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Improved Aerial Governor.

A steam engine without a regulator is like a man without a mind, it is uncontrollable. No matter how elegant the design or how perfect the finish of the machine, if it runs 20 strokes in one minute and 22 or 25 in the next, it is for most purposes useless; for machinery in these days runs with regularity, and mere motion is not enough to serve the ends of manufacturers. These truths are self-evident, but it is a fact not generally known among those who employ steam power, that an engine which runs irregularly consumes more fuel, oil and power, than is necessary to do the work, and is a source of continued expense to provide these indispensable articles. It is exceedingly important, then, in view of the issues depending upon the proper and economical performance of the steam engine, that a good regulator or governor should be attached to every one used in the land. The old-fashioned two-ballgovernor was well enough at one time, before another was constructed; but the difficulty with it was, that it was not sufficiently sensitive for all work, and also that the adaptation of centrifugal force to move the throttle valve rod was not a good one, as the balls must move so far before the throttle is sensibly affected that delicacy of operation is impossible in the engine.

The regulator illustrated herewith is a most excellent one, inasmuch as the working parts are strongly made and yet delicately adjusted—an exceedingly important feature in mechanism of this class; it is very sensitive to changes of speed in the engine, and acts by the force of gravity and atmospheric resistance; it is also handsome in appearance, simple in construction, not liable to derangement, and is, in all respects, a first-class governor.

Fig. 1

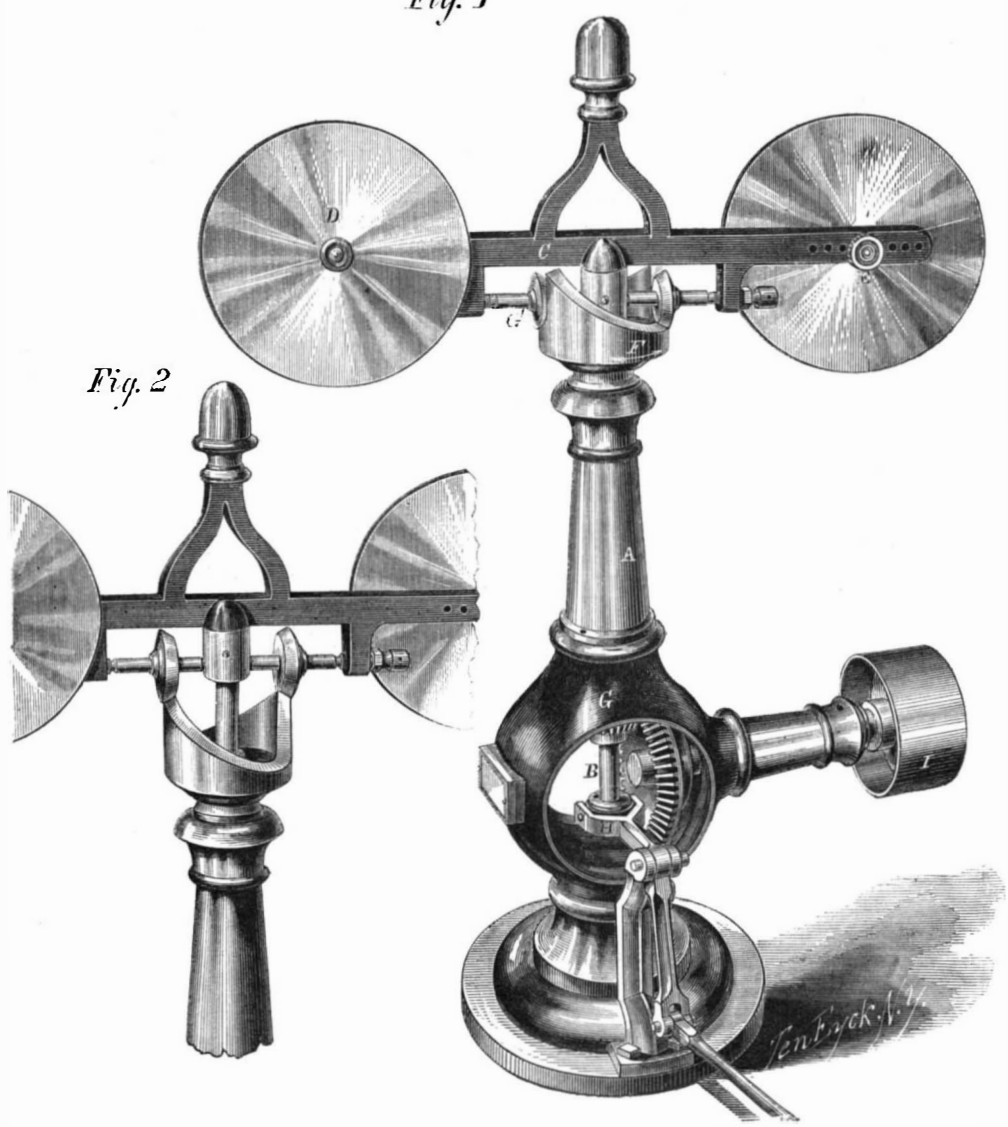


Fig. 2

POMEROY'S AERIAL GOVERNOR.

If the reader will refer to the engraving, Fig. 1, he will see that the cast-iron column, A, has a vertical shaft, B, running through it, which is surmounted by transverse arms, C, carrying thin metallic disks, D, at their extremities. These arms have holes in them at various distances from the center of motion, and the disks can be easily detached by slacking the thumb-screws, E, at the center, and quickly set nearer to or further from the center of motion, thus affecting the action of the regulator by increasing or decreasing the leverage on the central shaft; said leverage being obtained by the resistance of the air to the passage of the disks. The spiral inclined planes, F, are formed upon a casting which extends down the column inside, or is connected to the lower pinion, G; this head is, therefore revolved in the direction of the arrows. The lower sides of the transverse arms carry two small steel rollers, G', fixed on centers, so that they turn easily, and the spiral inclined planes, F, are so proportioned that the resistance opposed by them to the action of the disks is at all times equal. On the lower end of the vertical shaft is the small grooved pulley, which transmits the variation of the shaft, caused by the action of the disks, to the throttle valve, through the right-angled arm, H. In Fig. 2 the position of the governor at its highest elevation is shown, thus representing the range of the machine and the vertical travel of the shaft or spindle, B; the whole apparatus is driven by a belt from the engine running on the pulley, I.

The action of this regulator is as follows:—As the disks revolve the air resists their passage and causes the rollers to run up the inclined plane, thus acting upon the throttle valve through the lever below; as the speed of the engine increases the disks continue to rise rapidly until the velocity is great enough, they nearly close the valve. Should the belt run off, the disks and cross-head fall instantaneously, so that the engine cannot run any longer than the supply of steam already in the pipe will permit; thus all danger of breaking machinery by excessive velocity of the engine is prevented. When set to run at a regular rate the action of this governor will be continuous and uniform, unaffected by either strong currents of air or similar causes, and we see no reason why it should not prove a perfect success. Patented by J. H. Pomeroy, Dec. 10, 1861. For further information address J. H. Pomeroy & Co., Syracuse, N. Y.

Concerning Portable Engines.

In a very sensible and modest pamphlet by J. K. Hoadley, Esq., a celebrated builder of machines of this class, we find some details upon this subject which are interesting and valuable to engineers and others. The author says:—"A portable steam engine differs from a stationary steam-engine in that the boiler and the engine, with all intermediate and subsidiary parts, are, in the portable, connected together in a compact manner, so as to require no other than their mutual support; while in the stationary engine the boiler requires a foundation and setting of its own, the engine requires a separate foundation, generally with a detached support for the back end of the main shaft; and not unfrequently, the force pump is apart from the engine, requiring, also, its independent foundation and source of motion.

The portable engine differs, on the other hand, from the locomotive, chiefly in not being self-propeling. Another important difference is, that the portable engine generally has, and ought to have, more heating surface in its boiler as compared with the power exerted by the engine, than is attainable or desirable in the locomotive. A first-class modern locomotive performs, as its daily duty, a horse-power for every three to four square feet of heating surface, and that, too, with excellent economy of fuel. In the portable, it is judicious to give ten to twenty square feet of heating surface per horse-power. One reason for this difference is, that the locomotive is required to burn only the best fuel of the class to which it is adapted; while the portable is often expected to supply itself with fuel by the sawdust, slabs, and refuse lumber which its own power is producing. But another, and the chief reason is, that the attention

which the portable receives is not, and ordinarily cannot be, so constant, assiduous and skillful as that given to the locomotive ; to the latter, while at work, a skillful engineer and faithful fireman devote unintermitting care : the former must often perform its duties with the casual and desultory attention of a laborer.

Its boilers should be very strong. Having to do the duty of frame for the engine, as well as to bear the pressure of steam, they should be made of great strength in the direction of greateststrain: the extra pressure brought upon the boiler by having the cylinder attached to it, amounts to from eight to ten per cent of the steam pressure in the boiler. Acting as it does at a little distance from the boiler, the mechanical effect of this strain, with a certain leverage and intermittently, may be considered equal to an addition of fifteen to twenty per cent to the mechanical effect of the steam pressure acting directly upon the boiler in the direction of its length. To meet this extra strain, the boilers should be, and in many engines are, made fully twice as strong as would be necessary to withstand the pressure of steam to which they are to be subjected. In other words, in order to enable the boiler to form the bed plate of the engine, it is made twice as strong as it would require to be for the mere purpose of a safe and durable steam boiler: this extra strength is obtained in various ways. In the small engine, by simply using thicker iron than would otherwise be necessary. In the larger sizes, by using heavy sheets extending the whole length of the boiler, and by double riveting.

The cylinder is generally placed on top of the boiler over the fire-box ; the strain exerted by the engine is thus central to the boiler, laterally, and both ends of the crank-shaft should be available to receive driving pulleys : the cylinder, pump, starting-valve, throttle-valve and regulator must be immediately under the engineer's eye and hand while standing near the fire-door. Great compactness is obtained by this arrangement, to which there seems to be no objection, while there is everything to recommend it. In order to place the whole engine low, thereby diminishing the mechanical effect of the strain of the engine on the boiler and securing greater compactness, the top of the boiler between the stands which support the crank shaft, is sometimes depressed from two-and-a-half to six inches; this is done in small and medium-sized engines by simply depressing the boiler sheet ; in the larger ones, by riveting in a cast-iron saddle, having raised pedestals for the crank-shaft stands, and a suitable depression between them."

How to Run over Sharp Curves on Railroads.

A locomotive specially adapted for running over sharp curves has been constructed by the engineer of the St. Helen's railway ; the character of the curves and inclines are the governing points in the construction of all railways, and if the difficulties inherent to the present class of locomotives, in respect to such obstacles, can be overcome, expensive tunnels and cuttings might be, at least to a great extent, done away with. On the St, Helen's line, which is remarkable for the number and sharpness of its curves, Mr. Cross has been led to devote his special attention to the subject. He is now stated to have built an engine on eight wheels, covering a base of twenty-two feet in length, which, if on the ordinary plan of construction, certainly could not move on a curved line without a very great amount of impedimental friction. But the manner in which the difficulty is overcome is thus: the wheel tires are applied on hoop springs of elastic steel placed between the wheel and tire. On these springs the tires can slip or revolve without sliding on the rails, and thus the revolutions of the tires are adjusted to the varying length of the rails on curves by self-action; this sliding of the wheels on the tires is not found in any way to impede the tractive power of the engine, but the contrary: the extreme wheels at either end have their tires applied in the same mode, but another movement is also supplied—the axles have very long bearings, and the boxes in which they run, instead of being parallel to the axles, are formed in curved lines struck from central points, and are permitted to move in this curvature through the horn-plates and axle-guides beneath the spring-shoes ; the object of these arrangements being that the wheels and flanges should be free to follow the course of the rails both on the straight line and on curves. By such engines it is considered that a mountain side may be traversed by a series of zig-zags, like those of the old horse paths, and narrow and tortuous valleys threaded along the course of mountain streams. If so, the highlands of Scotland and Wales, of Derbyshire and the lake districts, the mountainous regions of Italy, Switzerland and Spain are within the reach of a cheap system of steam locomotion, dispensing with costly tunnels and protracted periods of time ; and it will become easy to deal with the streets and roads of towns and cities, when a powerful engine capable of large loads and high speeds can move freely round a curve similar to that of the Oxford street circus. Hitherto, engines for lines of sharp curves have not been well adapted to high speed, but engines of the new class may make their journey over mountains with facility, only that, of course, they cannot carry so heavy a load uphill as on a plain.—*London paper.*

[A patent for an invention exactly like the above was taken out on the 6th of January, 1863, by Geo. C. Beecher, of Livonia station, N. Y.—[Eds.

Artificial Fecundation of Grain.

A Frenchman, rejoicing in the euphonious name of Hooibrenk, considering that Nature did not understand her business thoroughly, has conceived a plan for aiding her to overcome this defect. His idea is to accomplish fecundation of plants, grain, &c., by artificial means, as according to the experimenter this is not so well done by Nature as it can be by his plan. To carry out his scheme, therefore, all Hooibrenk uses is an apparatus which consists of a coarse worsted fringe of about a foot and a half deep, appended to a cord which is recommended to be about twenty yards long—but this must of course depend upon the width of the furrows and other local incidents of cultivation—and to the ends of which fringe are attached here and there little pellets of lead or large shot, sufficiently heavy to keep it down. The two ends are carried by two men, while a boy in the middle holds up the line with a forked stick. The worsted is slightly impregnated with honey, by dipping the fingers into the latter, and passing them lightly through the fringe. The instrument is then passed over the standing corn in flower, so to speak, in such a way and at such a height as to catch and impart a slight degree of friction to the whole of the ear. When the operation is applied to fruit trees, it is accomplished by means of a little worsted mop, slightly impregnated with honey in the same way, with which the blossoms are gently touched, or as it were dusted. This improvement upon the old order of things, which was to trust to the wind to blow the pollen from one plant to another, or to depend on insects to perform the office, is said to have been attended with good results. According to recent experiments which have been made, the difference of production, under precisely similar circumstances, between wheat crops to which artificial fecundity has been applied, and those to which it has not, appears to be in the proportion of 41 to 30; and in the case of barley as 34 to 23.

Platinum Porous.

Messrs. Deville and Troost, of Paris, have lately discovered a curious property of platinum. In some experiments upon high temperatures they were induced to suspect that the platinum vessels employed were somewhat porous to gases. They accordingly tried a definite experiment with the object of ascertaining this. A platinum tube was placed inside a porcelain one; through the former a current of atmospheric air was passed, whilst hydrogen circulated through the latter. The pipe and delivery tubes were so arranged that the gases could not mix, but passed through and were collected apart, being separated by a solid and continuous partition of platinum. At the ordinary temperature the hydrogen passes along and may be collected at the other end in the pure state, whilst the air retains its normal composition. When the temperature is raised, however, to a red heat a change occurs; the platinum at this temperature is porous to the hydrogen, which accordingly passes through the metal and unites with the oxygen of the atmosphere, forming water, which may be collected and weighed in appropriate apparatus. It has been proved further that the porosity increases with the elevation of temperature. At the highest point tried (about 1,100° centigrade) the whole of the atmospheric oxygen unites with the hydrogen, and nothing passes out at the other extremity of the apparatus but nitrogen and aqueous vapor.

A Curious Steamer.

Some very novel things occasionally arise in the world of invention, but we think the following description of a steamer lately built in New Orleans rather bears off the palm for originality. The way in which the reporter works up the horse-power is rather startling; engineers may learn something from this genius, as it appears that it is only necessary to gear an engine up to run rapidly, to gain power indefinitely. The only wonder is that, while the constructors were about it, they did not put in gears big enough to get 3,000 horse-power out of the engine; but let us hear the reporter:

" A steamer was recently built in New Orleans under the superintendence of Col. Colburn, of the 12th Connecticut volunteers. The steamer is a double-hull vessel, length 154 feet, breadth 49 feet, over all, with six feet depth of hold. Each hull is 148 feet long by 12 feet 4 inches broad on the inside. There are two engines of 40-horse-power each, with 12-inch cylinders, 16-inch stroke, geared at the rate of 4 to 1, making each engine equal to 160 horse-power. The total of the two, after deducting for friction, is estimated 200-horse-power net. The boilers are made to stand over 200 pounds of steam, but at the trial trip the boat made about ten miles an hour with from 70 to 100 pounds. The result of the trial was satisfactory, the speed of the boat being good and the engine working well. Her tunnage is estimated at 250, and she is built in such a manner that at least 2,500 men can easily be carried at once."

We see no mention made of the length of the smoke-pipe or the diameter of the cook stove; this is a sad omission.

Grooming Horses.

Every horse should be cleaned daily, and his bedding straw should always be thrown behind him in the stable during the day. The manger should be kept clean and washed once a week, at least. Oats are the best food for horses, according to general experience, and yet they thrive well in Arabia on barley. A portion of ground oats should always be mixed with whole feed, and for horses having imperfect teeth the oats should be crushed. When the weather is not frosty, the crushed oats should be moistened with a little water and some salt added. Cut hay moistened and sprinkled with ground oats, forms excellent food. The hull of the oats is hard and often unmasticated, and passes undigested through the system, thus taking away instead of imparting strength and nutrition. For medium-sized horses, with moderate work, nine to twelve quarts of oats per day and fourteen pounds hay are ample. For large draft horses, eighteen quarts oats and sixteen pounds hay. Food consisting of one-third corn ground with two-third oats forms strong, hearty, winter food for work or coach horses; good beds and good grooming are as important as good feeding. Horses, like men, want good dry, warm, clean beds. In grooming, tie your horse so he can't bite his manger, and thus learn to crib-bite. Let the curry-comb be very moderately used on the body to loosen up the scurf and dirt, but never permit one near the mane and tail. Rely mainly on the brush and rough cloth for cleaning; combs tear out more hair in a day than will grow in a month, and they ruin manes and tails. Half an hour is enough for a good groom to one horse, but one hour's time at the outside, ample to be very complete. Always be gentle about the horse's body, especially his head. Use whips as little as possible and never teaze a horse.

Explosive Glycerin.

Nitric acid possesses the property of converting many substances containing carbon into highly explosive agents. It is this acid which converts common cotton into explosive gun cotton. One of the most singular explosive substances lately produced is glonoine, which is made by treating glycerin (a liquid obtained from fats) with a mixture of nitric and sulphuric acids. This product when heated explodes with great violence. It has not been applied to any useful purpose, and perhaps it will always be more curious than useful. It is a very powerful poison; one drop taken into the human stomach being sufficient to produce death.

The latest thing in the photographic line, in London, is the representation of the sitter minus his head, which he politely hands in a platter for the inspection of his friends, or carries tucked up under his arm.

The Mineral Wealth of the United Kingdom.

The number of collieries at work in Great Britain has increased from 2,397 in 1853 to 3,088 in 1862. In these collieries there were employed in 1861 no less than 235,590 colliers. The quantity of coals produced in and sold in 1861 amounted to 83,635,214 tons, this being the largest quantity produced in any one year. Owing to the interruptions which several of our manufactures experienced in 1862, the amount of coals which passed into the market, or were consnmed at the place of production, fell to 81,638,338 tons. Very large stocks have been stored in Lancashire and other districts; the actual drain, therefore, upon our coal beds was probably as large as it was in the previous year.

In 1861 it is stated in these returns that nearly two millions and a half tons of coal were burnt or wasted at the pits in Durham and Northumberland alone. In the publication for 1862, Mr. Hunt says, "the amount of the coals burnt or wasted at pits has been so differently represented, and appears such an uncertain, although very large quantity that it is for the present omitted." Since attention has been directed to the rate at which the exhaustion of our coal mines is going on, it becomes a really important element to determine with all possible accuracy the extent to which this system of waste prevails on the surface, and it is no less important to determine the waste which takes place in the mine. In Derbyshire about one-sixth of the quantity of coal raised, which amounted last year to 4,534,800 tons, is left in the colliery, and thisis not much in excess of the quantity of coals lost in the working of coal in other districts. In estimating, therefore, the rate at which we are draining our coal mines of their fossil fuel, we cannot take less than 90,000,000 tons as representing the annual rate of exhaustion.

