

Mr. Thomas Trebell, of Limehouse, County of Middlesex, England, has patented a paint for ships' bottoms and other submerged structures, consisting of rosin oil, black lead, French chalk, white zinc, oxide of iron, and tallow, mixed with turpentine, linseed oil, rosin, Gallipoli oil, tallow, shellac dissolved in alcohol, Venetian red, red lead, zinc paint, and tar spirit.

An improvement in the class of police nippers which are employed for seizing and holding the wrists or arms of prisoners, and the curved jaws of which are so connected that the movement of one of them in opening or closing it will cause a like movement of the other, has been patented by Mr. John B. Craig, of St. Louis, Mo.

HORIZONTAL STEAM ENGINE WITH AUTOMATIC SLIDE VALVE CUT-OFF.

In the construction of steam engines, the progress of improvement has been steady rather than remarkable; for, since the steam engine left the hands of James Watt, who invented separate condensation, expansion, steam jacketing, superheating, and the governor, it has advanced principally by improvement in details and construction, and not so much by the development of new principles. At the present time there are certain excellences sought after by nearly every builder of steam engines, namely, economy of fuel, regularity of speed, simplicity of construction, durability, and freedom from derangement, the greatest power with a given size of cylinder and pressure of steam, and, lastly, elegance of design and finish. In stationary engines we find an infinite variety of construction—some of unsymmetrical form, roughly constructed, with slight finish; and, again, others having every improvement that is considered really such by the designer, with elaborate finish, and beautiful but simple mechanism.

As an illustration of the latter class, the horizontal engine, with an automatic slide valve cut-off, constructed by Mr. Robert Whitehill, of Newburg, N. Y., may be considered an excellent one. By the accompanying engraving it will be seen that the general appearance of this engine is attractive in design, correct in proportions, and compact. But among its best features is the simple and positive automatic slide valve cut-off, which can be adapted to any plain slide valve engine with excellent results. From direct experiment it has been proved that with the use of this valve an increase of twenty per cent of power is gained, and a more perfect regularity of speed is secured.

This engine has three valves—the main valve, the cut-off valve, and the "grid" or governor valve. The main valve is the same as usually employed, and regulates the admission and exhaust. It can be adjusted independently of the cut-off valve. The "cut-off," or intermediate valve, slides on the back of the main valve, and is provided with a number of ports which are controlled by the governor valve.

The main and intermediate valves are driven by eccentric, in the usual manner, the intermediate having a motion coincident with the piston.

The cut-off valves are attached to the governor in such a manner that the governor, in rising by reason of an increase of speed, thrusts the valves apart and effects a cut-off or closure of the steam ports in the intermediate valve at an earlier period of the stroke. If the speed of the governor is decreased the cut-off valves are brought closer together and steam is admitted to the piston for a longer portion of the stroke. The range of the cut-off is from the closest point to full stroke, therefore when the engine is at a standstill the cut-off is out of action entirely, and the engine can be started at almost any point of the stroke.

Above is given a certified copy of an indicator card taken from a 16 x 36 engine, fitted with this cut-off, at the American Institute Fair, and is a proof of the efficiency of the mechanism.

For further information address the builder; as above, at Newburg, N. Y., or at 142 Greenwich street, New York.

MECHANICAL INVENTIONS.

Mr. Atley W. Ale, of Caro, Mich., has patented an improved door and sash clamp for clamping tables or benches for holding doors and sashes during the process of manufacture. The invention consists in a novel combination of levers and locking devices, whereby the door or sash can be clamped equally upon all sides and at one operation.

An improvement in mechanical movements has been patented by Mr. Peter Broadbooks, of Batavia, N. Y. The object of this invention is to provide mechanical movements which, in their operation, shall exert great force of compression in the performance of any kind of work. The invention, which has its principal application to punching and shearing machinery, consists in supporting a roller provided with a pin or axle on one end between a reciprocating plunger and a cam lever, so that the pin shall move in an inclined or curved mortise in the frame of the machine, and gradually nearer to a right line with the fulcrum of the

Larson, of South Pueblo, Col. When the machine is properly adjusted the setting of a saw is simply a matter of rolling it through the machine.

