Scientific American.

A JOURNAL OF PRACTICAL INFORMATION IN ART, SCIENCE, MECHANICS, AGRICULTURE, CHEMISTRY, AND MANUFACTURES.

VOL. IV.---NO. 3. NEW YORK, JANUARY 19, 1861. NEW SERIES.

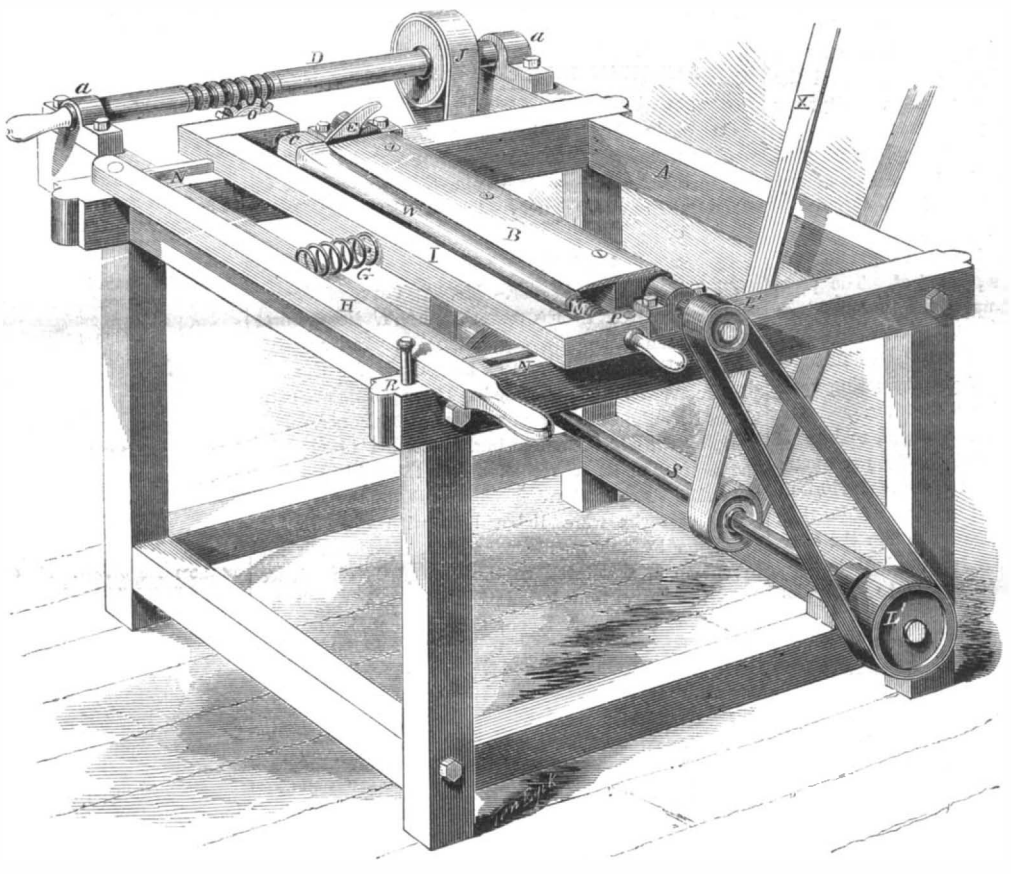
Improved Spoke Machine.

If there is one thing more than another which surprises Europeans when they come to the United States, it is the great number of elegant pleasure carriages which they behold wherever they go. This is no doubt principally due to the more general distribution of wealth among our people, by which they are enabled to obtain and use such vehicles; but, at the same time, it is also due, in a great measure, to the more general application of improved machinery for executing various kinds of work, the manufacture of which, in other countries, is performed by hand labor. Thus, in making the parts of wheels for carriages, alone, we employ one machine for fabricating the hubs, another for the felloes, and still another for the making of the spokes. Every improvement, however small, in this department of American industry is of much importance from the fact of there being such an endless number of wheeled vehicles employed.

The accompanying engraving is a perspective view of a machine for turning the spokes of wheels, for which a patent was granted to John Gilchrist, of Berlin, Wis., on the 3d of October, 1860. B is the rotating cutter shaft, on which are secured two or any desired number of blades. Each blade is as long as the spoke to be cut, so that its whole length is operated upon as the cutter shaft rotates. The cutting edge of each blade is slightly curved where it is intended to cut the thicker end of the spoke, so as to produce the slightly curved outline upon it. L is a pulley which drives the pulley on the cutter shaft by a belt L′; power is communicated by the belt, X, to drive the main shaft, S, of the machine, as represented. The piece of wood, W, to be formed into a spoke is held in the carriage, I, between the centering screw, and the sharp edge of the pattern, C, which is fastened to the inner end of a short shaft which has its bearings in the carriage, I, and has on its outer end the worm wheel, O. The latter wheel takes into the thread of a long screw, D, supported in bearings, *a a*. The screw shaft receives motion from and is connected by the pulleys and belt, J, with, the main shaft, S. The stick, W, is secured for cutting by the screw, as shown. A guard, E, is fastened to the main frame at one end of the cutters, and it is arranged in line with the pattern, C. The feed carriage, I, slides on ways, N N′, and it is guided at the end of the center screw by a pivot, P, projecting from the bottom of the carriage, underneath the screw into a groove cut into the way, N′. It will be observed that while the feed carriage, I, slides in the ways, N N′, it can also swing around the pivot, P. One end of a strong spiral spring, G, is fastened to the middle portion of the lever, H, which is pivoted to the main frame at A. The other end of this lever is confined with a pin, R.

As represented, the spiral spring, G, bears against the back of the feed carriage, I, and pushes it forward to the cutter until the pivot, P, rests against the forward end of the groove in the ways, and the pattern, C, against the guard, E. As the driving shaft revolves, the cutter shaft and that of the screw rotate at the same time. The cutter revolves with a high velocity, but the screw, D, rotates very slowly, thus causing the worm wheel, O′, the shaft of the pattern, and the stick, W, to revolve with a like slow speed. The whole circumference of the stick, W, as it rotates, is gradually exposed to the action of the cutters, until it is formed according to the pattern in the machine. When the pivot, P, comes against the forward end of the groove and a spoke is completed, the feed pressure of the spring, G, on the back of the carriage, I, is relieved by releasing the lever, H. The carriage is then drawn back from the cutter, B, the centering screw turned back, and the finished spoke, W, removed, to make way for another stick, to be cut in the same manner. The pattern, C, in its rotation, always bears against the guard, E, and the pivot, P, rests uniformly against the end of the slot in the bearing, N′. The pattern end of the feed carriage, I, is therefore made to recede from or approach the revolving cutter, as the diameter of that portion of the pattern which is in contact with the guard, E, increases or diminishes. The pivot, P, serves as the center of this motion. As the pattern corresponds with the shape of the thicker end of the spoke, the stick of wood is cut accordingly and with a tapering, cylindrical form towards the end that is held by the centering screw. A perfect spoke is thus produced during one revolution of the piece of wood fed forward to the revolving cutters.

The patent for this improved spoke machine was obtained through the Scientific American Patent Agency. More information may be obtained by addressing the patentee, Post Office Box No. 1,838, Chicago, Ill.



GILCHRIST'S IMPROVED SPOKE MACHINE.

Reproducing Ancient Manuscripts.

The following useful information on this subject is taken from the able Paris correspondent of the London *Photographic News:*—One of the earliest applications of photography consisted in the reproduction of ancient manuscripts; but this application has never taken the development expected of it. By the employment of Colonel Sir Henry James' method of zinco-photography, a sphere of the greatest interest and usefulness is opened up, which we hope to see extensively utilized. There are numerous rare historical manuscripts, *fac-similes* of which would be desirable additions to public libraries in all parts of the world. These copies could be produced by the process of zinco-photography, at an almost insignificant cost. A very curious fact has been recently brought to light, which touches the question of photography of the invisible, viz., that the effaced or faded portion of the writing of old manuscripts is restored in the photographic reproduction. Thus, the copy becomes more legible and perfect than the original. M. Vincent, one of the members of the "Académie des Inscriptions et Belles Lettres," recently presented to that body the first *fac-simile* of a manuscript reproduced photographically by M. Silvy. It was the Sforza manuscript, the original of which is in the possession of the Marquis d'Azelio. It is scarcely necessary to remark that all the designs and ornaments of this precious work are reproduced with marvellous fidelity. But the circumstance that deserves particular mention is, that certain passages which could not be deciphered in the original old parchment have actually been revived. This is particularly striking on the last page, where a note, written in German, under the signature, has not only become visible, but legible, while not the slightest trace of it can be discovered in the original. This remarkable circumstance is thus explained by M. Figuier:—On old parchments the ink, under the influence of time, assumes a yellowish tint, which often becomes undistinguishable from that of the parchment, so that it cannot be read without the greatest difficulty. But, during the photographic process, the brilliant and polished parts of the parchment reflect light much better than those where the ink has been deposited. However colorless it may appear, the ink has not lost its anti-photogenic qualities, opposed to the photographic ones of the parchment, and, thanks to this opposition, black characters may be obtained on the sensitive collodion in exchange for the much paler ones of the original.

In the London *Engineer*, a correspondent states that the opinion is erroneous, which was first broached by Professor Faraday, that "a drop of water contains as much electricity as an intense flash of lightning."

POWER OF BODIES IN MOTION.

BY JOSEPH W. SPRAGUE.

It is a well-recognized principle in mechanics that whatever amount of power has been expended upon a body in changing it from a state of rest to one of motion, the same amount of power will be yielded up by the body to whatever brings it back to a state of rest. When, therefore, we determine the amount of power necessary to impart to any body at rest the velocity v, we also determine the amount of power necessary to stop the same body when it is moving with the velocity v, for the two amounts are equal.

All our knowledge of force and the work which it accomplishes, or power, is derived from experiment. Let us therefore take some well-known instance of force at work, and deduce from it a general law. The most familiar of all forces is *gravity;* the intensity with which it acts upon any body is measured by the *weight* of that body. Experiment shows that a body abandoned to the sole action of gravity acquires, at the end of one second, a velocity of 32.2 feet per second; at the end of two seconds, a velocity of 64.4 feet per second; at the end of three seconds, a velocity of 96.6 feet per second; at the end of four seconds, a velocity of 128.8 feet per second. If then v represent the velocity in feet per second; t, the number of seconds during which the body has been abandoned to the sole action of gravity; and g, the experimental number 32.2, we have $v=gt$. During the first second, the body falls through a space of 16.1 feet; in two seconds, through 64.4 feet; in three seconds, through 144.9 feet; in four seconds, 257.6 feet. If then s represents the space, in feet, passed over by the body, we have s equal the product of the time and the mean velocity, or $s=[\,(o+v)\div 2\,]\times t=vt\div 2=gt^2\div 2$.

Suppose an iron ball weighing 1,440 lbs. to rest upon the piston of a vertical cylinder having an area of one square foot. Consider the piston itself devoid of weight, and moving without friction. Admit below the piston steam having a tension of ten pounds per square inch, or 1,440 lbs. per square foot. The pressure of the steam (1,440 lbs.) upon the under side of the piston just balances the weight of the body, and there is no motion; that is, the expansive force of the steam just equals the force of gravity acting upon the body, and the two neutralize each other.

Next double the tension of the steam, making it twenty pounds per square inch, or 2,880 lbs. per square foot. We now have a downward force of 1,440 lbs., and an upward force of 2,880 lbs. The resultant is an upward force of 1,440 lbs.; that is, under the combined action of steam and gravity, the ball has the same tendency to *rise* that it would have to *fall* under the sole influence of gravity. We know, then, that the piston and ball will, in one second, rise 16.1 feet, and acquire a velocity of 32.2 feet per second; in two seconds, rise 64.4 feet and acquire a velocity of 64.4 feet per second; in three seconds, rise 144.9 feet and acquire a velocity of 96.6 feet per second; in four seconds, rise 257.6 feet and acquire a velocity of 128.8 feet per second; and in t seconds, rise $s=gt^2\div 2$ and acquire a velocity $v=gt$.

We have for the cubic feet of steam consumed, the area of the piston multiplied by the hight it rises, in the first second, 16.1 cubic feet; in two seconds, 64.4 $=4\times 16.1$ cubic feet; in three seconds, $144.9=16.1\times 9$ cubic feet; in four seconds, $257.6=16.1\times 16$ cubic feet; in t seconds, $16.1\times t^2$ cubic feet.

Thus it will be seen that while the velocity increases as the numbers 1, 2, 3, 4, &c., the power expended (steam consumed) varies as the numbers 1, 4, 9, 16, &c.; that is, the power expended in producing any velocity varies as the *square* of that velocity. In determining the *absolute* quantity of steam used in producing velocity, it must be remembered that one-half of the above quantity is consumed in overcoming the resisting force of gravity, the other half alone producing motion. This would not, however, affect the *relative* quantities used.

For deducing a general rule, let W represent the weight of the ball in pounds; a, the area of the piston in square feet; and b, the tension, in pounds, per square foot of the steam. Making, as before, the pressure on the piston twice the weight of the body, we have $a\times b=2W$.

The quantity of steam consumed, while the piston and ball rise through s feet in t seconds, acquiring a velocity of v feet per second, is $a\times s=a\times(gt^2\div 2)=a\times(g\div 2)\times(v\div g)^2=a\times(v^2\div 2g)$.

As half of this is consumed in resisting the force of gravity, we have for the steam actually employed in producing the velocity, $(a\div 2)\times(v^2\div 2g)$.

The introduction beneath the piston of 10 cubic feet of steam, having a tension of 20 lbs. per square foot, is equivalent to raising 20 lbs. 10 feet high, or 40 lbs. 5 feet high, or is equal to $20\times 10=200$ feet-pounds, whatever be the size of the piston. Hence, if we multiply the cubic feet of steam used by the pressure (b) of the steam per square foot, we shall have a correct measure of the mechanical effect, or power, expended in producing the velocity v. Representing this mechanical effect by B, we have $B=b\times(a\div 2)\times(v^2\div 2g)=(ab\div 2)\times(v^2\div 2g)=W\times(v^2\div 2g)=\frac{1}{2}\,[\,(W\div g)\times v^2]$.

This last expression measures the power required to produce the velocity v in a body whose weight is W, and consequently measures the power stored up in this body, when moving with the velocity v. This power the body will yield up when it is forced to come to rest.

In determining the unit of mass of a body, physicists have taken as the unit that body whose weight is 32.2 lbs (or g). This choice was an arbitrary one, as any other might have been made just as well; the object of taking this peculiar value was to simplify the very result we have just obtained. If M represents the *mass* of a body, then $M=W\div g$. Substituting this above, we have $B=\frac{1}{2}Mv^2$. The product Mv^2 is called by physicists *vis viva* or living force. Hence we say the power stored up in a moving body is equal to one-half its *vis viva*.

AMERICAN ENGINEERS' ASSOCIATION.

[Reported for the Scientific American.]

On Wednesday evening, Dec. 26th, the regular weekly meeting of this association was held at its room, No. 24 Cooper Institute, this city—John. C. Merriam, Esq., President, *pro tem.*; Benj. Garvey, Esq., Secretary.

MISCELLANEOUS BUSINESS.

Carr's Low Water Detector.—Mr. A. Carr, of Jersey City, submitted to the association, for its opinion thereon, his patent low water detector. In its operation no alloys are used, and a new mode for the displacement of water is claimed. These points are considered by the inventor as very important ones. Mr. Carr, by the aid of a drawing, proceeded to explain the manner of its construction and the principles involved in its operation.

His remarks were listened to with considerable attention by the members present, after which his invention was referred to the Committee on Science and New Inventions. This committee, through its chairman, Mr. Louis Koch, then presented the subjoined report:—

Your committee having before it Roosevelt's "Anti-Friction Axle" and West's "Double-Acting, Anti-Freezing, Lifting and Forcing Pump," would respectfully submit their report on said inventions, based on a full and careful inspection and consideration, as follows:—

1. That in regard to Mr. Roosevelt's "Anti-Friction Axle," it is found that the principle being to insert an axis between a series of small rollers working between two plates, forming the sides and the rim of the wheel, your committee find that the area of friction presented by the grooved and tongued rollers, together with the bearing of the side plates, is greater than a common bearing would present, and that the stability of the wheel is less when dependent on such narrow limits as the model indicates would be allowed, than in a proportioned sized hub in a common bearing, and that in consequence of the friction rollers presenting so small a surface of bearing to the axis every tendency of side motion will necessarily increase the wear and tear of the small bearing of the side plates. In consequence of the above stated reasons, your committee are enabled to find properties in this invention, that would make it as valuable as a common axle bearing has been found to be.

2. That in relation to West's improved pump, it is found that, in regard to the claim consisting in a vent-hole over the suction piston, so that the water remaining in the pump immediately after use will flow away, it is the opinion of your committee that, though there is necessarily a small loss of water during the act of pumping through this hole, this inconvenience may be regarded of little consequence, the main object of non-freezing being secured, which is particularly of importance whenever the pump is of difficult access. Your committee also think the arrangement of two suction valves in the air chamber and in the bottom of the lower cylinder, respectively, is good, insuring a greater guarantee against choking. The committee have also been favorably impressed with the arrangement of the combined piston, working at the same time in an upper and lower cylinder, this latter being twice the size of the former, the quantity of water or liquid discharged being dependent on the diameter of the upper smaller cylinder and the length of the stroke, each piston being packed with overlapped expansion leather rings, the friction is always in proportion to the amount of work done, the suction piston being always under water when working, and the upper piston receiving a constant pressure from below, the action of the atmospheric pressure is counterbalanced; this is insured further by extending the exhaust pipes over and above the upper portion of the upper piston, whereby the chamber between the two pistons is kept full of liquid during the working of the pump.

Therefore your committee would respectfully recommend this pump to the favorable consideration of the society..

That part of the above report relating to Roosevelt's "Anti-Friction Axle" was, on motion, postponed to a subsequent meeting, to give an opportunity to members of discussing the principles claimed for it by the inventor. The portion referring to West's pump was then considered by the society. The inventor having kindly sent one of his pumps to the room of the Association, it was taken apart and the principles involved in its construction, together with the manner of its operation, were very clearly shown by Messrs. Koch, Simpson, Garvey and others.

The discussion that ensued did not present any new features; it only more strongly indorsed the pump in its adaptability to railroads, deep wells, decks of vessels, &c., &c., than did the report. A vote then being taken upon the acceptance of the report, it was unanimously adopted as the opinion of the society.

At this juncture, Mr. Garvey introduced to the notice of the members present, the pump styled the "Hydropult." By the aid of a drawing upon the blackboard, he very fully explained its construction and the principle upon which it operates. Although there was no extended discussion upon its merits, the sense of the meeting was adverse to its practicability. It was considered that the power required to work it was purely an exhausting one, in other words, it was a "dead pull." The amount of friction it prevented would compare unfavorably with the double-acting single cylinder pump. They thought it quite useful in washing windows, watering gardens, and even quenching small fires, but where much water or heavy work was required it could not be of efficient service.

The committee on accidents and their causes presented through their chairman, Mr. Merriam, the annexed report:—

The chairman, in company with Mr. G. E. Beach, a member of this committee, visited the steamer *Commonwealth* at her pier on the afternoon of the 19th, reported as having collapsed a flue at Hellgate. We found that she had opened a hole some twelve inches long above a row of rivets in her steam chimney or dome. On examining the plates we found them corroded at the seam so as to be but ⅛ of an inch thick. We account for this corrosion as follows:—The plates instead of being lapped so as to shed water are on the contrary so riveted as to arrest the particles of water at the seam, thus creating a constant rustling at that point. This is apparent from the fact that the iron ¼ of an inch above is as sound as possible.

Again, the chairman of the committee was upon a train coming from Philadelphia on Monday night last. Said train was delayed this side of Newark by the bursting of a tire on the main driver. Most fortunately the tire caught in such a manner as not to throw the engine off. On examining the break he found that the iron was very faulty, containing a flaw transversely of at least one-half the sectional area of the flange and tire.

This report was, on motion, accepted and placed upon file.

Letters in relation to late business before the society were read from Messrs. Ashcroft and Mead; they were referred to the appropriate committee.

SUBJECTS FOR FUTURE MEETINGS.

Mr. Koch proposed for discussion on the evening of January 9th, "Scale upon Boilers."

Mr. Garvey proposed for the evening of the 16th, "The Consideration of Cut-offs."

The meeting then adjourned.

Sugar.

The following, from the *Chemical News*, is an extract from a recent lecture on this interesting subject by Professor Lankester, of London, England:—

We find sugar more generally contained in the juices or the sap of plants than in any other form. Sugar has the remarkable property of fermentation, and it is during the process of this change of sugar that alcohol is produced, therefore you see we can make alochol from starch, but we must first convert the starch into sugar, and I now call your attention to the chemical composition of sugar as being of the same kind as starch. I have here some sugar, and I will submit it to the action of a substance that will draw away the water, and leave the carbon to act freely. I first dissolve it in warm water, and will then pour upon it some sulphuric acid, and this will withdraw a sufficient quantity of water for you to see that the sugar contains a large quantity of charcoal. You see, now, what a large quantity of charcoal is developed from this

sugar—there it is black, boiling, and hard from the action of the sulphuric acid. It is thus that we can demonstrate the presence of the charcoal, and in this way that very useful material which we call blacking is manufactured. A quantity of sugar is taken and sulphuric acid is added, and you see in what a shining state the carbon is left when it has been submitted to this process. In this way you see we can prove that the starch contains the same material.