The exportation of coals in 1862 amounted to 7,671,670 tons, which was an increase of 448,952 tons on the exportation of 1861.

The quantity of iron ore raised in 1862 in these Islands amounted to 7,562,240 tons, and we imported 36,270 tons. This was used to feed 561 blast furnaces, which were distributed as follows: In England, 306; in Wales, 130; in Scotland, 125; the quantity of pig iron smelted being 3,943,569 tons, which is an increase upon the two previous years. In 1860 we made 3,826,752 and in 1861 3,712,390 tons: The value of pig iron at the place of production last year is estimated at £9,858,672.

The number of copper mines worked in these islands in 1862 was 230; of these 201 are in Cornwall and Devonshire. For several years there has been a steady decline in the rate at which copper has been produced from our mines; the produce of the last three years has been in the aggregate 4614 tons.

Our imports, which were 74,163 tons of ore, and 20,317 tons of regulus in 1861, increased to 82,054 tons of ore and 35,388 tons of regulus in 1862.

The returns of dues paid to the Stannary Court, which are made up to the 29th of September in each year, give the production of the tin mines of Cornwall and Devonshire at 11,841 tons of ore, producing of white or metallic tin 7,478 tons valued at £879,048. The Keeper of Mining Records gives the production of the whole year 1862 as 14,127 tons of tin ore, producing 8,476 tons of metallic tin, valued at £983,216. This is the largest quantity of this metalliferous ore which has ever been produced in any one year, the probability being that this will be exceeded by the yield of the Cornish tin mines in the present year.

For certainly more than 2,000 years tin has been obtained from Cornwall and Devonshire, and yet we find the granite and clay slate rock of these counties yielding a larger quantity than ever to the industry of man; and there does not appear any reason for supposing that we are exhausting any of the stanniferous districts. A fear has been expressed by many that the copper mines of Cornwall are nearly worked out. That there has been a falling off in the quantities of ore mined for some years past is certain; but if ever mining is to be permitted to be carried on again with honesty and zeal, so that the full amount of the subscribed capital shall be expended in subterranean explorations judiciously directed by experienced miners, we believe it will be found that ample stores of copper are yet to be discov ered.

The produce of lead has shown a steady increase. In 1862 the returns were 69,013 tons. The silver produced from this lead in 1862 amounted to 686,123 ounces.

From time to time, after long intervals, there have been small quantities of gold produced in various parts of these islands, and consequently on the discovery there has been much excitement. The discovery of gold in the Lead-hills, Lanarkshire; at Wicklow, in Ireland; and more recently in the neighborhood of Dolgelly, in North Wales, are examples in each case of enthusiastic hope deferred.

We have, however, in the returns before us a reliable statement of the production of one gold mine (Vigra and Clogau) for the past two years. In 1861 the quartz lodes upon which they are working gave 2,784 standard ounces of gold, which were sold for £10,816 17s. In 1862 the production reached 5,299 standard ounces, which were sold for £20,390.

We find by the lists of mines given in the Appendix to the "*Mineral Statistics*, that no less than twenty-four workings are entered as gold mines. From none of these have we as yet any return of gold; we shall wait with much curiosity the publication of the statistics in 1864.

The returns of zinc ores, of iron pyrites, and of other less valuable metalliferous and earthy minerals, are given; the total results being as follows for the year 1862:—Value of British metals, £14,281,453; coals, 81,638,338 tuns, £20,409,584. Total, £34,691,037. Earthy minerals, such as barytes and lime, salt and the more valuable clays, are estimated at £1,750,000; and we find, by a return compiled by Mr. Robert Hunt in 1859, that the value of building stones, slates, &c., amounted to £7,954,075. We learn, therefore, that the actual wealth added to the national store, as obtained from our native rocks, amounts to nearly £45,000,000 sterling.—*London Ironmonger.*

Give the Boys Tools.

In man there is what may be termed a "making instinct," and our houses, garments, ships, machinery, and in fact, everything we use, are the practical results of this instinct. How important then that this faculty be cultivated, and that the idea be at once and forever abandoned that none but mechanics require this great element of usefulness and happiness. Whatever a man's occupation, whether he be a farmer, a merchant, an artist or a mechanic, there are hourly occasions for its practical application. Being thus general in its usefulness, the cultivation of this constructive faculty should be a primary consideration with parents. Skill in the use of tools is of incalculable advantage. It gives useful employment to many an otherwise idle hour. It prompts one to add a thousand little conveniences to the house, which but for this skill would never be made. In a word, it is the carrying out, in a fuller sense, of the design of the Creator, when he implanted this faculty of constructiveness within us. Let it then be cultivated in children. Indulge the propensity to make water-wheels and miniature wagons, kites and toy boats, sleds and houses, anything in fact which will serve to develop it and render it practically useful. Give the boys good pocket knives, and what is better, give them a good workshop. Employed in it, they will not only be kept out of mischief, but they will be strengthening their muscles, exercising their mental powers, and fitting themselves for greater usefulness, when they shall be called upon to take their place in the ranks of men.

Death of a Distinguished English Inventor.

Mr. Samuel Hall, formerly of Basford-hall, near Nottingham, whose death at the advanced age of eighty-two was recorded recently, has rarely been excelled in his genius for inventions, at once the result of science and the source of improvements in British manufactures. The greatest of these were the gassing of lace and the bleaching of starch—processes essential to the perfection of cotton fabrics. In the gassing process the gas flame was drawn through the interstices of the lace by means of a vacuum produced by an air-pump acting above it. Thus the sheet of lace which entered the flame opaque and obscured with loose fiber issued from it bright and clear, and undistinguishable from the fine linen thread lace of the continent. This beautiful invention excited much interest and drew many visitors, among whom was His Royal Highness, the late Duke of Sussex, who dined at Basford Hall in 1824. Mr. S. Hall belonged to a remarkable family. His father was the first to apply chlorine to the art of bleaching, and his brother was Marshall Hall, the distinguished physiologist and physician. Mr. S. Hall obtained numerous engineering patents, by one of which the steam was condensed, and returned to the boiler by passing it through pipes surrounded with cold water. Thus, the incrustation from the use of sea water was avoided, and a saving of more than twenty per cent in fuel and repairs was reported to the Admiralty as being effected by the process. The combustion of smoke and the reefing and unreefing of paddlewheels without stopping the engine or vessel, were among Mr. Samuel Hall's various inventions. On these and kindred subjects he labored and thought with extraordinary enthusiasm and devoted constancy, to the extreme close of his protracted life. He had in large measure the true genius of the mechanician, and belonged by nature to that illustrious line which has in all ages bequeathed the heritage of power, and to which the world looks for her most splendid triumphs.

MISCELLANEOUS SUMMARY.

Invention to Prevent Railway Accidents.—One of the Philadelphia city railway companies has placed an apparatus on their cars which, it is expected, will prevent many accidents. It consists of a fender placed in front of the wheels, and brought down close to the rails. A strong spring allows the machine to pass over a permanent obstruction, but any movable thing is at once pushed off or along the rail in front of the car. Experiments have demonstrated that a foot or hand placed on the rail is at once pushed aside, without stopping the car and without injury to person; this machine will also remove snow and other obstructions which may impede travel or throw cars from the track.

A saw mill on a new plan has just been put in operation at Cheshire, Mich., by J. G. Lindsay, the inventor; the saw works horizontally, cutting the lumber from the top of the log, and after passing through the log it is turned over, the carriage is started the other way, and the saw works back again, cutting the log as before.

Farmers in southern Illinois have been busily engaged, for some weeks past, in cotton picking on the high ground; the crop is but little injured by frost. On the bottom and low lands it was totally ruined. Cotton presses are going up in Huron and Jackson counties, and gins are running in every neighborhood.

According to Gen. Halleck's report, a remount for the whole service once in two months, is the rate at which our cavalry horses are used up, by want of skill and often culpable neglect of the animals; 435,000 horses will be needed for the coming year, if the evil remains unchecked. The stock breeders declare that if this goes on it will permanently injure the breed of horses in this country.

The Boot corporation in Lowell, Mass., is about to start up its machinery, and will employ some 300 hands. At the present time there is not a cotton spindle in motion in Lowell; this is a singular fact—Lowell, the head of the cotton business, is as still as the tomb.

A recent wind-storm in London actually blew the metal roof of a railway depot off—it was of immense weight, and braced with iron girders—overturned several locomotives, blew down sixty yards of another depot building, and inflicted many thousand pounds worth of damage.

The Sophomore Class, at Amherst College is paying particular attention this year to the manual of arms. Faithful drilling in the use of the musket is substituted twice a week for the regular gymnastic exercises.

Cochineal insects have been imported into England alive, and have been placed in the Horticultural Gardens, in Kingston.

A very large number of freedmen are employed by the navy on the Mississippi river; they are said to make excellent seamen, and are specially capable as gunners.

West Point military school is now full. Forty-six of the students were appointed the past year from the United States volunteers.

A Milwaukie paper invites the ill-requited working girls of the Atlantic cities to go "West," where they are needed.

Twenty-five thousand persons are engaged in Peru in obtaining india-rubber to supply the foreign demand.

The new war steamer *Eutaw*, coming up the Potomac, made 95 miles in six hours.

GOVERNMENT ORDNANCE EXPERIMENTS.

Practice at Iron-Plate Target No. 18.

PENCOTE BATTERY, September 16, 1862.

This target was made of two thicknesses of 1-inch wrought-iron plates, backed by 1¾ inches of rubber, 7 inches of yellow pine, and 3 beams 12 inches square running lengthwise the target. The outer layer of plate consisted of three plates placed horizontally, and the inner layer of two plates placed perpendicularly. The rubber was placed between the plates and timber; it not being as large as the plates, a margin of about one foot was left, which was filled in with pine planks—the whole being joined together with thirty-two 1¼-inch bolts. The target was placed against a solid bank of clay, with planks in its rear to keep the clay clear of the timber. Angle of incidence 15°.

DIMENSIONS.—Plates, 8 feet long, 6 feet 8 inches wide, 2 inches thick; rubber, 1¾ inches thick; timber, 7 inches; beams, 12 inches square.

Gun, XI. inches, No. 214; charges of cannon powder 1862; projectiles, Cloverdale cast-iron solid shot; primers, friction tubes.

No. from gun.	No. to-day.	Charge.	Weight of Projectile.	Insertion	Recoil.	Time Fired.	Distance to Target	REMARKS.
		lbs.	lbs.	in.		P.M. h.m.	ft.	
54	1	30	169	107	Taut Breech.	3.00	74	

The shot struck the target 24 inches from the right edge of center plate, tearing through the plate and rubber, and breaking the timber and beam, making a hole 2 feet 8½ in length, and 7⅛ inches mean width; extreme depth of hole, 9 inches.

The shot passed off and penetrated the bank 17 feet; angle of shot after leaving the target, 9°. The plates are indented at top edge of shot hole 4 inches, at lower edge 3 inches, at right-hand edge 1¾ inches, at left-hand edge 1½ inches.

The shot has a small piece broken out.

Practice at Iron-Plate Target No. 21.

PENCOTE BATTERY, Nov. 5, 1862.

The target was made of two 1-inch plates (wrought-iron), backed by two 1-inch plates of rubber, 7 inches of yellow pine, and three beams running lengthwise the target. The rubber was placed between the plates and timber, and the whole joined together with ten 1¼-inch bolts. The target was placed against a solid bank of clay, with timbers in its rear to keep the earth clear of the target. Angle of incidence, 15°.

DIMENSIONS.—Plates, 8 feet long, 4 feet wide, 2 inches thick; rubber, 2 inches thick; beams, 12 inches square; timber, 7 inches thick.

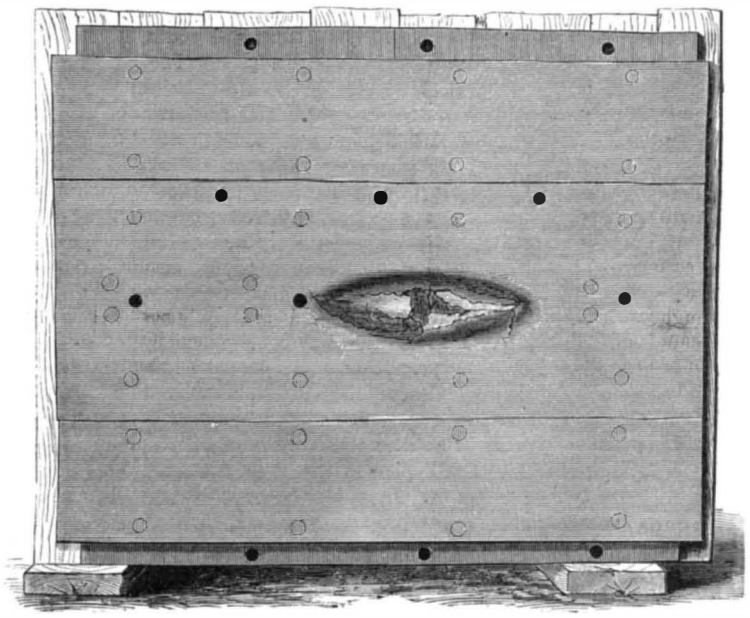
Gun, XI inches, No. 214; charges of cannon powder 1862; projectiles, solid Cloverdale cast-iron shot.

No. from gun.	No. to-day.	Charge.	Weight of Projectile.	Insertion	Recoil.	Time Fired.	Distance to Target	REMARKS.
		lbs.	lbs.	in.	ft. 11	A.M.	ft.	
155	1	30	164	107	Taut	9.51	74·9	
156	2	30	168		Breeching.	10.12		

First shot struck the target 11 inches from lower edge, and 30 inches from top edge of plates, tearing through the plates, rubber and timber, and breaking the lower beam; making a hole 28 inches long, and 6·8 inches mean width. The shot passed off and penetrated the bank 16 feet. Angle of shot after leaving the target 10°.

The plate is indented at top edge of shot-hole ¾ inches, at lower edge 1¼ inches, at right edge 1¾ inches, at left edge 1¼ inches. The shot broke into pieces, one of which was found in the bank (weight 52 lbs.).

Second shot struck the target on the right edge of the plates, and 12 inches from the top, tearing through the plates, rubber and timber, making a hole 31½ inches in length and 10·7 inches mean width. The shot passed off and penetrated the bank 18 feet. Angle of shot after leaving the target 15°. The plates are very much bent on the right-hand side, and the timber badly shattered. The cause of this shot striking the edge was occasioned by an error being made in sighting the gun from a point on the timber, and not allowing four inches for thickness of plates and rubber.



HOW STEEL IS MADE.

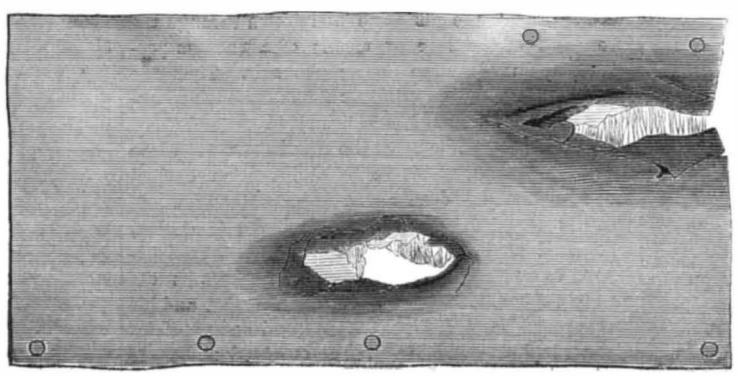
The following description of the manufacture of steel is condensed from the *Ironmonger* (London). It is contained in an article by a correspondent, giving an account of the establishment of Watkin & Co., at Stourbridge, England; celebrated for its manufactures of shovels, spades, scythes, forks, anvils, pick-axes, horse shoes, nails and black ironmongery in general. We direct the attention of our American tool makers to the subject; because instead of making their own steel they purchase it, while almost all the great tool manufacturers in England make their own steel, being thus enabled to obtain the material at much less cost:

"There are various kinds of iron, English, Russian, Spanish, German, but particularly Swedish, for making steel, by the process of cementation, which may be briefly described as follows: The converting furnace of cementation presents the shape of an oblong quadrangle, divided by a grate in the center into two parts. On each side of the grate runs a long trough or chest, technically called a "pot," about 13 feet long by 3½ feet wide and 3½ feet deep. The furnace is covered in by a semicircular arch, with a round hole, about 12 inches diameter in the center, which is opened when the furnace is cooling. A large and tall conical chimney or hood, open at the top, is built over the furnace, which serves to shelter it within, to increase the draught of air, and to carry off the smoke. There are two openings, about 8 inches square, in front of the arch, one above each chest or post; these serve for the introduction and removal of the bars, which are slid in and out upon a piece of iron placed to that end of the opening. A much larger opening in the middle, between the two pots, serves to admit the workman. An iron platform is laid along the grate between the two pots; upon this the workman takes his stand. He first sifts a layer of cement—that is, a mixture of about nine parts of ground charcoal made from hard wood, and one part of ashes, with a littte salt added to it—on the bottom of each pot or chest, to the depth of about half an inch, taking care to spread the mixture as evenly as possible. He then proceeds to place on this a row of iron bars, cut to the length of the pots. He always leaves about an inch between every two bars. The row of bars thus placed is covered again with a layer of cement about one inch thick, as the carbon here is intended to serve for the bars above as well as for those below. Another row of bars is placed upon the second layer of cement, in such manner that the portion of the bar composing it corresponds vertically with the interstices left between the first row. Then comes another layer of cement and another row of bars, placed in the same relative position to the second as the latter is to the first, and so on alternately in succession up to within six inches of the top (which makes about ten inches altogether). A final layer of cement is spread over the last row of bars, and the whole is then closely covered in with clay, or with so-called wheel-swarf (the earthy detritus found at the bottom of grindstone troughs), entire exclusion of the air being thus ensured. A few bars are left longer than the others; the extremities of these are left projecting through small openings made in the ends of the chests, closed by doors in the outer walls. These openings, which are called tap-holes, are placed near the center of the end stones of the chests, that the bars projecting through them may serve to indicate the average stage to which the process of conversion has proceeded throughout the entire mass of iron in the troughs. The projecting bars are called test-bars, or trial-rods; their projecting ends are encrusted with fire-clay, or imbedded in sand.

"When the pots are properly charged, all the openings in the furnace are bricked up air-tight. A large fire is lighted in the grate, the flame rising between the two pots, and passing below and around them, through a number of horizontal and vertical flues and air-holes leading to the chimney; the fire is carefully regulated and steadily maintained for the whole period of time required for the cementation of the iron bars in the furnace. It generally takes about four days to heat the iron through; on the sixth or seventh day, according to circumstances, a test-bar or trial-rod is drawn out through one of the tap-holes, to see how matters are going on. The conversion is considered complete when the cementation is found to extend to the center of the test-bar, which generally takes about eight days for soft steel, and from nine to eleven days for the harder sorts.

"The furnace is solidly constructed of refractory bricks; the two chests or pots being mostly built of fire-stone grit.

