

DEVICES FOR BENDING OR SWAGING SHEET METAL PLATES FOR COVERING SASHES FOR GREEN HOUSES, SKYLIGHTS, ETC.—John N. Woodward, Aurora, Ill.—This invention relates to a new and improved device for bending or swaging sheet metal plates for covering the exterior portions of sashes for green houses, skylights, etc. The object of the invention is to obtain a device for the purpose specified, which will be simple in construction, capable of being manipulated with facility, and which will admit of the work being performed with rapidity and in a perfect manner.

HYDRO-CARBON VAPOR MACHINE.—James T. Spence, Brooklyn, N. Y.—This invention relates to a new and improved machine or apparatus for vaporizing volatile hydro carbons for illuminating purposes, and consists in a novel and improved means for creating a draught of atmospheric air through the chambers containing the material to be vaporized, such for instance as the light grades of coal oil, naphtha, gasoline, etc., and also in improved valves for checking the draught whenever the apparatus ceases its operation. The invention finally consists in the use of a combination of heavy hydro-carbons, or those which vaporize at quite a high temperature with that of a lighter grade, whereby all danger of explosion is avoided. The invention has for its object the production of a steady light, a large vaporizing surface within a limited space, and safety from explosion in using the apparatus.

CULTIVATOR.—Isaac B. Mahon, Dunkirk, Ohio.—This invention relates to a new and improved cultivator for cultivating crops which are grown in hills or drills, and it consists in a novel construction of the device whereby a very durable implement for the purpose specified is obtained.

TRUSS.—Frederick W. Neubert, Pittsburgh, Pa.—This invention relates to a hernia truss which is so arranged that it can be applied for ruptures on either side, or even for double ruptures, and can be adjusted on bodies of different size.

MANGER, FEED BOX, ETC.—Friedrich Denzler and Jacob Miller, Brooklyn, E. D. N. Y.—This invention relates to such a connection of mangers, feed boxes, or feed troughs, with ordinary clockwork, that the same can be automatically opened at the necessary time, not requiring any attention after the boxes or troughs have been filled, closed, and the clockwork arranged. The object is to economize time and labor, especially in large dairies, studs, and stables, and to provide regularity in the time of feeding, the apparatus being so arranged that any desired number of troughs or boxes will be simultaneously opened from or by means of one clockwork, with which they are connected.

ICE-CREAM FREEZER.—Francis H. Duc, Charleston, S. C.—This invention relates to a new device for freezing ice cream, and consists in the use of a revolving cylinder in which the cream is held, said cylinder being fitted around a stationary shaft which carries a wing for feeling or indicating the state of the contents.

HOSE COUPLING.—John Kerns, New York city.—This invention relates to a hose coupling of such construction that two pieces of hose can be secured to each other by its use, without a wrench, or even without turning a ring or a nut for the purpose. All that is required to connect two ends of hose is to hold them together, and push one toward the other, and the connection will be complete, safe, and strong.

GARDEN TILE FOR BORDERING.—Francis B. Fancher, Lansingburgh, N. Y.—This invention relates to an improvement in the construction of tiles for the edges of walks, flower beds, and grass plots, in gardens and other ornamental grounds, and consists in forming the tile with a right-angled wing or wings, on one or both sides, and locking the tiles together with lap joints, or tongue and groove, in such a manner that they may be set in the ground with one edge projecting above the surface to divide a flower bed or grass plot from a walk, or to enclose a border on both sides.

MODE OF SECURING FELLY JOINTS.—James W. Lawrence, New York city.—The nature of this invention consists in securing the ends of fellys in a wheel by means of a bolt through the joint and the felly-plate in such manner that the ends will not split or crack when the tire is set up, nor work loose and uneven laterally and radially from service, but will form a tight joint of great strength and durability.

THREE WHEELED VEHICLES.—John W. Minor and David P. Ward, New Bedford, Mass.—This invention relates to improvements in wheeled vehicles, and it has more particular reference to those vehicles which are used for the transportation of heavy burdens, as trucks or drays, and it consists in the peculiar arrangement of a third or guiding wheel to the forward end of the said vehicles.

DISTANCE INDICATOR FOR VEHICLES.—James C. Spencer, Phelps, N. Y.—This invention relates to an improvement in the construction of an odometer, or distance indicator, for vehicles, and consists in a spur wheel placed in a box to be attached to an axle of any vehicle which is revolved by means of a screw or worm that receives motion by means of a pawl and ratchet, with every revolution of the wheel.