Let me now call your attention to the history of the plant in relation to the sugar. During the germination of plants sugar occurs in great quantities. If we throw these seeds into the ground, the little embryo in the interior grows, and that process is called germination. There is a large quantity of starch surrounding this little embryo, and as it grows the starch is converted into sugar, and this starch is as necessary for young plants as it is for young children. Now this is the case, on a very large scale, in the process of malting. The maltster takes his barley, immerses it in water, causes the seed to germinate, and then he roasts the young plant, seizing the sugar which it has just made, and converts it into beer. Then again we find the stems of plants in certain seasons of the year contain large quantities of sugar; thus, the whole of the grasses, wheat, barley, oats, rye, rice, and maize, contain sugar in their stems when they are about to flower; and it is just at this season of its development that the sugar-cane is used by man as an article of diet. We need not, however, confine ourselves at all to the sugar-cane. The only reason why we get sugar from nothing else arises out of our fiscal system, revenue being obtained from it, and sugar not being allowed to be grown in this country. In China they obtain sugar from the *Sorghum saccharatum*, which, like the sugar-cane, belongs to the family of grasses, and is cultivated in the North of China for the sugar it contains. Then the maize has been cultivated in America and Mexico for the purpose of obtaining sugar. When Cortes conquered Mexico he found the natives cultivating the maize and crushing it for sugar. The cocoa-nut tree of the island of Ceylon is a principal source of sugar, and there are a class of men whose occupation it is to ascend these trees and put on the blossoms of the tree a calabash to catch the exuding juice, which is an article of diet known in Ceylon as toddy, the men being called toddy-drawers. Again, at the budding season, the sap of plants contains sugar. The common osier has it. The birch, too, in England and Scotland is tapped for its sugar, and is converted in Scotland into an effervescing wine, exactly like champagne. In America there is a plant which contains so large a quantity of sugar that I think a third of the sugar consumed in the United States is obtained from it. It is the maple. Then the beet-root, the carrot, and the turnip contain sugar. When Napoleon Bonaparte excluded cane sugar from the French markets, they set to work to supply the loss, and adopted a German process, which resulted in the production of a very successful sugar from the beet-root and now, after years of production, sugar manufacturers are enabled to compete with the manufacturers of sugar from the sugar-cane. There is also another source of sugar in the fruit which we eat,—the fig, the pear, the apple and the orange, would be unpalatable but for their sugar.

I will now draw your attention to the different kinds of sugar. Although sugar is always sweet, and we call everything that is sweet sugar, yet there are various kinds of sugar. Sugar is obtained from milk; and we can, by taking the livers of animals and digesting them in water, obtain large quantities of sugar called liver-sugar, showing that animals have the power of producing or secreting sugar. Thus we have several kinds, and I would just call your attention to the four principal sources.

The cane sugar is found in the stems of plants, and in all those cases where it is procured before the flowering of plants, and in the roots of plants; so that the beet-root sugar and the ordinary sugar that we eat from day to day is cane sugar. But we obtain another sugar from fruit, which is uncrystallizable; and that fruit sugar is almost identical with another, which is called starch sugar; and fruit sugar and starch sugar are both known to chemists by the name of Glucose. The cane sugar is called Sucrose, and the sugar obtained from milk is called Lactose, while liver sugar is called Hepatose. Those are the four sugars. I told you just now that the liver contains a quantity of sugar; I may say that I believe it has been demonstrated that the liver does not contain sugar itself, but a matter which is easily converted into sugar; so that the instant you expose it to the air it becomes converted into sugar. We have in glucose a substance much more easily decomposed than the other forms of sugar; and I will finish by stating that this cane sugar is converted into this form of sugar, and then we have either glucose, lactose, or hepatose in the system. It is in that manner that the starch is converted into sugar, so that it becomes a heat-giving substance capable of maintaining heat in the animal body.

The Needle Women of London.

A correspondent of the London *Times*, describing one of the great mantua-making establishments in that city, communicates the following facts:—

Work is commenced every morning at 7 o'clock and continued till 11 at night—a period of sixteen hours, the only intervals allowed being about ten minutes for each meal; the total amount of time allowed for—eating their food, I was going to say, but, surely, "bolting" it is the more appropreate phrase—being forty minutes per day; thus leaving fifteen hours and twenty minutes as the period devoted to work. And this, be it remembered, is not merely during the busy season, as at the West End, but for all the year round, from January to December; for you must understand that, at the establishment to which I refer, the greater part of the sewing is given out to slop-workers in the busy season, and all that is done indoors is the original cutting out and ultimate fitting together of the separate pieces; but when the slack season comes, there is always as much sewing reserved as will keep the girls of the establishment employed up to the full pitch—so that there is, in fact, no "slack season" at all for them. And yet, for this continued and unrelenting pressure of sixteen hours' work per day, from year's end to year's end, this firm assume to themselves the greatest possible credit. They thank God that they are not as other firms are at the West End—oppressors and destroyers of young women. They never—not even for a few weeks in the busy season—make their people sit up till 3 or 4 o'clock in the morning! Oh, no!—their gas is always turned off in the workroom by 11 o'clock. Why, sir, the West End system, with its few weeks of severity, followed as it is by months of comparative leisure, is mercy itself, when viewed alongside of this unmitigated, "never-ending, still-beginning" slavery to which I am referring.

The only day of leisure which the girls of this establishment have is Sunday. From Monday morning to Saturday night, they are as complete prisoners as any in Newgate. They know not whether the sun shines or the rain falls at that time. They are not allowed to cross the threshhold even to purchase a pair of shoes or a new gown for themselves, and must employ their friends outside to do this for them.

Nor is the accommodation indoors such as in any way to reconcile them to this close confinement. The workroom, in which ten or twelve of them are employed, is only about twelve feet square, and is entirely devoid of arrangements for ventilation, which is the more to be deplored as, during the evening, they have to encounter the heat and foul air of three flaming gas burners right over their heads, every door and window being shut by which a breath of pure air could possibly enter. The bedrooms are equally uncomfortable, no fewer than six persons being huddled into one and four into another.

It is impossible to contemplate the condition of this class of workwomen, as disclosed by the facts quoted, without keenly sympathizing with it, and wishing that something might be done to mitigate its evils and misery.

A Drunkard's Brain.—Hyrti, by far the greatest anatomist of the age, used to say that he could distinguish in the darkest room, by one stroke of the scalpel, the brain of the inebriate from that of the person who lived soberly. Now and then he would congratulate his class upon the possession of a drunkard's brain, admirably fitted, from its hardness and more complete preservation, for the purpose of demonstration. When the anatomist wishes to preserve a human brain for any length of time, he effects that object by keeping that organ in a vessel of alcohol. From a soft, pulpy substance, it then becomes comparatively hard; but the inebriate, anticipating the anatomist, begins the indurating process before death—begins it while the brain remains the consecrated temple of the soul—while its delicate and gossamer-like tissues still throb with the pulse of heaven-born life. Strange infatuation, thus to desecrate the god-like! Terrible enchantment, that dries up all the fountains of generous feelings, petrifies all the tender humanities and sweet charities of life, leaving only a brain of lead and a heart of stone.

To Clarify Oil for Rifle Gun Locks.—Fill a phial three parts with almond oil, then fill up the remainder with clean lead chips. Keep the phial in a warm room and shake it now and then for a month, at the end of which time most of the mucilage and acid naturally in the oil will have combined with the lead, and thus be clarified and fit for lubricating gun locks and other similar work. The lead is easily procured in chips by cutting up with a knife a couple of elongated bullets.

FOREIGN SCIENTIFIC INTELLIGENCE.

[Translated for the Scientific American.]

COAL OIL FOR PAINTING.

The products of the distillation of coal, and especially of coal tar, seem destined to rival india-rubber in the variety of their applications. *L'Invention* describes an invention of Mr. Mallet for rendering the heavy oils derived from coal applicable to painting. The invention consists in dissolving resinous or gum-resinous substances in the oils. The oil is heated in a boiler and resins are added in various proportions from 50 to 100 per cent of the oil. The solution is filtered through a woolen strainer to separate all solid matters, and is either employed directly as a coating for wood, metal and other surfaces, or ordinary coloring matters are ground in it in the usual manner. These oils of coal tar have, in the crude state a very deep brown tint, which would injure the tone of most colors. This inconvenience is, however, remedied to a considerable extent, by purifying the oils by any known process. The quality of the resins also influences the tint of the paintings, and it is necessary for certain tones to employ the qualities of which the shades are the least deep.

These paintings, or the resinous solutions alone, may be used not only on wood, but also on stones, on the coatings of mortar and plaster, and especially on tiles, flower pots, metals, and articles of basket work. Detached objects may be covered by immersing them. These resinous solutions may also be applied to render linen impermeable. In this case the quantity of resin should be small; a twentieth part being sometimes sufficient. To give more suppleness to the solution a small quantity of india-rubber may be added; it readily dissolves in the oil. Two or three coats of these paintings leave a varnish on the surfaces covered with them.

BLEACHING OF PAPER PULP.

The *Annales des Mines* states that Messrs. Firmin-Didot and Barruel, in their experiments on the bleaching of paper pulp by the chloride of lime, have learned that this bleaching may be effected by means of carbonic acid. The carbonic acid gas is introduced into the liquid which contains the chloride and the matter to be bleached; it displaces the hypochloric acid. The generator of carbonic acid may be a furnace; the gas in this case being purified. It passes through three washing reservoirs in part filled with water, a refrigerator, and a purifier provided interiorly with a lattice work of osier covered with wool and with damp moss to arrest all the dust. Beyond this purifier is an air pump, which, after having drawn the gas through the preceding apparatus sends it through a last washer into a supply tube. Pipes, furnished with stop-cocks, lead from this tube, each of them communicating with a worm pierced with holes and placed at the bottom of the bleaching tubs. The carbonic acid is thus distributed as needed, in the same manner as steam is distributed.

THE PRESERVATION OF MEAT BY MOLASSES.

In many receipts for preserving hams, molasses is one of the principal ingredients, but Mr. Margueritte, in an article in *L'Invention*, asserts that meat may be preserved by molasses alone in the most perfect manner, and with the following important advantages: It has an agreeable flavor, it produces no scurvy or other disorders which result from the use of salt food, and it may be prepared at a moderate price.

The process consists simply in cutting the meat into pieces of moderate size and dropping them into molasses, such as is obtained from the sugar manufactories or refineries. By a natural process of osmose the lighter juices of the meat pass out, and the heavier molasses penetrates inward to every part of the meat. When the external molasses has acquired a certain degree of liquidity from the mixture of the juices of the meat, it is a sure sign that the meat is thoroughly impregnated. It is now taken out of the molasses, thoroughly washed, and hung in a current of air to dry. After it is completely dry, it may be packed in boxes and sent all over the world without experiencing any change whatever.

NEW ALLOY FOR SOFT SOLDER.

We find in *L'Invention* directions for preparing an alloy for a very soft solder, which that journal says has the following very valuable properties. It attaches itself very strongly, not only to metallic substances, but also to glass and porcelain; at a temperature of 700° Fah. it is as soft as wax, but in ten or twelve hours it becomes so hard as to take a polish like

silver; and it unites metals so firmly that they may be worked in any manner whatever. As its bulk is not altered by its hardening, it fills perfectly any channels, crevices or joints into which it may be introduced.

It is prepared as follows: Perfectly pure copper is procured, either by reducing the oxyd of copper by means of hydrogen or by precipitating the metal from the sulphate of copper with zinc turnings. Either 20, 30 or 36 parts of this pure copper, according to the hardness of the alloy desired—the more the copper the harder the alloy—is moistened thoroughly in a cast iron or porcelain mortar with concentrated sulphuric acid (at 1.85 density); then to this metallic paste is added 70 parts, by weight, of mercury; the mixture being constantly stirred during the addition of the mercury. When the copper is completely amalgamated, the composition is washed with an abundance of boiling water to remove the sulphuric acid. The composition, at first soft, becomes in ten or twelve hours so hard as to take a fine polish, and to scratch gold or tin. It may at any time be made as soft as wax by heating it to about 700° Fah., or by triturating it in a mortar at a temperature of 260°. If, in this state, it is placed between metallic surfaces free from oxygen, it will unite them so firmly that they may be wrought in any way without separating.

SPIDERS.

A learned entomologist, who has made a special study of the structure and habits of spiders, states that there is not a single authentic case on record of a person being killed, or seriously injured, by the bite of a spider; all the stories about the fatal bite of the famous tarentula being simply fables. These insects are, however, exceedingly ferocious in their fights with each other; their duels invariably ending in the death of one of the combatants. In some species, the first step of the young as soon as they are hatched is to eat up their mother.

ELECTRICITY AND SOME OF ITS PRACTICAL APPLICATIONS.

Article III.

The construction of the electro-magnet, and its application to the telegraph, are fully treated in a number of works, but of late the application of electro-magnetism to the production of rotary motion—or, indeed, of any useful mechanical effect—has received but little attention, and we know of no work which treats the subject in a thorough manner.

A great number of magnetic motors have been invented, none of which have ever come into practical use in this country, although it is reported that in France a few are in use for purposes requiring certain motions.

All, or nearly all, the electro-magnetic machines constructed have made use of one or more of the following powers:—

1. The attraction of a coil or helix.

2. The alternate attraction and repulsion of opposite and like poles.

3d. The attraction of an electro-magnet for soft iron.

Probably the first engine operated by the attraction of a coil was that of Dr. Page. The principle of this engine is as follows: A coil of insulated wire possesses powerful magnetic properties when a current passes through it, and if a coil be made in the shape of a tube or with a hollow cone, it will communicate magnetic properties to a bar of soft iron placed within it, and if the current be sufficiently strong, the bar will be suspended without any material support. The cut

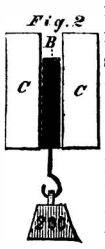


Fig. 2

represents a section of such an arrangement. C C represents the coil, and B the suspended bar. If, while the bar is in this position, the current be stopped, the bar will instantly fall out, and, when entirely without the coil, no attraction will take place; but if it be inserted part way, and the current then passed, it will be drawn wholly within. Thus, it will be seen that, by alternately breaking the current and allowing it to pass a reciprocating motion can be given to the bar, and, by means of a crank, a rotary motion may be communicated to any appropriate machinery. Such a device, however, would only exert its power through half of the stroke; but by using two coils drawing alternately in opposite directions, a constant power may be exerted throughout the stroke.

The cut represents a section of an improved device

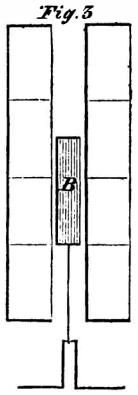


Fig. 3

invented by Dr. Page, in which a number of coils are used, piled upon each other, and so arranged that, as soon as one coil has attracted the bar to its full extent, the current shall be transferred to the one next to it; and so on for half the stroke, when the current is to be transferred to the other side of the bar, when it will be attracted in the opposite direction through the return stroke. This beautiful device has as yet failed to come into general practical use.

The invention of machines which are operated by the alternate attraction and repulsion of opposite and like poles has cost an immense amount of time and money, but such machines are liable to difficulties which render them impracticable upon a large scale.

Engines which are operated by the direct attraction of an electro-magnet for iron may be divided into two classes—reciprocating and rotary. Reciprocating engines are entirely impracticable upon a large scale, for various reasons, the principal of which are:—

1. The extremely small distance through which magnetic attraction is exerted.

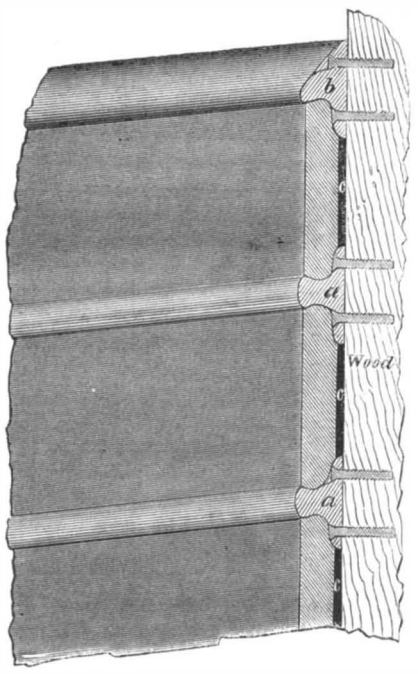
2. The waste of power by such an arrangement; and,

3. The large amount of friction to be overcome at each stroke.

These objections refer chiefly to engines in which only two magnets are used. Such machines form a part of every well-appointed philosophical apparatus.

IMPROVEMENTS IN PLATING SHIPS OF WAR WITH IRON.

As the great interest in protecting naval vessels with shot-proof plates, which now prevails in England and France, is doubtless destined to be also felt in this country, we present the accompanying illustration from the London *Mechanics' Magazine*, as an indication of the present state of the art in England.



These improvements have been invented by T. W. Plum, Esq., of Blænavon Iron Works, Monmouth, England, and of which the following is a description:

For shielding ships and batteries on land or floating with thick metal armour plates, metal ribs are used with a flange or flanges through which they are to be bolted to the ship, battery, or other structure, and a dovetailed or T.head rib for holding the plates. The flang and dovetailed ribs *a a b* may be of the forms shown in the engraving or of any similar form, so that there be a flang or flanges for bolting through, and a transverse head having more or less of dovetail shape, in order that when the plates, which are to be prepared to fit the ribs, are inserted between two of such ribs, they will be securely held in their intended position; that the plates when fixed shall cover the bolt holes, and that the joint or joints of junction between the plates and ribs shall have a tendency to tighten when struck.

In preparing the ribs, except the first, to be fixed to any structure, the bolt holes on one side of the flanges of the ribs are to be made longer, *i.e.*, oval in form in the transverse direction of the rib, so as to admit of the second and successively fixed ribs being in the first place bolted through the elongated bolt holes far enough from the rib previously fixed, to allow the plates to be inserted between them without difficulty; and the rib to be then drawn by cramps or other known means tightly to the plate; the row of bolts on the other side of the rib are then put in and made fast.

The upper and lower and vertical end ribs are made with one side only prepared to receive or hold plates. the other being rounded, moulded, or beveled off in any suitable shape, as at *b*.

The space between the back of the plates and the face of the ship or other structure shown at *c c c* may be more or less according to the dimensions determined for the ribs and plates, and may be filled with any material that may be found most suitable.

The Joint Action of Labor and Capital in Producing Wealth.

If a man is cultivating corn with a hoe, the hoe is capital. It is the saving of previous labor, and it facilitates his industrial operations, and these are the characteristics of capital. Nearly all active capital may be properly regarded as *tools* to work with. There is a regular gradation in implements from the simplest knife or ax up to the most complicated machine or the largest manufactory. There is no place in the ascending scale where a line of distinction can be drawn, and these implements are, in fact, essentially of the same character—they are all tools in the hands of industry.

There is capital, however, which cannot be regarded as of the nature of tools. Besides his hoes, plows, wagons, &c., a farmer must have food to eat and clothes to wear while raising his crops, and this food and clothing have been accumulated from previous labor, and are therefore capital; they aid the operations of labor, and are therefore active capital.

Men everywhere work with tools; consequently all wealth is the product of the joint operations of labor and capital. When Eve determined to sew some figleaves together, her first step was to procure a thorn or some other implement to work with, and that thorn was just as really capital as a Grover & Baker sewing machine, or the manufactory in which those machines are made. It is a curious fact that in the very first industrial operation of the human race, the first step was to procure the necessary capital.

Shoeing of Cavalry Horses.

The following circular has just been issued from the Horse Guards by the Adjutant General of the British army.

Sir:—It being very desirable that a uniform system of shoeing should be established in the cavalry, and the whole of that important subject having been recently referred to the consideration of a Board composed of officers of great experience in that branch of the service, assisted by two old and experienced professional men, the General Commanding in Chief has been pleased to direct that the following instructions, extracted from their Report, and which embody the whole of their recommendations, be circulated throughout the cavalry, accompanied by duplicates of the pattern shoes, which have been sealed and deposited at the office of Military Boards for general reference and guidance.

1. The shoe is to be beveled off, so as to leave a space and prevent pressure to the sole.

2. It is not to be grooved or fettered; but simply punched and the nails counter-sunk.

3. Calkin is to be applied to the hind shoe only, and is to be confined to the outside heel. The inside heel is to be thickened in proportion.

4. The weight of the shoes is to be from twelve to fifteen ounces, according to the size of the horse.

5. As a general principle, horses are to be shod with not less than *six* nails in the fore and *seven* in the hind shoe; nor is this shoe to be attached with not fewer than *three* nails on either side.

6. In preparing the foot for the shoe, as little as possible should be pared out, and the operation should be confined to the removal of the exfoliating parts of the sole only.

7. Both the fore and hind shoes are to be made with a single clip at the toes.

THE SCIENCE OF COMMON THINGS.

NUMBER III.

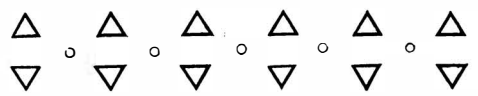
"The food of all animals, with the exception of the small quantity of common salt which they eat, consists of organic products; that is, of matter which forms a part, or which has formed a part, of either animals or vegetables. Organic substances are principally composed of four elements—oxygen, hydrogen, nitrogen and carbon. A man's body, which weighs 150 lbs., contains about 7 lbs. of earthy matter, and the other 143 lbs. consist of the four organic elements which I have named. Two of these—oxgen and hydrogen—I have already described to you; nitrogen forms about three-fourths of the air we breathe; and with carbon you are familiar under several forms. Charcoal is almost pure carbon, so is the diamond; black lead or plumbago is carbon with a little iron in it."

