

D. MAXWELL.

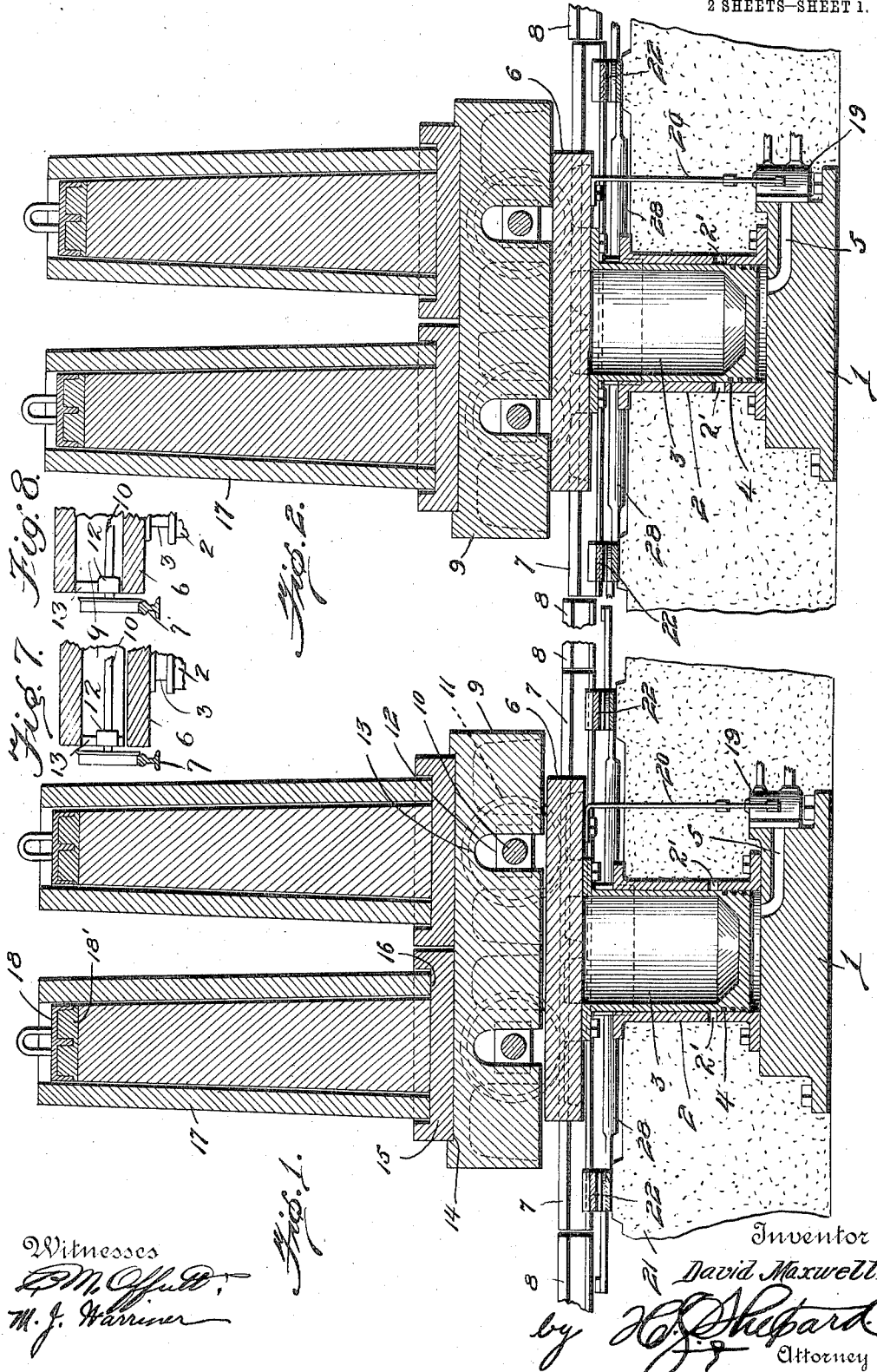
APPARATUS FOR MAKING CASTINGS.

APPLICATION FILED JAN. 9, 1911. RENEWED APR. 18, 1913.

1,062,290.

Patented May 20, 1913.