TRACE AND PAD BUCKLE COMBINED.—E. B. Winslow, Chatham, Ill.—The object of this invention is to fasten the trace and pad strap with a buckle, serving the purpose of two buckles, usually employed, making a large saving of strap leather in the harness, while the pad is lighter, stronger, and neater, and cheaper than any in use.

HARVESTING MACHINE.—J. M. Peters, Jr., Ganville, Ohio.—This invention relates to a new and improved harvesting machine, designed for general purposes, to wit, the cutting of grass and grain and standing corn stalks, and it consists in a novel construction of the frame of the machine, arrangement of the driver's seat, cutting device, etc., whereby the device is rendered capable of operating perfectly in cutting all standing crops.

WATER AND GAS METER.—Joshua Mason, Paterson, N. J.—This invention relates to a new and improved water and gas meter, and consists in a novel construction and arrangement of parts whereby water or gas may be measured in the most accurate manner and by a means not liable to get out of repair or become deranged by use.

CULTIVATOR.—Elijah Stafford, Decatur, Ill.—This invention relates to a new and improved cultivator of that class which is designed for cultivating crops grown in hills or drills, and consists in a novel arrangement of crank axles whereby the plows may be adjusted higher or lower, so as to plow more or less deep, as required, and all the plows of the machine graduated so as to plow an equal depth. The invention further consists in a novel arrangement of the plow standards and in a peculiar shape of the plows, whereby the latter are prevented from clogging or choking.

MODE OF COVERING STEEL WITH COPPER.—E. T. Ligon, Demopolis, Ala.—This invention relates to the covering of steel with copper.

PISTON.—Nathan Hunt, Salem, Ohio.—This invention consists in so forming and arranging the parts that no holes, valves, or springs are required, while the piston is self packing, the rings being expanded by the pressure of the steam.

SUBMARINE PLOW.—Edwin T. Ligon, Demopolis, Ala.—This invention consists in attaching to the side of a steamboat or other vessel a submarine plow which by its action on the bottom of rivers and other waters displaces the sand, mud, and other loose material, and thereby excavates a channel and deepens the water for purposes of navigation or for other purposes.

ADJUSTABLE MEASURE FOR PACKING LIQUIDS.—Joseph L. Abbott, North Providence, R. I.—This invention relates to a new and improved measure whereby liquids may be drawn from a tank or reservoir in certain limited quantities very expeditiously. The invention is more especially designed for the drawing off of coal oil and turpentine from large tanks or reservoirs in specific quantities for canning, and has for its object the varying of the capacity of the can to suit the variation of measurement peculiar to different countries, as the gallon, for instance, which varies materially, an "imperial" gallon being larger than the gallon United States measurement. The invention has further for its object the ready admission of the oil or other liquid into the measure by providing a free escape for the air therefrom during the process of filling; and finally the invention has for its object a speedy withdrawal of the contents of the measure without loss by leakage or drip in adjusting the cans to or removing them from the discharge faucet of the measure.

ROLLING MACHINE.—Hugh Baines, Manchester, England.—This invention relates more particularly to a rolling machine invented and secured by Letters Patent of the United States bearing date Dec. 11, 1860.

TUBE EXPANDERS.—E. J. Moore, East Boston, Mass.—This invention consists in arranging a stock with a number of rollers placed therein with beads formed on them, which rollers are so adjusted in the stock that they can be forced outward by a tapering pin which passes through the stock and operates upon the rollers.

COMBINED HOE AND RAKE.—Isaac Cook, Haynesville, Mo.—This invention relates to an improvement in the construction of a combined hoe and rake, and consists in a device for securing them to the handle together or separately.

WINDOW SASH.—Robert Thomas, Parkersburgh, West Va.—This invention has for its object the fitting of the sashes within the frame of the window in such a manner that the sashes may be removed from the window frame and fitted therein with the greatest facility, and without removing or detaching stops, parting beads, and other parts pertaining to a window frame, as is now necessarily required.

BALING PRESS.—S. J. Austin, Freeport, Me.—This invention consists in novel means employed for operating the platen and the expanding side of the press box, and also in a peculiar construction of the platen and head block, and other features, whereby a very simple, efficient, and durable press is obtained, and one which may be operated or manipulated with the greatest facility.