"Is there carbon in this piece of bread, father?"

"Yes. If you hold the bread very close to the fire, so as to scorch it, you will see the carbon all over the surface looking like charcoal."

"Why could we not see it before?"

"You could; but it had a different appearance. One of the most wonderful things in nature is the change which is wrought in the properties of substances by combining them together chemically. The air which we breathe is composed of oxygen and nitrogen mixed together mechanically. Let us have another ball to represent nitrogen and we can understand this matter perfectly. It must be made of some wood not quite as heavy as that which we used for the oxygen atom, for, though the nitrogen atom weighs fourteen times more than the atom of hydrogen, and the oxygen weighs only eight times more, the nitrogen atom is twice as large as the oxygen, being of just the same size as the hydrogen. Let us make the nitrogen atom of a different shape so as to distinguish it readily. Now, the little round balls stand for the oxygen atoms, and the large triangular ones for the nitrogen, and they are disposed thus in the air.



But if we combine them together chemically, thus—

one atom of nitrogen with five of oxygen (N. O_5), how totally are their properties changed! When mechanically mixed, they are in the gaseous form, invisible to the eye and impalpable to the touch except when in rapid motion. But when combined as represented, the atoms immediately come close together, they assume the liquid state, and become nitric acid. As atmospheric air, it is necessary that we should be constantly passing fresh supplies through our lungs or we perish; as nitric acid, a single teaspoonful taken into the lungs would produce instant death. The astonishing variety of substances produced by different chemical combinations of the four organic elements are illustrated in the articles before you on the table. Combined in one way they produce the sugar, in another the butter, in others the tea, the coffee, the bread, the meat, the eggs, the milk, the pepper, &c. There are a few things, such as potash, that are not composed of the organic elements; but with these few exceptions, everything derived from either the animal or vegetable kingdom is formed by the combination of two or more of the substances—oxygen, hydrogen nitrogen and carbon. They form oil, india-rubber, strychnine, chocolate, cider, wine, alcohol, lard, and the principal part of our clothes, shoes, hats, books, tables, floors, ships and, in short, everything that is derived from either animal or vegetable growth.

THE *American Engineer* is the title of a journal published in this city, devoted to the interests of locomotive, marine and stationary engineers, and edited by John C. Merriam, Secretary of the American Engineers' Association. It is the only journal of the kind published in this city, and is well edited. We wish our cotemporary much success.

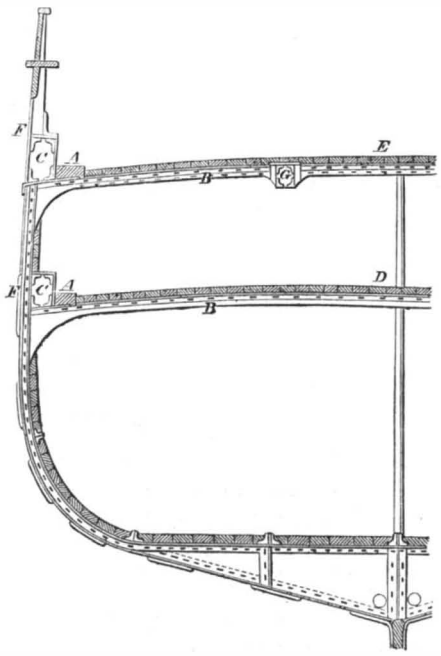
IN France every steam boiler is required by law to be furnished with a safety plug of fusible metal. It is composed of tin, 3 parts, lead, 2, bismuth, 4. A plug of this composition melts at a comparatively low heat.

LESLIE'S IMPROVEMENTS IN IRON SHIPS.

We find the following description of this important invention in the London *Mechanic's Magazine*:—

Mr. Andrew Leslie, of Hebburn Quay, Gateshead, iron shipbuilder, has patented an invention entitled, "Improvements in the construction of iron ships or vessels, and for strengthening the same." Mr. Leslie thus describes his invention.

"My said invention relates to the construction of iron ships or vessels and to the strengthening of the same at those parts where the strain is most felt by means of wrought iron, steel, or other metal box girder stringers or tubes, such box girder stringers being placed on the top of the main spar or lower deck beams at the sides of the vessel, or placed under or between the main spar or lower deck beams at or near the center line of the vessel, or at the sides of the hatchways. The whole or any of these stringers may be continued throughout the entire length of the vessel or extended along any part thereof, as may be desired. According to one mode of carrying out this invention, I propose first to secure a plate, A, as shown in the engraving (which represents part of a transverse section of an iron ship constructed according to my invention), on to the top of the beams, B, of the vessel, this plate extending entirely round the vessel and serving as a base or foot plate



upon which the wrought-iron box girder, C, is constructed. This box girder stringer extends along each side of the upper and lower decks, D and E (when two decks are used), and runs from stem to stern of the vessel or along any part of the length thereof. These box girder stringers, C C, are composed of wrought iron, steel, or other metal plates bolted, riveted, or welded together, and connected to each other and to the base plate by flanged plates or angle iron as shown. The base plate, A, may be made considerably wider than the stringers so as to project inward toward the deck for the purpose of having the water-way bolted thereon, and the oustide plates of the stringers may be carried up some distance above the top of the same, as shown at F F, for the purpose of securing the stanchions thereto. G G are the middle or intermediate box stringers or tubes also composed of wrought iron, steel, or other plates, and extending from stem to stern of the vessel or over any part of the length thereof, being secured to the beams, B. If found desirable these box girder stringers may be provided with suitable air valves in the top, bottom, or side plates for the purpose of ventilating the hold of the vessel, as it is found that the extension of the box girder stringers round the vessel admits of the gases, produced by some cargos, being readily collected and carried off."

In his patent-specification Mr. Leslie claims "the application and use to and in the construction of iron ships and vessels of hollow box girders composed of wrought iron, steel, or other metal plates, for the purpose of strengthening the same, in the manner herein before described." Fortunately for Mr. Leslie, his patent is dated 14th December 1859, about two months *prior* to the delivery at Liverpool of Mr. Fairbairn's lecture on iron ships, in which the distinguished author strongly recommended the adoption of just such girders as Mr. Leslie has patented.

War Frigates and Gunboats.

Russia, the third naval power of Europe, says an English exchange, intends not to be behindhand in putting on her armor, now that England has her *Warriors* and France her *Gloires*. The Russian Admiral, Count Putiatine, left London recently for St. Petersburg, taking with him, for imperial approval and ratification, the drawings and contract for an iron plated vessel of war, which is to be built forthwith on the Thames.

The Paris correspondent of the London *Times* says that a gunboat of a new model passed through Toulouse a short time since on her passage from Bordeaux to Toulon, where she is to be prepared for sea. This boat is constructed on an entirely new model, of which the plan is said to have been given by the Emperor. She is composed of steel plates, and will be propelled by two screws set in motion by a machine of 14-horse power. She will carry but one piece of cannon. The boat is shaped like a tortoise. The mouth of the cannon will pass just over the back of the fish, which will present an inclined plane to the enemy, over which the balls will slide. The crew will be completely sheltered under this roof, of which the force of resistance is so well calculated that the heaviest shot or shell cannot injure it. It is said that several gunboats constructed on the same model will pass from Toulouse to Toulon. The first gunboat ready for sea is to go round to Havre, and thence up the Seine to Paris.

NEW MODE OF VULCANIZING INDIA-RUBBER.—The Paris correspondent of the *Photographic News* states that india-rubber may be easily vulcanized by mixing it with sulphur and hypochlorite of lime. He says when flowers of sulphur and bleaching powder (hypochlorite of lime) are shaken together, a very strong odor of chloride of sulphur is immediately developed. If the mixture be somewhat forcibly rubbed in a mortar, elevation of temperature ensues, the sulphur softens, and the mixture becomes solid, while abundant vapors are evolved. When a much larger amount of sulphur than of the hypochlorite is used, and friction is avoided when the two are blended, a mixture is obtained, which being added to india-rubber paste, either with or without the addition of chalk or oxyd of zinc, which serve to give body to the compound, vulcanization is effected either at the ordinary temperatures or by a moderate heat. By this means objects of any thickness may be vulcanized.

ATMOSPHERIC FERTILIZERS.—M. Barral, of Paris, has lately made the discovery that rain water contains minute quantities of phosphorus. He believes that it exists in the atmosphere in the form of phosphorated hydrogen, which escapes from decaying animal substances. As phosphorus is necessary to the fertility of soils, we have in this discovery a key which unlocks the secret of "summer fallowed" lands becoming fertile. The ancient Hebrews were accustomed to allow the land to rest without cultivation every few years. This was, no doubt, for the purpose of restoring it from comparative barrenness by cropping, to renewed fertility. It is now well known that ammonia also exists in rain water, and this is held to be the chief of fertilizing agents. Any worn out lands may be restored to fertility by allowing them seasons for repose, in the same manner that Moses provided for the perpetual fertility of the land of Israel.

USES OF SOAPSTONE.—In Germany, soapstone or steatite is cut into pieces of any desired form, then placed in a crucible, heated to redness, and afterwards allowed to cool in a very gradual manner. Steatite, without having become hard or brittle by this operation, has acquired sufficient consistency to permit of its being worked without any difficulty; and such is the facility of manufacturing it that it has found numerous applications—such as in the making of buttons, cameos and gas-burners. To give solidity and durability to articles made from steatite, in the manner we have described, it is only necessary to expose them to a red heat for a few hours, when they become very hard. Articles made of steatite may be polished by the employment of emery, tripoli or oxyd of tin; and when impregnated with a solution of silver, and then subjected to a high temperature, they acquire a metallic luster.

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, Dec. 27, 1860. The President being absent, Mr. Bruce was called to the chair.

BUTTON-HOLE SEWING MACHINES.

Mr. ROWELL exhibited a specimen of work executed with Vogel's button-hole sewing machine. The stitch is formed with three threads, and cannot be unraveled. There are two upright needles, one working over the edge of the cloth and the other through it, and an under thread. A fair operator can make 100 button-holes an hour with it. By removing one of the upright needles, it is transformed into an ordinary sewing machine, forming the Grover & Baker stitch.

Mr. DIBBEN stated that so long ago as the first Crystal Palace exhibition in New York, a machine was exhibited which made a button-hole stitch as good as this; but it did not prove to be a practical machine. The great difficulty is in keeping the edges of the several thicknesses of cloth all even.

A SMALL MOTIVE POWER.

The special order of the evening, being the economy of motive power for farm buildings, small manufactories and sewing machines, was taken up.

Mr. DIBBEN presented some estimates upon the basis of a one-horse power, as the maximum probably intended to be considered. A steam engine of one-horse power would cost at least $300. The fuel would amount to 10lbs of coal per hour, or 25 cents per day. The wear and tear and interest would amount to 7 cents per day. The steam engine being a dangerous machine requires the attendance of a man of superior intelligence to a common laborer; estimating his time at $1.50 per day, and that one-sixth of it would be consumed in tending the engine, the cost of attendance would be 25 cents per day. The total cost, therefore, is 57 cents a day; which is very much less than the cost of doing the same work by man-power. In very many cases where work is done by hand, the steam engine could be used at a great profit, if it were not for the capital required in procuring the engine. The first cost of the air engine would be about double that of the steam engine. The interest will therefore be doubled. For wear and tear and interest he would allow 12 cents a day. For fuel he would be liberal and allow the same as before, 25 cents a day. The cost of attendance would be very much less, say one-twentieth part of a man's time, or 7 cents per day. So that a safer and more easily managed power can be obtained from the caloric engine for 44 cents per day. Another power commonly used for agricultural purposes is horse-power. The apparatus for applying the power will cost about $150.

Mr. VEDDER said that the ordinary endless chain apparatus would only cost $30.

Mr. DIBBEN—It is not safe to use a good horse upon such a machine. The cost of keeping a horse is much less than is usually supposed. A farmer can keep a horse for less than 20 cents per day in this vicinity. The cost of attendance would be but 15 or 20 cents per day for a boy, and for many purposes no attendance would be required, for the horse can be trained to stop and start by a bell. A good horse can be obtained for $150, and it will always be useful on the farm. Wear and tear and interest would be about 5 cents per day; making the cost of the horse-power 40 cents per day. The horse power is cheaper, therefore, than the power from the steam engine or air engine, when making full time; and the advantage is still greater when, as is usually the case, the power is not required all the time, for the horse can be used for other work, whereas the engines cannot.

Mr. STETSON remarked that one of the great objections to horse power is its excessive unsteadiness. It requires continual attention, and there is no regulator which can be conveniently applied. For this reason, the steam engine and air engine are frequently substituted for the horse power.

Mr. ROWELL narrated his own experience with horse power; his horse being so fond of "sojering" that it became necessary to put a ring upon the central shaft with an attachment by which he could be reminded of his duty at any part of the revolution. This apparatus they considered a perfect success.

Mr. VEDDER said that where farming is done upon a large scale, as upon the Western prairies, it is self-evident that other than horse power will be demanded Portable steam engines are used which are carried from farm to farm, to thrash, or to do any other work which may be desired, by the job. Horses are required for farm work; but they have enough to do, and would be injured by being used for power; so that farmers who own teams generally prefer to employ others to do their heavy work.

Mr. BABCOCK said that the expense of horse power had been underrated by Mr. Dibben. A horse will not last upon the city cars more than six or seven years. Besides, a nominal horse power cannot be obtained from a horse either upon the city cars or upon the farm for ten hours a day.

Mr. DIBBEN—It can from a horse which weighs 1,400 pounds.

Mr. BABCOCK proceeded to give estimates for the air engine, taking that of Wilcox as the basis. A 12-inch cylinder caloric engine now running in Westerly, R. I., costing $350, of at least four-fifths of a horse power, consumes only about 50 pounds of coal per day, which would be but 12½ cents. And as it supersedes the stove before employed in heating the room, the actual cost for fuel is even less than this. Another similar engine, with an 18-inch cylinder, at Pawtucket, R. I., is doing more work than two horses can do, at a cost not exceeding 15 cents per day for fuel. The wear and tear will not probably exceed the same amount.

Mr. FISHER said that, according to Tredgold, horses cannot usually do more than two-thirds the work of a nominal horse power for ten hours a day. Stage proprietors say that they are obliged to keep spare horses and to renew one-third of the whole number every year. The cost of a horse for interest and deterioration would be at least 20 cents per day. This will bring the animal horse power nearly up to the cost of the mechanical horse power. For the farmer who wants only a power for a week or two in the season, the horse power would be more economical; but for mechanical purposes the horses must be taken care of, and this is more disagreeable than to take care of a steam engine. In many shops no engineer is required to take care of the engine. As to safety, the low pressure engine, with a large safety valve, he considered as safe as a caloric engine. A low pressure engine would cost more than a high pressure engine of the same power, perhaps 15 per cent more.

Mr. STETSON remarked that the low pressure engines would be excluded from consideration for farm purposes on account of the large amount of water required for condensing the steam.

Mr. FISHER alluded to the success of agricultural steam engines in England, there being twelve or thirteen manufacturers of such engines, with an increasing demand.

Mr. CHURCHILL considered the comparison in England between steam and horse power no criterion for this country. Machinery there is cheap, and the cost of feed is much greater than here. Engines of about eight-horse power can be driven about from farm to farm, and do the work required with economy and success, and beyond all competition.

Mr. STETSON considered the wear and tear and interest underrated by Mr. Dibben in all his estimates. The interest alone would amount to nearly as much as he had allowed for wear and tear and interest. Another consideration has been overlooked. The chances of breaking down are always considerable with complex machinery. If the machinery breaks down in the city it can be at once repaired, or the work can be immediately executed by somebody near by. But when we go back into the country the result of breaking down is much more serious. If a steam engine breaks down it may cause a delay of several weeks. But if a horse power fails its place can readily be supplied by another. Where there is a large supply of water, with a considerable pressure, a water engine may be used. If a common steam engine should be connected with an elevated pond of water, and regulated to work slowly, it would work like steam. It would hardly do to apply the cut-off, however. [Laughter.] In the office of the Boston *Traveler* a rotary engine about as large as a half-bushel measure, fed by the Cochituate water, furnishes all the power that is required. But situations like that must be extremely rare, especially in the cases embraced in the subject for discussion.

The CHAIRMAN suggested the use of wind as a motive power.

Mr. FISHER said that a small amount of water exposed over night would be cooled sufficiently to be used again for condensation on the next day; so that where little power is required the low pressure engine would not require a very large supply of water.

Mr. ROWELL thought that would depend upon the degree to which the water was to be cooled. If it is to be cooled down to 80° or 100°, it would take much more time to cool it; and if it is to be used when but little below 200°, it would require from twenty to forty times as much water to condense the steam.

Mr. DIBBEN, reverting to the amount of work a horse can perform, said that he had made his estimate from the actual performance in hoisting stone. The average horses in New York weigh about 1,100 pounds; but a horse weighing 1,400 pounds, such a horse as may be seen upon the wagons of the safe men, can do the work of a horse power.

Mr. STETSON—Can we buy such a horse for less than $300?

Mr. DIBBEN—No, sir.

Mr. CHURCHILL—Did the horse lose its condition under that labor?

Mr. DIBBEN—I do not know.

Mr. CHURCHILL—Then that tells us nothing of the work a horse can do.

Mr. DIBBEN mentioned the fact that the air engine or the steam engine could not be stopped and left to stand a week or two without danger of injury; but the horse power can be used at any time, and left at any time, without any injury, and without any particular care. As to the air engine, if 44 cents per day was too much, he should like to hear another estimate.

Mr. BABCOCK estimated 15 cents for coal, 20 cents for wear, tear, and interest, and 10 cents for care, amounting to 45 cents, for a two-horse engine, founded upon the actual performance of the Wilcox engine in the Pawtucket bakery. A one-horse engine would probably cost about 30 cents a day. The cheapest power in use, he said, was water power. It is more reliable than wind, and costs scarcely anything. But it can only be made available in particular situations. Wind mills could not be made available, usually, except upon the coast, where there is a sea breeze at certain times, and upon high hills.

Mr. SEELY said that it would not do to settle the question merely by estimating the cost of the different kinds of power when in use, or the cost of the machinery, for there are considerations which entirely outweigh the question of cost. No farmer could profitably use an engine that would cost from $300 to $600; for the labor that could be done with it would last but a very few days in each year. For the rest of the time there is only an occasional piece of work to be done by power—an ax to grind, a little wood to saw, or a little straw to cut—and yet for these a power would be handy if it did not cost too much. But every farmer must have his horses, and they will do this work. Probably for a farm of 100 acres or less, no air engine or steam engine would be a profitable purchase. Water can be used for power much more frequently than it is. There are very few farms of 100 acres which have not a stream which could be made serviceable at a small expense. And wind mills will answer for labor that does not require steadiness. If we could take the power of the wind during the entire year and store it up to be used as a constant force when required, it would be very useful. This might be done by employing the wind mill to drive water into an elevated reservoir, or in condensing air, or in winding a spring, or in some such way. Personally, he would prefer steam, or air, or water, to horse power; and if either could be substituted for horse power upon a farm he should prefer it. What is wanted is a little power with all the advantages of steam or air and with none of its disadvantages; something that can be started or stopped by turning a key or touching a spring; something portable; something which could be put upon a carriage to drive us along. Such a power we now had not; but he believed it possible that at some day we should have it.

Mr. JOHNSON stated that Mr. Kennish had a small rotary water engine, using six gallons of water per minute, under the Brooklyn pressure, and equal to ten-horse power. There is eighty feet head of water.

Mr. STETSON said that if the wind mill should be used in pumping up water to be afterwards used for power it would probably be necessary to use two or three times as much power as could be utilized. For manufacturing purposes, and for driving sewing machines, the want of steadiness would prevent the use of wind mills. But, although their deterioration seemed to amount to 100 per cent a year, they might be useful for some kinds of work.

Mr. ROWELL suggested the use of the dog for motive power.

The CHAIRMAN suggested that the hog might be employed.

Mr. ROWELL stated that he had known of an instance where power was carried by levers and wires from a brook to a dwelling house, 400 feet distant, and employed to drive a churn.

Mr. DIBBEN suggested that wind mills have too unsteady a motion to be useful, even when furnished with what are called governors. Besides, the farmer's house is usually placed where it will be sheltered from the wind. For driving sewing machines in the family, the best power was the foot of the operator.

Mr. VANDERWEYDE stated that in his native country, Holland, wind mills compete with steam; they grind the corn, saw the wood and keep the land dry. But in Holland you find no small wind mills. They must be large enough to keep three men constantly employed in watching the wind, regulating the sails, &c., in order to be profitable. As you go up the Rhine, and ascend from this level country to the mountainous region, the winds become uncertain; and when you pass Cologne you pass beyond the region of wind mills. There you find that water power is used, the smallest streams being made serviceable.

Mr. KOCH referred to the use of a running stream for power. Upon the Rhine, near Mayence, are what are called the Rhine mills. They are floating vessels, with wheels dipping into the water, turned by the stream, thus furnishing the power for the mills.

The CHAIRMAN and Mr. DIBBEN said that the same method was in use in the West.

On motion of Mr. SEELY, the subject selected for the next evening, is "Pottery."

Curing Ham.