"When the trial-rod shows that the desired end has been attained, the fires are extinguished and the furnace is left to cool. The converted iron bars, or, more properly speaking, steel bars, are taken out; they are found, upon examination, to have slightly increased in length and in weight, which is owing to the absorption of the carbon from the cement. On breaking a converted bar across, the texture is found to be no longer fibrous, as it was in the original iron bar, but granular or crystalline. The surface of the bar is covered with blisters, which have procured for the article the name of blistered steel. These blisters are occasioned by imperfections in the iron, the metal dilating in the unsound parts, and gaseous carbon forcing its way between the imperfectly-welded laminæ. This blistered steel is chiefly intended for the manufacture of edge tools, &c. In the state, however, in which it leaves the converting furnace, it will not answer this purpose; but it has



to pass through another process, viz., that of tilting, or, as it is also termed, shearing; to this end the converted bars are broken or clipped into lengths of about thirty inches. Six or eight of them are piled or fagoted together, the ends being secured within an iron ring, terminating in a bar of about five feet long, which serves as a handle. The faggot is then raised to a welding heat in a wind furnace, and is covered with sand, which, melting on the surface and running over it like liquid glass, forms a protecting coat to defend the metal from the ordinary action of the air. When the proper degree of heat has been attained, the faggot is removed from the furnace and placed under a hammer, which unites the piece into a rod or bar and closes up internal fissures. This bar is again brought to a welding heat, and is in that condition subjected to the action of the tilt-hammer, which makes from 200 to 300 strokes per minute. Water is constantly kept pouring on the frame-work to keep it cool. The workman generally sits in front on a movable seat—a kind of swing formed by a board suspended by iron rods from the ceiling. In this posture he can, with a very slight motion of his feet, advance or recede with great rapidity, and place himself at pleasure in front or on either side of the anvil, and guide the bar or other object under the hammer so as to distribute the blows evenly over the whole surface. The effect of the process of tilting is to restore the original fibrous character of the metal, and to close up the loose parts and seams. Tilted steel, or, as it is more commonly called, shear steel, is close, hard and elastic, and retains the property of welding; it is also capable of receiving a certain degree of polish. It is more especially made use of for the manufacture of tools composed jointly of steel and iron.

"In former times shear steel was almost exclusively employed for the better class of goods; but since the introduction of cast steel the latter article has to a very large extent displaced its use for superior edge-tools. The reason for this is, that shear steel always labors under inequality of texture and hardness, the outer parts being unavoidably more strongly carbonized than the inner or central layers; whereas cast steel is of uniform texture and hardness throughout. Cast steel is more especially suited for the manufacture of cutting tools made entirely of steel. It is also largely used for tools made jointly of iron and steel. Some sorts, however, will not stand welding: they are therefore, of course, altogether unfit for the latter purpose."

RECENT DISCOVERIES AND INVENTIONS ABROAD.

Portable Gas Furnace.—W. Gore, of Birmingham, England, has invented and introduced a portable gas furnace, which consists essentially of two open cylinders of fire-clay, one within the other, the outer one being much thicker and a little taller than the other, and a gas burner of very peculiar construction placed at the bottom of the interior cylinder. The crucible is supported inside the interior cylinder, near the top, by three projecting pegs of fire-clay, forming part of that cylinder. The outer cylinder is covered by a movable plate of fire-clay, which has a hole in its center for the introduction of crucible and material, that hole being closed by a clay plug, with a small hole in it for stirring or examining the melted substances. The burner consists of an upright metallic tube, open at both ends, deeply corrugated at its upper end, so as to present the appearance of a star of numerous radiations, and the corrugations diminish gradually to about half the length of the burner downward. Gas is admitted into the lower end of the burner by a common gas tap; it there mixes with a large quantity of air and the mixture rises upward. The flame commences at the top of the burner, and burns with great intensity within the inside cylinder to the hight of the crucible; the heated products of combustion pass over the top edge of that cylinder, then downward between the two cylinders, and into the chimney through a hole in the side of the outer cylinder near the bottom. The outer cylinder is enclosed within a sheet-iron casing, which has a chimney 6 feet high attached to it, and is supported upon three iron legs, making the whole apparatus portable, and capable of being used either in a workshop or in the open air, as may be desirable. Several sizes of this furnace are manufactured. The first and smallest size consumes 33 cubic feet of gas per hour, and is suitable for assayers, jewelers, analytical chemists, experimentalists, dentists and others. The second-sized one consumes about twice that quantity of gas, and is suitable for persons who require to melt gold, silver, copper, German silver, brass, cast-iron, glass and other substances.

Riveting Iron Ships.—At a late meeting of the Liverpool Polytechnic Society, Macfarlane Gray explained a steam riveting machine for employment upon ships' sides, bridges, &c., which he has patented. The machine is suspended by a lanyard over a ship's side, and can be moved from point to point as may be required. The apparatus by which the rivets are driven is worked by steam, and so rapidly is the operation performed that at a trial three rivets were fixed in 25 seconds. There are two or three variations of the same machines for different purposes, and a chisel can be attached by which the heads of the rivets are pared off with as much ease as though they were of wood.

Preventing Incrustations in Boilers.—A patent has been taken out by C. Terrett, of Bristol, England, for a compound to prevent incrustation in boilers, which consists of Gambier terra japonica; mimosa japonica; catechu and myrabolams. These substances, in equal proportions, are dissolved in hot water and boiled until the solution becomes about the thickness of molasses, when it is strained through a sieve. About two pounds weight of this per horse-power added to the feed water of a boiler, once a month, will, it is stated, prevent incrustations from being formed from hard water.

Gunpowder.—A patent for a new gunpowder intended for artillery, has been taken out by W. Spence, London. The patentee puts into a vessel thirty-eight parts in weight of water, and two parts in weight of finely pulverized charcoal, which are to be thoroughly boiled together; he then adds twenty parts in weight of chlorate of potash, and six parts in weight of a mixture of two parts finely pulverized charcoal and three parts of the nitrate of lead, or saltpeter, the whole thoroughly mixed. After this there is added seven parts by weight of fine sawdust, and the whole is then boiled until all the ingredients are incorporated. The mixture is then dried in open pans heated with steam, and it is granulated in the same manner as common gunpowder.

Artificial Fuel.—When fuel is so high in price, any method of manufacturing it to obtain a cheap substitute for coal is valuable, but we must say that most of the propositions made for producing cheap fuel have been based upon a misconception of the nature of combustibles. This appears to be the case with the following artificial fuel, for which a patent has been solicited by J. Lark, London. He takes limestones, chalk, cement, stones, gypsum, slate, or other stones which become porous when calcined, or clay may be employed; and having calcined the same he boils or mixes the material, which should then be in lumps of suitable size for fuel, with gas tar, pitch, bitumen, or bituminous matter. In this manner the lumps are thoroughly saturated with the material, which is kept liquid by sufficient heat. He also sometimes employs a small quantity of paraffine, naphtha, resinous and fatty and oily matters, to increase the inflammability of the fuel.

Medicated Oil for Preserviug Metal and Wood.—R. Smith, of London, has taken out a patent for a compound, to be used either alone or in combination with any description of paint, for the preservation of iron or wooden ships, buildings, or articles made of metal, wood, or stone, composed of the following ingredients:—One gallon of any description of oil, and a like quantity of water, two pounds of saltpeter, either mixed or separate. If the compound is intended for the preservation of stone add about two pounds of sulphur.

Hardening Gypseous Limestone.—Soft gypseous limestone may be easily formed into artistic shapes, but it is readily injured and does not withstand exposure to the weather. A patent has been taken out to harden it, by R. A. Brooman, London, and the process consists in submitting the articles to a mineral solution in a bath for several days. The sulphate of iron in solution, or the cyanide of potassium, alumina, and lime water will answer for the hardening bath. The articles are immersed for several days in the solution, then taken out and dried, when they become quite hard. Casts made of plaster of Paris may be hardened by the same treatment.

New Electro-magnetic Engine.—If we coil an insulated copper wire many times round a rod of soft iron and pass a current of electricity through the wire, the iron will remain magnetic like a common magnet, as long as the current is passing on the copper wire, and it will attract to itself any other piece of soft iron, of suitable weight, that may be brought sufficiently near it; but the moment the current ceases to pass, the piece of iron which it had been passing round will cease to be magnetic, and will instantly drop any other piece of iron which, while it was magnetic, it may have lifted to and sustained in contact with itself. Many inventors have constructed engines for the supply of motive power, by arranging that magnetic currents should pass intermittently round pieces of soft iron, and so the pieces of soft iron be alternately magnetized and demagnetized, and thereby enabled to alternately lift and drop other pieces of iron; but all such engines have hitherto labored under a disadvantage, which has prevented them being of any practical use. Power enough has been attainable from them, but only at a cost immensely exceeding that of steam-power, and several times greater even than that of animal power. J. B. Thomson, of Glasgow, has invented a new electro-magnetic engine, which has been described as being more economical of power than any that had been previously brought before the public. His artificial magnets are square plates of thin sheet-iron, the magnetization of which by the current is managed in a novel and very ingenious way. There is a hole in the corner of each plate, so arranged that the plates can be strung by means of them upon an arrangement of four horizontal rods, upon which the plates can slide backward and forward. When the engine is at rest, there is an interval of from an eighth to a sixteenth of an inch between each plate; the moment connection with the battery is made and the current allowed to pass, the plates all rush together, being converted for the time being into magnets, one after the other, and each successfully attracting to itself the one next to it. There are two sets of plates, strung on two separate arrangements of rods, so that one set may undergo magnetization, and so make a stroke, while the plates in the other set have been demagnetized by the transference of the current from them to the other set.

SERIOUS ACCIDENT TO THE "RE D' ITALIA."

The magnificent iron-clad steam-frigate *Re d' Italia*, which was built for the Italian Government by Mr. W. H. Webb of this city, met with a serious accident on Monday, the 29th ult., when on a trial trip at sea. While proceeding on her voyage, with everything working favorably, the ship making fully 11 knots and the engine 42 revolutions, a block of wood which had been left in the steam pipe of the after engine, was blown through into the steam chest, jamming the valve, smashing it and the connections, and also injuring the piston, thus completely disabling the engine. After some time the broken engine was disconnected from the forward one, which was unharmed. Steam was let on again, and the ship traveled off, making a good seven knots with half power. Some time after this, in the darkness of the night, and from some cause as yet unknown, the frigate was run ashore on Long Island beach, where at late accounts she remained hard and fast. We very much regret this disaster to the noble ship. The daily press asserts that the vessel was at the time under the control of the Italian officers; if this is correct it may account in part for the accident, as they cannot be supposed to know much of the peculiarities of our coast. It seems almost incredible, however, that such a vessel should be given into the hands of Italian officers, unacquainted with the dangers which lay before them; and we are loath to credit the assertion. The accident to the engines is one that has often occurred before to other machinery, and we can call to mind many instances of a similar character. The *Brother Jonathan's* cylinder head was knocked out by a block of wood carelessly left in the steam chest, as was also that of the *New York*, and stationary engines have repeatedly been smashed up by oversights of this kind. Since the above was written the vessel has been rescued from her perilous position.

Correspondence

Ventilation of Buildings.

MESSRS. EDITORS:—I have by the mercy of God lived to see 71 years, and as I cannot expect to make myself useful much longer, I am desirous of improving my time in the exemplification of ventilation and warming, which has engaged the most of my time in experimenting for the last twenty years.

I have only now perfected the system, which requires no extraneous help or labor, but is in every respect natural and spontaneous in its action. After the building is completed, no labor or expense whatever is required about the premises, except that which supplies the fuel in cold weather.

I will undertake to superintend the erection, for ventilation, of any building, public or private, in Boston, New York, or Philadelphia, and will charge nothing but my necessary and actual disbursements whilst attending the work; and will moreover give satisfactory security that the operation, after the building shall be completed, will be certain and efficient—more efficient, indeed, and less expensive than any ventilation hitherto known in any part of the world.

The extra expense of the building for ventilation will be but trifling, and I will guarantee that the warming apparatus, fuel and attendance afterward, shall not exceed one-fourth of the sum now paid for the hot water or steam heating, where the same quantity and flow of fresh air is kept up. My firm belief is that it will not cost one-tenth part of the sum.

I should prefer an hospital, gaol, penitentiary or other public building, and must of course confer with the architect.

My sole object in making this offer to the public is, that no time may be lost in the exhibition of the system to architects and builders; so that it may not be lost. Its perpetuation will be sure and certain.

HENRY RUTTAN,

Cobourg, Canada, 28th Nov., 1863.

Priming of Steam Boilers.

MESSRS. EDITORS:—I have been a constant reader of your journal for ten years, and have frequently noticed your correct explanations on different matters; I wish to get your opinion as to the cause of priming in three nests of cylinder boilers, eight in each nest. I will explain the way they work:—They were put in last March, filled with water, and then heated to boiling; they then stood idle until this winter. When we started them up they primed so badly that we cannot do much with them; the engineer has blown the water entirely out of the boilers twice, and some thirty or forty times to the lower gage cock, and still they will prime. Now what is the cause? will you please to let me know and oblige

LEVI FERGUSON.

Lowell, Mass., Dec. 21; 1863.

[We are afraid we cannot help our correspondent much; it is possible in this case, however, that blowing the water out to the lower gage-cock is not sufficient to clean the boilers. Cylinder boilers ought not to prime if there is sufficient steam room in them and the steam pipe is high enough above the water line to prevent the water from rising when the engine is started; boilers sometimes prime from this cause. A dirty boiler may be cleaned by putting in two pounds of soda for a twenty horse boiler, or one pound of potash; this will not prevent priming, but will remove one cause of it—dirt and grease accumulating on the flues and shell; this forms a soap with the grease which simply washes the boiler out. The engine should not be used when the boiler is so cleaned, as the latter will foam badly; blow it out until clean, and if the boilers still foam there must be some radical defect in the construction, or mismanagement in running them which causes the trouble; of that we cannot judge at this distance.—EDS.

Blackening Brass.

MESSRS. EDITORS:—Having noticed some inquiries in the SCIENTIFIC AMERICAN, for a method of blackening brass articles, allow me to give you a process used by Mr. Alvan Clark, the distinguished telescope manufacturer. Old daguerreotype plates are to be dissolved in diluted nitric acid and the articles to be colored should be washed with this solution, previous to which operation they must have been heated nearly hot enough to melt soft solder, which last point is the only objectionable feature in the process. But it answers perfectly for solid and hard-soldered work, and it is more convenient for most persons than the solution of bichloride of platinum, which is not always to be obtained. The inside of the tubes of optical instruments are, however, never blackened by any of these methods, but with a mixture of lamp-black and shellac varnish; in some instances, too, they are lined with black velvet, which is an excellent absorbent of light.

IRON-CLAD.

Jersey City, N. J.

Improvements in Water Power.

MESSRS. EDITORS:—I recently noticed in the columns of the SCIENTIFIC AMERICAN, a few remarks about the use of water wheels, in Manchester, England, as a domestic help. Now I wish to state that I have a much better method than the using of turbine wheels for such purposes, and I put it into operation eight years ago at South Orange Water-cure, New Jersey. That establishment was then supplied with water from the mountains, at a pressure of about eighteen pounds to the inch, and I found my hydraulic engine work well for sawing wood, &c. Since then I have made great improvements on it, and I am prepared to give an estimate as to the cost and practicability of applying and using this engine, so that it may be used to a great advantage where steam and fire are dangerous, and where water of high pressure can be obtained. The best place that I have ever seen to bring this kind of motive power into use, is the city of Washington, where I made inquiry last year as to the pressure and supply of water. I found the pressure to be from sixty to eighty pounds to the square inch, and the supply almost unlimited. I then remarked to a friend that the time will come when the whole of the Potomac River will run through the City of Washington, and be used there as a motive power instead of steam.

THOMAS WELHAM.

Brownsville, Nebraska Territory.

STREET PAVEMENTS.

The condition of Broadway, the principal street of this city, is such that at present it is a dangerous matter for any one to drive or ride upon its treacherous surface. Only a few days since we saw an officer riding quietly along on a spirited horse; on each side of him crowded omnibuses rolled by, the animals drawing them slipping and sliding about in all directions. Almost in the twinkling of an eye, so quickly did the event occur, the officer and his horse were thrown violently to the pavement, the wheel of an omnibus just escaping the head of the rider. On attempting to rise, the horse fell heavily again, and was doubtless much injured. Such a spectacle is not by any means rare, and at all hours the sensibilities of the public are shocked by the sight of maimed and bruised horses. On the morning after Christmas two dead horses lay in Broadway for some time, and scarcely a week passes that these poor brutes are not permanently injured, if not slain outright. There is one thing that might be done by the omnibus proprietors to prevent this wholesale destruction of horse-flesh, and that is to put suitable shoes on the animals; the most of them have neither toe nor heel corks, and an inexperienced horse could hardly stand upon a country road with such foot gear. It seldom occurs that carriage horses fall, at least not so often as the poorly-shod omnibus horses; and some benefit would undoubtedly be derived from properly shoeing horses. In any event it is almost incredible to think that such a street as Broadway should be left in the condition it now is. Our city authorities should take immediate measures to remedy the matter, even to the extent of pulling the pavement up and replacing it with some more suitable one, if necessary. Let a premium be offered for the best street pavement, and we are confident that the trouble in Broadway and other principal streets of the city would be remedied forthwith.

A VERY neat and convenient pocket diary for 1864 is issued by Francis & Loutrel, 45 Maiden lane; they also supply blank books of all styles and prices, and those who desire a good article of this kind should give them a call.

NEW BOOKS AND PUBLICATIONS.

ATLANTIC MONTHLY. Ticknor & Fields, Boston, Mass.

The January number of this excellent magazine is before us, and the promise of the publishers in their annual circular that their periodical should equal if not surpass former volumes, is fully kept. Such articles as "Governor John Winthrop in Old England," "External Appearance of Glaciers," "The Beginning of the End," &c., have a permanent value, and the beautiful poems of Dante, translated by Longfellow, are excellent as a means of educating the popular taste for poetry of a refined character. "My Book" sounded to us like the familiar and piquant utterances of "Gail Hamilton," and in the article quoted by us unfortunate critics who have dared to comment upon this writer's solecisms, &c., are disposed of singly, in pairs, and in whole platoons, in a style which, even to the flayed reviewers, is extremely funny.

It is perhaps natural enough that a writer whose little freaks of composition are disapproved of by the public, should revolt against its decision; but surely it would be more wise to keep some parts of human nature in the background, and if so be that the critics must slash away at authors, let them slash! An exhibition of pique, or an appeal for sympathy, is sure to be received with outbursts of laughter by impartial readers. "Gail Hamilton's" articles always remind us of a pawnbroker's shop where many incongruous things are gathered together. There are very beautiful sentiments, similes, thoughts, &c., in them, but the effect is very much marred by the crude and oftentimes coarse expression, affectation, and want of sound sense she displays.

THE CARPENTER'S AND JOINER'S HANDBOOK. H. W. Holly, Architect, Norwich, Conn.

This little work will be found most useful to woodworkers, as it contains a large amount of information of a practical character, illustrated by numerous diagrams. The author has not, apparently, been bitten with a desire to "write a book," but, as he says, "in his progress through the mill has often felt that such a work as this would have been of great value, and some one of the principles here demonstrated worth many times the cost of the book." The work is well printed, in a large clear type, on fine paper, and will doubtless prove extremely useful to all classes of mechanics; the language is plain, and the ideas simply expressed; indeed, in this respect it is worthy of notice, as too many mechanical works published now-a-days are written as if every workman had received a collegiate education.

Azuline.

Azuline is the name given by Mr. Septimus Piesse to a new body discovered by him to exist in several essential oils. In a paper describing azuline, read before the Chemical Society of London, the author stated that though this substance was first observed by him as a product derived from the fractional distillation of otto patchouly, he has since found it to exist generally in essential oils as an integral part of their proximate constitution, giving in fact the color by which each oil is distinguished. Pure azuline has a beautiful blue color. It is to the presence of a small quantity of azuline that blue oil of chamomile owes its azure tint, and hence the name given to the new body. It is now ascertained that brown-green, yellow-green and green oils owe their color to a portion of azuline and yellow resin, varying in proportion as optically indicated. We cannot, however, view the general presence of azuline in essential oils merely as a coloring matter, but think it must play some other part in connection with odorous bodies, and which we trust Mr. Piesse will ascertain in his future experiments.