Mr. George F. Sawyer, of Liberty, Texas, has patented an improvement in bench planes. The object of this invention is to prevent dulling the cutting edge of a plane iron by the backward movements of the plane. The improvement consists in a stirrup pivoted to the sides of the plane in such a manner that the transverse piece of the stirrup passes through a transverse groove in the under surface of the plane, this groove increasing in height toward the rear of the plane, so that when the plane is drawn backward it will be slightly raised by this stirrup, so that the cutting edge of the plane iron cannot slide on the board being planed.

The Shaw Locomotive.

The Hinkley Locomotive Works of Boston, Mass., have lately built a locomotive after the designs of Henry F. Shaw, of Roxbury, Mass., intended to obviate those strains on the frame of the ordinary locomotive that are caused by the alternating thrusts of the unbalanced moving parts on each side of the machine. The impulse of the change of direction of the heavy side of wheel, etc., is in a "fore-and-aft" direction on one side of the engine, while it is vertical, either upward or downward, as the case may be, on the other side at the same instant, the former tending to rack the frame and the latter cause lateral oscillations, which it actually does, more or less, to the great damage of the road bed. The effect is far greater if the engine is rocking from side to side than what would be due to the simple impulse of the preponderating

weight of the reciprocating and revolving parts. The plan of the Shaw locomotive is to place a duplicate set of revolving and reciprocating parts on either side of the engine, so connected that one set on each side will be thrusting in the same direction at the same instant, and thus tend to correct this hitherto unavoidable objection to outside cylinder locomotives.

A trial trip was recently made with this new machine on the Camden and Atlantic railroad. The Philadelphia *Inquirer* gives the following as the dimensions of the four cylinders, etc.: They are "10½ inches in diameter, 24 inches stroke, equal to a 14½ x 24 of the ordinary locomotive. The cylinders are placed side by side in the same place. Four cylinders are contained within two castings, and do not increase the width of the locomotive as much as might at first be supposed.

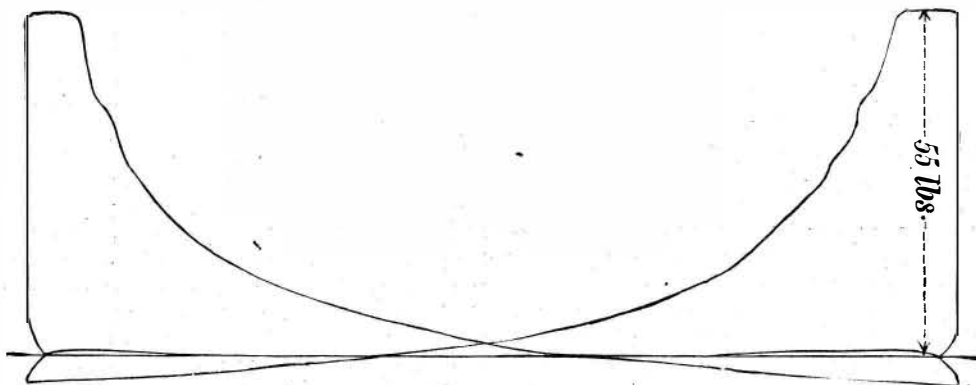
"One slide valve admits and exhausts steam to and from each pair of cylinders, which are placed side by side; the valves are operated by the usual link motion and rock arm (as is customary upon ordinary locomotives), thus avoiding the complication that would arise from the use of a separate slide valve for each cylinder. This engine, when running, cannot be distinguished from the ordinary locomotive having only two cylinders, as the steam is taken and exhausted from the opposite ends of two cylinders simultaneously.