The following method of curing ham is given by R. M. Conklin, in the *Country Gentleman*:—After cutting out the hams they are looped by cutting through the skin so as to hang in the smoke-room shank downwards; then take any clean cask of proper dimensions, which is not necessary to be water-tight, cover the floor or bottom with coarse salt; rub the hams in fine salt, especially about the bony parts, and place them on the bottom of the cask with the rind down, covering the floor of the cask first; sprinkle dry fine salt evenly all over them wherever it will lie, so as to cover them perhaps half an inch; then lay others on them, letting the shank dip or incline considerably, placing salt in all cases between them, where they come in close contact with each other, or with the sides of the cask; small lumps of salt will be found very convenient for this purpose. Sprinkle fine salt over this as before directed, giving the thick part of the ham a good share, as the shank begins more and more to incline downwards. Proceed in this way until the hams are all salted, always observing to place them skin down and flesh side up; and if they sometimes get standing too much on end, the difficulty may be obviated by using a small piece of pork as a *check*. Let them lie about five weeks if of ordinary size, if larger, six weeks, and then smoke them.

I have constructed a smoke-room over my kitchen, in the garret—made dark—and so as to admit smoke from the chimney. Here I hang the hams and let in smoke until they are smoked enough, and this completes the entire operation; nothing more is done—no securing against flies, for they never enter this dark chamber, and when we want a ham we go to the smoke-chamber and take it from the hook. During a period of twenty-five years I have not lost a ham, but before adopting this mode, through careless smoking, injudicious salting, or from flies, I was continually suffering disappointment with my hams. Possibly hams may have a better flavor by using other ingredients with salt, yet where I have had opportunities of tasting such cured hams, I confess my inability to detect their superiority.

Steam Canal Navigation.

A correspondent of the Buffalo (N. Y.) *Courier* signing himself "Mechanic," presents some statistics to show that steam propulsion, as a substitute for horse haulage has not been successful on the New York and Erie Canal. He says:—

Steam machinery, of thirty horse power, comprising boiler, engine and wheels, put into a canal-boat, will cost about $2,500, and will occupy in the boat the space of about 30 tuns of freight. As a steam canal boat of this power of engine, and 90 feet long, cannot carry as much freight as one of the same size towed by horses, it should compensate by speed for its greater cost; but such is said not to be the case. A boat towed by horses usually makes a trip from Buffalo to Albany in about ten days, and I have not heard of a steam canal boat that does it in much less time—not, according to my recollection, enough less to predicate upon it the claim of a business improvement.

The difference in the accounts of the two boats, without mentioning those expenses which would be alike to both, for a trip from Buffalo to Albany, may be thus stated:—

STEAM CANAL BOAT.

Interest on $4,000, the cost of the boat, for 10 days,	$7 67
Coal, $3 per day	30 00
Engineer, at $2 per day	20 00
Total	57 67
170 tuns of freight, at $5 per tun	850 00
Balance	$792 83

BOAT TOWED BY HORSES.

Interest on $1,500, the cost of the boat, for 10 days,	$2 87
Towing, at $5 per day	50 00
Total	52 87
200 tuns of freight, at $5 per tun	1000 00
Balance	$947 13

By the above comparison of accounts, it is plainly seen that steam propulsion of canal boats, as yet, has been but an expensive amusement, or unremunerating novelty.

The writer goes on at some length, as he has done in former communications, to argue against the economy of steam on the canal. It is only by experiment that the economy of any system can be determined, and perhaps in the center of New York where coal is so expensive, horse power is cheaper than steam power for canal haulage. And yet the above statement is very unsatisfactory to us, because we have been assured, that instead of ten days, the steam canal boats have made the trip in five, which would reduce the working expenses to one half of the above estimate. As boats are built during the winter season for canal navigation in summer, now is the proper time to canvass this subject thoroughly.

The Secret of Table Turning.

This phenomenon is thus pithily described in *Once a Week*:—

You may now proceed to your crowning experiment, which consists in making the tables rise clear off the ground, still maintaining its upright position. As a preliminary, you make it go through some extraordinary evolutions by alternately pressing and pushing the top with your hands, contrary to Michael Faraday's theory, by *voluntary* and not involuntary muscular action. You then allow the table a little respite while you cross the right leg over the left knee, and insert the end of your right foot under the base which supports the column; maintain the pressure of your hands as you straighten your leg, and the table will rise perpendicularly about two feet from the ground. Before, however, attempting this astounding feat, care should be taken that no wary person is sitting within reach, or he may dash out his feet (as a friend of mine did) and catch you under the ankle, pinning you to the table, with your leg in the air, a position from which you will find great difficulty in extricating yourself, without bringing the *séance* to an ignominious termination.

STEAM EXPANSION.—A correspondent, writing upon the subject of working steam expansively, says "both parties are right. Working steam expansively is economical in quick-acting engines, because the steam has so little time to condense in the cylinder. It is the contrary in slow motion. This pertains only to this one item; there may be many other causes why science and practice do not agree here. It must be remembered that steam is simply harnessed electricity, and that it is the electricity that escapes, and not the heat alone, in a slow action—electricity is the force. I shall not be responsible for this, however, as I know nothing at all about the steam engine, and the science of the day in that direction."

IF 100 parts of tallow (by weight) are mixed with 25 of carbonate of soda, and heated to 360° Fah. in a close boiler, a good soap will be formed. It has generally been supposed that the carbonate of soda would not combine with a fatty acid to form soap; and this is true at the ordinary boiling temperature of water, but not at high temperature.

Column of Varieties.

The velocity of air rushing into a vacuum at the level of the sea, is about 1,338 feet per second.

King Victor Emanuel has accorded 200,000 francs in aid of the public schools to be established in Naples.

In making alloys of copper and zinc to form brass, the metals require careful stirring in the crucible. A rod of soapstone, about ten inches in length, fitted into a piece of common gas pipe, makes the best stirrer for this purpose which can be used; the soapstone is fireproof and will not fuse.

Pure iron in a state of minute division is now much used in medicine as a powerful tonic. It is produced by reducing the best qualities of iron with hydrogen, whereby all the impurities are expelled. The affinity of this iron for oxygen is so great, that, if a pinch of it be thrown into the atmosphere, it will take fire. It is kept for use in hermetically sealed glass phials.

Nitric acid, which is much used in galvanic batteries, stains the skin of the hands a dirty yellow color, which is very difficult to remove. M. Swartz, in the *Repertoire de Chimie*, states that such stains may be removed by the sulphide of ammonium and a little caustic potash. This removes the epidermis which has been stained.

Professor E. Lankester, M.D., F.R.S., says of consumption, in one of his lectures: "The want of a free supply of fresh air, and the want of getting rid of carbonic acid gas from the house and the lungs, are the greatest sources of this disease."

Dr. Carl Eylerts, a German chemist, has discovered a new acid in marrow which he has named medullic acid. Its formulæ is C_{42} H_{12} O_4; and its melting point is 72.5°. The composition of ox marrow is palmitic acid, 46 per cent; medullic acid, 10 per cent; elaic acid, 44 per cent.

The London *Chemical News* states that hundreds of barrels of the clarified fat of horses are imported from Ostend to England and sold in London for genuine butter. Pies and puddings made of such a savory substance must be very tempting to epicures.

A new fact in the history of aluminum consists in its now being reduced, in the hands of the gold beater, in France, into leaves as thin as those of silver and gold. These results have been arrived at only with very great difficulty. The annealing of the aluminum must be frequently repeated, and cannot be performed in the ordinary manner as with silver and gold. Otherwise, the operation of beating is conducted in the usual manner.

A Pittsburgh cotemporary contains the following sensible advice:—"The public are asking whether some method cannot be devised for warming the cars upon city railroads, and some suggest that stoves be placed in them. A better plan would be to allow the self-propelling cars to be put upon the roads. Then the steam which drives the cars could be made to keep them comfortable."

Metallic paper is produced by causing very thin tinfoil to adhere to sheets of paper. This material admits of many useful applications: it is superior to pure tin as a *hydrofuge*, applied to damp walls, preventing the exudations of saltpeter, and all kinds of deleterious emanations. Applied to the backs of paintings, it protects them against the damp of the wall, &c.

Cadmium promotes the fusibility of some metals, as tin, copper, lead and bismuth, while it does not promote the fusibility of others, as silver, antimony, &c., that is, it does not lower the melting point beyond the mean. Its alloy with lead and tin in any proportion, and with silver and mercury within a certain limit, sad equal parts, and especially if two parts of silver any one of cadmium, or two parts of cadmium and one of mercury are used, are tenacious and malleable, while its alloys with some malleable metals—gold, copper, platinum, &c., are brittle.

Toilet sponges may be bleached snow white as follows:—Select the softest suitable for the purpose, then dip it into hot water; take it out, cool and squeeze it in the hand. Now, put it into dilute hydrochloric acid (muriatic), and allow it to steep for half an hour; then take it out and wash in hot water again. Now steep it for 24 hours in a fresh bath of dilute hydrochloric acid, to which six per cent of dissolved hyposulphite of soda has been added. This treatment will make the sponge quite white; it is finished by washing again in warm water.

Improved Connecting Link.

This is an invention remarkable for simplicity, extensive application and great utility. Its use is to connect parts of mechanism, &c., which have to be occasionally disconnected, but particularly to take the place of laprings, which are such an annoyance to farmers and teamsters. A lapring is used to connect a single tree to a double tree; a single tree to a plow; the parts of a broken chain, and for similar purposes. It consists of an open ring, the ends of which are extended and lap on each other about half around, and, when open, these ends are a sufficient distance apart to admit the parts which are to be connected; and after these parts are slipped into the lapring, the lapring ends are hammered together. When disconnection is to take place, these ends have to be pryed apart with a chisel or similar tool. The objections to this lapring are, that after the ends are thus bent forward and backward a few times, they are subject to break off; also, that when the ends are not sufficiently closed the parts will work out, and when they are sufficiently closed, it requires a chisel or substitute to open them again; and even then this is difficult to accomplish without a vise or other means to hold the ring during the operation. None of these objections can be urged against this connecting link.

The link No. 1, in the accompanying figures, has all the strain upon the pivot, and is easier attached and detached. It will not become loose as long as any weight bears on either side of it; nothing less than quick successive jerks can detach it from the object to which it is attached.

No. 2 has no strain upon the pivot; it is easier manufactured, and presents better security against accidental detachment. If only partially closed, a strain upon the same will close it.

No. 3 is more complex in construction; but it combines all the other advantages of Nos. 1 and 2, without using the same amount of metal to produce the same strength. The ends of this link being turned under, the round parts forming the extremes cannot straighten out, and therefore its strength is nearer to the tensile than the transverse strength of the metal. There is no strain upon the pivot of this link.

No. 4 is simply a link similar to No. 3, but of lighter construction, and without ends turned under; it is particularly suitable for saddlery and other light work.

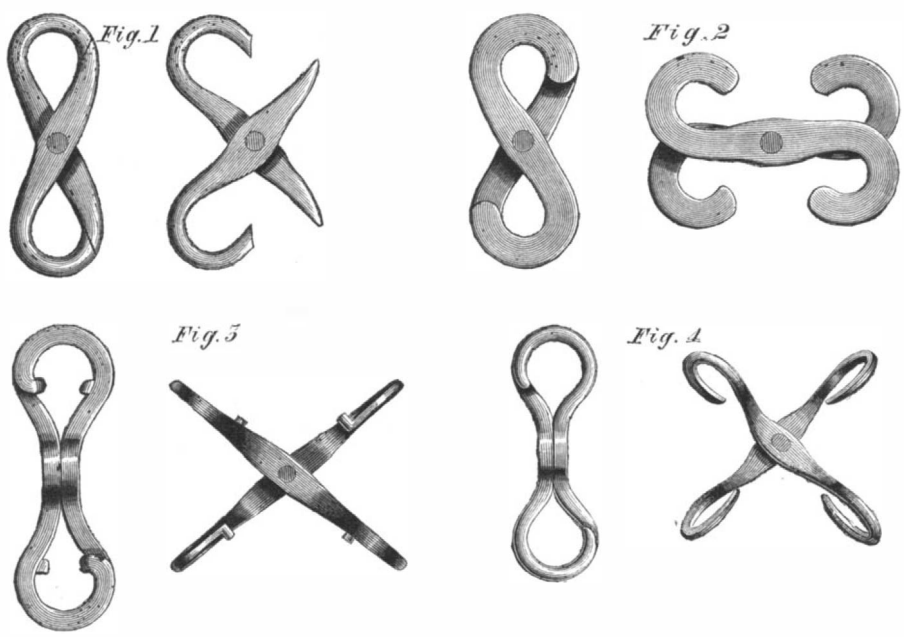
The number of laprings in use is very large. There are some 3,000,000 of farmers in the United States, and if half of this number average one span of horses each, they require 1,500,000 of double trees formed of two single trees, each attached to the main tree by two laprings. When a corn or other crop has to be cultivated in rows, these single trees are disconnected and attached to single plows, one horse to each. This gives 3,000,000 of laprings constantly required on hand for this purpose alone. Suppose the other half of the farmers to use oxen to cultivate their lands: they again require single trees to work their oxen singly within the rows, and, if not solely used for that purpose, they also require laprings. If one-third of these single trees are to be used for other purposes, they require 1,000,000 more of these laprings, or else connecting links in their place.

Again: each of these 1,500,000 yoke of oxen use an chain each, which is liable to be broken; and, if broken, the chain must be carried to the shop to be mended, which involves a loss of time besides expense, to say nothing of the inconvenience at the time of the breakage, compared to which the price of these connecting links is but a trifle.

Every teamster using stay chains, trace chains, ox chains, or chains of any kind, would find it advantageous to keep a few of these links in readiness, so that when a chain breaks there may be no delay. The third or fourth modification of link would be very suitable to attach a watch to a watch chain; in fact, their application will suggest itself to many purposes not now thought of.

The manufacture of this link is very simple. The iron is drawn out into flat sheets of the proper thickness, and then, while hot, cut into the required shape in a die. Or, to preserve the fibers of the iron, it is drawn to the proper dimensions and bent to the required shape in a die or form. Both of these processes are particularly suitable to No. 2.

This Connecting Link was patented, through the Scientific American Patent Agency, to John P. Kirk, of Austin City, Texas, on Nov. 13, 1860; and further information in relation to it may be had by addressing Robert Creuzbaur, as above.



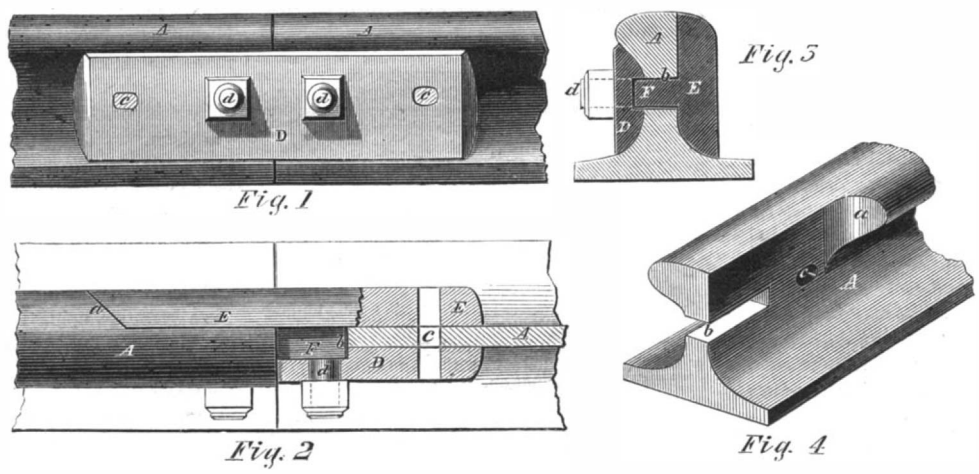
KIRK'S IMPROVED CONNECTING LINK.

Improved Railroad Joints.

There are at present more than 30,000 miles of railroad in the United States, and there is no part of the "permanent way" which causes so much trouble as the joints of the rails. It is at these points that the rails are most liable to spring and be worn away by the passing of trains over them. Every improvement, therefore, which tends to render the joints of rails more secure, and less liable to be crushed by the "rolling stock," inures to the permanency of the track and to a corresponding saving of expense. This is the object of the improvement represented by the accompanying illustrations. Fig. 1 is a side elevation of the improved rail joint; Fig. 2 is a top view of Fig. 1, with a horizontal section through one end of a rail section; Fig. 3 is a cross section taken through the rail at the joint; and Fig. 4 is a perspective view, showing one end of a rail section. Similar letters indicate like parts on all the figures.

A A represent the ends of two sections of the ordinary T-rail. The ends of each section are swaged or cut out in the manner represented by Fig. 4. The outer lip of the rail table is cut out on a vertical plane with the rail's neck, a suitable distance from each end of the rail, and then beveled or cut obliquely to the line of the rail; thus forming the shoulder portions, *a*. The end of the rail is again cut as represented, forming a slot, *b*, into the the thin portion or neck of the rail. An elliptical hole, *c*, is then punched through the neck of the rail section near the end of it, as represented in Figs. 1, 2 and 3. Each rail end may be thus shaped if it is desirable to secure every joint with the improved fastening, but each corresponding rail end is formed as represented by Fig. 4.

A piece or "fishing bar" of metal, D, extends some distance on each side of the rail joint. The outside of this piece or plate of metal is plane—the inside is of a convex form, to correspond exactly to the shape of the rail at the side, and to fit in snugly between the base and the lip of the table. When put into its place, it serves as a brace, and also as a bar for the bolt nuts. E is a bar of about the same length as the piece, D; it is formed so as to fill up the side of the rail that is ut out, as shown in Figs. 2 and 3, and thus give additicnal support for the weight it is to bear and strength toothe rail neck at the joint. It will be understood that this piece will "break joints" with the rail joint. F is a lip which projects from the inside of the piece, E, and passes through the two slots in the ends of the rails when they are brought together, and it projects slightly through the opposite side of the neck of the rail. A screw bolt, *d*, projects from each end of the piece, F, and there are nuts on these bolts for locking or screwing up the joint. Each end of the piece, E, projects under the rail table, so as to support the table at the beveled end, *a a*. Holes are punched through the piece, E, corresponding to those in the neck of the rail and the fishing piece, D. This latter has a recess cut into its inner surface to receive F, and has holes for the screw bolts, *d d*.



HEARD'S IMPROVED RAILROAD JOINT.

With this improved rail joint, the ends of rails are rigidly secured against springing in any direction, and the piece, E, which serves to strengthen the rail at the joint, receives a portion of the rolling load and transmits it to the base of the rail. And, while this rigidity at the joint is secured to prevent the rails springing, a free end play is at the same time secured to provide for the expansion and contraction of the metal with changes in the temperature of the atmosphere. Greater safety in traveling is also secured by this mode of fastening rail joints than by the old methods.

The patent for this invention was granted, through the Scientific American Patent Agency, on the 13th of November last; patents have also been secured in France and England through this office. Further information may be obtained by addressing the patentee, Dr. J. M. Heard, at Aberdeen, Miss.

Scientific American

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY
At No. 37 Park-row (Park Building), New York.

O. D. MUNN, S. H. WALES, A. E. BEACH.

TERMS—Two Dollars per annum.—One Dollar in advance, and the remainder in six months.
Single copies of the paper are on sale at the office of publication, and at all the periodical stores in the United States and Canada.
Sampson Low, Son & Co., the American Booksellers, No. 47 Ludgate Hill, London, England, are the British Agents to receive subscriptions for the SCIENTIFIC AMERICAN.
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VOL. IV. NO. 3.....[NEW SERIES.]....*Seventeenth Year.*

NEW YORK, SATURDAY, JANUARY 19, 1860.

HOME PROSPECTS.

We are the advocates of peace, both foreign and domestic; but as war is sometimes—unfortunately too often—an inevitable necessity, we have, in accordance with the spirit of the times, decided to put the SCIENTIFIC AMERICAN, for one week at least, upon a war footing, regretting, however, the necessity which obliges us to depart, even for so brief a period, from the exclusive discussion and elucidation of the beneficent topics for which this journal is altogether intended.

Our present number shows that we have brought out the big gun, and that we have got upon the stocks iron plated frigates of war, soon to be in readiness for sanguinary conflict upon the high seas. We have not yet reached those "last days" spoken of by the good old prophet Isaiah, when "the mountain of the Lord's house shall be established in the top of the mountain, when He shall judge among the nations, and shall rebuke many people; and they shall beat their swords into plowshares, and their spears into pruning hooks; nation shall not lift up sword against nation, neither shall they learn war any more." For fifteen years past we have had extensive correspondence with mechanics and manufacturers throughout all the States, and we have yet to learn that the predictions of the inspired prophet have even an incipient realization on this or any other continent.

We know not of an instance where a single rusty old sword has been beaten into a plowshare, but we have heard it announced that even the weather-beaten muskets of our distinguished fellow citizen, George Law, have at last found a ready sale. Amidst the general dullness of trade and finance, the forges of Mars are blazing away with unwonted fury, and even "strange fire" is issuing forth from their smoky embers. Dragons' teeth have suddenly sprung up as armed men, and we can almost hear "the shout, the shock, the groan of war." This, then, is the ugly side of the question, and before using our big gun to pour broadsides from our iron frigates, we will stop to think the matter over a little more seriously.