GUM ARABIC STARCH.—Take two ounces of gum arabic powder, put it into a pitcher, and pour on it a pint or more of boiling water (according to the degree of strength you desire), and then having covered it, let it set all night. In the morning pour it carefully from the dregs into a clean bottle, cork it, and keep it for use. A table spoonful of gum water stirred into a pint of starch, that has been made in the usual manner, will give always (white, black or printed) a look of newness, when nothing else can restore them after washing. It is also good, much diluted, for thin white muslin and bobinet.

SOME one calls the high-crown hat, which has been so long in fashion, the "cylinder of civilization."

Changes in the Metallic Currency of the United States.

In a suit which was lately tried in Philadelphia, Col. J. Ross Snowden, formerly director of the Mint, while acting as one of the counsel, presented some interesting information respecting the history of the metallic currency of the United States. The first coinage of the United States was executed under the act of 1792. By that act the silver dollar and the lower denominations in proportion were of the weight of 416 grains, and contained 371¼ grains of pure silver; this fineness is not easily expressed in decimals, but is very nearly 892-4 thousandth; this coinage continued until the act of Jan. 18, 1837, when the weight of the dollar was fixed at 412½ grains and fineness at 900 thousandths. The dollar called for in the deeds was under the former law; thus continued the silver coinage until the passage of the act of March 3, 1853, and by that act the half-dollar was reduced from 206¼ grains (the weight under the act of 1837) to 193 grains; this was a reduction of 14¼ grains to the half-dollar, or 18½ grains to the dollar. Lower denominations of silver coin were reduced to the same proportion. A popular error prevails that these coins were decreased in fineness, but the only change is in the reduced weight; the appreciation of silver rendered this alteration necessary; the large production of gold from California and Australia has somewhat changed the proportional value of the two metals. Before the mines of gold were opened, the proportion of the production of gold and silver was about as one ounce of gold to seventeen of silver. But the proportion now is about one ounce of gold to a little over four ounces of silver. Compared with gold, silver has appreciated in value as a metal, and is therefore worth more as bullion than coin. The silver dollar of 1832 is no longer issued from the mint, and cannot be obtained. So also, the dollar of 1837 is no longer a coin of circulation. It has ceased to be a current coin since the passage of the act of March 3, 1853, because it became too valuable for circulation, when two half dollars, although weighing 28½ grains less than the whole dollar, would pass as an equivalent. Neither of these dollars is quoted in the market, because they are not to be obtained; the only silver coins which have a market price are the half dollars and those of less denomination; these last are quoted at a lower rate, because they are generally more worn, and have consequently, less weight. Besides the instances already given, there is the act of June 28, 1834, known as Col. Benton's bill, which reduced the weight of the Eagle from 270 grains to 258 grains, and the lower denominations in proportion. Before the passage of that act gold coins did not circulate because they were undervalued; the gold contained in the Eagle was worth more than $10 as bullion. If a deed made in 1833 called for Eagles of the weight then established, ought not the payer be permitted to pay in the gold coin which are made a legal tender at the time the payment is made! The former coin no longer exists; the latter takes its place by authority of the sovereign power which has the constitutional control over the subject matter. Fixing of the weight and fineness is not within the control of an individual, but is the prerogative of the sovereign power; the coinage of a country is an act of the highest sovereignty. Our Constitution vests this power in the Congress of the United States; they alone can fix what shall be a legal tender in the payment of debts.

A Pleasant Place to Live in.

Charleston must be rather a lively place to live in just now. On the night of the 24th ult., Gen. Gillmore kept up a steady shelling, destroying a dozen buildings. All day on Christmas he dropped in his explosive compliments; one white man was killed, and one woman badly wounded; three firemen were crushed under falling walls, and eight or ten were less seriously hurt. All remained quiet at the heap of rubbish that was once Fort Sumter. From midnight on the 24th to 4 P. M., of the 25th, 130 shells were fired at the city from five guns—three at Gregg, one at Cummings Point, and one mortar. There had been an engagement on Johnson's Island between a light battery and the Union gun-boats, which was a drawn fight. On the night of the 26th only four shells were sent into the city. The rebels were trying to prevent Gen. Gillmore from erecting a new battery at the extreme of Cummings Point. All this is rebel news, and of course tells as little as possible against their side.

How Submarine Divers Operate.

A correspondent of the New York *Tribune* says:—

During a recent visit to Port Royal I witnessed with considerable interest the operations of the divers employed to clean the bottoms of the monitors, and perform other operations under the water. Messrs. Joseph H. Smith and James B. Phelps have a contract with the Government for the performance of this work, and have been of great use here. The principal diver—appropriately named Waters—is so used to this work that he has become almost amphibious, remaining for five or six hours at a time under water. A man of herculean strength and proportions, when clad in his submarine armor he becomes monstrous in size and appearance.

A more singular sight than to see him roll or tumble into the water and disappear from sight, or popping up, blowing, as the air escapes from his helmet, like a young whale, can scarcely be imagined. Waters has his own ideas of a joke, and when he has a curious audience will wave his scraper about as he "bobs around" on the water, with the air of a veritable river god. One of his best jokes—the better for being a veritable fact—occurred last Summer. While he was employed scraping the hull of one of the monitors, a negro from one of the up-river plantations, came alongside with a boat-load of water-melons. While busy selling his melons the diver came up, and rested himself on the side of the boat.

The negro stared at the extraordinary appearance thus suddenly coming out of the water with alarmed wonder, but when the diver seized one of the best melons in the boat, and disappeared under the water, the gurgling of the air from the helmet mixing with the muffled laughter, the fright of the negro reached a climax. Hastily seizing his oars, without waiting to be paid for his melons, he put off at his best speed, and has not been seen in the vicinity of Station Creek since. He cannot be tempted beyond the bounds of the plantation, and believes that the Yankees have brought river devils to aid them in making war.

The diver when clothed in his armor is weighted with 185 pounds. Besides his armor, he has two leaden pads, fitting to his breast and back. The soles of his shoes are of lead, an inch and a half thick. All this weight is needed to overcome the buoyancy given by the mass of air forced into the armor and dress, the latter of india-rubber, worn by the diver. When below the surface he can instantly bring himself up by closing momentarily the aperture in the helmet for the escape of the air. His buoyancy is immediately increased, and he pops up like a cork and floats at will upon the surface. The work of scraping the bottoms of the monitors is very arduous.

The diver sits upon a spar, lashed athwart the bottom of the vessel, so arranged as to be moved as the work progresses, and with a scraper fixed to a long handle, works on both sides of himself as far as he can reach. The mass of oysters that becomes attached to the iron hulls of one of the monitors, even during one Summer here, is immense. By actual measurement it was estimated that 250 bushels of oysters, shells and sea weed were taken from the bottom of the Montauk alone. The captains of the monitors have sometimes indulged in the novelty of a mess of oysters raised on the hulls of their own vessels.

Besides cleaning the monitors, the divers perform other important services. They have ransacked the interior of the Keokuk, attached buoys to lost anchors, and made under-water examinations of the Rebel obstructions. Waters recently examined the sunken Weehawken and met an unusual danger for even his perilous calling. The sea was so violent that he was twice thrown from the deck of the monitor. Finally, getting hold of the iron ladder, he climbed to the top of the turret, when a heavy sea cast him inside the turret between the guns. Fearing that his air hose would become entangled, he made his way out with all possible speed, and was forced to give up his investigations until calmer weather offered a more favorable opportunity.

An Insect Samson.

Every one that has taken the common beetle in his hand, knows that its limbs, if not remarkable for agility, are very powerful; but I was not prepared for so Samsonian a feat as that I have just witnessed. When the insect was brought to me, having no box immediately at hand, I was at a loss to know where to put it until I could kill it; a quart bottle full of milk being on the table, I placed the beetle for the present, under that, the hollow at the bottom allowing him room to stand upright. Presently, to my surprise, the bottle began to move slowly, and glide along the smooth table, propelled by the muscular power of the imprisoned insect, and continued for some time to perambulate the surface, to the astonishment of all who witnessed it. The weight of the bottle and its contents could not have been less than three pounds and a half, while that of the beetle was about half an ounce; so that it readily moved a weight of 112 times exceeding its own. A better notion than figures can convey will be obtained of this fact by supposing a lad of fifteen to be imprisoned under the great bell of St. Paul, which weighs 15,000 pounds, and to move to and fro upon a smooth pavement by pushing within.—*Professor Goss.*

It is stated that linens of a coarse kind are now manufactured in Ireland, that are not only relatively but absolutely cheaper than cotton.

Petroleum and Hydro-Carbon Oils for Generating Steam.

Three chief engineers of the Navy, Messrs. Wood, Whipple and Stimers, have been investigating, by actual experiment, the process of using hydro-carbon oils for the generation of steam, by the method and process of Messrs. Shaw & Linton, of Philadelphia.

This commission made a series of careful experiments, extending over a period of five months, which have proven highly satisfactory. From their report we extract the following:

"The volume of flame was so great as to pass entirely through the tubes of the boiler, and heat the smoke-pipe red-hot for several feet from the base, in consequence of which the maximum amount of combustion and evaporation was not reached, in the use of petroleum."

The evaporation in favor of petroleum was 103 per cent., as shown by the report; the same boiler being used with the best anthracite coal, and under precisely the same condition.

"The time of generating steam from water of equal temperature to 20 pounds pressure above the atmosphere was, for the oil, an average of 23 minutes, and for the coal 60 minutes; or in favor of the oil 114.3 per cent."

"The time from full operation for the complete extinguishment of the fire in the use of the oils, was about sixteen seconds. One of our iron-clads or naval steamers, by its successful use as suggested in the experiments so far as tried, would be enabled to keep the sea under steam three times as long, with less labor and greater convenience as compared with the use of coal, equal weights of each on board being considered."

These advantages, as set forth in this report, are very great, and if true a complete revolution in the mode of generating steam will be the result. A company is now being formed in this city for the purpose of applying this method of generating steam to a large ocean steamship.

The Art of Walking.

In a graceful human step the heel is always raised before the foot is lifted from the ground, as if the foot were a part of a wheel rolling forward; and the weight of the body, supported by the muscles of the calf of the leg, rests for the time on the fore part of the foot and toes; there is then a bending of the foot in a certain degree. But when strong wooden shoes are used, or any shoe so stiff that it will not yield and allow the bending of the foot, the heel is not raised at all until the whole foot rises with it; so that the muscles of the calf are scarcely used, and in consequence, soon dwindle in size and almost disappear. Many of the English farm servants wear heavy, stiff shoes; and in London it is a striking thing to see the drivers of country wagons with fine robust persons in the upper part, but with legs that are fleshless spindles, producing a gait which is awkward and unmanly. The brothers of these men, who are otherwise employed, are not so misshapen. What a pity that, for the sake of a trifling saving, fair nature should be thus deformed! An example of this kind is seen in Paris; there, as the streets have few or no side pavements, and the ladies have to walk almost constantly on tiptoe, the great action of the muscles of the calf has given conformation of the leg and foot to match which the Parisian belles proudly challenge all the world—not aware, probably, that it is a defect in their city to which the peculiarity in their form is in part owing.

Our New Dress.

The beautiful font of type upon which the Scientific American is printed was cast at the celebrated type foundry of Messrs. Conner & Sons, 28 Center street. It has a copper face, which was put upon it by the Newton Copper Type Co., 14 Frankfort street. The printing is done at the well-known establishment of J. A. Gray & Green, corner of Frankfort and Jacob streets. The skill of these establishments is well attested by the excellent appearance of our journal.

At a recent meeting of a Photographic Association in Glasgow, Scotland, a resident photographer exhibited ingots of silver, of the value of £120, which he said had been collected in about twelve months from old collodion, printing baths, filter papers, blotting papers, and other refuse; this seems to indicate a secret in photographic establishments.

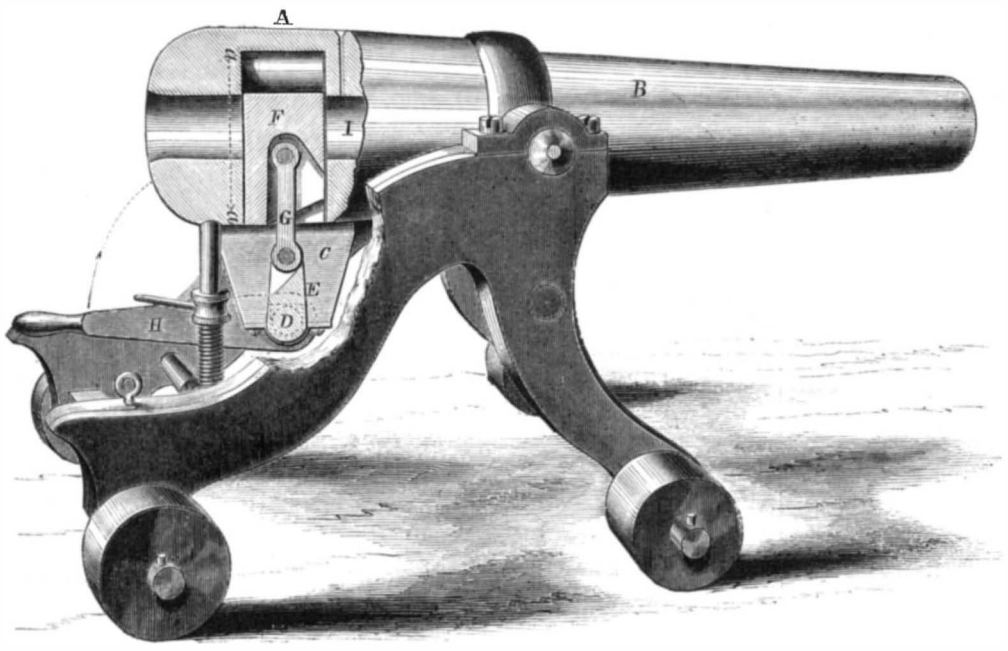
Improved Breech-Loading Gun.

This gun is intended to effect a speedy loading and firing of the charges, and thereby obtain greater efficiency than with artillery of the ordinary kinds; and there are also peculiarities in the bore and rifling of the piece which, it is claimed, render it much more perfect than other guns not so constructed. The weapon is represented as mounted on an iron carriage, but is not, of course, confined to one of that class : the breech portion of the gun is broken out in the engraving, so as to disclose the internal arrangement of the bore, as also the mechanism which is used to close the same. The cannon is to be made of wrought-iron, steel, cast-iron, or any material usually employed for the purpose. In the one from which this engraving is taken the reinforce, A, is shrunk over the tube, B, and to this reinforce, on the bottom of the piece, are fastened two brackets, C (only one shown in the engraving), which carry a rock shaft, D ; this rock shaft has an arm, E, which is connected to a sliding block, F, by the toggle, G; and the shaft has, further, a longer lever, or handle, H, on one end, for the purpose of operating the block ; the block which closes the bore fits closely in a mortise, and is slightly wider than the bore sideways, so that it is well supported by the breech when receiving the force of the explosion; this block extends from *a* to *a*, and the top portion shown in shadow is that part which is hollowed out, so that when the bore is opened for the introduction of the charge and projectile, the block shall interpose no obstacle to its easy entrance ; it perfectly corresponds with the bore of the piece. When the lever, H, is thrown up in the direction indicated by the arrow, the block is withdrawn from the bore, and the same is open to the loading chamber, so that the charge can be introduced therein ; on restoring the handle to the position shown in the engraving the parts assume the positions also shown therein, and the firing may proceed at once.

The piece is rifled and bored differently from most guns. The bore is not parallel, but is taper for a portion of its length. In the explosion chamber, I, just forward of the breech block, the bore is large and the projectile fits rather easily, but at the muzzle the size is decreased, and here the shot just fills it; by this method, and that of rifling the weapon, it is claimed that great advantages are obtained ; the rifles or grooves end at a short distance from the explosion chamber, and do not, consequently enter it at all, and they begin gradually to increase in depth from their starting point until they end at the muzzle, and here they assume their full proportions.

It is claimed by the inventor that the projectile will start easier and take the grooves with much less strain on the weapon than with the ordinary plan of rifling, also that windage is prevented by the thorough compression of the packing on the shot, as it enters the rifles easily at first ; by this method of rifling, it is made to fill the grooves with less liability of stripping, or tearing off the bands at the base, than shot as generally made ; also that the metal packing on the projectile may be made much lighter, and answer its purpose much better.

The patent for this invention was obtained through the Scientific American Patent Agency on the 29th Sept. 1863, by R. B. Reynolds of the U. S. Naval Academy at Newport, R. I. For further information address him, or Rensselaer Reynolds, Esq., Empire Loom Works, Stockport, N. Y.

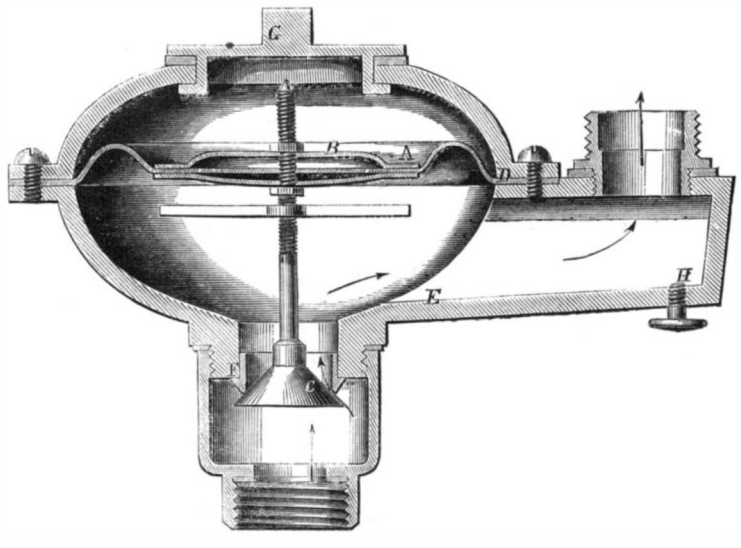


REYNOLD'S BREECH-LOADING GUN.

Improved Gas Governor.

This apparatus is intended to economize gas, to so regulate the pressure that no more than is actually required to maintain the light shall flow through the pipes; the use of quicksilver and fluids of all kinds is dispensed with and the inventor says that a saving of at least thirty per cent in gas bills is obtained by the use of this governor. Each machine is tested by the meter when applied, and is warranted to give perfect satisfaction in all respects.

The principal points of this invention are the diaphragm and the method of confining the same permanently, and the non-corrosive metal used in connection with it ; this is shown in the engraving published herewith. The diaphragm, A, is composed of soft leather, and is clamped between two metallic plates, B, by nuts upon the stem of the valve, C; these clamps are made of non-corrosive metal, and are not affected in any way by the action of the gas or deposit which is always left by it in apparatuses of this class ; the joints, D, of the iron case, E, which contains the diaphragm, are also provided with non-corrosive metal; this is interposed between the leather diaphragm and the joints, and prevents any wasting or deterioration of the iron by the coal tar left in the case ; the valve and its seat is of the same incorrodible metal as the other parts mentioned, and all injury to these parts, which generally occurs from the causes heretofore alluded to, is thereby obviated. The small cover, G, is conveniently adjusted to the case, so that it can be taken off at a moment's notice to clean or otherwise repair the internal fittings whenever such a course is necessary ; the course of the gas through the governor is shown by the arrows ; the small screw, H, can also be removed for the purpose of emptying the case of its deposit. This governor was patented on the 16th of Oct., 1860, through the Scientific American Patent Agency. Further information can be had by addressing J. G. Leffingwell & Co., 102 Nassau street, New York.



LEFFINGWELL'S GAS GOVERNOR.

WEATHER TELEGRAPHING.

