Bostwick, of Lexington, Ky. for an Improvement in Fire-places:
I claim the combination of the ribbed or corrugated back with the air chamber and registers, as shown in the accompanying drawings, substantially as described and for the purposes set forth.

209.—J. P. Reynolds, of Mirabile, Mo., assignor to H. H. Robertson and C. G. Carr, of Kingston, Mo., for an Improved Harness for Shoeing Horses:
I claim the combination of the straps, e c c′ and v, cords, l u, and movable post, s, the said parts being applied, arranged and secured substantially as and for the purposes set forth.

[This is an ingenious device for securing wild or vicious horses while being shod.]

210.—Quartus Rice, of Nevada, Cal., assignor to Lorenzo Rice, of West Winsted, Conn., for an Improvement in Sewing Machines:
I claim, first, The combination with a sewing machine of any suitable construction, of the gage, K K′, constructed and operating substantially as set forth, to produce continuous tubular work.
Second, The adjustable guide rollers, N N, operating in combination with the gage, K K′, substantially as and for the purpose set forth.
Third, The general combination of the feed movement, G H I M, sewing mechanism, A B C D, gage, K K′, and rollers, N P, arranged and operating substantially as and for the purposes set forth.

[This machine is adapted to form continuous tubular work of any desired diameter and of indefinite length, for hydraulic hose or other uses.]

211.—G. J. Wheeler, G. W. Dunnell and William Sharp (assignors to J. C. Beach), of Bloomfield, N. J., for an Improvement in Paper-making Machinery:
I claim the use, in press rolls, of the perforated roll, D, in combination with the felts, K and S, which carry the pulp between them, substantially in the manner and for the purposes described.

212.—J. W. Sprague, of Rochester, N. Y., assignor to himself, G. B. Redfield, trustee (for the benefit of C. Gates), James Jones and A. W. Tyrrell, of same place, for an Improvement in Fire-escapes:

I claim, first, The braces, C C, combined with the levers, A A, and struts, B B, when the same are constructed and operated substantially as described for the purpose aforesaid.

Second, The combination of the platforms, M M, the ladders, L L, and the guidebars, N N, when the same are constructed and operated substantially as described.

Third, The combination of the upper platform, O, the revolving platform, P, and the sliding platform, R, substantially as described.

Fourth, The attachment of the wagon frame to the axles in such a manner as to allow the wagon frame to be leveled, by means of the sliding wedges, Y Y, substantially as described.

Fifth, The arrangement of the cams, I I, in combination with the ratchets, H H, and with the brakes, in such a manner that the act of raising the ratchets shall tighten the brakes, substantially as described.

RE-ISSUES.

25.—Samuel Barley and J. H. Barley, of Longwood, Mo., for an Improvement in Harvesters:

I claim, first, The arrangement of the oblique bars, a'' a*'', of the frame, the latter bar, a*'', extending over or within a vertical line with the shoe or lower part, b*', of the frame, D, in connection with the long axle, B, with the driving and grain wheels, A A', on either end, as and for the purpose set forth.

Second, The arrangement of the rake bar and head, e' e'', to operate in combination with the guard plate, S, crank, d', shafts, e' Q, and platform, I, as shown and described.

Third, We do not claim broadly the invention of the divider; but we do claim the arrangement of the horn-shaped divider, T, to revolve, so that it can be adjusted to any desired position in the manner shown and described.

26.—Willis Humiston, of Troy, N. Y., for an Improvement in Machines for Molding Candles:

I claim, first, The combination of the candle tip mold, a, with the drive rod, D, as and for the purposes described and set forth.

Second, The combination of the said candle tip mold, a, connected and combined with the drive rod, D, with the candle mold or tube, B, as and for the purpose set sorth and described.

Third, The clamping of the candles in the position in which they are driven or forced from the molds or tubes, B, and thus and thereby holding them during the operation of casting or molding candles in the said molds or tubes, B, directly below, until the said candles in the said clamps are ready to be removed therefrom, substantially as described and set forth.