The old adage says that, "It is an ill wind that blows nobody good," and this is as true now as it ever was. If our readers suppose that the "rumors of wars" which now fill the country have destroyed *all* trade, enterprise and business prospects, they are roundly mistaken. The printers of daily newspapers have all that they can possibly do to supply the immense editions for which the public anxiously calls. The want of a new invention by which papers can be more quickly thrown off was never more sensibly felt than to-day. We are told that the fire-arms and gunpowder manufacturers are overcrowded with orders, and, in some instances, are employing double sets of hands and running their works day and night. Colt's great establishment, at Hartford, Conn., is said to be flourishing to an astonishing extent. We hear of the *farming* out from that concern to neighboring machine shops of one job involving forge work for seventy thousand arms. We are also told that the New England wagon manufacturers have received large orders for baggage and transportation wagons; this will also give employment to many. There is an immense demand, so we hear, for rubber clothing, coats, pants, boots, knapsacks, buckets, tents, blankets, spreads, and every conceivable article required for field use. All the above goods are, at the present issue, *cash articles.*

Several of the States have appropriated large sums, amounting to millions of dollars in the aggregate, for arms and munitions of war. Nearly all of this money will necessarily go to our mechanics and inventors, and keep thousands of them busy through the winter. The influx of money is very great at the present time. Nearly every steamer from Europe brings us half a million or a million. One steamer, the *Persia*, from Liverpool, arrived, a few days ago, with three millions. From California the regular supply is from one to two millions monthly. Meantime, at New York, there are, in our banks and savings institutions, $32,000,000 in specie on hand, and the prices of stocks have, of late, much advanced. Tennessee, North Carolina, Missouri, and some other State stocks, have improved very sensibly since the 18th of December. Illinois Central Railroad stocks, which stood, Dec. 7, at 51, sold January 3d for 79½, an advance of 28½ per cent. New York State 6 per cent stocks, New Loan, still remain above par, the latest quotation being 104. In reference to the cotton crop of the Southern States, we understand that the shipments from some of the seaports are very large. At the West, large orders for grain are reported, accompanied by the gold. Red Western wheat has risen, within a short time, from $1.08 per bushel to $1.37½. The panic, or "hard times," that our people passed through three winters ago appears to have had the effect of preparing them for a similar contingency in the future. We notice that the savings banks of the single state of Massachusetts, contain deposits to the amount of almost *fifty millions of dollars.* These deposits are on interest, and consist, almost wholly, of the earnings of mechanics and other working classes. As the total population of that State is only 1,331,499 souls, it will be seen that the financial condition of that great mechanical and manufacturing State is extremely good. This desirable state of things doubtless exists, in a proportionate degree, in many, if not all of the other States. By the recent treaty of peace, ratified between China and the Anglo-French allies, that immense empire is now at peace with the world. The previously signed treaty between China and the United States is therefore now brought into practical operation, thus opening to our people an immense and highly profitable market for all kinds of American manufactures. The House of Representatives has lately passed a bill for the construction of *two great lines of railroads*—a northern and a southern route—from the *Mississippi river to the Pacific!* It is expected that the bill will shortly pass the Senate and become a law. The construction of these railroads will form one of the most gigantic enterprises of the day, will give occupation to hundreds of thousands of workmen and engineers, and will impart a permanent stimulus to every description of business. The Homestead Bill, which has just become the law of the land, *gives every man a farm for almost nothing*, provided he will go West and cultivate it. We have thrown together these few items in order that our readers may see that, notwithstanding the political troubles which now brood over the country, our condition, in a financial and industrial point of view, is better than in 1857.

With such abundant resources at command, and with our political difficulties composed, a thrill of joy would sweep over our whole land, and start into new life the wheels of commerce and manufacturing industry.

PROGRESS OF NAVAL ARCHITECTURE—NAPOLEON'S NEW IRON FRIGATE.

It was said of Napoleon the Great, when he was an exile at St. Helena, that if some person were but to elevate his old grey coat upon a pole, in some corner of France, all the rest of Europe would quake. It is pretty much the same with his successor, the present emperor. All Europe watches every movement of Louis Napoleon with the most sensitive interest, and his prolific genius keeps all the nations of the Old World busy. No sooner does he adapt some new idea and commence to put it into practice, than John Bull straightway follows in his footsteps. This is especially the case with naval affairs, as it would never do to allow the French to surpass the English in maritime efficiency. In nautical skill, and in all that concerns the manning and maneuvering of ships, England has long maintained a decided superiority; but with that scientific grasp of intellect for which the ruler of France is distinguished, he, sometime ago, concluded that it was perfectly possible to construct war ships, so invulnerable in their character, as to give them the same advantage over others more ably manned but less skillfully constructed, which a soldier, furnished with a coat of mail, has over a nude antagonist. In carrying out his ideas, he has produced *La Gloire*, a great war frigate covered with thick plates of steel, and perfectly proof against shells, and almost so against solid balls. As to the necessity of commercial nations adopting this entirely new system of building war vessels, we think there can be no question. Mr. H. Vivian, a member of Parliament, in writing to the *London Times* respecting the *La Gloire*, gives it as his opinion that the best wooden war ships are as useless in her presence as the old flint musket is before the Minié rifle. Ten vessels of the same class are now building in French dockyards, so that England must endeavor to meet the issue of supremacy, when it comes, by equal, if not superior ships. In order to encounter such vessels as the *La Gloire* on equal terms, two giant iron frigates are now being built in Great Britain, and these are intended to be very superior in steam power as well as general construction. One of these frigates, called the *Warrior*, is now building in London, and the other, called the *Black Prince*, by Napier & Co., at Glasgow. A correspondent, writing to us from Malone, N. Y., gives a brief description of this latter vessel, which will be of general interest. He says:—

As you enter the yard of Messrs. Napier, the first object which attracts attention is a great iron framing resembling what we might fancy would be the skeleton of the *Great Eastern.* It is at present surrounded by a scaffolding, upon which several hundreds of workmen are busily engaged like bees around a hive. The *Black Prince* is to be 420 feet long; her breadth, 58 feet; depth, 42 feet. She is to be divided into eighteen watertight compartments, and two great Armstrong rifled guns are appointed for each bulkhead. The bottom is constructed of plates 1¼ inches thick, and the sides lined with plates ⅝ths of an inch thick. Over this is to be laid teak wood planking, 1 foot thick; and the teak is to be covered with wrought iron plates, each 15½ feet long, 3 feet wide, and 4½ inches thick. All these iron plates are made in the best manner. They are tongued and grooved on the edges and ends, so that they fit most accurately into one another, and make watertight joints throughout the whole hull. All the iron plates are cut and punched close to the vessel, whereby the fitting of them is rendered very convenient. When completed, the *Black Prince* will be 10,000 tuns burden, and her screw engines, now being built by Penn & Co., of London, will be 1,250 horse-power. No person can have an adequate idea of the great size and strength of such a ship without actually beholding it, but the account given will convey such an idea as will at once render it apparent that no wooden frigate could possibly compete with it.

The conclusion at which our correspondent arrives respecting such an iron ship is reasonable. It appears to us that such a frigate could walk through an entire fleet of wooden war ships as easily as a life guardsman could cut his way through a regiment of pasteboard soldiers. In addition to the above, we find some further information on the same subject in the London *Engineer.* It states that the entire shells of the *Warrior* and *Black Prince* are made of the best scrap iron, which has been found far superior to common rolled iron for resisting shot. The ribs which spring from the keels are 3 feet 8 inches apart, and are T-shaped beams; and inside of these another set of iron beams run along the whole length at intervals of 5 feet, and all strengthened with enormous iron girders. The decks are to be covered with timber, supported on huge iron arches. The engines are to be so protected that no shot will be able to reach them, and the stem and stern may be completely riddled and yet the frigate will float. When finished, each of these vessels will certainly be a "leviathan of the deep."

WHAT WE MOST NEED.

Food and raiment are the chief of the material wants of man; if we have these wants fully satisfied, we should have necessity for little besides, at least for the physical man. Thus, tailors and cooks, who make the final preparation of the things we most need, seem to be the most worthy of the dignity and praise which are always denied them.

If we consider a house with its appurtenances as a kind of mantle or overall for the family, we very readily arrive at the conclusion that nearly all kinds of mechanical and chemical work have in view, directly or indirectly, the wants of the stomachs or skins of men. A steam engine grinds corn or weaves cloth, or if it builds a railroad or a ship, it is only to transport the corn and cloth to the consumer.

The first inventions of men, of course, were such as ministered to their necessities or pressing wants. The

garden of Eden was so happily planted, and Adam was so perfect, that all his wants, as soon as felt, were satisfied, and he had no use for an inventive faculty. But a change came, and the garment of fig leaves was invented—an invention the first among men—and the rude prototype of all the strangely fangled notions of tailors and milliners. When the human family increased beyond the narrow limits of a tropical climate, or perhaps in Eden, when winter came on, they invented for themselves more perfect garments from the bark of trees and the skins of animals. The arts of preserving food and building houses must have been very early learned, and the improvements in food and raiment must soon have culminated in the invention of roast beef and breeches, which may still be received as symbols of our greatest perfection and of our exaltation above the brute creation.

Many people think that if they only had enough to eat and to wear, and at the same time had nothing to do, they would be happy. These are foolish people, for they do not understand how and why nature exacts labor. It is only after labor that bread tastes sweetest, and raiment is most becoming. Some of our paupers are practical illustrations of these do-nothings; they incapacitate themselves for labor by the practice of laziness, and the State gives them enough to eat and to wear, and they have nothing to do!

Besides the necessities of victuals, clothes and labor, there is perhaps a necessity of amusement or recreation for the senses; the ear needs music; the nose, fragrant odors; the eye, gay colors; the tongue, spices, &c. These wants open a wide field for invention; they call into action the talent of such as Beethoven, Piesse, the French milliner, and the great and lamented Soyer.

A New Instrument for Taking Horizontal and Vertical Angles.

Mr. Abel Ware, of Athens, Maine, recently obtained letters patent on a new surveying instrument, one of which he exhibited at our office a few days ago. As a piece of workmanship it is exquisitely fine, and the improvements which the patent secures appear to be of much importance in furnishing a cheap and portable instrument, which are both *desiderata* to the practical surveyor. The object of the invention is the production of an instrument which is adapted to the measurement of both vertical and horizontal angles, and is much more simple in its construction and less expensive than the theodolite, while it is capable of performing the work of the transit and of the circumferentor, though its cost does but slightly exceed that of either of these instruments, thus meeting a long-felt necessity for an instrument which shall be cheap, compact, portable, and sufficiently correct to supply the ordinary requirements of the land surveyor in taking both vertical and horizontal angles. To effect this purpose, the several parts of this instrument are combined in such a manner that by the use of but one graduated limb or circle and rotating vernier plate or carriage with its sights or telescope, both horizontal and vertical angles can be taken. The inventor will be happy to give further information in regard to his instruments upon being addressed as above.

AMERICANS AT SEVASTOPOL.—When this city was besieged by sea and land, a few years since, the Russians sunk a large fleet of war vessels in the river and harbor, to prevent them falling into the possession of the British and French, and also to render the river unnavigable. After the Crimean war was concluded, our countryman, Colonel Gowan, made a contract with the Russian government to raise the sunken vessels and clear the channel of the river. For several years he has been engaged in fulfilling his contract, and has, by the latest news, rendered the river once more navigable. He employs daily about 200 men, who, with his clerks, &c., occupy the naval arsenal, which was converted into a rendezvous specially for them. The operations connected with the raising of sunken ships, &c., are on a large and grand scale; by the improved apparatus which Colonel Gowan uses, his principal divers being able to remain in 22 fathoms of water for the space of four hours; and though the operations have extended over four years, only one accident has happened, and that was the drowning of one of the divers in consequence of one of the air pipes bursting under the pressure of the air, which was being pumped into it. It is supposed that Colonel Gowan's operations will yet occupy two years.

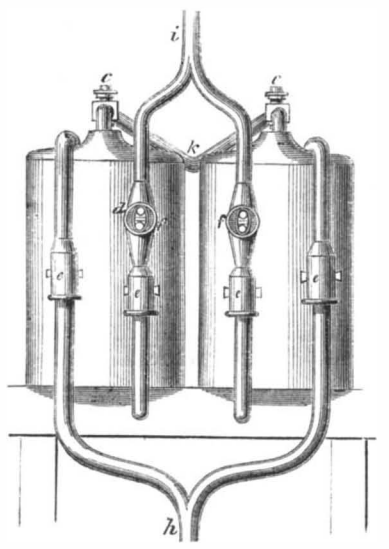
ROMANCE OF THE STEAM ENGINE.

ARTICLE VI.

SAVERY—SHIP'S INDICATOR—STEAM FIRE-ENGINE.

After the Marquis of Worcester, the next steam inventor of prominence who appeared on "the stage of time" was Captain Thomas Savery, also an Englishman. This was about thirty years after the noble Marquis had been laid to rest at Ragland Castle. Very little is known of Savery as a man, but he published a pamphlet in which we have a record of his mechanical and inventive abilities. It is certain that he possessed considerable wealth and that he had acquired a thorough practical knowledge of mechanics. In 1718, no less a personage than the great Sir Isaac Newton made a report to the government on the practicability of a machine invented by Savery for measuring a ship's way at sea, which, from the description, appears to have been principally composed of a set of blades placed on a vertical spindle set down under a ship's bottom, and which was revolved by the water. It communicated motion to an indicator through a train of gearing, like that of a gas meter. Captain Savery also constructed a fire-engine and exhibited it before King William, at Hampton Court, and the monarch was highly pleased with its performance. At this period Newton was president of the Royal Society, and all matters of science and mechanics were treated before that body with profound respect. To this institution Captain Savery carried his invention, and in its transactions is a record of an experiment made with it before its members, in their apartment. It is stated to have been quite successful, but we are not left in doubt as to what the engine was, as the accompanying engraving is a representation of it, taken from the printed volume of proceedings for the year 1699.

In the illustration, *k* is a pipe which conducts the steam from a boiler, left out of the figure to render the



explanation more clear. The steam passes into two receivers similar in form to retorts. A pipe, *i*, branching from each of these vessels is inserted into their bottoms; *e e d f* are valves opening outward and preventing—by their action—the return of any water that may have been forced through them. A pipe, *h*, proceeding from the cistern also branches to both receivers, and is inserted into the top of each. Valves are placed at *c c*, by which a communication may be opened or shut off with the boiler, alternately, accordingly as they may be adjusted—one being open when the other is closed.

Steam from the boiler being permitted to flow first into either of the receivers, the water which that receiver contains is forced by the steam pressing upon its surface, up one of the branches of the pipe, *i*, and when the vessel is thus emptied of the water and filled with steam, the valve, *c*, is closed, and communication with the boiler cut off. Cold water is then suffered to flow over the surface of the vessel, which thus condenses the steam within and forms a vacuum. The pressure of the atmosphere now forces water from a cistern or well below up the pipe, *h*, into the empty vessel. At the instant steam was shut out from one receiver it was admitted into the other, by turning the other steam valve, and then the water was forced from it up the pipe, *i*, during the period that condensation was being effected in the other vessel, and so on, as has been described. In this manner, by the employment of two close vessels standing in the same relationship to one another as the two cylinders of a common fire-engine, first by the pressure of steam and then by its condensation alternately in each vessel, a constant column of water was raised from a cistern and forced to an elevation proportionate to the pressure of the steam. This was certainly a direct steam engine, and was recommended principally for raising water from mines. It would, and did, do this, but not economically, although it exhibited much ingenuity. Its inventor was rather despised than appreciated by the owners of English mines, for whose benefit it was chiefly designed. Subsequently he added several improvements to this engine, which will be illustrated in our next article on this subject, together with a further account of this very worthy inventor.

MECHANICS, ATTENTION—TURNING TOOLS.

The proper shape of a tool employed for turning metal can only be determined by experience, aided by a philosophical knowledge of the laws which govern motion. The relation of the curve or straight line to the ends desired to be attained must be as carefully considered as that of any motive agent whose action is correspondingly valuable to man. A tool which has merely a very sharp and hard edge will not accomplish the same useful results as one which is constructed upon philosophical principles, with respect to its shape and position. It would save a great deal of time and expense in machine shops if a more correct knowledge generally prevailed among those who forge tools, so that they might form them as nearly right as possible while "the iron is hot." Much valuable time is wasted in grinding down tools to the proper shape after forging, a great deal of which time might be economized.

If we consider the first principle of a cutting tool, we shall find it to be that of the wedge, and that in its performance it separates the atoms comprising a whole by cleaving them asunder with more or less force, as its shape is correct or incorrect; but the way in which the action of that wedge is to be applied is the secret of the whole art of tool making. Speaking of tools, we do not in this connection recognize any but roughing tools.

Let us suppose a round shaft to be in the lathe, and the tool applied to it; the first consideration is whether the one in hand is such as to act with economy, and produce good workmanship. The surface of the shaft is to be turned down one-fourth of an inch, and it is a well known law that all revolving bodies throw off at a tangent with their circumferences whatever is loosely attached to or detached from their surfaces. In obedience to this law, the object to be attained is to turn the surface of the iron so that its refuse will run in a tangent. Now, supposing the tool to be moving laterally, as it does in operation; if the edge be inclined at an angle of 45°, the "chip" will first endeavor to pass off at a tangent, but, as it meets with resistance from the cutting edge and the surface, it will deviate from that direction, and, running down the angle of 45°, a corrugated and very brittle chip is produced. If we alter the edge of the tool so that its point reaches high above the "centers" of the lathe, and set its angle sloping partially, instead of arbitrarily to the right, while its cleaving edge forms a tangent (or nearly one) with the circumference, the chip produced will run off the tool in a true spiral, and vary but slightly from the path we claim it should travel. In the first mentioned instance, the turning produced, although apparently even and true, is not and cannot be so even and perfect as that produced by the second tool set forth. The fact of the cutters being high above the centers of the lathe prevents the work from rolling upon and "chattering" it, as it is called. Moreover, by testing the heat of the two chips, produced as described, as they leave the tool, it will be found that the last-mentioned is not so hot—consequently the tool worked with less friction on the metal, and therefore less power was required to drive the work. When we consider this fact, we directly recognise its great value; for, if we admit that one instrument is more economical of power than another, we must admit that the freest working one will remove more iron in a shorter space of time. From this recognition, the pecuniary value of the instrument becomes evident.

But in discussing the quality of tools which have keen edges and cut "clean," we do not allude to

"fancy tools," made merely for experiment. It is only the practical advantages to be derived from an experiment that makes it valuable; by the form of the chip taken in working his lathe, we can, in some measure, judge of a craftsman's skill.

A revolution in the shape of cutting tools is gradually taking place in our best machine shops; ten years ago the "diamond point" was regarded as the *ne plus ultra* of roughing tools, but those now in use are very different in shape, and are difficult to describe without illustrations.

Every man, of course, makes his tools to suit himself, but as each handicraft is improved by individuals composing it, we ask the attention of our workmen to their cutting tools, and try what progress can be made in this direction.

CAN WATER BE USED AS FUEL?

It is quite a common belief that water thrown on a fiercely raging fire acts as fresh fuel to the flames, and makes the fire hotter. A little consideration of the nature of water, and the laws of combustion, will show that this belief is an error.

Water, for neutralizing heat, is far more efficient than any other substance. Thirteen pounds of water, at 212°, in changing into steam, will practically extinguish all the heat from the burning of a pound of coal; a thermometer placed in the steam will not be raised a single degree, although, in fact, heat enough is generated by the burning coal to melt nearly ten pounds of cast iron. Nothing will put out a fire so quick as water.

But it is said that water may be decomposed when thrown on the fire, and that then it will burn; this is nearly the truth. The water may be decomposed, but not in such a way that the oxygen of the water can assist in the burning of its hydrogen. The separation of the elements of water requires and consumes a great heat; the oxygen of the water combines with its equivalent of carbon, and so much carbon is, in effect, taken from the fire and produces no heat. When the water is thus decomposed, an equivalent of hydrogen simply takes the place of its equivalent of carbon, and gives out in burning precisely the same amount of heat as is attainable from the carbon. Of course, as hydrogen is a gas and carbon a solid, the decomposition of water in a charcoal fire would give a flame where otherwise there would be none.

Now, if these facts be put together, we arrive at the practical conclusion that if water be thrown on a fire, in the first place a great deal of heat will be consumed in converting the water into steam; and, in the second place, that if any of the steam is decomposed, the hydrogen set free will be at the expense of its equivalent of carbon, and can, in burning, produce no more heat than the carbon.

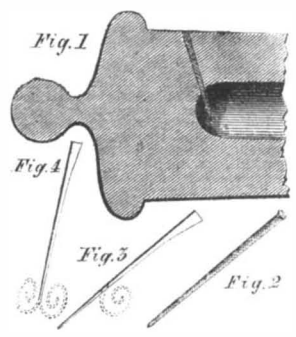
Manufacturing Iron Ship Plates.