CHURN-DASHER.—J. W. Pettingill, Rockford, Ill.—This dasher for churns in fact embraces two in one it working to crush or mash the cream without a rubbing or grinding movement, which as is well known, has a tendency to leave the butter soft and salvy while it mashed or crushed it is rendered hard and brittle.

WEATHER STRIP FOR DOORS.—J. H. Miller, Milwaukee City, Wis.—This invention consists in so hanging and arranging the weather strip that when the door is closed it will be brought down and upon the sill of the same in proper position for preventing the passage of air, dust, etc., under the door, while as the door is opened it will so swing or turn as to pass freely over the sill and offer no obstruction to the movement of the door.

CART.—N. W. Godfrey, Locust Valley, N. Y.—This invention principally relates to the construction of the bottom of a cart whereby, when so desired, it can be simultaneously opened at various points of its length and width for dumping the material contained in it upon the ground or any other desired place and in the most easy, convenient and ready manner.

DOUBLE-ACTING FORCE PUMP.—John C. King, New York City.—This invention relates to a steam pump in which the circumference or rim of the cylinders is connected with, attached to and moving with the piston, between the stationary heads, thereby doing away with piston rods and piston packings. The ports pass through the stationary heads, and the water or steam is acted upon by the motion of the piston in the same manner as in ordinary cylinder engines.

PORTABLE SHEEP SHED.—Wilson M. Baker and John Hisner, Urbana, Ohio.—This invention has for its object to furnish an improved portable sheep shed so constructed and arranged that it may easily be transported from place to place, and that the sheep may be protected from the weather and easily and conveniently fed.

BOLT.—A. H. Sherwood, Southport, Conn.—This invention consists in the combination with two bolts which are connected together by a toggle, the one for securing the top of the door, and the other the bottom, and of a catch so arranged as to automatically catch upon a hook or the like secured to the siding of the house or building for holding the door open.

HORSE-POWER.—S. Coin, Cazenovia, N. Y.—This invention relates to that class of horse-powers in which an endless platform is employed on which the horse travels and thus imparts power, and it consists more particularly in a novel construction of the link pieces for the several sections of the platform in their application and attachment to the platform sections, the iron tie rods heretofore used are dispensed with, and the machine not only much simplified but made lighter, and its cost of construction diminished.

FRUIT BOX.—Israel F. Brown, New London, Conn.—The objects of this invention are first, to construct a fruit box in such manner as to avoid all shrinkage of the wood of which the box is made, and second, to obtain a simple, cheap and efficient fastening device or devices for the bottom to the sides or other portions of the box.

BELTING FOR MACHINERY.—M. A. Strouville, St. Louis, Mo.—This invention or discovery relates to a new and improved mode of making belting for machinery and consists in preparing and curing hides without tannin.

CARRIAGE JACK.—Joseph F. Emmert, Quincy, Pa.—This invention relates to a new and improved carriage jack which is operated by a lever to raise a sliding rack. It is made wholly of cast iron and is both cheap and convenient.

PRESERVING MEATS, GAME, ETC.—Edward de la Granja, Boston, Mass.—This invention is designed for the preservation of all kinds of meat, game, poultry, etc., used for human food, and when the process is properly followed it will preserve such meats, etc., in a perfectly sweet and edible condition with but a trifling expense.

SHIFTING RAIL FOR CARRIAGE TOPS.—Patrick G. Clancy, Augusta, Me.—In this invention the carriage top is fixed to a rail which can be easily attached to or detached from the seat. The means for attaching and detaching it are short hooked projections on the rail catching in eyes in plates attached to the seat and held in position in the eyes by shortening the rail. The rail is made extensible by means of an independent piece screwed into its center, by right and left screws.

HERNIA TRUSSES, ETC.—William Pomeroy, Brooklyn, N. Y.—This invention has for its object to so improve the construction of hernia trusses, abdominal supporters, etc., that the tension of the body spring and the position of the pressure pad may be adjusted at pleasure.

CLOTHES DRYER.—D. B. Randall, and A. A. Williams, Glover, Vt.—This invention has for its object to furnish an improved clothes dryer, simple in construction easily and conveniently used and operated and which will occupy little space in the room in which it is placed.

CHURNING MACHINE.—M. V. B. Rowley, Worcester, N. Y.—This invention has for its object to furnish an improved machine by means of which a churn may be operated at any desired speed, steadily and regularly, bringing the butter in a very short time.

FENCE.—Daniel Kaufman, Boiling Springs, Pa.—This invention has for its object to furnish an improved fence so constructed and arranged that the posts will be no more liable to decay than the boards or rails, which may be easily set up and taken down and conveniently moved from place to place.