2 SHEETS—SHEET 1.



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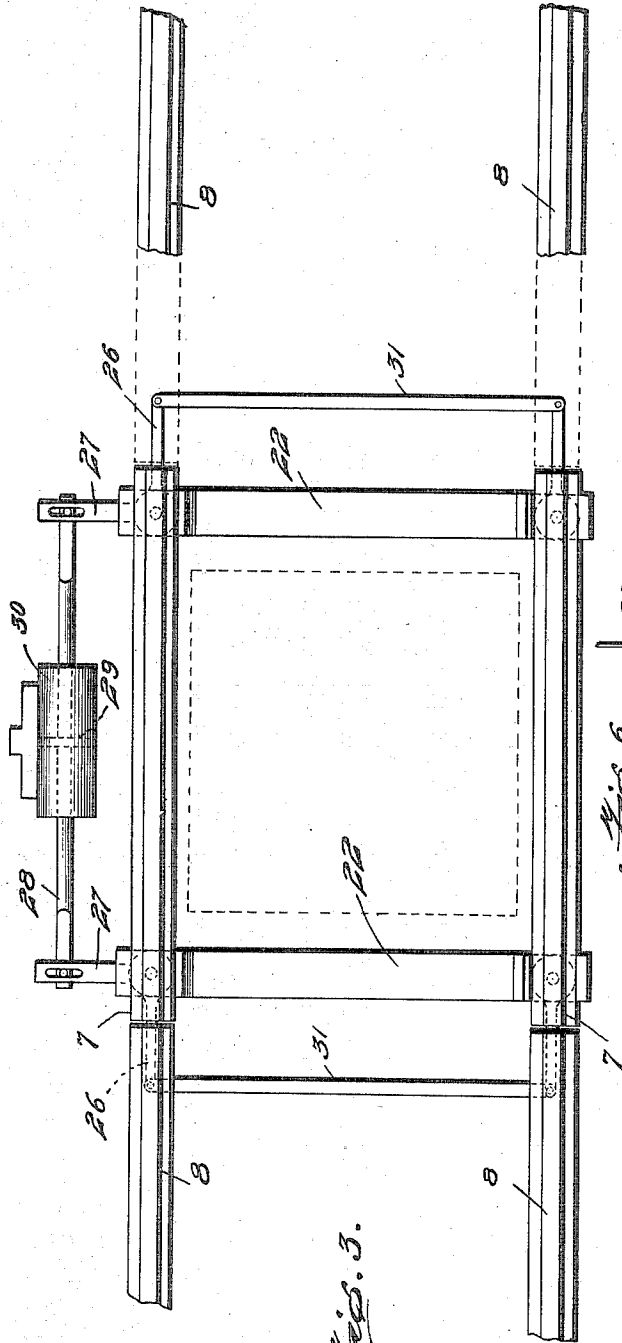


Fig. 3.

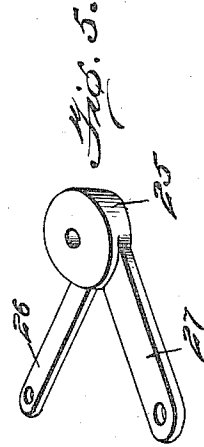


Fig. 5.

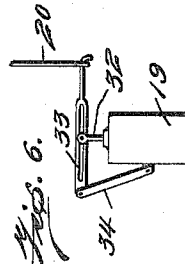


Fig. 6.

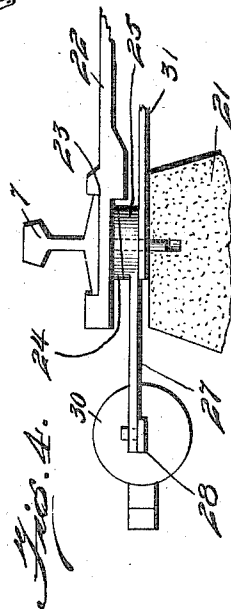


Fig. 4.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MAKING CASTINGS.

1,062,290.

Specification of Letters Patent.

Patented May 20, 1913.

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To all whom it may concern:

Be it known that I, DAVID MAXWELL, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented new and useful Improvements in Apparatus for Making Castings, of which the following is a specification.

This invention relates to the art of casting, and while applicable to castings in general is particularly designed for use in the making of ingots, and has for its object to prevent piping and segregation. Many attempts have been made to overcome these objections, mostly on the assumption that the defects were caused by the accumulation of gases, and the treatments have been for the most part chemical.

As the result of my investigations I am satisfied that the defects are mechanical, as well as chemical, and therefore I propose to prevent the defects by mechanical manipulation of the casting during solidification.

In carrying out my invention I submit the casting during solidification to a succession of impacts, preferably in a vertical direction, whereby successive downward impulses are given to the metalloids which will thereby be prevented from floating or rising to the top of the casting. It will therefore be apparent that my method will effectually prevent segregation and produce a homogeneous casting.