The following graphic description of manufacturing the iron plates for the English war steamer *Warrior* is from the London *Engineer*:—

The tests which were applied to the plates furnished by the builders of the *Warrior* were of the most trying character. Some plates were fired at with 68-pounders, at 200 yards' range, and were literally cut in halves by balls fired one after another on a line drawn on the surface, each ball striking immediately below its predecessor. Upon some other plates the balls made a circular indentation upon the surface, nearly as deep as the plates, exactly of the form of the projectile, and as though a mold had been taken of it in some soft and yielding substance. It was only after repeated trials that it was decided that the plates should be of annealed scrap iron. The labor involved in building up these plates is enormous. In the first instance, small scraps of iron are thrown into the fires, and, when in a state of red heat, are subjected to severe hammering, under the steam hammer, until the whole is beaten and amalgamated into a solid mass of about half a tun weight. This lump is then placed on the top of a similar mass, the whole made red hot, and hammered and welded together. Repeated additions of this kind are made until about five tuns of metal are thus welded together in one huge shapeless body. This is then brought to a glowing white heat, and placed under the huge hammer, the thundering blows of which gradually reduce it into shape. Again and again the enormous slab is put into the furnace and hammered into one piece of 15 feet long, 3 feet wide and 4½ inches thick. From ten to a dozen men are engaged in the work of moving these ponderous masses of iron, which are moved about apparently with the most perfect ease. Powerful cranes swing the molten mass from the furnaces to the hammer; a nicely adjusted balance is provided by a massive iron lever, one end of which is welded into and forms part of the metal, and this is provided with a dozen or more of horns or handles, by which the iron can be turned in any direction; for the plates are not only hammered on the broad surface, but at the sides and at the top and bottom. The plates, after having been roughly formed into shape, are completely planed and squared. Planing machines of enormous size hug these plates in their resistless arms, and bear them slowly and silently under the sharp cutting edges of the tools, and thin shavings of the metal, which, as they are cut, coil up in long bright ringlets of iron, attest the tremendous power of these noiseless and all but omnipotent machines. When the edges and surfaces are made perfectly smooth, like the finest work of the cabinet maker, the plates are placed on an end, gripped firmly by a mortising machine, and, as they travel slowly backward and forward in the framework against a small tongue of steel, a groove of about one inch in width and depth is formed, into which the corresponding projections formed on the side of another plate will fit with the most perfect accuracy, the plates all being made to dovetail on each of the four sides.

Mode of Spiking Cannon.

From the number of inquiries which which have been put to us since Colonel Anderson spiked the cannon at Charleston, as to the way "spiking" is done, we are led to believe that a large majority of persons are ignorant of the process. To enlighten such, we have had the annexed views engraved to illustrate the plans most usually adopted. Fig. 1



represents a longitudinal section of a cannon, with its priming hole spiked with a small rat-tail file, as shown in Fig. 2. The steel is driven hard down, as far as it can go, and then broken off even with the surface of the barrel. The steel is so hard that it cannot be drilled, and so rough that it cannot be forced out, and is, therefore, the best material used. Figs. 3 and 4 show two forms of wrought iron spikes, which assume the position shown by the dotted lines when used, and thus cannot be withdrawn without much difficulty.

The Mechanism of the Horse's Hoof.

The hoof of a horse is considered as an epidermic appendage—similar to nails and claws of other animals, and scales of fishes, which are produced, in the first instance, by the growth of cells, the contents of which gradually evaporate, so that the walls of ths same gradually approximate each other.

In the upper part of the hoof—near its matrix (mother)—these cells are to be observed; they are somewhat flattened against each other, but still retain a rounded form.

The hoof, nails and scales, are not traversed by nutrient vessels nor absorbents, as is the case in regard to the sensitive tissues; and the flattened cells, when fully developed, undergo but little change.

The chemical analysis of the constituents of the hoof are as follows;—

Carbon	52 parts
Hydrogen	7 "
Nitrogen	17 "
Oxygen and sulphur	14 "
Total	100

—*American Stock Journal.*

Water Gas and the Emperor's Heart.—Baron Gudin, the French marine painter, describing to the Liverpool Social Science Association a gas and water apparatus, happened to say: "The Emperor is my friend, and I know the very bottom of his heart." At these words, Lord Brougham, who was in the chair, smiled and shook his head; and, at the conclusion of the Baron's remarks, while eulogizing his talents as an artist, added: "But, with reference to this great discovery—I don't mean that of the bottom of the Emperor's heart, but of the gas and water apparatus—I hope we shall soon hear more." These words, delivered in the noble Lord's dryest manner, excited roars of laughter, which seemed to puzzle Baron Gudin immensely.

Professor Newbury thinks that artesian wells cannot be bored to any advantage in Ohio. The well in the State House yard at Columbus has reached a depth of 2,775 feet (or over half a mile), and yet the water will not rise above the surface; and even if water shall be got, the Professor says it will be warm and salt, and so unfit for use.

Our Correspondence.

A Sign of Prosperity.

Messrs. Editors:—In your issue of last week, you say "the mechanical and manufacturing industry of the country is at a standstill." This is no doubt the case to a considerable extent, more especially your way, but much less this way.

The factories are all quite busy in the "City of Spindles," having just made up their accounts and declared good dividends (payable on demand), and are buying large invoices of cotton at a low figure. Some of them have immense orders on hand. Our mechanical establishments are, as a general rule, doing more now than they were one year ago; indeed, several of them are doing more than double. Some of them run three nights per week until 12 o'clock.

I learned of one business firm in your city who received, within a week or two, the largest order they have ever got, and find no difficulty in doing business except in the stringency of the money market. It seems to me that all ought to endeavor to do all in their power to restore confidence. The country was certainly never in a better condition—want of confidence alone excepted. Our farmers all through this section have raised unheard of crops of wheat, corn, rye, oats, potatoes, and fruits of nearly all kinds. Wages have been good, and are good now. Farmers are advertising for help, and everybody about here seems to be busy. A. M. S.

Lowell, Mass., Jan. 1, 1861.

[We are glad to learn that dullness in trade is not supreme in all sections of our country. If our political differences could be composed, joy would fill the hearts of all our people, and prosperity would crown the labors of all. Confidence will not, however, be restored until our national affairs are settled in some form.—Eds.

Prospects in Mississippi.

Messrs. Editors:—Inclosed I hand you $10 for five years' subscription to your valuable paper, which I cannot do without, even if the Union is dissolved. I was pleased to see the stand you took in regard to taking the notes of suspended banks in payment of subscriptions and money due you, and I shall tell everyone that I sent such money to you for five years' subscription. The Southern banks are as solvent as ever, and in a short time exchange on New York will be drawn at its usual rate, say from par to one cent discount, and I hereby proffer my services to you, if I can aid you, in getting such money as you may take converted into exchange on New York, at living rates, of which time I will advise you. Pardon me for intruding a long letter upon you; but knowing that you do not dabble in political matters, and believing that political newspapers generally do not represent the true feeling of the people, is my excuse for writing thus much. The South is comparatively easy, being an agricultural people and raising enough to eat, an ample cotton crop selling at good prices, and, as a people, nearer out of debt than they ever were, they are snugly fixed up to secede from the Union without feeling it much.

Your friend and ob't servant, W. J. L.

Okalona, Miss., Jan. 1, 1861.

[It does us good, in these exciting times, to receive such solid and cheering evidences of kindly good will from our Southern friends. So long as the peace of the country is secured, our resources are ample and our people will be happy.—Eds.

The First American Locomotive.

Messrs. Editors:—An inquiry is going the rounds in relation to the first railroad built in the United States. A locomotive was placed on the eastern portion of the road from Carbondale to Honesdale, Pa., previous to 1830; but when the road was built, I do not know. I was there in the summer of that year, and saw the locomotive, which had been taken off on account of the road being so slenderly built. It was not a passenger road. A. H.

Schenevus, N. Y., Jan. 2, 1861.

At the Augusta (Maine) bridge, a novel mode of transit for winter teams has been adopted. A track is laid the entire length of one carriage way, and a large platform car placed thercon, so constructed that a loaded sled can be driven upon it and easily drawn over.

Recent American Inventions.

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

TYPE CASE.

The object of this invention is to render type cases capable of being made more portable than hitherto, or of much less dimensions, so as to economize in space, and, consequently, in rent and artificial light, and, at the same time, expedite the work of the compositor. Type cases constructed in the ordinary way require to be of such dimensions as to preclude the necessity of frequently supplying or replenishing the boxes with type, which would consume considerable time. This arbitrary size occasions much embarrassment. The hand of the compositor in the prosecution of his work necessarily travels over a great deal of space in a given time, and considerable artificial light is required to render visible all parts of the case. To obviate these difficulties, a type case is constructed of quite moderate dimensions, so far as area is concerned, but with the case and its boxes made quite deep, so that these boxes may hold a comparatively large quantity of type, the boxes being provided with movable bottoms, arranged so as to be readily adjusted or raised from time to time to compensate for the gradual exhaustion of the boxes, and keep the type at the surface of the same. This invention was patented by Thos. N. Rooker, of the New York *Tribune* office.

APPARATUS FOR ENLARGING PHOTOGRAPHS.

The object this invention is to obtain from photographic negatives of a given size, positive pictures of a much larger size. The invention relates to the employment of mirrors to reflect the direct rays of the sun through the camera containing the negative, and it consists in so applying and operating a system of mirrors or reflectors in combination with the camera, whereby, notwithstanding the movement of the earth upon its axis, the rays of light will continue to be reflected in the same direction for as long a time as may be necessary to obtain the print, and distortion of the picture be prevented. The credit of this invention is due to J. H. Whitley, of Owego, N. Y.

ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING JANUARY 1, 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.

1.—W. C. Berry, of Woodbridge, N. J., for an Improvement in Machines for Cutting Roots:

I claim the knives, G and H H, and the wedges, I I, arranged relatively with the cutter, F, and the finger plates, K K, to operate as and for the purpose set forth.

2.—Eliakim Briggs, of South Bend, Ind., for an Improvement in Feeding Mechanism for Spoke Machines:

I claim the arrangement of the screw, D, wheel, E, attached to block, G, the cord, N, attached to arm, I, and axis, F, of wheel, E, catch bar, T, and sliding clutch, H, all arranged for joint operation as and for the purpose specified.

[This invention relates to an improvemenl in that class of turning machines in which a pattern is used for giving the desired form to the work to be produced. The invention, although more especially designed for turning spokes, is applicable for turning all articles having a regular curved longitudinal profile as well as those having an irregular form circumferentially.]

3.—B. J. Burnett, of Mount Vernon, N. Y., for an Improved Refrigerator:

I claim, in combination with the provision chamber, the employment of an ice chamber, B, so constructed and arranged, as specified, as to have tapering spaces, f, on each side, as specified, for the purpose described.

I also claim the employment of the door or leaf, C, constructed and operating as specified, for the purpose set forth.

4.—J. M. Connel, of Newark, Ohio, for an Improvement in Water Elevators:

I claim the arrangement of means for actuating the spout, M, which is hinged to the curb, as set forth, for operating the valve, P, and controlling the quantity and the flow of water in connection with the aperture board, J, as and for the purposes described.

5.—A. L. Dennison, of Waltham, Mass., for an Improvement in Watches:

I claim, first, The intermediate wheel, I, in combination with the main gear, C, and central wheel, K, when the intermediate and central wheels are in the same place, as set forth.

Second, I claim combining the maintaining power with an intermediate wheel between the main gear and the central wheel, whereby the ratch of the winding arbor and the ratch of the maintaining power are placed in the same plane, for the purpose set forth.

6.—J. H. Dialogue, of Camden, N. J., for an Improvement in Valve Motion for Steam Engines:

I claim the reciprocating bar, D, its slides, C and C′, connected to the steam valves by any suitable devices, and the catch levers, I and I′, having their upper surfaces parallel with the line in which the said reciprocating bar moves in combination with the vibrating cams, T and T′, or their equivalents, controlled by the governor, the whole being arranged for joint action, substantially as and for the purpose set forth.

7.—Edward Dithridge, of Pittsburg, Pa., for an Improvement in Pots for Glass Making:

I claim the use of the second or false back in retorts or pots used for making glass, as described, and for the purpose set forth.

8.—C. H. Dolbeare, of Boston, Mass., for an Improvement in Lamps:

I claim, in a burner of the kind as specified, the application or arrangement of a filling tube, D, so as to pass down through the cap, a, substantially in manner and for the purpose as set forth.

9.—J. H. Durand, of Niles, Mich., for an Improved Clothes-dryer:

I claim a clothes' dryer, A, consisting of a series of slats, B, connected by cross rails, C, in combination with the links, E, and legs, D, all arranged and operating in the manner and for the purpose set forth.

[This clothes dryer is so constructed that it can be expanded or contracted at pleasure, and that it can be used equally well when expanded to its full length or when expanded only partially. Its legs are made so that it will stand firm under all circumstances, and the rests which support the clothes are so arranged that the same do not rise or fall materially when the clothes-dryer is expanded or contracted, and that, when the same is used in the open air and a sudden storm makes it desirable to take in the clothes, this can be done simply by contracting the clothes dryer without danger of soiling the clothes.]

10.—C. Eggelston, of Beloit, Wis., for an Improvement in Seeding Machines:

I claim, first, The combination with the spoked driving wheel, B, and concentric spur gear, E, of a surrounding case, D, and sled shaft pinion, F, the whole arranged and operating as specified, for the purpose set forth.

Second, I claim, in combination with the series of spouts, C, the series of cut-offs, v v′, and the adjustable diamond-slotted bottom, Z, and slide, W, with its hand lever, K, and adjustable stop, L, the whole constructed and operating as described, for the purpose set forth.

Third, I claim, in combination with the semi-cylindrical seed-box bottom, the double seed shaft, G H, with two sets of gears and central bearing partition, t, and separate cut-offs to each seed spout, the whole constructed and operating as specified for the purposes set forth.

Fourth, I claim, in combination with the spouts, C, attached by removable rods, h l, and set in and out as specified, the chains, g, supporting adjustable beam, S, and the main frame with two beams, M and N, one in advance of the other, the whole constructed and operating as described for the purposes set forth.

11.—Nicholas Hackett, of Albany, N. Y., for an Improved Chimney Top:

I claim the employment of the openings, D D D D, near the closed end of the pipe, A, when shielded by the caps, F F, and used in combination with the external conical case, E, and the guard, H, as and for the purpose specified.

12.—Joseph Harris, Jr., of Roxbury, Mass., for an Improvement in Adding Machines:

I claim the spring escapement movement, a, in connection with the pins, n n, and inclined plane, c, working in the manner and for the purpose described.

13.—Alfred Hathaway, of Charlestown, Mass., for an Improvement in Skates:

I claim an improved skate as made not only with its foot rest combined with its runner by means of a hinge, rocker or fulcrum, but with a spring or springs so applied to such runner and foot rest as to present an elastic support to either or both ends of the runner.

I also claim the combination and arrangement of the locking arms, or their equivalents, with the foot rest and the runner having a spring or springs so applied to them as to enable them to operate together, substantially as specified.

14.—H. Hathaway, of Detroit, Mich., and B. Lathrop, of Tolland, Conn., for an Improvement in Apparatus for Evaporating Liquids:

I claim the use of the siphon, in combination with the gratings and arrangement of the pans, substantially as described.

15.—J. G. Henderson, of Mo., for an Improvement in Hand Looms:

I claim, first, So constructing and combining the picker staff, M, and driver, L, that the staff will stand at right angles to the lay and operate as a stop to the lay when the shuttle fails to box, substantially as described.

Second, Operating the take-up and let-off motions by the beating up of the web, by means of the endless belt connecting the cloth and yarn beams, substantially as described.

Third, The combination of the treader, E E, guides, G G, and shaft, M, Fig. 1, so arranged that the taking down of one treadle by the backward motion of the lay turns said shaft, M, partly around, throwing out another staple, to take down the treadles in the proper manner to make the required shed, substantially as described.

16.—Joseph Hollen, of Fostoria, Pa., for an Improvement in Knitting Machines:

I claim, first, The hook, G, when the same is constructed and arranged to operate in taking up the stitch and carrying it over the end of the needle, V, substantially in the curved manner described.

Second, I claim giving the said hook, G, the sinking and curved returning motions described for carrying down and discharging the stitch by means of the hook carrier, H, operated by the lever arm, N, substantially in the manner described.

Third, I also claim making the lower end of the presser, I, in the forked form described, and causing the said fork to move in a curve along the two sides of the needle. v, as described and for the purpose specified.

17.—W. J. Hotchkiss, of Derby, Conn., for an Improvement in the Link Shackle of Chain Cables:

I claim The construction of the link, A, and the movable side piece, B, with apertures and hook-formed tenons in their extremities, in the manner and for the purposes shown and described.

[The ordinary shackle used to connect cables with anchors, and to connect two pieces of chain, or supply the place of a broken link in cases where it is inconvenient to insert a new link by welding, consists of a stirrup-like bow, with two eyes at its extremities, having a pin inserted through them, making a very cumbrous and awkward attachment. This improved link shackle consists of a link of the form of an ordinary chain link made with a movable side fitted into its place, with one or more tenons, in such a manner that, when in its place, the complete shackle presents the appearance of an ordinary chain link. The movable side is to be secured in its place by rivets.]

18.—Prosper Humbert, of Boston, Mass., for an Improved Lever Escapement:

I claim the lever, C, having its cylindro-pallets, i j, on a cylinder, D, and its fork, g g′, and staff, d, arranged substantially as described relatively to the staff, b, of the balance and spindle, c, of the escape wheel, to operate as set forth.

[This invention consists in a certain construction of the lever and mode of applying its pallets, and mode of applying the lever relatively to the balance and escape wheel, whereby the fork of the lever is made to act upon the said pin with a more nearly accompanying movement, and thereby to operate with much less friction.]

19.—John C. Kimball, of New Haven, Conn., for an Improvement in Self-adjusting Carriage Seats:

I claim so constructing and connecting the two seats that the curvilinear motions of the back seat will perfectly control the curvilinear motions of all parts of the forward seat, when the two seats are constructed, connected and made to produce the result, substantially as described.

20.—Henry Leibert, of Norristown, Pa., for an Improvement in Lamps:

I claim forming an adjustable cap for lamps of a single flat piece of metal having projections, e, f and b, and recesses of the shape and arrangement described, the said piece of metal being bent as specified, so as to form the body of the cap and so that the two projections, e e, shall form a spring clip for grasping the tube of the lamp in the manner set forth.

21.—T. D. Mathews, of St. Peter's Parish, S. C., for an Improvement in the Composition of Castor Oil Soaps:

I claim the product formed by combining the following named articles in the proportions indicated:—Oil of palma christi, 1 gallon; aqua ammonia, 2 lbs.; refined potash, 6 lbs.

22.—A. G. Mack, of Rochester, N. Y., for an Improved Machine for Setting up Barrels:

I claim the adjustable or rising and falling band, B, in connection with the adjustable and flexible loaded band or rope, D, applied to a frame, A, which is provided with an annular ledge, d, at its base, a, an annular plate, c, at its top, and a winch or windlass, H; all arranged substantially as and for the purpose set forth.

[The object of this invention is to obtain a simple machine that may be economically constructed and manipulated with great facility for setting up the staves of barrels and all kinds of casks preparatory to hooping them, so that the work may be done much more expeditiously than by the usual process.]

23.—John Middleton, of New York City, for an Improved Ice Crusher:

I claim the combination of the receiver, A, jaws, B and D, and sliding bottom, G, operating together substantially in the manner and for the purpose set forth.

24.—G. H. Moore, of Rochester, N. Y., for an Improvement in Plows:

I claim a plow constructed and composed of the several characteristic features described.

25.—Wm. Newbury, of Clarksville, Mo., for an Improvement in Straw Cutters:

I claim, first, the combination of one rake-toothed feed roller, U, a vertical hopper, F, a series of revolving knives, T T, a horizontal gage plate, A, and the gearing, D B E K J G I M N, the whole constructed, arranged and operating in the manner and for the purposes set forth.

Second, The combination of the separate or removable projections, b b, on which the knives rest, set screws, m, knives, T T, and horizontal gage plate, A, in the manner and for the purposes set forth.

26.—August Nettinger, Jr., of Philadelphia, Pa., for an Improved Sausage Stuffer:

I claim, first, The cylinder, J, with its projection, m, in combination with the spring latch, i, the latter being so constructed and so arranged in respect to the said projection that the cylinder is rendered self-locking, as set forth.

Second, The hinged table, L, and its oblong slot, p, when arranged on the frame in respect to the cylinder, J, and its tube, K, as and for the purpose set forth.

27.—J. T. Plummer, of Plainfield, Conn., for an Improvement in Machinery for Drawing and Twisting Wool:

I claim the stationary detached tube, G, applied in combination with the rotating gear box containing the front or lower drawing rollers, substantially as and for the purpose specified.

[This invention relates to that description of drawing and twisting machinery in which the front or lower drawing rollers are caused to revolve about a common axis perpendicular to their own axes for the purpose of producing twist and draft of the roving at the same time. It consists in a certain construction and arrangement of the parts, whereby the distance between such revolving drawing rollers and the receiving end of the channel for conducting the sliver or roving to such rollers is very greatly reduced, and the difficulty of introducing the end of the roving between such rollers is obviated; and in the employment of a detached stationary conducting tube, applied in combination with such drawing rollers, whereby the necessity of "piecing" is generally avoided.]

28.—John Reist, of Philadelphia, Pa., for an Improvement in Scissors:

I claim scissors formed by the described combination and arrangement of blades, A, springs, C and D, plates, B, and pivots, b and c, the whole being constructed and operating substantially as described.

29.—G. H. Reynolds, of New York City, for an Improvement in Mounting Lithographic Stones:

I claim mounting each stone permanently in a metallic frame, in the manner and for the purposes substantially as set forth.

30.—Ezra Ripley, of Troy, N. Y., for an Improved Wrench:

I claim the rotating face adjustable jaw, C, having a direct screw adjustment, as described, in combination with the hook or claw gripper, B, hinged to the wrench stock or bar, A, combined substantially and operating in the manner and for the purposes set forth and shown.