Fourth, The adjusting and holding the wick (for the candles) in the center of the said molds or tubes, B, by the use of the said clamps, F, and the candle therein firmly secured by means thereof, in connection with the said candle tip mold, a, attached to said drive rod, D, substantially as described and set forth.

27.—Willis Humiston, of Troy, N. Y., for an Improvement in Apparatuses for Molding Candles:

I claim, first, The wicking the candle molds, A, by means of the gripers or pinchers, D, in connection with the reel or spool containing the wick below, as described and set forth.

Second, I also claim the suspending of the candles in and upon a center line with the molds, A, directly below, by means of the gripers or pinchers, D, in connection with the tip of the said mold, as and for purpose described and set forth.

Third, I also claim the griping of the candle wicks, by means of the said gripers or pinchers, D, or their equivalents, and by the same drawing the candles from their respective molds and suspending the same above the molds until the next series of candles are molded and those suspended are cut from the wick and removed in the manner and for the purpose described and set forth.

Notes & Queries

S. A. W., of Mass.—We thank you for the list of names you send us. We do not think your hand power attached to a churn, or any other domestic machine like a washing or sewing machine, is patentable; but if you desire it, we can have an examination made at the Patent Office, and thus be able to give you more satisfactory advice. The price of the examination is $5. A number of patented straw-cutters have the knife arranged on a wheel, so adjusted as to make a drawing cut. In some of the early volumes of the Scientific American you will find engravings of such machines.

R. R. T., of N. Y.—India-rubber varnish, made by dissolving india-rubber in benzole, is suitable, we think, for protecting the seams of glass door plates and preventing the entrance of moisture. India-rubber dissolves in turpentine, but the varnish thus made dries very slowly. To make a superior black japan varnish for iron work, take 50 lbs. of asphaltum and 8 lbs. of gum anime, and fuse them together in an iron vessel. In another vessel place 12 gallons of drying linseed oil and bring it to the boiling point; then pour this among the fused asphalt and gum, and boil them all together with effectual stirring until they are completely incorporated and have attained to a ropy consistency; take it off and cool, then thin it down for use with spirits of turpentine. It should be applied to iron work in several successive coats, each of which should be thoroughly dried in an oven heated to 212° or 300° Fah. The addition of some "amber varnish," made with amber boiled in linseed oil, greatly improves common asphalt varnish, but increases its expense.

A. T., of Canada.—Your plan for superseding the negro minstrels by a band of singers dressed in burlesque costume to represent different nations, we have no doubt would be a very profitable enterprise if well managed. The community is always ready to pay for good simple music. There would be no possibility, however, of your obtaining a grant for an exclusive right to the business from the United States government. Exclusive rights are granted only by general laws, and the idea is not patentable. The right of acting any original play may be secured under the copyright law.

J. V. B., of Ind.—We did not receive your plan of a school house. The water raised by an Archimides screw discharged upon a water wheel would not turn the wheel with sufficient force to work the screw. It would just do it provided there was no friction of the machinery or of the water in its passage through the tube, nor any other resistance except mere gravitation, and provided that the water could be discharged upon the wheel so as to utilize its whole power. Even then you would barely raise the water, and would have no surplus power for other purposes.

P. D. G., of Minn.—To harden a steel plowshare without having it twist, prepare a bath of naphtha heated to 200° Fah., and after heating your steel, as usual, to a cherry red, plunge it into the bath till the naphtha boils, then withdraw it and plunge it into cold water. Draw the temper in the usual manner.

J. S., of Pa.—You can buy steel punches with letters on their ends, for making stamps, at William Ward's, 47 Chatham-street, this city, for 18 cents apiece. These are tapered at their lower end, but he will have them made for you in the form of type, at about the same price. These punches, as well as the stamps, are made by men who have learned their art, like any other trade.

J. M. L., of Ind.—You can make the india-rubber cement, yourself, for shoe soles, by dissolving shreds of india-rubber in refined turpentine, or, what is better, in good naphtha. Gutta-percha dissolved in naphtha makes a good cement also. We do not know where such cements are sold.