"Many experiments have been made in balancing, reciprocating with rotating parts to run steadily with each other, on locomotive engines, as they are now built, involving some of the finest mechanical calculation; but all of them have been unsuccessful.

"This locomotive is built for fast running, and it is claimed that there is an increase in the area of wearing surfaces, perfect balancing of the revolving parts, due to divid-

ing the work between four steam cylinders. One of the remarkable tests that have been applied to this locomotive is to place it on four jack screws and elevate it clear of the track, and then to open the throttle valve and run the engine at a speed of two hundred and seventy-five revolutions per minute in this position without disturbing it, while an ordinary locomotive in this position would be disturbed at three revolutions per minute.

"The time made between Camden and Atlantic was seventy-seven minutes, which included two stoppages of six



INDICATOR CARD TAKEN FROM A 16x36 ENGINE.

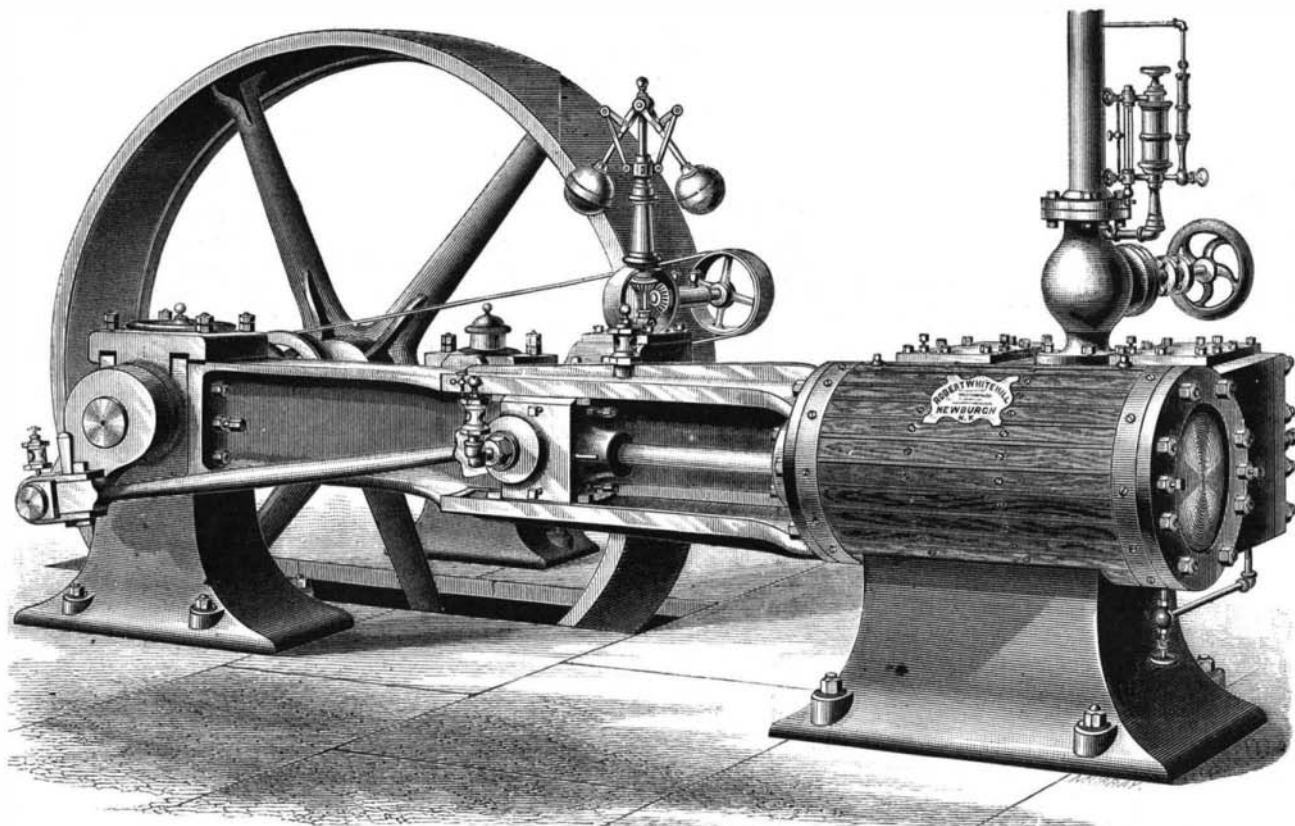
lever, and the point of contact of the roller with the reciprocating head or tool holder, to increase the compression as the operating tools are doing their work, and in so combining the frame of a machine which supports its operative parts with an upright post or standard that the compressive force exerted by the operating parts shall be increased by the addition of the entire weight of the frame and operating parts.