FOLDING CHAIR.—E. W. Vaill, Worcester, Mass.—This invention relates to that class of folding chairs in which the seat is supported on crossed legs which fold together; and consists in a new method of constructing and hinging the arms and back of such chairs, by which the whole chair is more neatly and compactly folded together, the back folding forward over the seat, and hanging in front of the legs.

FOLDING CHAIR.—E. W. Vaill, Worcester, Mass.—In this invention a new method of pivoting the arms to the front part of the seat is employed, by which the chair is more neatly and compactly folded together.

ROUNDING FLY NET STRAPS.—Cornelius K. Burkholder, and Henry Lerew, York Springs, Pa.—This machine has two jaws, one movable; to these are attached guides whose apertures correspond with the square shape of the strap as it is fed into the machine, and knives whose semi-circular notches give the required rounded form to the passing strap.

GRINDING MACHINE.—Menno A. Dieckrichs and J. H. Dieckrichs, Baltimore, Md.—This invention relates to an automatic arrangement for holding and feeding the article to be ground in relation to the stone, and in the means for adjusting the different parts to suit different sizes of tools etc.

VEGETABLE PLOW.—Wm. Richardson, Hookstown, Md.—In this invention of the three plow points, the forward one is removable and the two rear ones are adjustable both laterally and vertically. The object of constructing a plow in this manner is to adapt it to plowing between rows of different distances apart, and to adjust it either to surface or subsoil plowing, as may be desired. It also pulverizes the ground more thoroughly than the common plow.

INVALID SPITTOON.—John M. Cayce, Franklin, Tenn.—In this invention the cover of the spittoon is raised by the act of lifting the instrument and falls by its own weight when the spittoon is set down again.

WASHING MACHINE.—Albert Dennison, Stillwater, N. Y.—This invention relates to that class of washing machines in which the clothes are placed in a revolving box, together with loose balls, and cleaned by the action of the balls, in connection with the water. The invention consists in making the box a polygonal prism, instead of a cylinder and in the peculiar construction and attachment of the journals and journal boxes.

IMITATION WOOD.—Henry Carter, Taunton, Mass.—This invention relates to a new composition for making imitation wood from the dust of those kinds of wood which it is desired to imitate, and to a new process of ornamenting such imitation wood by means of metal shavings.

PIN.—A. R. P. Walker, Richmond, Me.—This invention relates to an improved pin for brooches, shawls and like purposes, and consists in dispensing with the rivet and hinge as ordinarily used by bending the pin itself through the eye.

PUNCH.—Edward Shindler and Charles H. Metzger, Easton, Pa.—The object of this invention is to construct a tool for punching leather or any other material of a similar nature in an accurate and expeditious manner.

FURNACE FOR SMELTING ORES.—A. H. Richardson, Denver, Colorado.—This invention, which relates to an improvement in furnaces for smelting silver, consists in directing a blast upon the treated ores with charcoal in a furnace having three apertures at different levels for the separation of the slag silver and lead by gravitation.

COMBINED CHAIR, LOUNGE AND STEP LADDER.—Joseph Gerdon, Jr., West Albany, N. Y.—This invention relates to a new and useful device which will be of great use in stores and magazines of all descriptions and which is so arranged that it can be set up as a chair, step ladder or lounge, as may be desired.

TRACE ATTACHMENT.—Andrew Thompson, Ottumwa, Iowa.—The nature of this invention consists in attaching to a harness trace a metal point or end having ratchet teeth or a series of projections on the upper side which catch a clamp for fastening the trace.

STEAM ENGINE.—Thomas Adams and George John Parson, Adelphi, Eng.—This invention consists in certain improvements in slide valves, which are also applicable to pistons and glands. The object is so to construct a valve that the effect of the steam, acting on the back of the valve shall be equal to the effect of the steam acting on the face of the valve; but should the surfaces acted on by the steam not be opposite each other, then the areas of such surfaces, multiplied by the distance of their centers of action from the center of the valve (being the leverage with which the steam acts) should be made equal.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address the correspondent by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 50 cents a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

N. U. A., of Mass., asks if we can inform him of any cement for steam pipes which cures quickly and is durable? We know of no better cement than that ordinarily used, composed of red and white lead mixed with linseed oil. It sets readily, especially when subject to compression. Our correspondent is, of course, aware of the constituents of the permanent joint made of iron borings, sal ammoniac, sulphur, and water. The proportions of both the above have been published several times. Rubber makes an instantaneous joint without cement.