C. W., of N. Y.—A horse power is a power which will raise 33,000 lbs. one foot high in one minute. The machinist's trade is a very good one for a boy to learn. It would be well for him to get as good an education as possible before going to his trade.

S. C., of Ind.—Boiled linseed oil is the best substance known to us for making waterproof tarpaulins. Resin varnishes will not answer for this purpose, because they become quite hard when dry.

R. M. G., of N. Y.—Large numbers of envelopes are manufactured with business cards in water lines upon their face.

E. G., of Conn.—The only effect of the crank motion on the power, is that of increasing the friction in certain parts of the stroke.

G. W. T., of Del.—A continuous motive power cannot be obtained from a permanent magnet. Was not the machine which you saw driven by steam or some other power?

N. S. B., of Ill., and J. W. H., of Iowa.—Our opinion coincides fully with yours in regard to the economy of working steam expansively in high pressure engines.

J. F. W., of Wis.—Your plan for superseding flat belts with ropes, for driving machinery is objectionable on account of the increased friction. It is surprising how little disposed a belt is to slip on a pulley; there is no difficulty from this source.

W. P. K., of Mass.—The hight to which mercury would rise in a thermometer tube ½ inch bore, subjected to a temperature of 12° Fah., would depend on the size of the bulb.

E. B., of Pa.—Glass blowers split up long cylinders of glass by first drawing a red hot rod of iron along each cylinder on the line in which it is to be divided, then snapping it between the thumb and fingers of the two hands. By this mode, you can divide your long glass tubes into several short ones.

A. McE., of N. Y.—We really do not know how you can unite cast-iron with wrought iron "perfectly," in a mold, by pouring the cast around the wrought iron, unless the latter is heated to about the welding temperature. Wrought iron rods, for railings, are tied at their intersecting points, with cast iron run round the rods in small, hard molds; but although this method holds them together more firmly than simple riveting, still the two metals are not fused together.

J. M. G., of Ohio.—No power is lost by yoking the cranks of two piston rods in line with the shaft of a saw mill. The cranks of two engines are usually yoked at right angles to one another, to produce regularity of motion.

T. B., of Ind.—We believe that a patent may be obtained for treating molds for gold castings, as you have described, if it is found to be an improvement on the common modes of casting. All the engines of steamships are fitted with counters which indicate the revolutions of the main shaft during each voyage; you therefore could not obtain a patent for such an instrument. No advantage would be secured by coating iron telegraph wires with copper: better use solid copper wires which have just eight times the conducting capacity of iron.

A. M. O., of Wis.—The substance which you send us is clay colored with peroxyd of iron. It is worthless except, perhaps, for making brick.

H. M. H., of Pa.—We are not able to give you the names of the principal operators at the oil mills at Franklin.

S. T. R., of N. Y.—The aerophon is essentially the same instrument as the caliope. It consists of a series of steam whistles, of different sizes, to sound the several notes of the gamut, with valves and keys to let the steam into such as may be necessary to produce the music desired. It was patented by J. C. Stoddard, in the United States and Great Britain.

M. Q. P., of Mass.—The old way of polishing cabinet work, without varnish, was by rubbing over its surface with a little sweet oil, then rubbing down vigorously with a cushion of silk: an old silk handkerchief would answer your purpose.

A. J. B., of Kansas.—The pencil point which you have sent us appears to be composed of tin and lead. Without a chemical analysis, it would be impossibbe to tell its real composition.