31.—Ezra Ripley, of Troy, N. Y., for an Improved Mode of Hanging Covers to Boiled Metallic Hollow Ware:

I claim an improved and more convenient article of tea kettle cover, substantially the same as fully described and shown, and such as may be attached in a line with the spout, to spouted and bailed metallic hollow ware or tea kettles, in the manner substantially as set forth.

32.—Archibald H. Rowand, of Allegheny, Pa., for an Improvement in Coupling for Railroad Cars:

I claim the application and use of the compound metallic springs, supported by the elastic spring pods or cushions, C C CC, and its socket or bed, m m, operating by lateral resistance or pressure against the entrance of the wedge-shaped end of the bar, A, substantially as described in the second claim.

I also claim the application of the ratchet-shaped notches, N N N N N N, in the inside of the main or metallic springs, and the corresponding recesses in the wedge-end of the bar, A, in combination, for the purpose set forth substantially as described.

33.—Thomas N. Rooker, of New York City, for an Improvement in Type Cases:

I claim a type case having its boxes, a, provided with movable or adjustable bottoms, b, arranged to operate by any suitable mechanism, substantially as and for the purpose set forth.

34.—Henry Scheuerle, of New York City, for Improved Punches for Making Sides for Hoop Skirts:

I claim combining with the male and female dies, H I K L, for cutting and forming the slides from the strips of metal, the additional set of dies, M M′, for cutting and forming the tips from the portions of the metal strip which heretofore went to waste, as set forth.

35.—John C. Schooley, of Cincinnati, Ohio, for an Improved Refrigerator:

I claim, first, The application and arrangement of the air induction passage, G, extending from the top of the exterior of the ice chamber down its inside underneath the ice meltings, and discharging at a point above them, substantially as and for the purpose set forth.

Second, I claim the construction of the double water escape tube, M, so arranged as to carry off the meltings in the ice chamber and the moisture produced by condensation within the submerged air induction passage with one and the same water cup, substantially as and for the purposes set forth.

36.—Herrmann Shlarbaum, of New York City, for an Improvement in Aquariums:—

I claim the described construction of an aquarium arranged so as to be suspended on a wall in the manner and for the purpose substantially as set forth.

37.—R. R. Taylor, of Reading, Pa., for an Improvement in Steam Hammers:

I claim, first, Combining the vibrating wooden helve, G, with the hammer block moving in vertical guides and with a double-acting steam cylinder when the latter is connected to the wooden helve at a point between the center of the helve's vibration, and the hammer as and for the purpose set forth.

Second, Operating both exhaust and steam valves, by means of the projections, j, on the helve, and the slotted lever, h, with its adjustable set screws, k, and k′, the whole being arranged and operating as set forth for the purpose specified.

38.—John Terrell, of Philadelphia, Pa., for an Improvement in Knitting Machinery:

I claim, first, Operating the thread presser, 5, by means of the reciprocating slide, Q, and its roller, m′, in combination with the lever, S, vertical slide, T, and spring, s, the whole being constructed and arranged substantially as set forth.

Second, Giving the signal for reversing the motion of the machine on turning the heel or toe of the stocking by means of the sliding blocks, W W′, on the edge of the plate, U, in combination with the shaft, 7, its arm, 12, and bar, 13, catch, 9, and ratchet wheel, f, the whole being arranged and operating substantially as set forth.

Third, I claim the plate, U, ring, V, its projection, u, the blocks, W and W′, with the springs, x and w, engaging into the notches on the back of the said plate, U, and said ring, V, as specified, in combination with the movable yielding lever, C, the whole being arranged for joint operation, substantially as and for the purpose specified.

39.—H. W. Warner, of Greenfield, Mass., for an Improvement in Skates:

I claim a skate provided with separated foot plates, C, that are jointed to the runner, A, as shown and described.

40.—L. C. T. Weber, of Rochester, N. Y., for an Improvement in Breech-loading Ordnance:

I claim, first, The attachment of the block, G, containing the screw plug, H, to the barrel of the piece, by strap pieces, I I, attached to pivots, c c, secured in the sides of the barrel, such strap pieces being arranged to swing in vertical planes from the said pivots and the rear face of the barrel, and front face of the said block, having the form of corresponding arcs concentric to the said pivots, all substantially as described.

Second, The adjustment of the elevation of the piece by means of a shaft, M, and cam, M′, combined with a shaft, r, by means of an endless screw, r′, and worm wheel, q, and the whole applied in combination with the gun and its carriage, substantially as set forth.

Third, The employment for working the piece in a horizontal direction of a shaft, P, roller, P″, worm wheel, t, endless screw, O′, and shaft, Q, the whole applied, combined and operating substantially as described.

Fourth, The swinging gunner's seat, R, applied and secured to the carriage and operating substantially as specified.

Fifth, The employment for meeting the recoil of the gun, and employing the force thereof to return the gun to its place, of springs, U U, and V V, arranged in combination with boxes, C C, and operating substantially as specified.

41.—Stephen R. Weeden, of Providence, R. I., for an Improvement in Lamp and Candle Wicks:

I claim the wick composed of a single strand enchained in a series of single loops as described.

42.—S. A. Whitney, of Glassborough, N. J., for an Improved Glass Stopper for Bottles:

I claim the glass stopper, B, its screw thread, d, shoulders, e and f, cork washer, h, and tapering termination, i, the latter being so formed and so arranged in respect to the two shoulders as to facilitate the adjustment of the washer to and confinement within the recess between the said shoulders, in the manner described, and the whole being constructed and adapted to the neck of the bottle and its shoulder, in, as set forth.

43.—John Wilkinson, of Baltimore, Md., for an Improvement in Automatic Brakes:

I claim operating carriage brakes by the vibration or rocking of the axle, substantially in the manner and upon the principles set forth, and for this purpose I claim the subbolster, b, and its pillar, h, combined with the main bolster, a, as set forth.

44.—William Williams (assignor to himself and R. D. Goodwin), of St. Louis, Mo., for an Improved Floating Mattress:

I claim the arrangement of continuous flange, P, with its eyelets and cord laced through the same, and the inflated gunwale, with the mattress, the whole to be made substantially in the manner described.

45.—C. A. Wortendyke, of Godwinville, N. J., for an Improvement in Candle Wicks:

I claim the wick produced by the system of spinning and twisting specified.

[We shall shortly publish an illustrated description of this wick.]

46.—C. O. Wood, of Worcester, Mass., for an Improvement in Breech-loading Fire Arms:

I claim the arrangement and combination of the notched estopping pin, D, or its equivalent, with the percussion hammer and the lever latch or mechanism for latching the barrel.

47.—Hanson Wright, of Westford, N. Y., for an Improvement in Preparing Patterns for Molding:

I claim, first, The process of preparing the surfaces of cast iron patterns to be molded from, by coating the heated surfaces of those patterns with a composition of matter consisting of beeswax, india-rubber and sulphur, substantially in the manner set forth.

Second, I claim, also, so coating such patterns after they have been previously prepared by immersing them in dilute sulphuric acid, and substantially as described.

48.—John Burk, of Schwenningen, Wurtemberg, Germany, assignor to J. E. Burk, of Paoli, Ind., for an Improved Watchman's Time Detector:

I claim the employment of a series of keys, C, with bits of different shapes, in combination with spring points, B, and with a drum, A, carrying a strip of paper, F, and rotated by a clock movement, substantially as and for the purposes specified.

[This device is so arranged that it can be combined with every stout watch or with any other portable clock movement, and it is inclined in a strong metallic case. It is placed into the hands of the watchman locked just before he starts on his beat, and on his return he gives it back to the superintendent or supervisory officer, who, on opening the same, can find the precise time when the watchman has visited the several stations to be visited on his beat, which direction he has taken, in which order he visited the several stations, what delays and deviations have occurred, how long a time he has tarried on the way between the several stations and on the stations themselves, &c.]

49.—J. F. Greene, of Brooklyn, N. Y., assignor to S. B. Tobey, of Providence, R. I., for an Improvement in Machines for Making Hat Bodies:

I claim the combination of the picker with the doffer of a carding engine and the winding cones substantially as and for the purpose specified.

And I also claim, in combination with the rotating picker, the break current plate in the cap case over the picker, and the deflecting plate, substantially as and for the purpose specified.

50.—James Haynes, of Hollis, Maine, assignor to himself and T. T. Lewis, of Boston, Mass., for an Improved Device for Straining Wood Saws:

I claim the described peculiar arrangement of the arm, D′, the rack, D, and the lever, E, together and within the saw frame, and with respect to the lower crossbar, d, and either of the end bars, a b, as specified.

51.—F. G. Johnson, of Brooklyn, N. Y., assignors to himself, W. T. Milliken, of Morrisania, N. Y., and E. Jones, of New York City, for an Improvement in Water Meters:

I claim the alternate combination of the several (two or more) sections, 1 2 3, of the water passages with the several (two or more) intervening blade wheels, 1″ 2″ 3″, substantially in the manner and for the purpose set forth.

52.—Purches Miles, of New Haven, Conn., assignor to himself and A. P. Plant, of Plantville, Conn., for an Improvement in Nut Machines:

I claim the combination of the lateral countersunk stamping projection, m, with the cutter, e, in the manner shown and described.

The arrangement of the cutter, N, punch, P, swage, O, clearer, Q, and block, G, with the rotary die plate, B, and bed, E, as shown and described.

In nut machines, I claim making the lower portion of the open die, F, of conical form, substantially in the manner and for the purpose set forth.

I also claim the locking of the nut blank within the bottom of the open die, F, substantially as and for the purposes shown and described.

[The object of this invention is to obtain a machine by which the operation of cutting off the blanks from the bar, the swaging of the same and the punching of them may be simultaneously and automatically performed in the most perfect manner.]

53.—J. W. Pearson and H. O. Peabody, of Winchester, Mass., assignors to themseves and D. E. Hayward, of Malden, Mass., for an Improvement in Skating Boots:

We claim the combined boot and skate described, the support for the runner being confined within the sole, as set forth.

54.—William Schilling (assignor to himself and Jesse Klinefelter), of Baltimore, Md., for an Improvement in the Manufacture of Spirituous Liquors from Tomatoes:

I claim the described process for making brandy from tomatoes, not wishing to confine myself to the precise proportions of the ingredients used nor to the exact degrees of heat specified, but to vary the same as may be found necessary, without departing from the essential character and principles of said process.

55.—F. Veerkamp and F. Leopold (assignors to R. A. Maxwell), of Philadelphia, Pa., for an Improvement in Gymnastic Apparatuses:

We claim, first, The employment, for gymnastic or calisthenic exercise, of one or more pulleys with cords attached to their peripheries when the force applied to raise the cords and turn the pulleys is resisted by the frictional contact of surfaces and when the amount of friction is regulated by the devices described, or their equivalents.

Second, We claim the employment of two or more friction disks faced with leather or other suitable material, and constructed substantially as described, when the said disks are so combined with the shaft, H, as to resist the turning of the latter, as set forth.

Third, We claim one or more pulleys, N, on the shaft, H, each pulley having a cord, n, and a spiral groove for receiving the same, in combination with the ratchet wheel, h, and spring dog, d, the coiled spring, P, and the friction disks before described, or their equivalents, the whole being arranged and operating substantially as set forth, for the purpose specified.

Fourth, We claim the graduated index plate, Q, pointer, q, and spindle, M, in combination with the friction disks and the intervening devices, or their equivalents, by which the movement of the spindle is caused to increase or diminish the amount of friction, as set forth.

56.—John H. Whitley (assignor to himself and C. S. Carmichael), of Owego, N. Y., for an Improvement in Apparatuses for Enlarging Photographic Pictures:

I claim so applying and operating a system of mirrors or reflectors, in combination with a camera, that, by the movement of one of the mirrors, the rays of the sun may continue to be reflected in the same direction through the camera for as long a time as may be necessary to obtain a print, substantially as described.

57.—G. K. Winchester (assignor to the New England Butt Company), of Providence, R. I., for an Improvement in Braiding Machines:

I claim the arrangement of the spring hooks, J, in combination with the slotted table, A, and with the carriers, B, constructed and operating substantially as and for the purposes set forth.

I also claim giving to each carrier of an even strand braiding machine two or more partial revolutions, at two or more successive points of its circumition on the table, substantially as and for the purposes described.

[In braiding flat bands containing an even number of strands by an ordinary braiding machine, each strand receives a twist each time it traverses the table, and if it is desired to keep the sides of the strands facing always one way, the braiding of such bands must be done by hand. The object of this invention is to arrange a braiding machine with an even number of carriers, in such a manner that the twist is taken out of every strand, by giving to each carrier two or more partial revolutions on two or more points on its circumition table, which forms the support and guide for said carriers, thereby keeping the sides of each strand always facing in the same direction.]

58.—J. E. Furguson, of Micanopy, Fla., for an Improvement in Cotton Gins:

I claim the roller, C, constructed as described, and the adjustable plate, D, in combination with the adjustable vibrating rake or comb, H, arranged for joint operation as and for the purpose set forth.

[This invention relates to an improvement in that class of cotton gins in which rollers are employed, and which are designed chiefly for ginning long staple cotton. The object of this invention is to obtain a simple and efficient gin, and one which, while capable of working rapidly, will not injure or break the staple or fiber.]

59.—J. M. Hill, of Angel's Camp, Cal., for an Improvement in Amalgamators:

I claim the device shown and described for collecting precious metals, which I term a "gleaner," and which consists of a rotating basin, H, provided with a central mercury vat, G, mounted above a driving shaft, B, and frame, A, the whole constructed and operating as set forth, whereby the water, quartz and other impurities will be expelled over the edges of the basin by centrifugal force, while the precious metals of superior gravity will fall into the central mercury vat—all as specified.

[The invention consists in the use of a rotating basin, provided with a central vat, the upper or inner surfaces of the basin being amalgamated, and so operating, in connection with mercury, as to effect the desired end.]

60.—B. B. Hotchkiss, of Sharon, Conn., for an Improvement in Riveting Curry Combs:

I claim supporting the several parts of a curry comb in their proper relative positions between and while being acted upon by the heading dies, A B, by means of the bearers, I K M, or their equivalents, substantially as and for the purpose specified.

61.—J. W. Lewis, of Providence, R. I., for an Improved Blacking Box Holder:

I claim, as an improved article of manufacture, a blacking box holder, constructed with the inclosing box, a, hinged cover, b, adjustable slotted clamping plate, A, and otherwise made as shown and described.

[This invention consists in securing and inclosing a blacking box within a case or box having a cover, and attached to a suitable handle.]

62.—James McNamee, of Easton, Pa., for an Improved Bread and Pastry Board:

I claim a bread and pastry board having its top, C, provided with receptacles, E E f, drawer, g, rabeted traps, d d, lifting shafts, C C, and otherwise made as shown and described.

[The object of this invention is to obtain a flour receptacle, with a board or cover provided with traps for molding the flour, the above being used with various small boxes for retaining spices, and also supplemental boxes for containing flour, the latter being within reach of the operator, and all so arranged that a very convenient flour box and molding board with the necessary appurtenances will be combined so as to form a compact and desirable article for the kitchen.[

63.—John Taber, of Bangor, Maine, for an Improvement in Attaching the Shrouds of Ships:

I claim the combination of the tapering semi-tubes, A A, as constructed with the clasp, B, and right and left screw, D, operating as set forth and for the purposes described.

64.—J. S. Vernam, of Rochester, N. Y., for an Improvement in Corrugating Iron:

I claim the combination of two distinct corrugations in one sheet of iron, where the line of direction of one corrugation is at right angles or transverse, or nearly so, to the line of the direction of the other corrugation, substantially as described above and shown in the accompanying drawings marked A.

65.—E. W. Tarpley, executrix, and J. T. Simms and Isaac Hull, executors of C. S. Tarpley, deceased, of Jackson, Miss., for an Improvement in Cotton Cleaners:

We claim the combination of the sieve floor, F, whipper chamber, B, having feed and delivery apertures, substantially as described, whippers or beaters, C C′, and blast flue, I, when the latter or blast chamber is separated from the dust chamber by the close partition, G, essentially as shown and described.

66.—George Williamson (assignor to L. S. Goble and H. E. Richards), of Newark, N. J., for an Improved Veneer Planer:

I claim, first, The yielding mouthpiece or slot table, Fig. 3, adjusted and operating substantially in the manner and for the purpose described.

Second, I claim the combination of the said yielding mouthpiece or slot table with the pressure bar, B, operating together to clasp the wood and render it firm while being planed, substantially in the manner and for the purposes described.

RE-ISSUES.

1.—F. E. Sickels, of New York City, for an Improvement in Steam Engines. Patented September 19, 1845. Extended for 7 years. Re-issued February 21, 1860:

I claim counterbalancing the weight of the lifting rods so as to relieve the engineer in working the engine by hand, and so that when the engine is hooked on, they will exert their full force in descending, to overcome any opposing friction.

2.—F. E. Sickels, of New York City, for an Improvement in Steam Engines. Patented September 19, 1845. Extended for 7 years. Re-issued February 21, 1860:

I claim the paddle wheel constructed with buckets of varying areas, substantially as described.

3.—Henry Keney, of Hartford, Conn., Grant Warren & Co., of Boston, Mass., and Joseph Jordan, of East Hartford, Conn., assignees of George Sweetland, of New Haven, Conn., for an Improvement in Pulp Machines. Patented September 5, 1848:

We claim the combination, in a pulping engine, of two series of disintegrating knives with two knife stocks (between which the paper material is passed and one of which revolves) in such manner that the edges of the knives diverge from the axis of rotation, substantially as described.

I also claim the combination of the following elements in a pulping engine, viz:—

1st. Two knife stocks, between which the paper material is caused to pass, and one of which revolves on a central axis.

2d. Two series of distintegrating knives secured to the stocks.

3d. A feeding or entry passage to, and an exit passage from, the knife stock so arranged relatively to the disintegrating knives that the paper material, in passing from one passage to the other, traverses lengthwise with the knives, substantially as described.

I also claim the combination of a series of diverging disintegrating knives upon the knife stock of a pulping engine, with filling between the knives which may be cut away as may be found necessary to control the more or less rapid passage of the paper material lengthwise with the disintegrating surfaces, substantially as described.

I also claim arranging a series of disintegrating knives upon the knife stock of a pulping engine, in such a manner that there are fewer knives near the entry passage than at the part of the knife stock further therefrom, substantially as described.

I also claim the combination in a pulping engine of the following elements, viz., a pair of knife stocks having diverging disintegrating knives thereon, suitable entry and exit passages for the paper material, and a casing so constructed that returns the partially ground pulp between the knife stocks for the purpose of grinding the pulp further, substantially as described.

I also claim the combination in a pulping engine of the following elements, viz., a revolving knife stock, a series of disintegrating knives upon one side thereof, and arms upon the opposite side thereof, substantially as described.

4.—A. Palmer, of Brockport, N. Y., and S. G. Williams, of Janesville, Wis., assignors, through mesne assignments, to D. H. Morgan, W. H. Seymour, S. G. Williams and Aaron Palmer, for an Improvement in Harvesters. Patented July 1, 1851. Re-issued April 10, 1855:

We claim discharging the cut grain from a quadrant-shaped platform, on which it falls as it is cut, by means of an automatic sweep rake sweeping over the same, substantially as described.

5.—A. Palmer, of Brockport, N. Y., and S. G. Williams, of Janesville, Wis., assignors, through mesne assignments, to D. S. Morgan, W. H. Seymour, S. G. Williams, and Aaron Palmer, for an Improvement in Harvesters. Patented July 1, 1851. Re-issued April 10, 1855:

We claim sweeping the cut grain from the platform upon which it falls as it is cut, by means of an automatic sweeprake moved by gearing located within the inner edge of said platform, substantially as described.

6.—J. E. Brown and S. S. Bartlett, of Woonsocket, R. I., for an Improvement in Grain and Grass Harvesters. Patented January 2, 1855:

We claim hanging or hinging the bar, G, to the carriage so as to vibrate, substantially as described, in combination with the hanging or hinging of the cutter stock to the bar, G, substantially as described, so that the cutter stock may vibrate and accommodate itself to any undulations in the surface of the ground, and so that it may be raised by the attendant to pass stones, stumps, or other obstructions without tipping the carriage.

Also, the use of a single draw bar attached by yielding and hinged connection at the side of the carriage or main frame, in combination with the hinged or rigidly connected cutter stock or finger bar, substantially as described, for the purpose specified.

[This invention relates to an improvement in that class of harvesters in which provision is made for admitting the finger bar and sickle to conform perfectly to the inequalities of the surface of the ground.]

7.—F. E. Sickels, of New York City, for an Improvement in the Method of Opening and Closing the Valves of Steam Engines. Patented October 19, 1844. Extended for 7 years:

I claim, first, My improvement in the periods of the movements of the valves by which they are opened and closed relatively to each other and to the movement of the piston, by means of which the piston completes each stroke in equilibrio, or nearly so, without admitting steam against the movement of the piston by a lead to the steam valves, which is effected, as before stated, by opening the lower exhaust valve before the end of the upward stroke of the piston and before the upper exhaust valve is closed, and opening the upper exhaust valve before the end of the downward stroke of the piston and before the lower exhaust valve is closed; the movement of the steam valves being so regulated as to admit steam to the cylinder only after the exhaust valve on the corresponding end of the cylinder has been closed.