Mr. Elmer P. Newman, of Dimondale, Mich., has patented a metallic hub for vehicles having such construction that all escape of oil from the outer end of the axle is prevented, the hub being of cheap and simplified construction and adapted to be held upon the axle by a nut and collar fitted upon the axle at the rear end of the hub.

An improvement in pipe tongs has been patented by Mr. Deloss Worden, of Oil City, Pa. This invention is an improvement upon the improved pipe tongs shown and described in Letters Patent No. 240,067, granted to the same inventor April 12, 1881; and it has for its object to provide

improved means for holding the bite-block in the bite-chamber, such construction as to the relative size of the bite-block and bite-chamber that the durability of the block is increased, and such construction of the bite-tong and its chamber that any length of bite-block may be used for increasing the bearing surface of the bite-block upon the pipe, and thus removing all danger of crushing the pipe.

An improved mode of setting saw teeth by means of rotating wheels provided with projections for engagement with the teeth of the saw, has been patented by Mr. Emanuel



HORIZONTAL ENGINE CONSTRUCTED BY ROBERT WHITEHILL, NEWBURGH, N. Y.

minutes at Egg Harbor and Absecon, the actual running time being seventy-one minutes. The fastest mile was made in fifty-eight seconds, and two consecutive miles, each fifty-nine seconds, three cars on the train."

IMPROVED ICE MACHINE.

We give an engraving of a new machine for manufacturing ice on a commercial scale, which possesses many points of novelty and interest. It is the invention of Mr. D. L. Holden, of Philadelphia, the well-known inventor of ice machinery. The cooling agent employed in this machine is ammonia, which is manipulated in much the same way as is usual in this class of machines; but there are several improvements on pumps, valves, etc., which add greatly to the perfection and efficiency of the machine.

The freezing, as will be observed by reference to the engraving, takes place in a chamber, A, thoroughly protected against external heat and provided with a hollow central shaft, D, arranged to receive the non-congealable liquid from above and the water to be frozen from below.

Around this central shaft, and some distance from it, there

In starting the machine the aqua ammonia is warmed in the still, W¹, and drawn through the dehydrator, W², and drier, W³, by the pump, R, and forced through the cooling coils, L, where it is condensed, and from which it is conveyed to the reservoir, Q, in a liquid form.

After this reservoir is once filled the valves of the pipes leading to the pumps are changed so that the cycle is from the pipes, V, in which the liquid ammonia is expanded into gas, to the pump, thence to the coolers, L, thence back to the reservoir, Q.

This machine is continuous in its action, and easy to manage.