E. V. R., of Mich.—The molds or matrices for casting glass bottles having raised letters or other devices on their exterior surfaces, are made of iron or brass and produced by casting from a wooden pattern, then finished up and fitted with the proper hinges or connections. The process is as simple as any other job in pattern making, molding, and finishing.

S. J. T., of Ga., desires a recipe for making the plaster of Paris stick to mill stones. Much of his work in this line puffs up and soon comes off. We know of no mystery in this operation. The requisites are fresh plaster and a clean stone.

C. R. C., of Ill. has a twenty-four inch gum belt which slips on the pulleys, one of which is of iron and the other of wood. He is told that tallow will spoil rubber belts, has used rosin, but it seems to glaze the belt and make it worse than before. Ans. Animal oil will not do for rubber belts. If the belt slips it should be lightly moistened on the side next the pulley with boiled linseed oil—cold—and repeated if one dose does not answer.

J. H. S., of Ohio asks how he can harden and temper the boards for cultivator plows, which have to be heated and pressed to form, without danger of their springing. We know of no certain way of tempering curved sheets of steel without springing, except hammering to shape after the tempering is done.

J. S. L., of Pa.—For producing the different grades of brass, etc., we refer you to the "Timman's Manual," published by I. R. Butts & Co., Boston, Mass. We have published the recipes several times.

E. W. D., of Conn.—In our statement on page 121, current Vol., that we "did not know of any dynamometer to be applied to the shaft which is entirely reliable," we intended no injury to any inventor of dynamometers. If the machine you speak of is so entirely reliable under all circumstances the fact has escaped our notice, although we are tolerably well acquainted with the machine. Its superior merits ought to procure its general introduction and obviate the necessity for a better measurer of power.

L. M. C., of Iowa.—In 1663, the magnetic and geographical meridian of the city of Paris coincided. From this time forward the declination proceeded westward till it reached its maximum in 1814 when it was 22° 34' W. Since 1814 the declination has receded. In 1860 it was 19° 33' W. In London it was 0° in 1663, reached its maximum west declination of 24° 41', in 1818, and was 20° 25' W in 1866. The line of no variation is an irregular line, and at present cuts the east of South America, passing east of the West Indies, enters North America near Philadelphia and traverses Hudson's Bay, thence it passes through the North Pole, entering the Old World east of the White Sea, traverses the Caspian, cuts the east of Arabia, turns then toward Australia, and passes through the South Pole to join itself again. No satisfactory explanation has ever been given of the variation of the needle.

Business and Personal.

The charge for insertion under this head is 50 cents a line.

Iron Manufacturers and Capitalists—Examine the Model Rolls at the American Institute. Patent for sale. P. Bright, Philadelphia.

For Sale—A small Metal-working Shop—Tools in good order. Also, two patents. Terms easy. Address G. Strong, care H. N. Meyers, 218 Fulton street, New York. 14 & 15

Wanted—Address of Makers of Toys Steamboats with small working engine.—W. C., Box 104 Mount Vernon, N. Y.

Gould's Bottle Stopper.—The Patentee states that his invention, which was illustrated on page 180, is better adapted for cider, ale, and porter, than for soda or other aerated waters.

**Improved Horse Hay Rake.**

The rake represented in the engraving has taken a premium wherever exhibited and tested. In the Indiana State Fair of 1866 it received the first prize over all others, including one which carried off the first premium at the Auburn, N. Y., trial. It is uncommonly light, very strong, and handy in operation. With it there is no necessity of shocking the hay previous to stacking it, as it will carry an ordinary sized shock to any part of the field. It works well on very uneven ground. It was contrived to answer a call for a more perfect rake published in the *SCIENTIFIC AMERICAN*, Vol. XIII., No. 12, page 176.

The thills are bolted to a double cross bar, A, to the ends of which are also bolted the curved hounds, B, the forward ends of which are securely united to the thills, thus strongly bracing the structure. These hounds extend back of the crossbar and have their rear ends made cylindrical and quite large to receive the rings of the short axletrees or journals on which the wheels turn. These axles are of metal and may be adjusted on the hounds to bring the wheels further forward or back, as may be desired, to properly balance the rake, and are held in position by set screws. Firmly secured to flanges on the inner end of the axles are upright guides, C, in which play the draft bars, D, which are pivoted to the hounds just in the rear of the crossbar, A, and at their rear ends support the rake head, E. This is pivoted to the draft bars by headed journals which allow the rake to be revolved.