I also claim, as my next improvement and as a means of carrying into effect my first and essential improvement, the arrangement of the toes and the rockshaft in such a manner relatively to the location and form of the feet on the lifting rods that at the middle or nearly so of the rocking motion of the rockshaft both lifting rods with their exhaust valves shall be partly up, as herein described; and I also claim in combination with this arrangement the slip of the lifters on the steam valve stems, as described, to insure the closing of the exhaust valves before the opening of the steam valves on the corresponding ends of the cylinder, as herein described.

8.—F. E. Sickels, of New York City, for an Improvement in the Method of Opening and Closing the Valves of Steam Engines. Patented October 19, 1844. Extended for 7 years:

I claim giving to each exhaust valve, alternately, while the piston is at or near the end of the cylinder furthest from it, a large amount of motion as compared with the motion of the other exhaust valve at that time, so as to move freely, exhaust the cylinder with less extent and greater ease of motion to the valves than has been done heretofore, substantially as described.

I also claim imparting these motions to the exhaust valves by means of a rocker interposed between the first motion from the engine and the valves, so that it will increase and diminish its leverage relative to each valve while moving them, and thereby impart my improved motion.

9.—Jesse S. Lake and David Lake, of Smith Landing, N. J., assignors to J. A. Saxton, Canton, Ohio, for an Improvement in Grass Harvesters. Patented July 20, 1852:

Having described one practical way in which that branch of our invention which forms the subject of this patent can be carried out, we wish it to be understood that we do not limit ourselves to any particular cutting apparatus, main frame, or mode of operating the cutting apparatus—

But what we claim under this patent as our invention is attaching or fastening that part of a mowing machine to which the guards or fingers which support and hold the grass while it is being severed by the cutter or cutters, are attached to the main frame, or to an intermediate coupling piece, so that the guards or fingers, or that part to which they are attached, and by which they are sustained and supported, will be free to rise or fall bodily, and also to have a lateral rolling or wabbling motion to enable the cutting apparatus to conform freely to the undulation of the ground over which it is drawn independent of the up-and-down motions of the main frame.

10.—Jesse S. Lake and David Lake, of Smith Landing, N. J., assignors to James A. Saxton, of Canton, Ohio, for an Improvement in Grass Harvesters. Patented July 20, 1852:

Having described one practical way in which that branch of our invention which forms the subject of this patent can be carried out, we do not confine ourselves to any particular mode of applying our said invention to the various mowing machines in use, but we do claim as our invention and desire to secure by Letters Patent—

First, The combination of a hinged lever slot for the driver with main frame and cutting apparatus of a mowing machine.

Second, We also claim the combination of a main frame and an inclined projecting hinged lever seat with a main drive wheel having no outside support.

11.—Jesse S. Lake and David Lake, of Smith Landing, N. J., assignors to James A. Saxton, of Canton, Ohio, for an Improvement in Grass Harvesters. Patented July 20, 1852:

Having described one practical way in which that branch of our invention which forms the subject of this patent can be carried out, we wish it to be understood that we do not confine ourselves to a machine in which any particular cutting apparatus can be used.

But what we claim as our invention, and desire to secure by Letters Patent, is—

First, Placing the driving wheel in a mowing machine on the outside of the frame in combination with a triangular- shaped frame on the inside of the wheel.

Second, We also claim in a mowing machine the combination of the following elements, viz., a triangular main frame, a single driving wheel, arranged on the outside of said frame, and a hinged lever seat for the driver, for the purposes set forth.

Third, We also claim in combination with the main frame of a mowing machine a single drive wheel and a leading swivel wheel, so arranged in relation to each other and the cutting apparatus, as that the said wheels shall run on lines just outside of the grass to be cut.

12.—Jesse S. Lake and David Lake, of Smith Landing, N. J., assignor to James A. Saxton, of Canton, Ohio, for an Improvemeut in Grass Harvesters. Patented July 20, 1852:

Having described one practical way in which that part of our invention which forms the subject of this patent can be carried out, what we claim, and desire to secure by Letters Patent, is—

First, The combination of the coupling piece, I, and finger support, G, with an intermediate metallic connection on lever, H, for the purpose stated.

Second, We claim the metallic connection or lever, H, both as a hinge and a support to the cutting apparatus and finger support.

Third, We claim the combination of the finger support and the metallic connection or lever, H, in such a manner that their lower surfaces shall be flush for the purposes set forth.

Fourth, We claim, in combination with the main frame of a grass harvester, a finger or guard support whatever it may be called having two independently acting hinges or yielding connections interposed between it and the main frame in such a manner as that said finger or guard support as it is advanced by means of its hinges or yielding connections shall be free to rise above or fall below the plane on which the carrying or driving wheel or wheels are passing.

Fifth, We claim so hinging that part of a mowing machine to which the guards or fingers are attached as that it may oscillate or turn on a line at right angles to the line of motion of the machine, for the purpose of raising the points of the guards to adapt the cutting apparatus to the condition of the ground, while it is also free to roll, rock or wabble on a line parallel to the line of motion of the machine.

Sixth, We claim the combination with the main frame finger support and cutting apparatus of a mowing machine, of a lever with an adjustable weight thereon, whereby the pressure of the finger support and cutting apparatus upon the ground can be regulated by simply moving said weight upon its lever.

Seventh, We also claim the combination of a counterpoise weight or the equivalent thereof with that part of a mowing machine, whatever it may be called, to which the guard fingers are attached to diminish its pressure upon the ground and thus obviate side draft and friction.

NOTE.—In the above list of patents eighteen of the number were issued through the agency of the SCIENTIFIC AMERICAN. While many kinds of business are temporarily paralyzed, we are happy in being able to state that inventors and most kinds of mechanicians are busily employed. Manufacturers of textile fabrics and merchants seem to be the class of persons whom the derangement of our domestic affairs seems most to affect. Within two weeks we have noticed a large increase of activity among inventors throughout the country.

Notes & Queries

H. H. D., of Mass.—The best way of coating iron with tin or with zinc is by melting the tin and zinc and dipping the iron (which must be well cleaned) into them. Iron can be coated with these metals by the galvanic process, but this is more troublesome and expensive, and, besides, the coating is not so perfect. The galvanic process is the same as that for electro-plating with copper, only strong solutions of tin or zinc must be used.

S. C., Jr., of Pa.—Your letter on the "crank motion" has been received. We have already devoted so much space to this subject that we cannot spare more room for it.

G. W. M., of Pa.—You think that we ought to call the oil obtained from the oil wells "carbon oil," in order to make a distinction between it and distilled coal oil. We think differently, because it is not really carbon but a hydro-carbon oil. "Terra oil" would be the most appropriate name for it; it would convey the idea of its source—the earth.

E. L. D., of N. Y.—The glue molds employed for plaster casts will produce spotted figures unless great care be exercised to pour in the plaster slowly, so as to displace all the air. The calcined alum and plaster cement is not manufactured anywhere, so far as we know. You can make it for yourself by following the recipe which we have already published, to which you refer. So far as we know, there is not an establishment in this city which makes busts and full figures of metal by the electro-depositing process, nor have we heard of aluminum being practically used in electro-metallurgy, but it can undoubtedly be employed.

J. E. F., of Pa.—Iron, like all substances capable of crystallization, expands during the change from the liquid to the solid state. If cast iron does not give a sharp impression of the mold, it is not that it does not expand, but because it loses its fluidity so quickly. Hence the use of churning to force the molten iron, when it will not go by its own weight.

B. S., of Iowa.—There is no difficulty whatever in constructing a steam carriage to run on common roads. This has been done repeatedly. The only question about success is, can such engines be made to pay? This has yet to be demonstrated.

W. H., of Mass.—Much has been done in the way of street sweeping machines, and there is a certain degree of resemblance between all of them. Yours seems to differ in some respects from all others known to us, but we think you had better have a preliminary examination made at the Patent Office before going to the expense of an application for a patent.

J. L. C., of Ind.—We have seen electrical machines made of vulcanite or hard rubber. The chief objection to the rubber is that it is not hard enough; it soon looses its polished surface by the friction.

H. H., of Iowa.—In using the mouth blow-pipe you should learn first how to keep up a constant blast. The mouth should be kept inflated, and the breathing done through the nose. Those who are accustomed to use the blow-pipe can blow a steady stream for hours.

C. S., of Mass.—Your match-dipping apparatus is new to us. It seems to be useful, and we should think it patentable. Should you decide to apply for a patent, please send us your model and government fee.

W. B. B., of N. Y.—A mechanical draughtsman should be acquainted with the rudiments of geometry and mechanical philosophy.

C. C., of N. C.—By referring to page 77 of the recent edition of the Patent Laws of the United States (for sale at this office), you will find interesting items of information for patentees and assignees. The point to which you refer about the use of patented inventions is fully answered.

P. A., of Va.—We are progressing with your business as fast as possible. Your mowing machine device is not new; we have seen the same thing before.

A. W., of Ohio.—We can explain the erroneous action of your slide valve only by supposing that the distance between the exhaust port and the steam ports is not the same on both sides.

B. H. M., of N. H.—The skins for drum heads are an inferior kind of parchment. The hides are not tanned, but soaked—treated with lime to remove the hair, then stretched on frames to be scraped and cleansed, and finally polished with whiting and pumice stone. Hides on which the hair is to remain need only to be well cleansed by scraping and soap; they may, however, be fully tanned in the ordinary tanning liquids.

J. A., of Conn.—If you will first give the iron a coating of copper by the battery or otherwise, you will have a good foundation for a surface of tin.

C. H., of Mass.—Shellac is a compound of several resins (organic acids). Good spirit varnishes may be made which shall contain no shellac. But for other purposes, we are not acquainted with any other substance which will be likely to take its place.

T. W. P., of Maine.—The expansion, in length, of a bar or tube of iron is not varied by its thickness or shape of cross section. Why should it be?

F. L., of Conn.—The final polish of glass is given by the use of a rubber of felt or leather, supplied with oxyd of tin, commonly called tin putty or putty powder. If the glass is very soft, a clean chamois skin may be used without any powder.

J. W. F., of Mo.—We do not like to make the discrimination between machines of nearly equal merit. Our opinion would seem like a condemnation of such as we should not name, unless we should take a great deal of space for unnecessary explanations.

F. A. C., of Va.—Tungstate of soda is not on sale in this city. Sulphate of ammonia is cheap, and may be procured from any of the wholesale dealers in drugs.

F. B., of Mass.—Some manufacturers use zinc nails as a substitute for sewing in ladies' slippers. A metal last is employed, and the nails, on being driven in thus, become headed, forming, it is said, a very secure fastening.

N. S. T., of Ind.—It is a very common idea that there is a great expenditure of power in forcing water into a boiler; but is it not plain that, as the water is forced in, if the passages are open it exerts its force on the piston of the engine, and thus there is no power lost by driving the injection pump, except what is expended in overcoming the friction? Even when the passages are closed, we do not see that the power exerted to force in the water is lost.

L. C., of Texas.—The undershot breast wheel is the kind almost universally used in the cotton and woolen manufactories of New England, but turbines are now being quite extensively introduced.

B. N., of Mass.—Pure hydrogen gas is very superior to the illuminating gas ordinarily used for inflating balloons. The specific gravity of hydrogen being .069, while that of good illuminating gas is about .650; that is to say, while illuminating gas is more than half as heavy as air, hydrogen is 14½ times lighter.

O. A., of N. J.—Cooper's isinglass is the concentrated gelatin extracted by steam from fresh bones, perfectly clean, and freed from fat by previous boiling. It was in the manufacture of this substance that Peter Cooper laid the foundation of the great fortune which he is expending so worthily.

G. G. L., of Ga.—Metal pulleys, properly turned, are the best; and the grain side of the belt should always be placed next the pulley.

Money Received

At the Scientific American Office on account of Patent Office business, for the week ending Saturday, Jan. 5, 1861:—

S. C., of Pa., $35; A. Q., of N. Y., $30; D. & W., of N. Y., $30; M. B. & S. J. L., of Maine, $25; F. S., of Cal., $50; J. H., of Cal., $25; E. C., of Ohio, $25; L. H., of Mass., $25; J. D., of N. Y., $30; M. B. S., of N. Y., $55; C. L. P., of N. Y., $25; G. W. R., of Ala., $25; C. L. P., of N. Y., $55; A. H. & C. R. B., of Ind., $25; F. D., of Ohio, $30; H. N. W., of Conn., $30; B. & C., of Ohio, $35; S. & B., of Cal., $25; C. G., of N. Y., $25; J. H. P., of N. Y., $25; L. C., of N. Y., $40; G. W. D., of N. Y., $96; A. G., of N. Y., $50; M. P. H., of Ohio, $15; R. McN., of N. Y., $30; E. J. F., of Mo., $55; C. & C., of N. Y., $30; W. M., of N. Y., $30; B. & F., of Wis., $25; B. R. H., of Cal., $25; W. J. G., of N. Y., $37; A. R., of N. J., $250; J. A. C., of N. Y., $55; H. P. De G., of N. Y., $25; D. C., 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. 5, 1861:—

W. F. Q., of Del.; D. & W., of N. Y.; M. P. H., of N. H.; A. G., of N. Y. (two cases); C. L. P., of N. Y.; B. & C., of Ohio; J. H., of Cal.; E. C., of Ohio; G. W. D., of N. Y. (two cases); J. B. C., of N. Y.; G. W. R., of Ala.; H. P. De G., of N. Y.; L. & S. B. H., of Mass.; A. R., of N. Y.; D. C., of N. Y.; M. B. & S. J. L., of Maine; L. C., of N. Y.; P. A., of N. Y.; A. H. & C. R. B., of Ind.; C. G., of N. Y.; J. H. P., of N. Y.; B. R. H., of Cal.; S. & B., of Cal.; B. & F., of Wis.; M. B. S., of N. Y.

Important Hints to Our Readers.

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

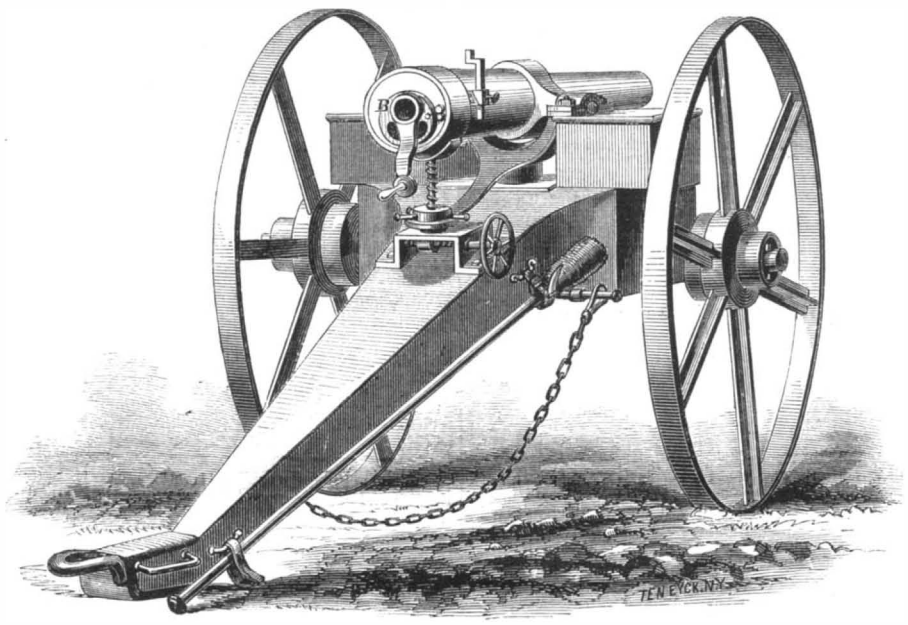
PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented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

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

Breech-loading Steel Cannon.

The most shrewd and far-sighted ruler of men now living is undoubtedly the Emperor of the French. He seems to have anticipated every emergency that has yet arisen, and has always been prepared to meet it. He was the first who introduced rifled cannon into actual warfare on the battle field, and it has been admitted that it was the terrible effectiveness of this weapon over the old smooth bore cannon which gained for him the battle of Solferino over an army numerically greater than his own. One great cause of the success of the Emperor of France in most of his undertakings, is the superior judgment which he exercises and the resolute will with which he directs it. As an evidence of the consummate skill of the Emperor Napoleon in all matters affecting the military and naval glory of France, we refer our readers to a highly interesting article in this week's number on iron war frigates.

The government of Louis Napoleon never insulted



BREECH-LOADING STEEL CANNON.

French inventors by the passing of an ordinance prohibiting the purchase of patented inventions. Napoleon himself is a generous patron of the arts, and he makes liberal provision for testing the efficiency of all inventions which relate to the national welfare.

It has been stated, over and over again, that the Armstrong gun was almost perfection itself, and that it had no equal. It has also been stated that it gave an immense superiority to British soldiers; but the late accounts which have been received from China of its efficacy do not sustain such conclusions. It appears that the lead bands around the iron balls separated from the iron as soon as they left the muzzle, and these played the mischief with some of their own outlying riflemen. The vent pieces of these guns are also said to be defective.

The material of which cannon are made is a very important consideration. Steel is the strongest of all known metals, and yet cast iron, which is not one-fourth as strong, is the common metal which has been employed for this purpose. The difficulty of obtaining large sound castings of steel suitable for the purpose has no doubt been the cause of using an inferior metal; but by the invention of puddled steel all such difficulties may, we think, be obviated. The accompanying engraving is a perspective view of a rifled steel cannon—a breech-loader—lately manufactured for the Russian government by Mr. Clay, of the Mersey Steel Works, Liverpool, England, and the London *Mechanics' Magazine*, which contains the illustration, states that he is about to make one for the United States government; it is therefore of no small interest to us.

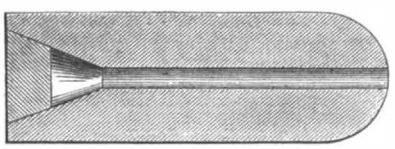
The breech-loading arrangement is effected as follows:—At the breech end, the gun is formed with a projection, or extra depth, on its lower side, to allow for the boring out of a circular screw-threaded bore or recess of much larger diameter than the bore of the gun, and with its center considerably below the center of the bore. Into this recess is screwed a cylindrical screw-threaded block or breech-piece, B, which closes the bore of the piece when screwed home, but which has formed through it a cylindrical passage so placed that when the breech-piece is turned back through a portion of a revolution, this passage comes directly opposite to the bore of the piece, and allows of the charge being passed into the barrel. In the engraving, the breech-piece is shown in such a position that the charge may pass freely into the barrel; when this has been done, by turning the handle (shown on the breech-piece) partly round, the hole in the breech-piece will be moved away from the bore of the gun, and the latter thus effectually closed. On a close inspection of the engraving, it will be seen that a pin is inserted at the upper right hand end of the gun; this forms a stop for the handle to come against, and may be removed by loosening a thumb screw that nips it, when it is desired to screw the breech-piece entirely out of place for cleaning the parts.

The carriage on which the gun is shown mounted is also made from Mersey steel, and has excited a good deal of admiration. The gun is supported by its trunnions (which are formed in one with a hoop shrunk on the gun) upon a strong bracket, which is pivoted upon the top of the carriage, and has a tail piece that extends backward, and is supported upon a box bracket fixed on the carriage near the top. In the extremity of the tail-piece is formed a slot through which rises the point of a nut or bolt, the head of which (which is within the box bracket) receives a transverse screw worked by a hand wheel. As this wheel is turned, the gun is traversed with the greatest nicety. The elevating screw is placed above the tail piece, passing into a hand nut below, and carrying a bracket above in which the breech of the gun rests.

The range and accuracy of fire of a gun depend in no degree upon any given form of breech-loading device, but a good breech-loading arrangement may prove very beneficial, viz., by increasing the rapidity of fire obtainable. This gun has been discharged no less than *nineteen times per minute*, and in this high rate of discharge it is incomparably superior both to the Armstrong and Whitworth breech-loading arrangements.

HEWITT'S PROJECTILE.

Mr. William Hewitt, of Bristol, England, has invented a method of "dispensing with rifling cannons, and at the same time securing long range and unerring accuracy of flight." The particulars of the invention, as stated by Mr. Hewitt, are as follows:—



1. The breech is bored, say one-eighth of an inch larger than the bore of the gun, the projectile, which is elongated, being constructed to fit the breech. 2. The projectile to be coated with a soft metal, with a hole through the center from end to end (see the drawing). 3. Immediately the projectile enters the gun it meets with a shoulder which takes off a shaving, thus molding it to the exact size of the gun, thereby precluding all windage. 4. Immediately the projectile leaves the gun the air forces out the "bevel" plug at the back (on the drawing); the air, then, having a free passage through the projectile, prevents the possibility of its diverging either left or right, or turning over; on the contrary, it causes it to travel with astonishing and unerring precision; the sudden expansion of the air at the back considerably assists its onward course.

American Rifled Cannon.—During the last summer a board of ordnance and artillery officers, belonging to the United States army, were engaged in making experiments with rifled cannon, and the results obtained left no doubt upon their minds as to the superiority of rifled cannon over plain, smooth bores. A report was made by them to the Secretary of War, recommending elongated and expanding projectiles. Arrangements have been made for grooving a portion of our army cannon.

Coal Oil Gas Explosion.—On the 31st ult., an explosion took place at New Bedford, Mass., in a manufactory for refining Pennsylvania petroleum oil. The apartment became saturated with gas from the oil, mixed with air, and the touch of a match by one of the workmen caused it to explode in an instant. The force of the explosion was felt at a distance of six miles.