Under the Board of Trade in England, a system of meteorological observation is maintained for the benefit of the shipping interests. Persons skilled in meteorology and the signs of the weather are located at stations along the coast, who telegraph their observations to the other stations, as also to the head station in London. Notices of the wind and weather prevailing at the different coast stations are posted upon bulletins in all the shipping ports, every few hours, so that the commanders of vessels may know the state of the wind and weather on any part of the coast. London also communicates by telegraph with France daily, where the same system is maintained in eighteen stations along the French coast. England also receives in return daily notices of the wind and weather on the French coast. This system of weather observation and the communication of the results of these observations to distant places, has been the means of saving a large amount of shipping. It frequently happens that a severe storm is raging on one part of the coast before it reaches another part, and the communication of this fact warns the captains of vessels that are ready to depart, of what is before them.

THE JANUS-FACED LOCK EXTENSION.

We understand that an application has been thrust into Congress for the extension of the patent of the well-known Janus-faced lock, and that parties in interest are working like beavers to secure the passage of the bill.

We have not investigated the merits of this case nor the grounds upon which the petitioner rests his claim; but it is enough for us to know that the patent has already been extended by the Commissioner of Patents, under the general laws, thus securing the monopoly of the lock for twenty-one years. Now let it become public property, especially as there is not much doubt of the fact that the manufacturers have made very large sums of money out of it; and we understand that the real inventor and patentee is not very urgent about the matter. The principal reason why we oppose the extension is, that Congress ought not to meddle with such matters. Its own legislation has provided the most generous patent-law system extant, and so far as it is left to the care and adjudication of the Commissioner to grant or refuse extensions, we have not a word to say. But we do protest in behalf of every inventor and manufacturer in the land, against all attempts on the part of Congress to keep alive, for the benefit of a few individuals, valuable patent monopolies, when they can no longer be maintained under our liberal patent system. We invoke Senators and Representatives to be on their guard against all such schemes. The extension of this Janus-faced lock may work the ruin of other establishments in the country.

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Contents:

INVENTION AND CIVILIZATION.

Invention is the great lever of civilization. Men have been raised above the condition of savages solely by the application of mechanical power to labor. The powers of nature, directed by the inventive mind of man, are employed to pierce down through the rocks, and lift ores and fuel from the mines. From the ores man produces metals, and from the coal he develops heat to propel the steamship across the ocean, and drive the locomotive along its iron path. The water falling over the rock and the wind whistling along the hill, have been harnessed by man, for grinding his corn and weaving his clothing. The steam engine—that great apostle of civilization—is the result of man's inventive genius. Shallow writers on political economy once called cotton "King," because it entered so largely into the manufactured products of nations. But it was the genius of Whitney, Crampton, Arkwright and Cartwright, that raised cotton from an insignificant to an important position, and the genius of man can devise means to supersede it, if this is necessary. If we trace the history of past ages we shall find that successive steps in civilization were effected by successive inventions, applied to subject the powers of nature to man's desires. It was by the application of the magnet to navigation that Columbus was enabled to discover a new world. A most accomplished and philosophic historian has justly attributed the downfall of the feudal system to the invention of gunpowder. Applied to artillery it beat down the castles of the fierce barons and pierced through the mail-clad oppressors of the people. It was the printing press that destroyed the mental thraldom of the Middle Ages. The steam engine has increased the productive powers of man a thousand-fold, and the electric telegraph has made the whole world a whispering gallery. By the use of steam power in a rolling mill one man can accomplish as much labor as thirty by the old modes; indeed, when we come to make such comparisons we altogether come short of the reality. Without the use of steam power the masses of metal that are now turned out in castings and forgings and the great engines that are employed in their production would be unknown. Some steamships are driven across the ocean by the power of six thousand horses! Without steam this would be impossible, and by no known application of thousands of the fleetest steeds could a locomotive be driven along the railroad at its present high speed. Invention has, of course, been a progressive work of itself. By successive steps it has been advanced from comparative obscurity. Occasionally great leaps have been made, but almost all collective improvements have been effected by the labor of many minds, each adding something to the general stock—a polished stone to the grand temple of science. There was a time when inventors were looked upon as a set of crazy enthusiasts—men who deserved either pity or ridicule. But more sensible and philosophic ideas now prevail respecting the importance and value of this class of brain-workers. When we hear a man talking of levers, wheels, cranks, pistons and pulleys, and who at the same time demonstrates the power that lies in their superior application, we are inclined to raise our cap to such a character; for he is one of the Kings of Civilization.

ENGINES WITHOUT BED PLATES.

If it costs money to carry weight in a steamship, then every unnecessary pound of iron, whether in the engine, hull, or elsewhere, is a constant source of expense. Some engine builders are apparently under the impression that an engine requires a certain amount of cast-iron to keep it down in its place, and they pile on metal by the tun, regardless of its fitness or utility. The engines of the new gunboats and sloops-of-war in the navy have iron framing which would answer for steam trip-hammers of the largest class.

In the engines of the *Puritan* and *Dictator* we have observed a novelty which is sufficiently important to warrant notice. These engines have neither bed plates nor frames, properly speaking. The duty borne by these details usually found in other engines, is transferred to light but rigid wrought-iron kelsons, or bulkheads, running athwart-ships. The entire machinery is upheld and retained in place by these kelsons; girders they are in reality, for while they carry the engines they also form a chord to the arc of the ship's bottom and materially strengthen the hull. The absence of bed plates dispenses with at least 40 tuns of iron, in round numbers; for these details and their appendages would, with engines of the usual construction, weigh that amount, while the absence of heavy cast-iron frames is also a source of great advantage. This is particularly the case in a vessel-of-war, where every pound of extra weight is a positive injury, increasing the draft, the load, and adding to the labor of the ship in a sea-way. The cylinders are bolted directly to the wrought-iron kelsons mentioned previously, and the power exerted within them is transferred to a short rock-shaft, supported on vertical pillow-blocks, bolted and braced firmly to the same kelsons: beyond this arrangement there is no other. Cumbrous and heavy frames which interfere with a thorough inspection of and access to the machinery, and massive bed plates, are both wanting, and the other details of the engines are equally sound from an engineering point of view. These improvements are important ones, and might be observed to advantage in the construction of other engines than those intended for war ships. Captain Ericsson is certainly entitled to much credit for the simple yet admirable plan of these engines. If they obtain a commensurate piston speed, they will certainly make the *Dictator* and *Puritan* what it is claimed they will be—the fastest war-vessels in the world.

FRANCE UNDER MONOPOLIES AND PATENTS.

A monopoly is justly odious, because it consists in a special privilege that takes away a public right belonging to the people. In the odious sense of the term a patent is not a monopoly, although it secures to the patentee an exclusive right to make, sell and use, the article patented for a certain number of years. A patent is granted for something new, devised by an inventor and which is his exclusive property; but a monopoly is granted for something which previously existed and in which all have a right. Monopolies have always tended to retard the progress of nations, while liberal patent laws have tended to their advancement. Above all countries in the world France affords abundant proof of the evils of monopolies and the benefits of patent laws. The system of monopolies for the purpose of taxation generally prevailed in France to an alarming extent before the revolution. Indeed before that event—under the old monarchy—it was really illegal to invent or improve any manufacture, because every improvement interfered with some edict. Industry was handcuffed and imprisoned within circles which could not be invaded without heavy penalties. Inventors were frequently prosecuted, convicted and punished, because the articles which they produced interfered with the business of monopolists. The Abbe of St. Germain des Pres had the monopoly of all the tools used by cutlers, and the Bishop of Orleans the monopoly of manufacturing wax candles. Trades corporations were then arrayed against new inventions, and being dependent upon despotism for power, they were taxed by despotism to support it. A whole army of officers was employed to carry out the laws emanating from monopolies, and when the king wanted money the forfeiture of goods for the infraction of monopolies became a source of revenue. Louis XIV sold the offices of inspectors of manufactured articles to the highest bidders, and the very counsellors of the monarch became inspectors—one of fire wood, another of butter, another of wine; and between 1691 and 1700, forty thousand offices were thus sold. In the reign of the "Grande Monarque" Quinolt, the French author, asserts that three hundred thousand offices had been created and sold, to raise money for the State Treasury and to worry trades and manufactures. Special corporations and trades paid vast sums for the prosecution of their different callings, and they demanded and received protection against every new invention that appeared to militate against their special privileges. Argand, the inventor of the lamp which bears his name, could not manufacture it because the interests of several trades could not be reconciled. Erard had to obtain the special protection of the monarch to make his piano, and throughout all France every department of industry was so clogged by oppressive restrictions that progress was arrested, and the end thereof was national ruin to state and manufactures. Napoleon, with his great intellect and keen discernment, pursued a different course after the old condition of things had been overthrown by the revolution. He encouraged inventions by offering premiums for new improvements and by rewarding their authors liberally. Jacquard, the inventor, was invited to Paris and treated with distinction; since then inventors have attained to their proper position, and liberal patent laws have been adopted and enforced in France. Results of the most beneficial character have followed. In practical chemistry, as applied to the arts, France has taken the lead, and in many of the arts she occupies the front rank. The most valuable improvement recently made in machinery for carding cotton and wool was by M. Heilbron—a Frenchman. In locomotive engineering and the construction of machinery in general, France is beginning to compete with England; and were coal as plentiful and cheap in the former as in the latter country, she would perhaps surpass all nations in Europe in the production of iron. This beneficial change has been brought about by the overthrowing of monopolies, in the encouragement of inventors by the adoption of equitable patent laws.

ABUSE OF THE STOMACH.

It is one of the mysteries of human nature that mankind abuse themselves in some respects worse than they would animals. The careful farmer sees that his stock has everything needful to health and comfort, that it is under shelter, and has enough, but not too much, to eat; and from this prudent provision for his pocket's sake, the farmer goes straightway to his own table and eats greasy fried meats, vegetables sodden in butter, and pastry or pudding as a make-weight to keep the load down; the farmer is only the representative of a class, for persons of all conditions in life are guilty of similar practices. As this performance is solely a matter of individual concern the law has no right to interfere, but we should like to know why a man in such a case is not equally a suicide with him who saps the foundation of life with slow but subtle narcotics—laudanum, opium in other forms, and the immoderate use of tobacco?

Perhaps we erred in drawing an illustration between a man and his beasts, because the latter seldom or never exceed the bounds of the instinct which nature has provided them with; but this trait being removed in the sentient being—man—he gorges himself to repletion, and sooner or later his or her posterity fall victims to the abuse of the stomach. Some digestive organs are strong fortresses. Fifteen-inch shot in the shape of huge, doughy apple dumplings, Greek fire in the semblance of scalding liquids, followed by deluges of ice water at the same meal, rifle shot and Minie bullets, disguised as pickles and sharp spices, have no apparent effect. "Pshaw," says the robust reader, "my stomach can stand anything. I never was sick in my life." All that is quite probable; but the strongest fortification in the world cannot resist the slow advance of rifle-pit, sap, mine and parallel, and the engineer knows full well that when he puts spade into the ground the stronghold is virtually his. The comparison holds good with the stomachs of men; al-

though for a time the individuals who compose generations of families may defy disease of the peculiar nature discussed, their posterity will be enfeebled until they are literally swept off the face of the earth entirely, or their blood absorbed into new and healthier organizations. Thus we see races, or rather families, die out; so great names perish. In some cases drink has destroyed the coating of the stomach; in others high living and dissipation generally, kept up through a series of years, are the sap and mine of which we spoke previously.

To paraphrase Patrick Henry, "Is money so dear and ease so sweet as to be purchased at the sacrifice of life and health?" Far better, in a physical sense, the humblest laborer, with his simple fare and regular habits, than the millionaire and his disordered constitution. The latter is of no more use to civilization as regards re-populating the world with healthy human beings than a wooden puppet.

The great social vice of the American people is eating too much and too fast. we are as a race naturally nervous in temperament, and this added to the evils first-mentioned results in the long, lean physiognomies characteristic of the nation. When an American business man takes dinner he does so generally with over-eagerness and a sort of gulping choke, as if it were an unpleasant duty which is painful to witness. In all probability his mind is actively engaged in calculating his profits and losses, when he should be wholly at ease and cheerful. Now, every one must know that such practices are wrong—that they are not what nature intended. The organs of the human body, particularly the digestive ones, are delicate in the extreme, and when used rudely nature revolts and disease results. If it is disputed that stomachs are naturally delicate, we may take the case of a hardy out-door worker; confine him to a sedentary or partially sedentary life and require him to overload his stomach as too many men do, and then mark the result. He will as assuredly become dyspeptic as any one else.

The punishment inflicted on such infractions of common sense are severe but justly imposed, and the remedy is as simple as obvious. Of all the ills that flesh is heir to there are none more distressing than those which arise from indigestion. We are not of that class who put faith in nostrums, bitters, purges and the whole nauseous category of the pharmacopœia for the reduction of the disease in question. When the system is already enfeebled we are to sustain it, not debilitate it; and this can only be done by food of the proper kind, taken in the right way at certain times. We are not going to run a raid against doctors or poach over their field; but we do think that patients afflicted with dyspepsia have the means of cure within their own reach. We have no recipes to furnish, as we are not exactly in the medical line of business; but we feel it incumbent to lift up our voices against the universal abuse of the stomach and digestive organs which prevails so extensively. Advice is very cheap, and those who fear the approach of a disordered condition of the parts mentioned, should take measures in time to prevent the real attack. Nature makes feints in every part of the system: she hangs out head aches and stomach aches, pains in the back and limbs, horrible lassitude and inanity generally over the whole system, as warnings that ere long the grand attack which cannot be repulsed will take place. Eat slowly, and even solemnly, if you must, reader; but be cheerful and merry if you can; eat slowly; make your teeth do what nature intended they should, and do not delegate their work to the stomach; it has no teeth and is intended for another purpose than mastication. Live temperately and avoid excitement; eschew quack medicines: eat only the best and simplest food, and if you do not recover wholly you will at least be improved, and certainly will be living in obedience, not only to the laws of nature, but to those of prudence and common sense.

TAXATION—ITS DEFECTS AND REMEDIES.

The able Report of the Secretary of the Treasury, and the elaborate Report of the Commissioner of Internal Revenue, which have recently been submitted to Congress, exhibit the fact very plainly that the expectations of the framers of the present system of internal revenue taxation have not been realized, in the amount thus far received into the Treasury, and that Congress will be compelled to address itself earnestly to the work of re-adjusting the system, in order that it may meet the just requirements of the Government. The loyal people of the United States will cheerfully submit to such taxation as is necessary to sustain the Government in maintaining its authority against armed treason; all they ask is that the system of taxation be equitably adjusted and the revenue economically applied.

As this subject is one that appeals directly to the business and bosoms of all men, every one is interested in seeing that the Government is not defrauded out of its just due; for unless there is increased vigilance on the part of the people in this respect, there is no telling to what extent taxation will have to be increased. Unfortunately all are not honestly disposed to meet the just demands which the Government has upon them; they shirk their duty in making their payments, and thereby throw heavier burdens upon those who honestly come forward and pay their taxes to the fullest extent of the lawful demand upon them. We are among the number of those who think that if the officers of the law were vigilant in the discharge of their duties, and were strict to exact payment from all alike, the revenues of the Government under the present law would be adequate to meet its wants. We cannot go over the whole system of taxation in a single article, but will refer to a few points to illustrate what we desire to say upon this important topic.

Take the subject of taxation upon income; the amount thus far received is much less than it ought to be, and below what it would be if the assessors were vigilant in doing their whole duty. In some cases it works about in this wise:—A merchant or manufacturer who has done a thrifty business is called upon to make, according to law, an analytical return of his income during the year. He calls on the assessor, bearing a good-natured face, and tells him that he cannot make out an accurate list of his last year's income. He acknowledges that his business was large, "but the truth is," he says, "we have trusted out to A, B and C, and we don't exactly know whether we have made anything or not." The merchant or manufacturer, as the case may be, has drawn enough from the profits of the business to support his family in luxury, but no positive dividend of profits has been paid to him; yet the actual fact is that some $50,000 more or less has been added to the capital stock of the firm. The assessor listens to these smooth words, a merely nominal assessment is made, and a small stingy tax is the result.

As a case in point, we saw, quite recently, in one of our exchanges, a list of the income-tax received from certain towns in Massachusetts. A wealthy manufacturing town yielded only the paltry sum of $1,000 from income-tax. Thinking that we knew something about the wealth of a few solid men of that town we said "Shame! It is no wonder that Commissioner Lewis calls for more revenue." In the town to which we refer, there are in full tide of successful operation five large woolen factories; and their owners have admitted to us within the past year, that their profits were much greater than at any former period. Many men of large incomes and somewhat elastic consciences, have been allowed to pay a certain amount of tax on an imaginary income, which would have made some difference in "Uncle Sam's" favor if the assessor had pinned them down to a sworn statement of each and every item. This shuffling system ought not to be allowed; it is intolerable; and the Government ought at once to instruct the assessors to require from every man a sworn statement of his income, item by item. Another evil exists in the want of diligence on the part of the assessors in calling for returns. The law, as it now stands, requires of the assessor to notify persons to make returns of their incomes; and that parties failing to do so, the assessor should assess an amount and proceed to collect it against the delinquent. We are fully persuaded in our own minds that many who should pay escape entirely, for the reason that they were never called upon by the assessor. Cases of the kind have recently come under our notice; the parties have been overlooked by the assessor and are quite willing to escape his notice.

In our opinion, the law ought to be so amended as to require every person of legal age—guardian, trustee, or executor—to make a sworn statement of the amount of his or her income, under a severe penalty in case of failure to report. If parties fail to respond let the assessor then fix an amount, in such proportion as his judgment may dictate—he being sure to make it large enough to arrest the attention of the delinquent. In this way something like a fair and equitable income-tax may be secured. If taxation is to be increased, let it fall chiefly upon luxuries—such as liquors, tobacco, tea, coffee, and other articles of like character: these things are not required in the family economy and are not neccessary to support a vigorous body; on the contrary, they are looked upon by many as more or less injurious, while the consumption is large. Hence they are admirable articles upon which to levy taxation; for if thereby people abstain from using them, the Government, in all such cases, has operated as a great reformer. Taxation on all necessaries should be comparatively light; whatever affects the wants of the laboring classes should be taxed as sparingly as possible.

There is one other source from which the Government might derive largely-increased revenues, if Congress would apply itself to work out a much-needed and healthy reformation. We allude to the emoluments which are derived from certain offices within the gift of the Administration. The Chief Magistrate of the nation receives a salary of $25,000 per annum, and each of his cabinet officers $8,000. Certainly no one can justly complain that these salaries are too liberal; they are none too large to enable those high functionaries to maintain the dignity that attaches to their respective stations; but what we complain of is, that there are many subordinate places given out to politicians which net their incumbents far more than the Chief Magistrate receives. The salaries attached to these offices, it is true, are much smaller than that enjoyed by the President; but the countless fees that flow in are often enormous. Take, for example, the Custom House of New York and its numerous offices. We candidly believe that thousands of dollars, every year, might be saved to the Government, if Congress in its wisdom could work out a reformation in its management, such as would secure to each officer a fair salary for his services, and require all fees and perquisites to be paid into the public Treasury. We have no specific charges to make on this point; we are not in the "ring," and know really but little of what is going on "behind the scenes;" to make ourselves understood, however, we will illustrate what we mean by referring to a single example. Rumor says that the office of Surveyor of the Port of New York is worth to its incumbent $100,000 a-year. Lean and hungry politicians have gone into that bureau and come out fat and sleek. Now we contend that if this rumor is based upon any reliable data, it is an outrageous swindle upon tax-payers to allow it longer to exist; and they have a just right to complain of the gross injustice which allows any officer under Government to pocket a sum so enormous. Throughout the whole ramification of official patronage, such as marshals, postmasters, collectors, district attorneys, surveyors of ports, &c., there are rich "placers" now being worked on "private account" which ought to be made to yield valuable nuggets to the Government; and we call upon Congress to explore these mines and see if something cannot be saved to the people. There are thousands of competent men who would gladly take the office of Surveyor of the Port, and conduct its affairs soundly and well, at a fixed salary of $5,000 per annum, returning all fees to "Uncle Sam's" Treasury; and it is a foul unmitigated wrong to allow the existence of any system which thus absorbs the public revenues. Plain, honest people, who live by respectable industry, are cheated and swindled out of their hard earnings, by pampered insolent office-holders. Such things ought not to be tolerated. Let Congress apply the scalpel to these diseased cases, and let taxation be fairly and honestly distributed.