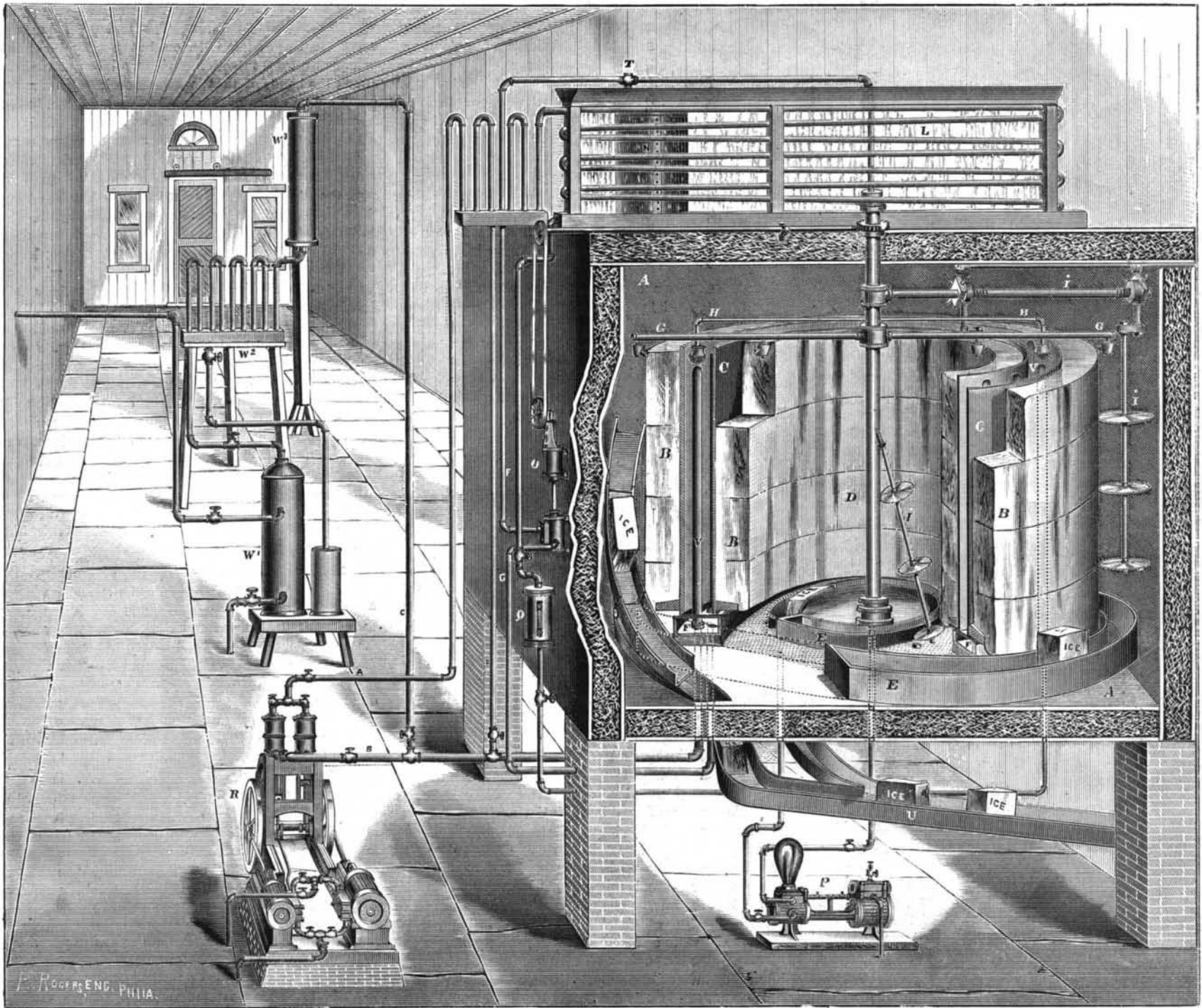
The engines and pumps used in this machine are duplex, and so arranged that either pump or engine can be stopped and the other continue to work. The pump pistons are converted into valves, and are as automatic as a slide valve. This is an important feature that will be appreciated by users of pneumatic pumps. The improvement in valves, connections, etc., is of great value, making them, as we are informed, absolutely ammonia tight.

Perhaps the greatest improvement is the method by which

sedimentary matters brought into it by the current of the water may be trapped off and prevented from passing through the head gates of the race. The invention consists in forming a trap in the bottom of the race which communicates with waste gates made in the side walls of the race.