The rake head is square and the teeth are double or made of two curved pieces of wood, which are seated in mortises on opposite sides of the head and are bolted through. At their ends the two parts of the tooth are brought together and held by rivets or screws, and strengthened and protected by shoes of malleable iron. This method of construction makes a very strong and at the same time a very light tooth.

In operation, the driver guides the horse with one hand and manages the rake with the other, as seen. He can easily, by depressing the rear ends of the teeth, elevate the forward ends to avoid obstructions or to accommodate the rake to unevenness of surface, while the guides, C, permit the draft bars to rise and fall. The rake head may be set higher or lower by means of adjustable blocks in the lower part of the guides, C. The rake will revolve for unloading in the usual way by removing the pressure of the hand.

This rake was patented through the Scientific American Patent Agency, Aug. 6, 1867, by Levi W. Frederick, who may be addressed for rights to vend and manufacture, or for other information, at Gosport, Owen county, Ind.

**Improvement in Screw and Ratchet Wrenches.**

Two views of an improved wrench are shown in the accompanying engravings. The object is to relieve the screw (if one is used) from the whole strain exerted in setting up a nut or bolt by introducing a stop-catch with teeth which engages with a rack or ratchet cut on the shank of the wrench. It is, in one form, a combination of the screw wrench and the ratchet wrench, and in another form, is a simple ratchet wrench.

Fig. 1 is the ratchet wrench, *per se*. The movable jaw, A, can be slipped to position by the thumb and finger, and held by the catch, B, which engages, on its under side, with two of the teeth of the ratchet rack, when shut to place, where it is held by the spring, C, that acts like the spring of a pocket knife. The plate, D, is a permanent portion of the jaw and thimble, A, and, of course, moves with it.

Fig. 2 represents the combined screw and ratchet wrench, E, being the screw, and F the spring of the catch-bar, which in this case is connected with the movable sleeve. The jaw may be adjusted by the screw, E, and then held by the catch-bar, or it may be operated by the screw alone by raising the catch-bar.

Letters patent were issued for this invention through the Scientific American Patent Agency, Aug. 27, 1867, to Theodore D. Christopher, who may be addressed at Madison, Ind. The patentee desires to arrange for the manufacture of his wrench on a royalty.