Patent Committees.

The following are the Senators and Representatives who compose the Patent Committees:

SENATORS.—Edgar Cowan, of Pa., Chairman; Ten Eyck, Sherman, Ramsay and Saulsbury.

HOUSE.—Thomas A. Jenckes, of R. I., Chairman; Leonard Meyers, Noble, Hubbard and Chanler.

Mr. Jenckes is well qualified to take the position to which he is appointed, as he is an able advocate in Patent causes, and an honorable man. We trust that Mr. Jenckes will keep a sharp eye upon all extension schemes.

FIRE-PROOF SAFES—THEIR CONSTRUCTION AND USE.

Fire-proof safes have become indispensable for the preservation of valuable papers and books, and no business man at the present day thinks of doing without one. A fire-proof safe consists of a strong iron box, having double sides, door, top and bottom, and the spaces between the iron walls are filled with some infusible non-conducting material; the papers and books to be preserved are placed within the safe, and secured by a burglar-proof back; and should it be exposed to a high degree of heat from the burning building in which the safe is deposited, the material forming the lining prevents the metal from becoming overheated, and the papers and books are thus preserved from destruction. Different manufacturers employ different substances for filling safes. One kind of filling consists of plaster of Paris (calcined gypsum) made into a paste with water and packed between the iron partitions. Although it is an excellent non-conductor, the trouble with this material is, that it gradually gives off moisture, which tends to produce mildew in the books inclosed; besides, it is likely to rust the metal plates which surround it. And just in proportion as it gives off moisture it also contracts, and, in time, the filling becomes loose in the shell of the safe. Another kind of filling consists of calcined aluminous lime. It is also made into a paste and packed between the partitions of the safe; but a similar complaint is made against this material. Another filling material consists of pieces of brick, clay and alum, packed between the partitions. Alum is a superior fire-proof material, and we have used this class of safes in our own business for a number of years, much to our satisfaction.

For a long period it has seemed as if no improvement had been made in the material for the filling of safes; but at last an advance has been made by Messrs. Marvin & Co., of New York city—whose advertisement will be found upon another page—and who have obtained a patent for same. It consists of dry plaster of Paris mixed with small pieces of alum. These materials have been long known to possess superior non-conducting qualities, and have been used separately for this purpose for a long time; but the novelty and utility claimed by Messrs. Marvin & Co., for their new filling, consists in the combination of the two substances. When exposed to a high degree of heat the alum gives off its water of crystallization in the form of steam, which is immediately absorbed by the dry plaster and a comparatively low temperature is maintained in the safe. We have examined an experimental safe which was packed with this filling and exposed to a high degree of heat in a furnace: the roasting to which it had been subjected produced a perfectly cellular structure in the filling, and the safe came from the fiery ordeal through which it had passed comparatively uninjured.

Mercuric Methyl.

A remarkable organic substance which has received this name has lately been discovered by Dr. Frankland (London). It is formed by allowing iodide of methyl to act upon sodium amalgam, in the presence of acetic ether. When purified it forms a colorless, highly refracting liquid, of the specific gravity 3·069, being in fact the heaviest known liquid, with the exception of mercury itself. So dense is it that a piece of heavy glass will float upon it. Dr. Frankland states that in the event of this organo-mercuric compound being required in quantity, no difficulty would be experienced. Upon seeing the specimen of mercuric methyl handed round at a late meeting of the Chemical Society, London, the idea occurred to a correspondent of the *Chemical News* to apply this liquid to the manufacture of prisms. At present the only liquid suitable for this purpose is bisulphide of carbon, which is not above half the density, besides being objectionable from its offensive odor, its great volatility and the ease with which it ignites. The mercuric methyl appears to be superior to the bisulphide of carbon in all these respects. Besides its use for prisms, this liquid might be advantageously employed in the manufacture of lenses. Formerly, compound lenses, in which one of the constituents was a fluid held between outer meniscus lenses, were somewhat in vogue, but were abandoned owing to the advantages of their construction not being sufficiently great to counterbalance the difficulties.

Colored Glass.

The distinguished French chemist, M. Chevreul, who has devoted so much attention to the subject of color, has lately published a memoir on painted windows, in which there are many points which deserve the attention of artists and others who are interested in the manufacture of colored glass. It has often been much noticed that old stained glass windows have a much richer effect than modern ones, and M. Chevreul, speaking of this superiority, attributes it to what moderns regard as defects. In the first place, much of the ancient glass is of unequal thickness, and so presents convex and concave parts, which refract the light differently and produce an agreeable effect. In the next place the old colored glass is not a colorless glass, to which has been added the particular coloring material, such as protoxide of cobalt, &c. Old glass contains a good deal of oxide of iron, which colors it green, and to this must be attributed the peculiar effects of antique glass, colored by cobalt and manganese. M. Chevreul appears to think that modern stained glass is too transparent to produce the best effects. M. Regnault, the chemist, has recommended that all this kind of stained glass should be cast, to avoid the monotonous effect of plain surfaces on the light; and also that foreign substances should be mixed with the glass to diminish its transparency.

RECENT AMERICAN PATENTS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week : the claims may be found in the official list:—

Self-fastening Hook.—This invention relates to an improvement in that class of hooks which are generally used on clothes or hat racks, and it consists in the arrangement of a claw at the upper end of the bracket, to which the hook is fastened, in combination with one or more brads projecting from the under surface of said bracket, in such a manner that, by pressing the claw over the top of the wooden slat to which the hooks are to be secured, and the brads in its face, each hook is rendered self-fastening and can be attached or detached in a short time, and with the least possible labor or exertion. Mr. George B. Fowler, 37 Park Row, New York, is the inventor of this little device, the patent for which bears date Dec. 16, 1863.

An Improvement in Grain Separators.—By means of certain improved modes of mounting and agitating the riddles and screens and controlling the flow of grain and the blast of air through the apparatus, a machine has been produced which though less costly and complicated in construction than a majority of fanning mills, cleans and separates the various kinds of grain in a most efficient manner. A working model of the invention, but one foot in length, which was exhibited in our office, completely separated five distinct varieties of seed which were thoroughly mixed before being passed through the machine : the same work is performed with a full-sized machine operated by hand at the rate of upward of one hundred bushels per hour. B. S. Hyers, of Pekin, Ill., is the inventor of this improvement.

Grain Dryer.—This invention relates to an apparatus for drying grain, in which the grain is passed through a zig-zag channel made of perforated sheet-metal and arranged in such relation to a furnace and fan-blower that it can be exposed to the direct action of the hot air rising from the fire, or to a current of air forced in by the action of the fan-blower, or both combined. In order to effect the drying of very wet grain, two or more dishes with inclined bottoms and made of perforated sheet-metal, are combined with the zig-zag channel, each of said dishes being provided with a rotary stirrer, in such a manner that the grain is exposed to the current of air in thin layers previous to its passing into and through the zig-zag channel. R. T. Sutton, of Rochester, N. Y., is the inventor of this improvement.

RECENTLY a large steamship, the *Scotia*, ran into a heavy stone pier in England and totally destroyed it ; the vessel herself was uninjured.

THE greater part of the camphor that comes to Europe and America is from Japan and China. It grows abundantly, however, in Borneo and Sumatra.

THE city of Quebec is to be lighted with coal oil.

ISSUED FROM THE UNITED STATES PATENT-OFFICE

FOR THE WEEK ENDING DECEMBER 22, 1863.

Reported Officially for the Scientific American.

☞ Pamphlets containing the Patent Laws and full particulars of the mode of applying for Letters Patent, specifying 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.

40,989.—Fire-place.—A. C. Bacon and J. G. Jennings, Cleveland, Ohio:

We claim, first, The combination of the several air-chambers, A B E, forming an open grate of increased radiating power for chimney or stove, that will also furnish the heated air-draught of a register, viz., the chamber, A, extending around the back to the sides of the grate, and into which air is admitted from below, the arched chamber, B, projecting from the summit of the chamber, A, with which it is connected over the fire with more or less inclination as the nature of the draught may require, and the chamber, E, meeting the chambers, A, and B, in the sides of the grate, and extending over the arch of the smoke flue, all combined in the manner and for the purpose substantially as described.

Second, We claim the apertures, c, in their application to the hereindescribed grate, in combination with the movable perforated front or blower, D, when constructed as described and operating as specified.

40,990.—Apparatus for Heating Brewer's Boilers.—D. S. Blair, Albany, N. Y.:

I claim the peculiar arrangement by which separate and independent congeries of pipes or flues for the circulation of steam or hot air through a vessel containing liquids can be so fitted upon central axis pipes as to permit any of the said congeries to be turned upon its axis to any degree without interupting the regular flow of steam or air, or its escape excepting by its regular exit passage: the apparatus consisting of the pipes, C1 C2, secured to the side of the vat, A, as ingress and egress passages for steam or hot air. The slee es, E1 E2, with pack joints connecting pipes, B', with C1 C2. The pipes, D1 D2, entering into the ends of pipes, C1 C2, and connecting them with pipes B2; the pipes C1 C2 and D1 D2, being axes on which the separate congeries of pipes, B1 B2, revolve, substantially as described.

40,991.—Making Steam-tight Joints.—Edward and John Bourne, Pittsburgh, Pa.:

We claim as a new article of manufacture a steam radiator formed of two flat sheets of metal having their edges united together by a lap joint, when said joints are made steam-tight by the interposition of a strip of wood between the sheets before closing down the same, substantially in the manner as herein set forth.

40,992.—Breech-loading Fire-arms.—J. W. Cochran, New York City :

I claim, first, The apron, G, applied and operating in combination with the movable breech piece, substantially as and for the purpose herein specified.

Second, So combining the slide, H, of the cartridge drawer with the apron, G, by means of a latch lever, I, or its equivalent, and so applying spring, j, and screw, or other fixed point, k, in combination with said slide and apron, that the slide may be attached to and moved back with the apron and automatically detached therefrom and drawn back independently thereof, substantially as and for the purpose herein described.

Third, The gas check, J, provided with a projection, S, on its bottom arranged to operate in combination with the piston, n, and movable nipple, p, substantially as and for the purpose herein specified.

[This invention consists in certain improved means of supporting the cartridges before their entrance into the barrel at the breech ; also in an improved mode of operating the device by which the withdrawal of the discharged cartridge shells from the barrel is effected; and, further, in an improved arrangement of a safety bolt for the purpose of preventing the cocking of the hammer while the breech is imperfectly closed.]

40,993.—Knitting Machine.—W. W. Clay, Nottingham, England:

I claim the system of reciprocating hooked needles, F, and the system of springs, G, or their equivalents applied to a revolving cylinder, in combination with the presser wheel, K, or its equivalent, the whole being arranged for joint action substantially as and for the purpose herein set forth.

40,994.—Turning Lathes.—R. J. Cole, Poultney, Vt.:

I claim the tubular center, i, in the live or moving spindle, H, the same projecting beyond and in combination with the spurs, j j, in a lathe designed to bore through the article to be turned.

I also claim the slotted spindle, I, in the foot-stock of a lathe (for turning curry-comb handles or other articles of wood, requiring to be bored in the center) through which power is introduced to operate a bit stock and bit working in the center of the spindle in combination with the bit stock and bit, substantially as described.

I also claim the employment of an opening or slot, n, in the under side of the spindle of the foot stock, and in its tubular center, if necessary for the discharge of chips, in combination with a bit stock and bit working within the hollow spindle, substantially as described.

40,995.—Grain Separator.—J. F. and H. D. Cummings, Fremont, N. Y.:

We claim, first, The frame of the sieve of a fanning mill constructed without mortises and tenons or scarfing, but by lapping the joints, substantially as set forth and described.

Second, The return screen (next below the upper one) so placed that the blast is forced through it from the top, constructed and arranged substantially as described.

Third, The wind forcer, composed of the flap, C, the cut-off, C', to which the flap, C, is hinged, and the sliding piece C2, to which C1 is rigidly attached, substantially as described and for the purpose set forth.

Fourth, The combination of the first, second and third screens, B B'' B''', when arranged substantially as described, either in the shoe, A, or in the shoe as originally constructed.

Fifth, The combination of the first, second and third screens, B B'' B''', with the wind forcer, C C1 C2, when arranged substantially as described, in the economy shoe, A, or in the original shoe, during construction.

Sixth, The combination of the first, second, and third screens B B'' B''', the wind forcer, C C1 C2, and the gate, D, when arranged substantially as described, either in a secondary shoe, A, or in the original shoe during construction.

40,996.—Cover for Fruit Cans.—Timothy Earle, Smithfield, R. I.:

I claim the combination of a spring, b, and patch, a, with the air-vent in the cover of a preserve can, substantially as described for the purposes specified.

40,997.—Churn.—S. F. Emerson, Saville, Ohio:

I claim arranging the vibrating dasher shaft at the top of the swinging box, A, said shaft being provided with the pinion, E, in combination with the segment gear, D, the whole being constructed and operating as and for the purpose set forth.

40,998.—Casting the "Andrews and Kalback" Water-wheel.—A. C. Emmick, Columbus, Ohio:

I claim casting the Andrews and Kalback water-wheel in one homogeneous piece and at one operation, in the manner and by means of a mold or molds constructed and arranged substantially as described.

40,999.—Cribbage Board, &c.—John Gill, New York City:

I claim the sliding press or pins with flattened ends, in combination with the perforated board or table constructed as and for the purposes specified.

41,000.—Grain Separator.—John Gray, Milwaukie, Wis.:

I claim the combination with "Booth's compound shaker" for separating wheat from oats, &c., the movable screens, d, together with the back fall, e, for the purpose of more fully separating the smaller seeds, &c., from the wheat.

And I also claim the application of the slide legs, D, to "Booth's compound shaker" for the purpose of elevating and depressing the zinc sieves, C, to any desired angle.

And I further claim the application of the crank power, E, and the eccentric rod, L, to "Booth's compound shaker," said crank power and eccentric rod being arranged and attached in manner substantially as above set forth, for the purpose of producing upon the machine known as "Booth's compound shaker" a quick vibratory motion.

41,001.—Folding Chair.—P. J. Hardy, New York City:

I claim attaching the flexible material forming the back of a folding chair to the rear edge of the seat, so that the act of unfolding the chair shall stretch the flexible material of said back as specified.

I also claim a seat attached to the legs at the joint on which said legs fold, in combination with a movable nook or hooks that connect the seat to the folding legs and retain it in position as specified.

41,002.—Grain Binder.—W. D. Harrah.—Davenport, Iowa:

I claim, first, Effecting the bundling and binding of grain by compressing the grain, slipping an endless band over the sheaf and allowing the latter to expand within the band, substantially as described.

Second, The combination of a grain compressor and a prepared or endless band, substantially as described.

Third, Passing the sheaf of grain within the circle or compass of prepared bands a proper distance and then slipping the band upon the sheaf, substantially as and for the purposes described.

Fourth, A grain-carrying compressing chamber, D, constructed and operating substantially as described.

Fifth, The combination of a grain-compressing chamber and a band-holding tube, operating substantially as described.

Sixth, Passing grain in a compressed state through a square or round or other shaped tube, adapted for holding the bands and for allowing the same to be readily slipped off over the sheaf, substantially as described.

Seventh, A prepared band-holder, G, or its equivalent substantially as described.

41,003.—Thrasher.—Thomas Harvey and N. J. Becker, Amsterdam, N. Y.:

We claim the double cam, b′, in combination with arm, k, rod, e, and spring, c′, when constructed and operating in the manner and for the purpose herein set forth.

41,004.—Machine for making Carriage Wheels.—G. W. Hatch, Parkman, Ohio:

I claim, first, The frame, A, bed, B, rod, C, swivel, E, and attachments, G and H, arranged as and for the purpose specified.

Second, I claim the arms, J, and cross head, K, for receiving and operating the head blocks as set forth.

Third, I claim the graduated scale, L, in combination with hea blocks, Nos. 1 2 and 3, and cross head, K, constructed and operated substantially as and for the purpose specified.

Fourth, I claim the tablefigure 3, when constructed substantially as described, for the purpose of holding the felly while being bored as set forth.

41,005.—Plotting Instrument.—H. L. Hervey, Windsor, Conn.:

I claim the straight-edge scale, A, in combination with the sliding vernier, B, when constructed and operating substantially as herein set forth, and for plotting and enlarging or reducing plots.

41,006.—Mode of Hanging Doors.—Alonzo Hitchcock, New York City.—Ante-dated Dec. 13, 1863:

I claim hanging a sliding door on an extended support, substantially in the manner described.

And I also claim suspending a door on a tube, whether the same is extended or not.

41,007.—Hot-air Furnace.—Henry Holcomb, Painesville, Ohio:

I claim, first, The double or turn-valve arrangement, actuated by a single expansion rod, the said arrangement consisting of the expansion rod, i, levers, h, and V, twin valves, g and g′, and thumb nut, X′, in combination with the tubes, a b c and d, perforated slide tube or cut-off, e, and perforated deflector and fire-draught, as described and for the purposes set forth.

Second, I claim the perforated concave deflector constructed and operating substantially as described, and for the purposes stated.

Third, I claim the perforated slide tube, c, or its equivalent, operating in combination with the valve, g, and register of tube, a, as and for the purpose stated.

Fourth, The application and use of a compensating device for regulating the action of the expansion rod on the twin valves, the said device consisting of the short rod, Y, slot, Z′, and thumb nut Z, connected with and operating said expansion rod in the manner and for the purpose stated

41,008.—Apparatus for detecting sugar, &c., in Waste Liquids.—G. A. Josper, Charlestown, Mass.:

I claim the "sweet water detector" or combination of the overflow pan or vessel, B, the induction chamber, C, and its float, D, valve, g, and valve seat, e, arranged and combined together substantially in manner and so as to co-operate as described.

And I also claim the combination of the said "sweet water detector" or filter, A, and a pipe, a, or equivalent means of conducting a fluid from the filter in to the said "sweet water detector."

And I also claim the "sweet water detector" as not only made of the overflow pan or vessel, B, the induction chamber, C, and float, D, valve, g, and valve seat, e, but as having an efflux chamber, E, or an auxiliary thermometer chamber, F, or both, as circumstances may require.

41,009.—Rake for Harvesters.—Samuel Johnston, Buffalo, N. Y.:

I claim, first, The constructor, e′, of the rotating hub or cylinder with the arms extending therefrom for the attachment of the rake and a lever and a pitman, so that the rake may be operated by either, as and for the purpose described.

Second, The combination of the upright axle with the revolving hub and cylinder and the cam tracks for the operation of the rake, substantially as described.

Third, The combination of the adjustable rod, i, with the rake head, k, and the arm, h, to which it is attached, substantially as and for the purposes described.

41,010.—Apparatus for Rendering Lard.—James J. Johnston, Allegheny City, Pa.:

I claim, first, The arrangement of the boilers, e and f, furnished with openings, r and s, caps, g and m, and pipes, d and h, the whole being constructed, arranged and operating, substantially as herein described and for the purpose set forth.

Second, The use of heated air, or heated air and steam combined, or heated air surcharged with the vapors of heated charcoal, when used in connection with the apparatus herein described or with the equivalent of said apparatus, and for the purpose set forth.