Money Received

At the Scientific American Office on account of Patent Office business, for the week ending Saturday, Jan. 26, 1861:—

H. & N. H., of N. Y., $30; T. D. I., of Mich., $55; S. F., of Pa., $55; R. & McC., of N. Y., $40; T. H. G., of Wis., $100; E. C., of Conn., $32; M. S., of N. Y., $55; A. M., of N. Y., $150; C. T. S., of N. Y., $30; J. A. M., of Mo., $30; A. R., of Mich., $25; S. & R. W. C., of Ohio, $25; J. E. T., of N. Y., $150; N. & S., of Conn., $10; D. K., of Pa., $25; L. M., of Wis., $55; J. M. R., of Ky., $30; J. S. S., of N. Y., $55; O. S., Jr., of Vt., $25; F. C. T., of N. Y., $25; S. McL., of N. Y., $30; D. M. C., of Ind., $20; A. L. W., of N. Y., $20; T. C., of N. Y., $48; J. O., Jr., of N. H., $20; S. & S., of N. Y., $30; E. P., of Conn., $55; L. R., of Conn., $64; S. & R., of N. Y., $30; A. D. B., of Mass., $25; S. T. B., of R. I., $100; A. M., of Maine, $35; F. D., of Ohio, $25; T. & E., of Pa., $30; J. M. W., of N. Y., $40; J. E., of Maine., $30; B. R., of N. Y., $30; J. & D. B., of N. J., $25; C. & C., of N. Y., $25; S. McL., of N. Y., $25; G. S. T., of Mich., $25; J. S., of Texas, $25; B. R., of N. Y., $21; R. & T. S., of Cal., $250; W. N. M., of Mass., $30; W. F. S., of Ohio, $25; C. G. D., of N. Y., $25; I. D. S., of N. Y., $30; E. T. C., of Mass., $25; S. K. W., of N. Y., $10; F. D. B., of Mass., $25; W. H., of Iowa, $21; L. & M., 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 Jan. 26, 1861:—

R. & McC., of N. Y.; L. P., of Conn. (2 cases): D. K., of Pa.; H. D., of Ohio; A. M., of Maine; A. D. B., of Mass.; J. M. R., of Ky.; T. C., Jr., of N. Y.; S. & R. W. C., of Ohio; R. S., of N. J.; J. & D. B., of N. J.; E. P., of Conn., J. S. S., of N. Y.; J. R. R., of Mass. (3 cases); J. & A. J. R., of Mich.; O. S., Jr., of Vt.; J. M. P., of Ohio; C. & C., of N. Y.; W. F. S., of Ohio; E. T. C., of Mass.; S. McL., of N. Y.; T. & L., of Mich.; B. R., of N. Y.; J. S., of Texas; W. W. V., of Cal.

New Books and Periodicals Received.

Negroes and Negro "Slavery:" The first an inferior Race; the latter its Normal Condition. By J. H. Van Evrie, M. D.

The above work has been received from the publishers, Van Evrie, Horton & Co., No. 162 Nassau-street, New York.

The Atlantic Monthly, for February.—Published by Ticknor & Fields, Boston.

In the "Professor's Story," Dr. Holmes gives this opinion of a kiss: "So Mr. Bernard thanked Helen for her interest without the aid of the twenty-seventh letter of the alphabet—the love labial—the limping consonant which it takes two to speak plain."

The American Journal of Photography.—Edited and published by Charles A. Seely, No. 424 Broadway, New York.

The editor's thorough mastery of the art and science of photography, as well as the kindred sciences, gives a peculiar reliability to the statements of this journal.

Bibliotheca Sacra and Biblical Repository.—Published by Warren F. Draper, Andover, Mass.

This is a theological and classical quarterly, the organ of what is called "New England Theology." It is edited by Professors Park and Taylor, and has a world-wide reputation for learning. The number for the present quarter contains an able article on the philosophy of Sir William Hamilton and his recent theological teachings.

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.

The North Atlantic Telegraph.