A central unloading car, specially designed for dumping earth on railroads, has been patented by Mr. Joseph S. Halsey, of Lebanon, Ohio. The invention consists of a car having a platform constructed in longitudinal sections, pivoted at their ends within inclined slots made in the car sills in such a manner that when the platforms are elevated at their outer edges the weight of the load will cause their pivots to slide down the incline of the slots and depress the platforms at their inner edges, so that the load will be centrally dumped through an opening along the entire length of the platform.

An improvement in stamp mills has been patented by Mr. Frederick L. Preston, of Walworth County, Wis. The improvements relate to mills for crushing and pulverizing ores, and have for their object to furnish a simple, durable, and inexpensive mill. This mill consists of a V-shaped grating adapted to receive the angular face of a heavy hammer which



HOLDEN'S NEW ICE MACHINE.

are two concentric metal walls, C, resting in a circular trough, F, for receiving the non-congealable liquid, and in the center of the space between the plates, C, there are vertical pipes, V, in which the liquid ammonia is expanded into gas. Above these pipes, and in communication with the upper portion of the hollow central shaft by a pipe, H, there are two rose nozzles which receive a supply of the non-congealable liquid from the trough, F, through the pipes, G, I, the circulation being maintained by the pump, O.

The water to be frozen is forced by a pump, P, through the lower portion of the hollow shaft, D, and through the nozzles carried by the tubular arm, G. The water is directed in a stream against the circular wall plates, C, upon which it freezes and forms the foundation of the solid coating of ice that gradually forms within and outside of the walls, C.

When the cylinders of ice have acquired the desired thickness they are sawed up into rings by the circular saws which are carried by the shafts, *ii*; one set of saws being arranged for the inner cylinder of ice and another set for the outer cylinder.

The ice is loosened from the circular walls by temporarily elevating the temperature of the non-congealable liquid sufficiently to detach it. The ice is then cut into cubes and discharged through chutes in the bottom of the chamber.

the water is frozen, insuring perfect clearness and great rapidity in making the ice. The uncongealable fluid performs a double function; first, it conducts the heat from the water to be frozen through the iron plates; it refrigerates the room down to a low degree of temperature, and by this means causes surface freezing, thus permitting of freezing ice twelve inches thick in twenty-four hours, whereas by the old system of conduction alone it required from six to eight days.

The water flows in a stream upon the freezing surface in sufficient quantities to allow a surplus to run down and fall in the tank or pan beneath, washing off all air bubbles and other foreign substance, leaving the ice perfectly transparent and as hard as Kennebec ice.

ENGINEERING INVENTIONS.

A machine by which cuts on railroads can be cleared of snow rapidly and without the labor of shoveling, has been patented by Mr. Wayne Choate, of Glenwood, Iowa. The invention consists, essentially, in oscillating boxes and movable end gates, by which the snow is first gathered and then dumped.

Mr. Gordon Land, of Alamosa, Col., has patented an improvement in water races in which the sand and all other

crushes the ore as it is raised by wipers or friction rollers carried by the shaft of the machine.

An improvement in duplex steam engines has been patented by Mr. George Aab, of Brooklyn, N. Y. The invention consists in constructing a duplex steam engine with the piston rod of the one cylinder connected with the valve of the other cylinder by an arm, a connecting rod, and a crank arm, whereby the movement of the piston rod of each cylinder will shift the valve of the other cylinder.

Mr. John W. Thomason, of Salado, Texas, has patented an improvement in car couplings, which consists of certain devices whereby the coupling pin raised in the drawhead is supported until the drawheads strike each other in coupling, when the coupling pin falls by gravity. The invention also consists of devices whereby a link or pin may be raised separately or both raised simultaneously, as the case may require.

A novel rotary engine, patented by Mr. David O. Holman, of Adams, N. Y., consists in a new form of the cylinder and piston, and certain details connected therewith, whereby an engine is produced which will run with equal facility in both directions. It is what is practically two engines combined in one, which may be used either separately or both together.