41,011.—Coloring Tanned Leather.—Benjamin H. Lightfoot, Philadelphia, Pa.:

I claim the application of petroleum or any other oily hydro-carbon in combination with lamp-black or its equivalent to the coloring of tanned leather, substantially as described.

40,012.—Animal Trap.—John Liming, Philadelphia, Pa.:

I claim the described arrangement and combination of the treadle, f, the trigger, c, and the striking lever, b, when the inner end of the said treadle, f, is loosely connected with the front-end of the trigger, c, and the said trigger, c, provided with an upright post, c′, against which the lever, b, strikes, when released from the hook, h, so as to cause the spear or knife-end of the treadle, f, to be suddenly forced upward as described, for the purpose specified.

41,013.—Car Brake for Railroads.—Wm. S. Martin, Waukegan, Ill. Ante-dated Sept. 20, 1863:

I claim, first, The combination of the shaft, A, the friction wheels, B B′, the clutches, C C′, springs, S S′, and slides, D D, with the chain, b, arranged and operating as and for the purposes herein delineated and described.

Second, I claim the peculiarly-constructed lever for moving the shaft, A, marked, H, whereby said shaft is moved forward in the desired direction, whether the lever, H, is moved forward or backward, arranged and operating substantially as shown and set forth.

Third, I claim communicating motion to the friction wheels, B B′, by the impact thereof upon the wheels of the cars, when said friction wheels are used in combination with the shaft, A, the clutches, C C′, the springs, S S′, the slides, D D′, the lever, H, and the chain, b, operating as and for the purposes specified and shown.

41,014.—Metal Pointing Machine.—Adam Moltz, New York City:

I claim the grinding wheel, h, and strap, p, with the grooves, i, arranged substantially as described and for the purpose set forth.

41,015.—Peg Float.—Charles H. Odell, Poughkeepsie, N. Y.:

I claim the adjustment and controllment of the float, C, in any position by means of the rod, B, the clamp, D, and thumb-screw, E, or their equivalent for the purposes described and heretofore set forth.

41,016.—Harvester.—Isaac H. Palmer, Lodi, Wis.:

I claim, first, The rake, C, mounted upon a swivel post secured to bar, D, and operated by a lever, C′, and crank, E, arranged within the wheel, A, in the manner described.

Second, The clutch pinion, E′, and detaining pin, b′, arranged within the hub, A, of the wheel, A′, and employed in combination with a rake, substantially as herein described, to retain it in its elevated position when out of gear.

Third, In combination with a rake constructed and operating substantially as herein described, I claim the large hollow hub, A′, projecting on one side of the driving wheel to counter-balance the cutting apparatus and rake, and exclude straw and other matters from the gearing, as explained.

Fourth, The vertically-adjustable wheel, H, and balancing platform, G, when used in the described combination with the wheel, A A′, of a self-raking harvester, in the manner and for the purpose set forth.

41,017.—Breech-loading Fire-arm.—Wm. Palmer, New York City:

I claim the collar, g, and spring, h, applied to the breech-pin, d, as specified, for the purposes set forth; and in combination therewith I claim the ejector, l, for the purposes and as specified.

[The leading features of novelty in this machine are a simple and compact arrangement of gearing, effectually protected from injury or choking; a device for overcoming side draught; and a simple and effective form of rake which requires but little power to work it and admits of being readily removed.]

41,018.—Railroad Turn-out.—Isaac N. Pillsbury & N. E. Warren, Cleveland, Ohio:

We claim the herein-described mode of adjusting the tracks and turn-outs of street and other railroads, so that the cars from either end of the tracks can enter upon the turn-out in straight lines from either end, and pass the two points of intersection at either end before making or entering upon the curve, in the manner and form as herein set forth.

41,019.—Hot-air Grate.—Theodore F. Randolph, Cincinnati, Ohio:

I claim making the hot-air chamber, C, in the rear of the corrugated fire-back, B, of sheet or cast metal, securely joined to the fire-back and forming therewith a tight chamber secure from smoke, as herein specified.

41,020.—Safety Brake for Horse Power.—David M. Reynolds, Rising Sun, Md.:

I claim the lever, D, with its rubber, e, constructed and arranged in respect to the driving or other pulley of a horse power substantially as described, in combination with the trigger or lever, F, or other equivalent device by which the lever, D, will be released, and its rubber, e, brought in contact with the driving wheel when the belt slips from the pulleys, or when the belt is broken.

41,021.—Manufacture of Table Cutlery.—Lorenzo Rice, West Winsted, Conn.:

I claim the mode or method of attaching the bolster to the knife or fork, for the purposes herein set forth, with a pin, nipple, or spur on one or both half parts of the bolster, and as herein set forth, holding them firmly during the process of heating and welding the bolsters to the blade or fork, as herein set forth, or any other mode substantially the same, or by which the same results can be produced.

41,022.—Machine for making Horse Shoes.—L. D. Roberts, Cleveland, Ohio:

I claim, first, Operating the arms, L L′, by means of the peculiarly-shaped cam, N N′, in combination with the arm, M, and shaft, C, as specified.

Second, Operating the arms, L L′, by means of the cam, N N′, arm, M, the inclined planes, f g, the finger, h, and stops, i i′, and springs, d, substantially as described.

Third, I also claim the inclined planes, f and g, spring, d, stops, i i′, and finger, h, for opening and closing the arms, L L′, when constructed, combined and arranged as specified.

Fourth, I claim the guides, U U, constructed and operated substantially as and for the purpose set forth.

41,023.—Grain Drill.—Jasper Scovil, Hamburgh, N. Y.:

I claim, first, Attaching the covering plows, E, to the diagonal beam, c, of an independent frame, when the latter is supported and adjusted by means of the chains, H, levers, G, and rack, K, substantially as above described.

Second, In combination with the pendent plow frame as above described, I claim the distributing seed box, Q, operated by the cams, u, and spring, V, arranged and operating substantially in the manner and for the purpose herein set forth.

41,024.—Apparatus for Cooling Liquids.—Addison Smith, New York City:

I claim, first, The combination of blast or air-conducting arms, F, with a supply tube, D, and a tank for containing the material to be cooled when the arms, F, are caused to rotate as and for the purpose described, and are supplied in any way with a current of air.

Second, I claim providing the openings through which the air passes into the mass of material, with valves or gates, substantially for the purpose set forth.

Third, I claim making the arms, F, thinner at their forward than at their rear edges, substantially as described.

41,025.—Mode of Cooling Mash of Beer, &c.—Addison Smith, New York City:

I claim, first, The process of cooling the mash of beer, substantially as hereinbefore described; that is, by discharging the blasts of air into the mass of material beneath its surface while the mass is agitated.

Second, I claim a cooling apparatus consisting of a hollow stirring apparatus provided with a blast of air in connection with a suitable reservoir for the material, all operating substantially as set forth.

41,026.—Steaming and Shucking Oysters.—Isaac Solomon, Baltimore, Md.:

I claim the combined steam chamber and shucking box, B, constructed, arranged and operating substantially in the manner hereinbefore described.

41,027.—Socket for Hanger Bars.—T. A. Summers, Rochester, N. Y.:

I claim a socket for a removable hanger bar, constructed substantially as described, as a new article of manufacture.

41,028.—Grain Dryer.—R. T. Sutton, Rochester, N. Y.:

I claim, first, The combination of the perforated zig-zag channel, D, tower, A, hot-air furnace, B, and fan blower, C, all arranged in relation to each other and operating in the manner and for the purpose substantially as shown and described.

Second, The perforated disks, E E′, with inclined bottoms and provided with stirrers, F, in combination with the towers, A A′, zig-zag channel, D, and hot-air furnace, B, constructed and operating substantially as and for the purposes set forth.

41,029.—Bronzing Machine.—J. F. Tapley, Springfield, Mass.:

I claim, first, In combination with suitable feeding mechanism, the use of one or more reciprocating or vibrating pads or brushes, F G, for the purposes and in the manner substantially as herein set forth.

Second, The bronze receptacle, S, provided with the gate, i j, or its mechanical equivalent, when used in combination with the box, A, and feeding mechanism of a machine for bronzing printed sheets of paper or other similar substances.

Third, The bed piece, D, in combination with the endless apron, C, and one or more vibrating pads, F G.

Fourth, The cleaning brushes, P P′, arranged as herein described whereby both sides of the sheet are cleaned at the same time, in combination with the rolls, O O′ and R R′, or their equivalents, when used for the purpose substantially as described.

Fifth, The adjustable feed roll, E, in combination with the roll, B, and endless apron, c, or its equivalent, whereby the rolls, a a, may be so adjusted as to run in the margin of a printed sheet for the purpose herein described.

41,030.—Roll for Spinning Yarn, &c.—Amos A. Taylor, New York City:

I claim preparing rolls for spinning and preparing yarn for the manufacture of cloth and other purposes, of gutta-percha or other fibrous or globular gums (other than india-rubber), compounded and prepared as aforesaid.

Also obtaining by the aforesaid means a surface impervious to oils and other substances in, or added to the materials to be spun or manufactured, combined with the inner elasticity as and for the purpose described.

41,031.—Grain Scourer.—Gardner E. Throop, Chicago, Ill.:

I claim in combination with a grain scourer constructed substantially as described.

The combination of the revolving fan blades, B B, or their equivalent, with the cutting surfaces or edges in the metallic cylinder, A, made by the numerous small perforations in said cylinder, substantially as described.

41,032.—Grain Separator.—Joseph Van Houten, Mount Morris, N. Y.:

I claim providing the upper end of the wheat sieve, C, with an adjustable plate or covering, D, substantially in the manner and for the purpose set forth.

41,033.—Artificial Leg.—Richard M. Vaughan, Glasgow, Mo.:

I claim, first, The combination of the angle irons, A and A2, and tubular iron, B, with the foot and leg of an artificial limb, substantially as and for the purpose described.

Second, The arrangement of the spiral springs, c c, in combination with the angle irons, A A2, in the manner shown and described.

Third, The arrangement of the hinge rods, D D, in combination with the tubular iron, B, plate or bar, F, and springs, F, substantially as described.

Fourth, The combination of the vertical bar, D′, with the angle iron, A2, and the supporting rods, E′ E′, in the manner shown and described.

Fifth, The arrangement of the springs, A″, in combination with the tubular pivot, B2, lever, D″, and bar, H′, substantially as described.

41,034.—Machine for Sawing Irregular Forms.—Henry S. Vroomen, Paterson, N. J.:

First, In the mechanism for turning the saw to guide it in the direction of the intended kerf or cut, I claim giving a compensating play to the mechanism between the pattern and the saw, substantially as described, so that the turning of the saw on its longitudinal axis by the pattern shall not be affected by the change of position of the saw gate in bevel sawing, as set forth.

Second, I claim the reciprocating saw and saw sash, the turning or beveling frame to give the required inclination for bevel sawing, and the horizontally-sliding frame for curvilinear sawing, in combination with the application of the power for driving the saw, constructed substantially as described, so that it shall at all times operate in line with the saw, whatever may be its change of position in curvilinear and bevel sawing as described.

Third, I claim the flexible template or pattern for turning the saw on its longitudinal axis, in combination with the friction rollers or surfaces which embrace it, and which communicate the turning motion to the saw, when the rollers or surfaces which bear against the outer surface of the template or pattern are connected with the friction rollers or surfaces that bear against the inner surface thereof, and connected by joint links or arms free to turn, substantially as described, whereby the action resulting from the motion of the template or pattern on the said outer rollers will cause them automatically to take their proper position relatively to the pattern and the inner rollers, and take up any play which may arise from imperfect construction or wear of the parts, as set forth.

Fourth, I claim in combination with the saw gate the turning frame for bevel sawing, and the sliding frame for curvilinear sawing, connecting the feeding mechanism with the saw gate by a sliding mechanism, substantially as described, so that the feeding operation will continue to be derived from the reciprocating motion of the saw gate irrespective of its change of position, as set forth.

Fifth, I claim the segment rack attached to the beveling frame, and the worm or screw mounted in the horizontally-sliding frame, substantially as described, in combination with the index hand attached to the beveling frame, and the index on the horizontally sliding frame, constructed and operated substantially as and for the purpose described.

41,035.—Piston Valve for Steam Engines.—T. C. Ball, Bellows Falls, Vt., assignor to himself and M. L. Baxter, of Derby Line, Vt.:

I claim, First, the induction and eduction ports, a b, formed in the steam chest near each end thereof in combination with the balanced piston valves, C C, when arranged to operate in the manner described.

Second, In combination with the piston valves, C C, and steam chest, A, closed at its ends, the pistons or heads, E E, arranged to operate in the manner and for the purpose specified.

Third, In combination with the balanced piston valves C C, the annular cavities, c, formed around the interior of the steam chest in the manner and for the purpose specified.

[This invention consists in the combination of separate induction and eduction steam ports in each end of a steam chest with two piston valves which are balanced by a surrounding body of steam contained in grooves in the steam chest, of corresponding width with the ports. It also consists in providing the valve-rod with two extra pistons or heads whereby the effect of the exhaust upon the valves is counteracted. The invention further consists in certain means provided for lubricating the valves.]

41,036.—Apparatus for Stretching Hats.—J. W. Blackham, of Brooklyn, N. Y., assignor to J. H. Prentice, of the same place:

I claim a Hat-stretching Machine, in which the surfaces 1J and 2J are alternately extended and contracted to adjustable extents, substantially in the manner and for the purposes herein set forth.

Second, I claim, in connection with the above, giving a uniform and parallel motion to the entire surfaces of 1J and 2J, so that the quantity of stretch in the base and top may be always uniform, substantially as set forth.

Third, I claim no combination with the foregoing substituting forms in hat-stretching machines, each separately adapted to uniformly stretch a given style or character of hat, substantially in the manner and for the purpose herein set forth.

41,037.—Machine for Punching the Lifts of Boot Heels.—George W. Ellis (assignor to himself and Luther Hill) of Lynn, Mass.:

I claim the projecting nails c2, operating as guides for placing the work in the subsequent machine as set forth.

I also claim the awls, f, and the drivers, n, in combination with the bed, D, and plunger, I, operating as set forth for the purpose specified.

I also claim, in combination with the above, the stationary knife, G, operating as set forth.

I also claim the rim, E, upon the bed, D, for the purpose of arranging the lifts as set forth.

I also claim the arm, P, attached to the rod, K, in combination with the spring, g, whereby the awls are withdrawn and the plunger elevated and held up as set forth.

41,038.—Machine for Nailing Heels to Boots and Shoes.—George W. Ellis (assignor to himself and Luther Hill), of Lynn, Mass.:

I claim, First, In combination with the follower, R, placed inside of the shoe, the nailing blocks, A B, so arranged with regard thereto, and to the shoe, as that the nails shall be driven from the exterior of the heel toward the interior of the shoe, in the manner and for the purpose set forth, thus making one set of nails hold the lifts tightly together, and the whole to the shoe as described.

I also claim, in combination with a knife carriage, or block, I, that traverses through, or is guided in, or by a curved slot, and moved by a slotted lever, the hanging of the knife therein by pins or trunnions working in slots, l, and guided by the tail piece, m, and fender, z, substantially in the manner and for the purpose set forth.

41,039.—Shingle Machine.—Smith Head (assignor to B. G. Steever), of Millersbury, Pa.:

I claim, First, The combination of two circular saws, F F, with the

horizontally-revolving endless belt, B, grooved bed-piece, G G, head blocks, K K, and guard, J J; when constructed and arranged to operate in the manner and for the purpose specified.

Second, The metal plates, I I, in combination with the bed-piece, G G, endless belt, B, and circular saws, F F, when arranged in the manner and for the purpose specified.

[This invention consists in a novel arrangement of devices whereby s produced, at a moderate cost, a machine capable of turning out a arge amount of work with but a small expenditure of power.

41,040.—Harvester.—Stephen Hull (assignor to himself and Wm. Van Anden), of Poughkeepsie, N. Y.:

I claim, First, the spring device, H, constructed and applied substantially as shown and described, in combination with the divider, J, and the platform, G, substantially in the manner and for the purpose described.

Second, In combination with the platform, G, the adjustable sectional-jointed fender, G′, so constructed and applied that by a simple manipulation the machine can be made to deliver the grain either at the side or at the rear end of the platform, substantially as described.

Third, A reel constructed with obliquely-curved compressing rods, S S S′, applied to its wings and operating substantially as herein described.

Fourth, Combining with the spring fender, H, the obliquely-curved compressing rods, S S S′, on the reel, substantially as described.

Fifth, The spring fender, H, in combination with the adjustable sectional hinged fender, G′, and platform, G, substantially as and for the purposes described.

Sixth, The hinged fender, G′, in combination with obliquely-curved rods or gatherers, S S, on the reel, substantially as and for the purposes described.

41,041.—Grain Separator.—B. S. Heyers (assignor to himself, Stephen Roney and Theodore Deyo), of Pekin, Ill.:

I claim, First, The pivoted strips, S, applied to the edges of a riddle, screen, or chute board, when used in the described combination with pins, R, or any other suitable device to support one end of the said riddle, screen, or board, at any desired hight.

Second, The latch, U V, constructed substantially as described, and employed to retain the riddles within the shoe, or permit their ready removal as desired.

Third, The combination of the rock shaft, L, arms, K M, and rod, N, operating in the manner explained to impart longitudinal and vertical motion to the screen, I, within the shoe, by the lateral motion of the latter.

Fourth, The adjustable and removable deflecting board, H, attached to the shoe, B, by bolts, h h, in the manner and for the purposes explained.

41,042.—Car Brake.—W. S. Morrow (assignor to Warwick Martin, Rosaline N. Ambler, and Elizabeth Johnson), of Chicago, Ill. Ante-dated June 22, 1863:

I claim, First, The arrangement of the two drums, A A′ and B, with the chains, a c and c′, in combination with the tumbling-rod, R, constructed and operating substantially as and for the purposes herein delineated and set forth.

Second, I claim the arrangement of the drum, A A′, constructed in two parts, with the vertical shaft, and the chains, c and c′, when constructed, arranged and operating, substantially as, and for the purposes herein shown and described.

41,043.—Instructing Scale for Pianos.—Septimus Winner (assignor to Winner & Co.), of Philadelphia, Pa.:

I claim the within-described scale, made in sections and formed for resting on the keys as set forth for the purpose specified.

41,044.—Washing Machine.—G. L. Witsil (assignor to himself and Philip A. Boyle), of Philadelphia, Pa.: Ante-dated Dec. 4, 1863.

I claim the vibrating rubbing board, f, with its ribs or flanges, m, and opening or openings, x, in combination with the arched trough; the whole being arranged and operating substantially as and for the purpose herein set forth.

41,045.—Braiding Machine.—J. B. Wood, of Providence, R. I., assignor to Darius Goff, W. F. Sayles, F. C. Sayles and D. L. Goff, all of Pawtucket, R. I.:

I claim so constructing the carrier and arranging its yarn winder, that the tension weight may have a sufficient traverse above the base of the carriers, or racer, to allow wide flat braid to be formed at any required distance from the center in the single plate braiding machine, substantially as herein specified.

I also claim combining with a single plate braiding machine, substantially as described, the former C, or its equivalent, adapted to braiding at a distance from the center, substantially as described, for the purpose specified.

41,046.—Cotton Gin.—Enoch Osgood, of New York City:

I claim, First, The combination of the elastic roller, A, and the concave plate or bar, B, substantially as described.

Second, In combination with the above, the endless apron, C, as described.

Third, Forming the teeth of the clearer or doffer as and for the purpose described.

Fourth, The belt or apron, C, constructed as described, in combination with its guides, D.

Fifth, The combination of the elastic roller, A, friction roller, 8, and apron, C, as and for the purpose described.