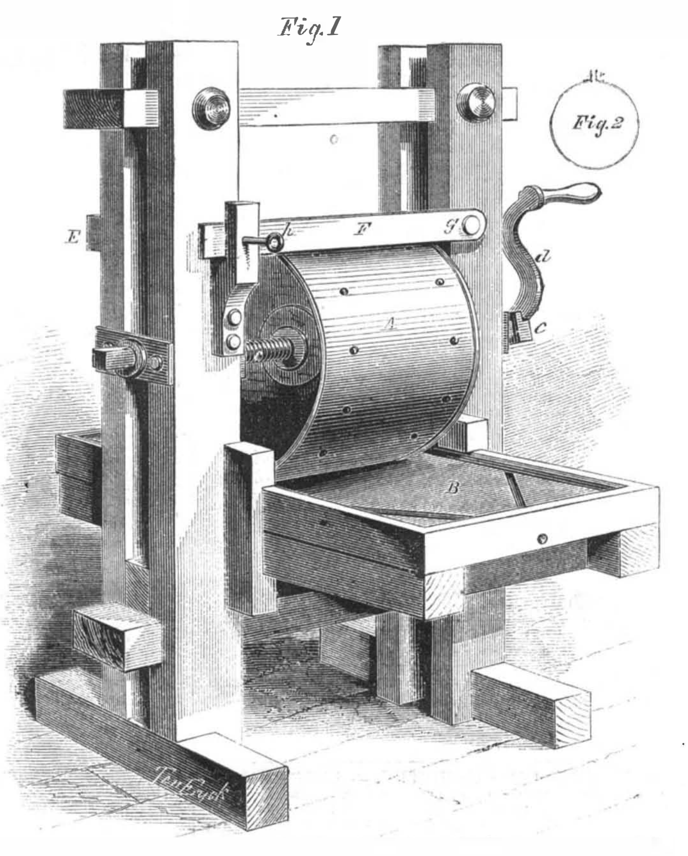
On page 41, Vol. III. (new series) of the SCIENTIFIC AMERICAN, we gave a brief account of this project, and the survey which had been made of the route by T. P. Shaffner, Esq., the originator of the enterprise. We also stated that the British government had furnished the ship *Bulldog* to resurvey the entire route through the Northern seas, and report upon the practicability of laying several marine cables so as to provide an ocean telegraph between Europe and America. This surveying expedition returned to England last month, and its commander, F. Leopold McClintock, has made a report of his labors. This survey has corroborated that made by Mr. Shaffner in his schooner last spring, and the practicability of the route is now believed to be a settled question. Capt. McClintock says: "The contour of the sea bottom, and depth of the ocean throughout, is decidedly favorable, and the soundings very regular."

The plan is to lay a cable from the north shore of Scotland to the Faroe Islands, another from thence to Iceland; another to the coast of Greenland, and the last to the coast of Labrador. There will, therefore, be no less than three relay stations on this route; and, it is to be hoped, that although two of the cables will be about 600 miles long, they will be worked without difficulty. It had been supposed that the drift ice in the Northern seas would render the laying of the cables an impossibility, but Capt. McClintock has given the following different opinion: "As for the short lengths of cable between Scotland and Faroe, and from thence to the east shore of Iceland, no difficulties need be encountered; there are certain channels between the Faroe Isles where the tides are very strong, but there are also still-water creeks, and these, I presume, will be selected for landing the shore ends. * * * The shores of Iceland are only visited by drift ice about seven or eight times in each century, and it is only upon two or three of these occasions that the drift ice is sufficiently extensive to reach the south side and surround the whole island. True icebergs are never seen; the heavy masses often so called, are small enough to float freely in comparatively shallow water, so that a cable would remain undisturbed at the bottom, the shore end being carried up a fiord." In a letter to Sir Charles Bright (of Atlantic Telegraph Cable notoriety), he states that a land line should be laid across Iceland to Faxe Bay, which never freezes, and where drift ice is seldom seen. He believes that a cable may be laid down in the autumnal months without obstructions, and that its shore ends may be carried into bays perfectly secured from icebergs and drift ice. A suitable situation for landing the shore end of the cable on Labrador has yet to be sought, but no obstacle to this is believed to exist. Captain A. Young, also of the expedition, in his reports addressed to Mr. J. R. Croskey, states that his decided opinion is favorable to the practicability of the undertaking; and that "the cable once laid, no drift ice can in any way injure it, if the proper precautions are taken in securing the shore end." Dr. Rae has also made a report, stating that he does not believe the ice, either in the form of floe or bergs, can injure a cable if once down, and that in ordinary seasons a cable may be laid without much difficulty. The delegates which were sent with the vessel by the Danish government express equally favorable opinions. From such information, we are led to indulge in the reasonable conclusion, that a new Atlantic Telegraph Company will soon be formed in London, and that we may hear of an ocean telegraph line in operation in four or five years from the present date. Large cables can be used, which will secure speed in telegraphing.