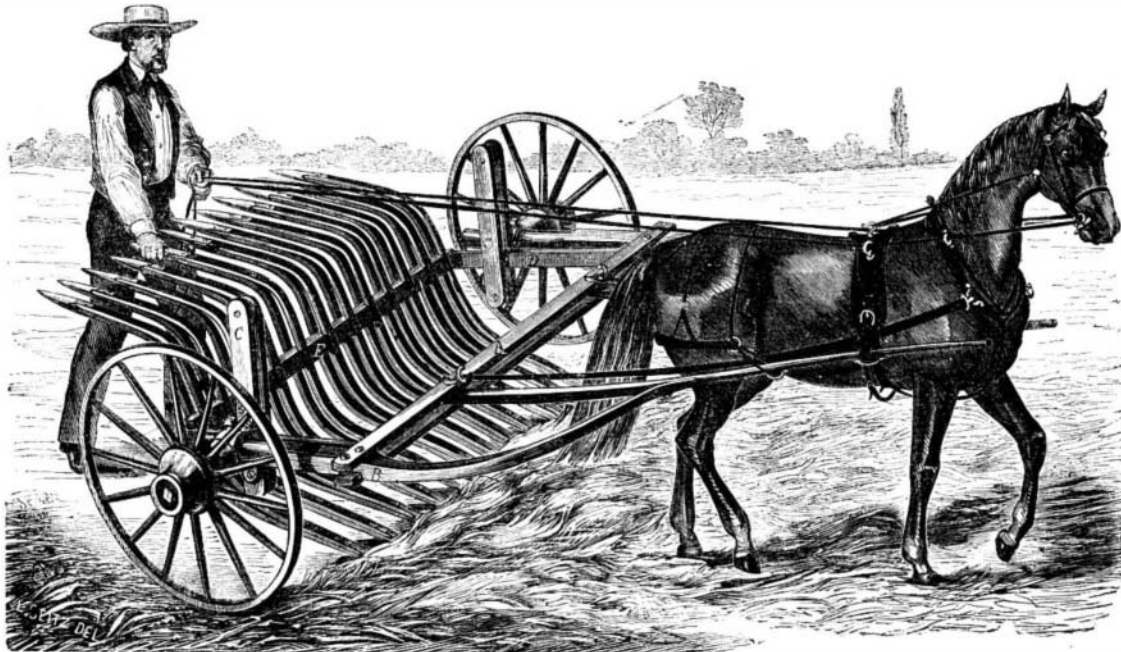
**A DEEP COAL MINE, WITH A DESCRIPTION OF ITS PUMPS, WINDING ENGINE, ETC.**

A very correct idea may be obtained of the deep English coal mines from the following extracts from a paper read by Mr. Higginbottom before the Manchester Geological Society, on the Astley Deep Pit, said to be the deepest coal mine in England.

The new pit, which has been sunk to the Black Mine on the Dunkenfield estate, near Manchester, is no less than 686½

yards deep from the surface of the ground. The usual diameter of this pit is 12 feet, with the exception of a short distance in the middle of its length, where it is widened to 12 feet and 6 inches to facilitate the passing of the chairs, and also excepting a short distance of the bottom of the pit, where it is gradually increased to 19 feet 20 inches. 320,981 cubic feet of materials have been taken out in sinking this pit, and 10,584 cubic feet in addition for mouthings. Out of the total depth of the pit 211 yards have been sunk through rock; 443½ feet through shale; and the remaining 32 through seam coal.

With respect to the coal seams, there are 26 of more than one foot in thickness, of which 15, with an aggregate thick-

**FREDERICK'S PATENT REVOLVING RAKE.**

ness of 58½ feet, have been worked at different places in the neighborhood and may, therefore, be considered to have a present commercial value. The shaft with the exception of 42 yards where it is tubed with cast-iron segments, is walled with a nine-inch wall of arch bricks, stiffened at intervals by stone wings, 18 inches thick, of which there are 80. Altogether, 7,308 cubic feet of stone, and 750,000 bricks have been used in the shaft exclusive of those employed in the mouthings, etc.

In sinking, water was met at the following depths: At 481 yards from the surface 40 gallons per minute; at 240 yards, 35 gallons; at 358 yards, 52 gallons; at 413 yards, 33 gallons; at 590 yards, 5 gallons, making a total of 165 gallons per minute.

This water is raised to the surface by seven lifts of plunger pumps; of these, the four upper are 12 inches in diameter, and the three lower 9, 7, and 6 inches diameter; they have all a stroke of eight feet.

The four heavy lifts average above 90 yards in length each, and are arranged alternately on opposites of the pump rods; each stroke of the pump raises 39 gallons, and consequently the engine has to run at an average speed of four and a quar-

ter inches diameter by seven feet stroke. The winding drums are twenty-four feet two and a half inches in diameter, and the whole weight of crank, crank axle, and drums, is fifty-three tons.

To one of the winding drums a brake drum is attached which is acted on by a steam brake of great power. Beside the winding drums, there is on the main shaft a balance weight drum 6 ft. 8 in. in diameter, to which is attached a balance weight of 5 tons. The engine is capable of making 25 strokes per minute, thus raising the load in the pit about 21 miles an hour. Allowing for the time lost in hooking on and taking off, the engine is able to raise 600 tons of coal in 10 hours.

The winding ropes are of wire 4½ inches broad by 1¼ inches thick at the top tapering down to 3¼ inches broad by ¾ inch thick. They weigh 4½ tons each, and the breaking strain at the thin end is 30 tons; the actual working load is 3½ tons, which is made up as follows: The chair, which is constructed to carry four double tubs, weighs 16 cwt., four tubs which weigh 17 cwt., and the coal weighing 32 cwt., making in all 65 cwt. The winding ropes pass over pulleys 15 feet in diameter, which are supported by the head gear at a height of 50 feet above the landing stage. Besides the engines described, which were erected by Messrs. Fairbairn of Manchester, there is on the ground a high-pressure capstan engine of 30-horse power by Messrs. Garforth, of Dunkenfield. There are now eleven boilers actually in use, and room in the boiler house for two more.

There are seven lifts in the pit, all being rams, the largest lift being 158 yards. There is also a small low-pressure engine which drives a circular saw and drilling and punching machines, and supplies generally the power required in the workshops. The workings are aired by the assistance of a dumb drift, which is driven up from a counter level to No. 2 shaft, rising two feet to the yard. The dumb drift is ten feet diameter, which forms an area of 78½ square feet, and enters the upcast shaft at 600 yards from the surface; the furnace drift is 25 yards from the pit bottom, being 61½ yards below the dumb drift.