Sixth, The combination of rollers, A and 8, apron, C, and tightening roller, 5, as and for the purpose herein described.

RE-ISSUES.

1,593.—Sealing Fruit Cans.—J. F. Griffin, of New York, assignee of James Spratt, of Cincinnati, Ohio. Patented July 18, 1854:

I claim the employment, in combination with the can, or jar, and its cover, of an elastic and compressible packing ring of vulcanized rubber as its equivalent, substantially as and for the purpose set forth.

I also claim the employment of wax or other sealing material, in combination with a can or jar, and its cover, when a packing is employed between the jar and its cover, for the purpose set forth.

1,594.—Coal Stove.—D. G. Littlefield, of Albany, N. Y. Patented August 18, 1863:

I claim the suspension or arrangement of the fire-pot in a chamber, C, at the base of the stove, entirely shut off or separated from the chamber which receives the heat directly from the burning fuel and the heated products of combustion, so that said chamber, C, may separately receive the heat radiated from the outer surfaces of the fire-pot and transmit it to the surrounding case, and from thence radiate it near the floor to the apartment to be warmed, substantially as herein specified.

In combination with the fire-pot, suspended or arranged in a separate chamber at the base of the stove, I also claim the suspension of the supplying cylinder in the chamber, G, above and separate from the fire-pot, substantially as and for the purpose herein set forth.

I also claim the construction and arrangement of the stove, in such a manner that it not only may be a connected whole, but may be readily separated into two sections (Figs. 3 and 4), each complete in itself, to the extent described, when thus applied to the suspended fire-pot in a separated chamber at the base of the stove, and to the separately-suspended supplying cylinder, substantially as and for the purpose herein set forth.

I also claim suspending the detachable soap-stone, or fire-brick, supporting cylinder or section, L, of the separately-suspended supplying cylinder, by means of eyes, O O, and stirrups or hasps, P P, or their equivalents, substantially as herein specified.

1,595.—Steam for Actuating Engines.—C. E. John and Samuel Wethered, of Baltimore, Md. Patented Sept. 21, 1853. Ante-dated, May 25, 1853:

We claim combining superheated steam with saturated steam for actuating steam engines, substantially as specified.

We also claim, in combination with the steam chamber of a steam boiler and the engine, two or more pipes, one for conveying the saturated steam and the other the superheated steam, as and for the purpose herein described.

Back Numbers and Volumes of the "Scientific American."

VOLUMES I., II., III., IV., V., VII. AND VIII. (NEW SERIES) complete (bound) may be had at this office and from periodical dealers. Price, bound, $2 25 per volume, by mail, $3—which includes postage. 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 VOL. VI. is out of print and cannot be supplied.

ence. Some complaints have been made that our past mode of binding in cloth is not serviceable, and a wish has been expressed that we would adopt the style of binding used on the old series, *i. e.*, heavy board sides covered with marble paper, and morocco backs and corners.

Believing that the latter style of binding will better please a large portion of our readers, we commenced on the expiration of Volume VII., to bind the sheets sent to us for the purpose in heavy board sides, covered with marble paper and leather backs and corners.

The price of binding in the above style is 75 cents. We shall be unable hereafter to furnish covers to the trade, but will be happy to receive orders for binding at the publication office, No. 37 Park Row, New York.

TO OUR READERS.

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 enclosing $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.

INVARIABLE RULE.—It is an established rule of this office to stop sending the paper when the time for which it was pre-paid has expired.

Models are required to accompany applications for Patents under the new law, the same as formerly, except on design patents, when two good drawings are all that are required to accompany the petition, specification and oath, except the Government fee.

RECEIPTS.—When money is paid at the office for subscriptions, a receipt for it will always be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgement of our reception of their funds.

Notes and Queries

E. G. of Ill.—Red lead, as a paint for wrought-iron, will not protect the metal perfectly when buried in moist soil. Gas pipes laid in the ground are made of cast iron. We are unacquainted with any rule for calculating the probable durability of wrought iron exposed to the weather. From our own experience we consider that red lead is the most durable paint for iron exposed to water. A coating of asphalt, thoroughly dried upon iron pipes in an oven, would be the best protective agent, we think, for the metal when buried in the damp soil.

J. P. K., of U. S. N.—Your criticism of an article recently published in the SCIENTIFIC AMERICAN is kindly received, though it advances no new ideas upon the subject, but merely argues in favor of those already published in the article in question. We have long ago adverted to the folly of placing stuffing boxes on safety valve stems. You object to boring brasses slightly larger than the shaft! That proves that when you have had a little more experience you will acknowledge the utility of it. The principal wear of a journal brass is on the bottom, for about one-third or more of its diameter; for all purposes of lessening friction, &c., the remainder of the brass might be removed entirely, without interfering with its functions; the sides of a box are of no earthly use except to retain oil and keep dirt out; and are, therefore, very properly filed away, so as to clear the shaft. This assertion only holds good in very large engines; those of a small size, running rapidly, need less clearance in the box. It is quite probable that you may know more than the bureau at Washington, but a little more modesty would not be out of place.

T. A. H., of Ill.—Your patent granted in 1858 will not expire until 1872. An application for an extension of a patent must be made at least 90 days before the patent expires. Patentees who have valuable patents which are about to expire had better consult us without delay.

E. F., of Wis.—Some prefer cold water, others salt brine as a liquid for hardening mill picks. Either will answer. The main object to the obtaining of good picks is a prime quality of steel; and it should never be heated beyond a dull red temperature before being plunged into the hardening medium. There are two articles on tempering mill picks on page 211, Vol. XII. (old series) of the SCIENTIFIC AMERICAN.

E. O. B., of Iowa.—The plan of generating steam for an engine by injecting into a heater or generator sufficient water to make steam for each stroke of the piston is very old. It has been tried both in this country and in Europe, and was abandoned many years ago. One cause of its failure was the liability of the water, on coming in contact with the heated surfaces of the generator, to assume what is termed the spheroidal state—that is to say to form itself into small globules, which are very difficult of conversion into steam. Another cause would have been the difficulty of obtaining a durable generator. There has been a patent granted for a plan of driving sewing machines by mechanically-compressed air, but we have never heard of anything having been done toward putting it in practice.

E. M. P., of Wis.—When the vapor of water is passed through a gun barrel, maintained at a red heat in a furnace, the water is decomposed by the oxygen leaving the hydrogen and uniting with the iron of the barrel. The hydrogen which will then escape from the gun barrel is not explosive; it burns with a blue flame giving out a very intense heat, but emits very little light.

F, W., of Brooklyn.—You will find a full account of the construction of bridges in Brig.-Gen. Cullum's work on the subject, published by D. Van Nostrand, 192 Broadway, this city.

Money Received.

At the Scientific American Office, on account of Patent Office business, from Wednesday, Dec. 23, to Wednesday, Dec 30, 1863 :—

J. M., of N. Y., $25; A. S. L., of N. Y., $20; H. G. G., of N. Y., $45; W. C. M., of N. Y., $16; A. P., of Mass., $20; D. & K., of N. J., $20; R H., of Ill., $49; A. S., of N. Y., $16; J. G. E., of N. Y., $25; J. W., of Mass., $30; G. E. W., of R. I., $18; G. M., of Ill., $15; P. R., of Conn., $25; J. P. N., of Maine, $25; J. L., of Ill., $15; J. H., of N. Y., $37; La. B. & C., of Ill., $15; H. & S., of Cal., $31; B. & P., of N. Y., $16; A. S., of Iowa, $16; G. B., of N. J., $25; J. S. W., of Va., $20; H. D. F., of Mass., $10; S. L. C., of N. Y., $41; J. McK., of Iowa, $16 F. J., of N. Y., $22; H. & D., of N. Y., $20; J. A. of N. Y., $20; E. S., of N. Y., $45; E. C. H., of N. H., $25; I. C. C., of Ohio, $15; H. J., of Mass., $25; G. B R., of Ill., $25; F. J. N., of Maine, $12; E. Y., of Mich., $25; R. L. S., of Conn., $25; I. C., of Mo., $30; M. D. & Y., of N. Y., $152; W. C., of Wis., $15; J. R. P., of Conn., $16; S. U. K., of Vt., $44; W. S., of Vt., $30; G. S. C., of Pa., $22; R. B. C., of Mass., $20; M. & G., of Ill., $45; J. H., of N. Y., $16; I. N., of N. Y., $16; R. W. P., of N. Y., $16; J. A. D., of N. Y., $40; J. A., of N. Y., $20; E. S. H., of N. Y., $30; I. L. H., of Mass., $16; C. B. S., of Ill., $16; A. A. D., of Mich., $25; L. D. W., of Mich., $16; E. L., of Vt., $25; J. Z., of Cal., $15; J. F., of Pa., $15; J. J. M., of Conn., $16; W. C., of Mass., $16; C. B H., of Mass., $16; J. F., of Ill., $15.

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Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office, from Wednesday, Dec. 23, to Wednesday Dec. 30, 1863 :—

J. M., of N. Y.; H. H. H., of Ohio; R. H., of Ill.; J. G. E., of N. Y.; F. J., of N. Y.; F. J. N., of Mo.; R. L. S., of Conn.; J. P. N., of Maine; H. H. H., of N. H.; H. & S., of Ill.; G. B., of N. J.; S. U. K., of Vt.; G. S. C., of Pa.; J. A. D., of N. Y.; E. S. H., of N. Y.; S. M., of Ill.; J. H., of N. Y.; E. Y., of Mich.; A. A. D., of Mich.; N. C. W., of N. Y.; G. S. C., of Pa.; S. L. C., of N. Y.; P. L. S., of N. Y.; La. B & C., of Ill.; H. H., of Ill.; H. J., of Mass.; E. L., of Vt.; G. B. R., of Ill.

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B. T. BABBITT, 64 to 74 Washington street, New York. 12 tf

NEW HAVEN, CONN., Oct 22, 1863.

To B. T. BABBITT :

SIR:—Observing your Premium advertisement in the SCIENTIFIC AMERICAN, I concluded to state, in a few words, what I knew of the merits of your soap, having used it enough to conscientiously say that it is all that it is represented to be.

I wish to ask you if it is necessary to write my name in full under the article, should I put it in one of the New Haven papers.

If the article, which is on the next page, is of no account, please say so, and that will end the matter ; if it is acceptable, it will appear in the paper immediately. J. D. W.

B right'golden day that ever gave
E he world a man who cares to save
E times the toil of womankind.
A man with an ingenious mind
B estows a real gift to us ;
E cause experience proves it thus.
I n every way its claims to aid,
T here's none but true assertions made.
T hus to affirm the truth we're bold,
S ince using *this* we are not sold ;
H aving our time and patience too—
O ur friends will find this statement true.
N single trial, and you can
E rceive that BABBITT is the man.
J. D. W.

DEPARTMENT OF AGRICULTURE,
WASHINGTON, D. C., Dec. 15, 1863.

To the Growers and Manufacturers of Flax and Hemp :

THE COMMISSIONERS APPOINTED BY THIS DEpartment, consisting of Hon. J. K. Morehead, of Pennsylvania, William M. Bailey, of Rhode Island, and John A Warder, of Ohio, to consider the following appropriation made by the last Congress, viz. :

"For investigations to test the practicability of cultivating and preparing flax and hemp as a substitute for cotton, twenty thousand dollars."

Having met, and after several days' investigation, believing that a further and fuller notice of their investigations might produce valuable results, adjourned to meet again on Wednesday the 24th day of February next, at 12 o'clock, M.

They request all interested in the distribution of this appropriation, or anxious to develop the subject for the public good, to send to this Department, on or before that day, samples of the hemp and flax in the different stages of preparation; of the fibers and fabrics prepared by them, accompanied by statements of the various processes used, and the cost of production in each case; also, descriptions of the kind and cost of machinery used, where made, &c., together with any and all information that may be useful to the Commission.

This information is necessary before an intelligent distribution of the appropriation can be made. ISAAC NEWTON.
1 9 Commissioner.

UNITED STATES MILITARY RAILROAD OFFICE,
No. 250 G street, Washington, D. C., December 19, 1863.

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About 200 tons of Cast.
A lot of Steel Springs, Sheet Iron, &c.
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Terms Cash in Government Funds.

H. L. ROBINSON,
1 3 Captain and A. Q. M.

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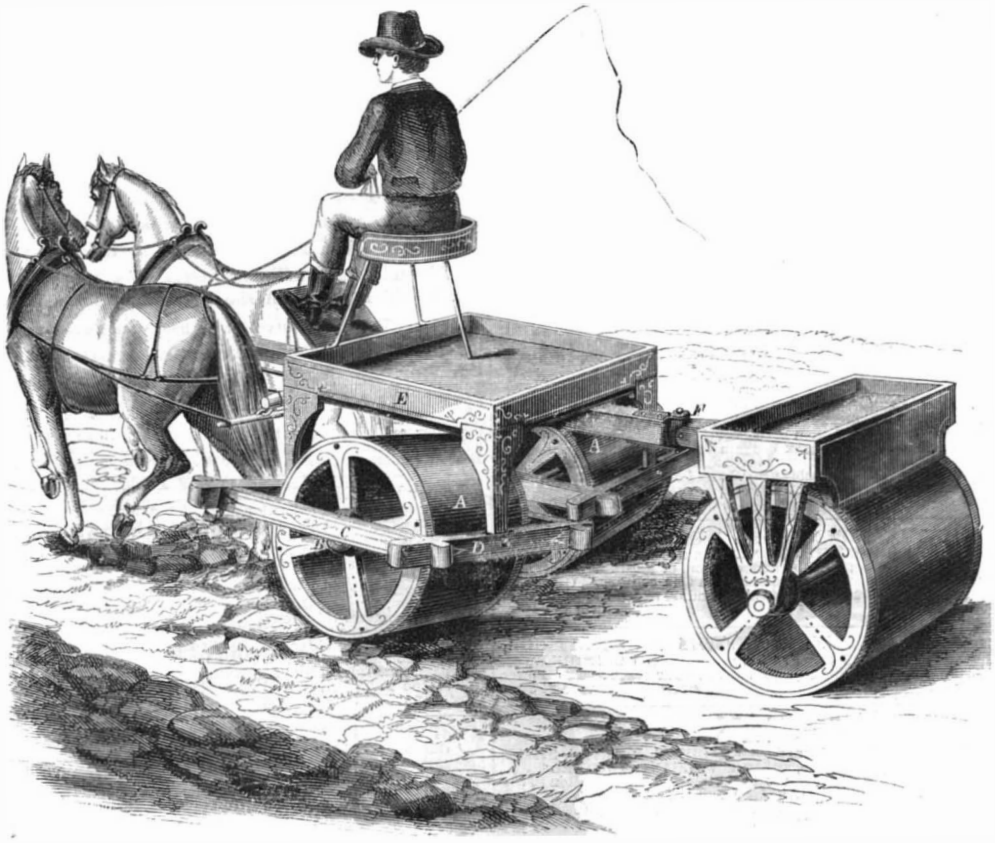
The "Buckeye" Roller.

The engraving published herewith is an improved apparatus for rolling land. It differs from others heretofore constructed in that the roller is not continuous throughout its length, but is made in two parts, so that it readily accommodates itself to unevenness of surface.

The engraving shows two rollers, A, which are swung on independent bearings, B, in separate frames, C. These frames are jointed at D, to a separate box, E, so that they readily accommodate themselves to any irregularity of surface in the field they are at work upon. This peculiarity is represented in the engraving, one of the rollers being shown in the act of crushing large clods in its passage. The draught pole of this machine runs through it and is joined behind to another single roller of the usual construction. The universal joint, F, permits the driver to wheel the machine around in a very small circle, as the plan of connecting the two rollers enables the forward set to be turned nearly at right angles with the one behind; this last roller follows between the track of the two first and crushes the ridge left by the space between them. This machine is very light in draft and can be easily managed by any one. It is not only adapted to crushing clods in plowed fields, but can also be employed to advantage in carrying stone or rails across swampy and muddy places, where the soil is so loose that wagon wheels would sink in and get bemired.



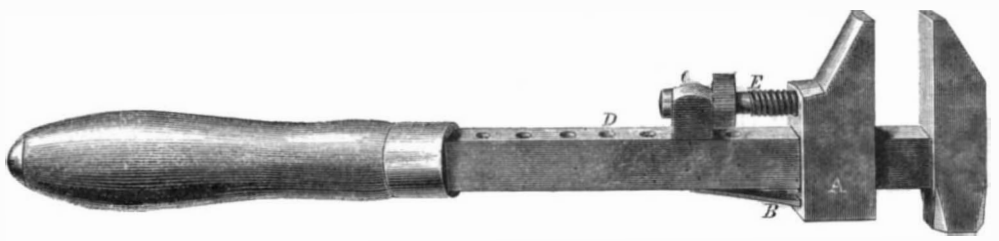
DUNHAM'S LAND-ROLLER.

The patent for this machine was procured through the Scientific American Patent Agency, on Oct. 20, 1863, by Chester Dunham, and assigned to Osborn, Dunham & Co.; by whom it is being manufactured, at Bedford, Cuyahoga Co., Ohio. Further information can be had by addressing the firm as above.

Improved Screw Wrench.

A good adjustable wrench is an indispensable tool to every mechanic, and not only to this class of the community but to all persons who engage actively in the duties of life; farmers, grocers, merchants, in fact almost every one has at some time or other occasion to use a wrench of some description. The wrench herewith illustrated is very easily fitted to nuts of almost any size, as it is very long in the shank, and has an adjustable jaw of peculiar style, which enables the person using the wrench to set it very quickly.

Upon examining the engraving it will be seen that the jaw, A, has a spring, B, fastened to its back, in such a way that it bears upon the shank of the wrench; this jaw is made larger than the exact size of the shank, so that by pressing upon the bottom of the jaw the sliding block, C, is lifted out of the holes, D, in the shank; in this block there is a short stout pin which just fits the holes and takes the strain thrown on the jaw, A, when the wrench is in use. There is also a small screw, E, which runs through the block, C, and works in a thread cut in the jaw, A. The manner of adjusting this tool and using it is readily apparent to every one; it is only necessary to throw the pin in the block, C, out of the holes by pressing on the bottom of the jaw, moving the same along to the size required; any inaccuracy may then be compensated for by the screw, E.



M'DONALD'S SCREW WRENCH.

The patent for this invention was procured through the Scientific American Patent Agency, on April 8 1863, by A. Y. McDonald, Dubuque, Iowa. For further information address the patentee, or John Morrison, at the place above-mentioned.

Setting on Safety Valves.

It seems that an ignorant fellow in England recently adopted the old trick of engineers on the Mississippi river—sitting on the safety-valve lever so as to increase the steam pressure. This is what happened:—"The deceased actually sat upon the safety-valve, and insisted upon retaining his seat, although warned that his sitting there was a source of great danger. The boiler exploded, and Hirst was thrown a distance of at least 100 yards, and fell dead in a field. The end of the boiler was driven out, and the main portion of the boiler itself was forced in the air a hight of 100 feet at least, and fell at a distance of 150 feet from its place. Mr. Inett, the engineer, was buried beneath the bricks and *debris*, and sustained serious injuries, as did also Mr. Walker's groom, one of his farm servants, and two of the laborers who were engaged there. One of them was found insensible under the hot bricks in one corner of the engine-shed and fearfully scalded. Mr. Walker himself and two women who had just arrived to assist in the thrashing had very narrow escapes." All from the recklessness and stupidity of one man.

PERILOUS SITUATION,—A man out West was recently caught on a railroad bridge, during a dark night, by a train approaching close behind him: the ties were wet and slippery, it was impossible to run, to jump off or stand still was certain death, and he therefore bent down, slung his arms around one of the ties and swung off between the rails and the water until the train had passed. A very trying situation certainly: the fright he experienced occasioned a severe fit of sickness.

FROM THE STEAM PRESS OF JOHN A. GRAY & GREEN.