Improved Cheese Press.

Simple as is the operation of pressing a cheese, there have been numerous patents for improvements in the apparatus, and the series seems to be by no means completed. The object of the invention here illustrated is the production of a novel, cheap and simple press, of easy and efficient operation.

In the engravings, Fig. 1 is a perspective view of the whole press, and Fig. 2 shows the mode of fastening the edges of the hoop together. The hoop, A, perforated with numerous small holes to allow the escape of the whey, is laid upon its edge or periphery on the table, B, in such a position that its center will be in line between the two screws, *c c*. These screws have followers at their ends, nearly filling the hoop, which are forced alternately inward by turning first one screw and then the other, by means of the handle, *d*, which is made to fit the square outer ends of both screws, and is movable so as to be transferred from one to the other.



TAFT'S IMPROVED CHEESE PRESS.

The hoop is held in place in the frame of the press by the stationary bar, E, on one side of the frame and the movable bar, F, on the other. The bar, F, is secured by the pivot, *g*, at one end, and by the pin, *h*, at the other end. The pin, *h*, has a screw at its end by which it is screwed into the solid part of the frame. When the pressing operation is completed, the screws, *c c*, are turned outward so as to withdraw the followers from the hoop, the pin, *h*, is taken out, when the bar, F, can be turned up out of the way, and the hoop with the cheese in it taken out of the press with the greatest ease.

The advantages of this press are—

1. The cheese is pressed without turning.
2. It is pressed on both sides at the same time.
3. The whey must all run off and leave the cheese dry on the surface, and not sour and injure the rind.
4. The whey is all pressed out, leaving the cheese solid like butter; hence there is no fermenting, and the result is the cheese will preserve its condition perfectly, and neither crack, leak whey nor swell.
5. The cheese will cure for market in from one-half to two-thirds the time required by cheese pressed in the ordinary way.
6. Pressure is so great that the cheese curd may be perfectly cold, and the result is the white whey or butter of the cheese is not pressed out.

This press was patented by Myron E. Taft, and the patent was granted through the Scientific American Patent Agency April 10, 1860. The right has been assigned to Smith, Taylor & Co., of Cleveland, Ohio, to whom inquiries for further information in relation to purchasing territory or presses may be addressed.

INFLUENCE OF EXTREME COLD UPON SEEDS.—Some experiments have been made this year, by Professor Eli Wartmann, of Geneva, Switzerland, on the influence of extreme cold upon plants. Nine varieties of seeds, some of them tropical, were selected. They were placed in hermetically sealed tubes, and submitted to a cold as severe as science can produce. Some remained fifteen days in a mixture of snow and salt; some were plunged into a bath of liquid sulphuric acid, made extremely cold by artificial means. On the 5th of April they were all sown in pots, and placed in the open air. They all germinated, and those which had undergone the rigors of frigidity produced plants as robust as those which had not been submitted to this test.

THE HOT SPRINGS OF ARKANSAS.—Of the hot springs there are some sixty-four distinctly recognizable, besides a considerable number in the bed of the creek. With one exception, their temperature ranges from 120° to 140° Fah., and their composition is nearly the same. The exception is a warm spring (temperature 100°) discovered a year ago on the bank of the creek, beneath the others. It has a strong odor and taste of sulphur, and is believed to have considerable virtues. The quantity of water discharged by the various hot springs is estimated at 350 gallons per minute (one spring affording 60 gallons), or say about 500,000 *gallons per diem.*

FROM THE STEAM PRESS OF JOHN A. GRAY.