Careful observations made during the sinking of the pit have shown that the temperature of the strata, increases with tolerable regularity from 57° at a depth of six yards to 75½° at a depth of 686½ yards. The temperature on the pit top, May 28, 1867, at 11 A. M., was 58°; at the pit bottom 64°; variation 6°: in the return air roads, when the air passes round the workings, and has done all its work previous to making its exit into the dumb drift, is 71°; variation from pit bottom 7°. There is now an incline at work at the bottom of the Astley pit, which is 250 yards down, lying at an angle of one foot to the yard, making the total perpendicular depth from the surface to the lowest point 770 yards.

**FAIR OF THE AMERICAN INSTITUTE.**

This exhibition, which is of a national character, has entered upon its second week, and is now in a presentable shape. We had hoped that before the issue of this present number of our paper we could have begun a report of the exhibition, taking the departments and their individual divisions *seriatim*. This has, however, been rendered impossible from the great extent and comprehensiveness of the exhibition, and from

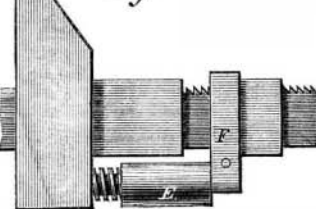
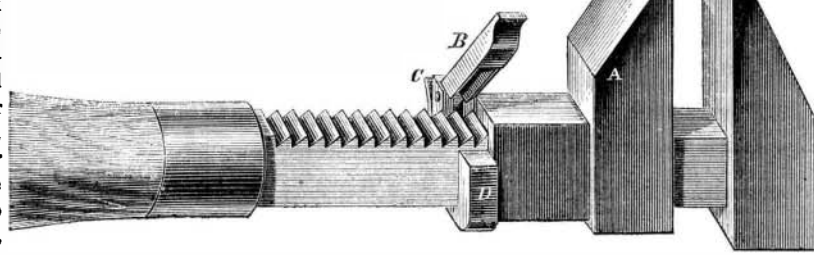


Fig. 1

**CHRISTOPHER'S IMPROVED WRENCH.**

ter strokes per minute for twenty-four hours. At full speed the engine would make from eight to nine strokes per minute. The pump trees are thirteen inches internal diameter, and are for the most part of wrought iron, the plates of which they are made to increase somewhat in strength toward the bottom of the lifts. The total weight of the pumping rods, joint plates, clamps, bolts, plunger poles, etc., is 85 tons; of this weight, 40 tons are balanced at the pit top, leaving 45 tons to overcome the weight of the column of water and the friction of the plunger poles, etc. The pumping apparatus occupies in the pit an area of twenty-nine square feet, leaving eighty-four square feet for winding.

The conducting rods are of pitch pine, attached to beams of the same wood, which are supported on cast-iron boxes set into the walling of the pit.

The horse trees are also for the most part of pitch pine, as are the pump rods, which are fifteen inches square at the top and diminish gradually downward to ten inches. The total amount of timber used in the pit is 5,882 feet.

The pumps are worked by a side lever Cornish engine, with a seventy inch cylinder eight feet stroke. The steam is supplied by three boilers, thirty-four feet long six feet 6 inches in diameter, with an ordinary working pressure of twelve lbs. to the square inch. The winding-engine cylinder is sixty

the fact that in one of the prominent departments—that of machinery—the power for its propulsion has been inadequate. This trouble will, however, be immediately remedied. Additional steam boilers are being daily added, and before our next issue the machinery department will be a hive of humming industry.

We might, even now, make some notice of particular portions of the exhibition, but we wait until we can give a view which shall not only be agreeable to our readers, but just to the exhibitors. In the meantime we advise all who can, to make a visit to this exposition of art and industry, and they will not fail to be greatly interested and benefited. One of the novelties which will attract attention is the pneumatic tube, in actual operation, by which passengers are shot through space as is a cannon ball; and another the letter delivery tube, by which letters and parcels are sent almost instantly from one point to another.

Music every evening and the brilliancy of the gas lights make the scene one of unusual beauty. The pictures and statuettes in the art department are seen to as good advantage in the evening as during the day, and the machinery performs its evolutions as satisfactorily. This is the period which seems to be the favorite one with the mass of visitors.