During the pipe forming period of solidification, whenever any bridges, hanging walls, or crusts form or tend to form, the impacts applied to the casting will effectually break down such bridges, hanging walls and crust, whereby the broken portions and molten metal combine into a molten mass. Consequently permanent bridges, hanging walls and crusts are effectually prevented and there is substantially no segregation nor piping of the casting.

With these and other objects in view, the present invention consists in the combination and arrangement of parts as will be hereinafter more fully described, shown in the accompanying drawings and particularly pointed out in the appended claims, it being understood that changes in the form, proportion, size and minor details may be made within the scope of the claims, without departing from the spirit of the present invention.

In the drawings,—Figure 1 is a vertical central longitudinal sectional view of an apparatus embodying the features of the present invention in position for receiving and discharging a mold. Fig. 2 is a similar view showing the apparatus in position for impacting. Fig. 3 is a detail plan view showing a means for raising and lowering the mold independent of the impacting mechanism. Fig. 4 is a detail view illustrating the elevating cam mechanism. Fig. 5 is a detail perspective view of one of the rotating cam elements. Fig. 6 is a diagrammatic view of means for varying the reciprocatory movement without stopping the apparatus. Figs. 7 and 8 are diagrammatic views on a reduced scale showing different elevated positions of the apparatus.

Like characters of reference indicate corresponding parts in each of the figures of the drawings.

Referring to the drawings; 1 designates a suitable base, from which rises an open top cylinder 2 within which works a plunger 3, suitably packed as desired. Elastic fluid under pressure, preferably air, is admitted into the bottom of the cylinder 2 beneath the plunger 3 through an inlet port or passage 5 which is in communication with any suitable source of supply. The top of the plunger 3 is provided with an enlarged head or table 6 of suitable dimensions according to the size and number of castings to be made.

The cylinder 2 is provided with escape ports 2', normally closed by the plunger 3, but which will become open should the bottom of the plunger rise above the level of the escape ports, thereby to permit escape of the fluid and prevent excessive elevation of the apparatus.

At opposite sides of the head or table 6 are provided rail sections 7 capable of being raised and lowered. These rail sections come into alinement with permanent rail sections 8 in the elevated position of the rail sections 7, whereby a suitable car or truck may be run onto and off of the movable rail sections 7 with respect to the main track 8.

A suitable truck or car is employed, for the support of the casting, and includes a body 9, axles 10, carrying suitable wheels 11 to travel upon the rails. Each end of each axle is mounted in a journal box 12 having a suitable amount of vertical play

preferably by being mounted in a slot 13 in the adjacent side wall of the body of the car, whereby the car body is permitted to reciprocate vertically upon the journal boxes 12. In the top of the car body or platform there is a socket or depression 14 for the accommodation of one or more casting plates 15 of the usual type.

Each casting plate has the usual socket or seat 16 to accommodate the lower end of any ordinary or preferred form of mold 17. Each mold is provided with a cover 18 in the form of a plug adapted to be inserted into the open top of the mold and float upon the molten metal, as will hereinafter appear. This cover preferably consists of a spidered casting filled with some suitable refractory or infusible material 18' forming a facing for the lower side of the cover to come into direct contact with the molten metal.

The length of the stroke of the plunger 3 as well as the rate of movement thereof may be changed in any suitable way, as for instance, through the means of a valve chest 19 communicating with the port 5, the valve in the chest being actuated by a connecting rod 20 secured to some movable part of the apparatus, for instance the head or table 6.

Any preferred or well known means for adjusting the connection 20 between the valve and the table 6 may be employed to vary the throw of the valve and thereby vary the length of the stroke of the piston or plunger 3 and the rate of movement thereof.

Any suitable means may be employed for raising and lowering the suitable rail sections 7, one form of which means being shown in Figs. 3, 4 and 5. Extending longitudinally between each rail section is a wall or abutment 21. Corresponding ends of the opposite rail sections 7 are connected by a tie bar 22, preferably provided at each end with a seat 23 for the reception of the rail 7. Fixed upon the under side of each end of the tie bar 22 and directly beneath the rail section, is a cam member 24 having a vertically inclined lower cam face resting upon the similar cam face of a rotatable cam 25 suitably supported upon the top of the wall or abutment 21. This rotating cam is in the nature of a bell-crank lever having angularly related arms 26 and 27, the arm 27 extending outwardly beyond the track and suitably connected to a piston rod 28 connected with a piston 29 working in a cylinder 30 located at one side of the track. The arm 26 of one cam is connected with the arm 26 of the other rotatable cam at the opposite side of the track by means of a connecting bar 31, whereby the two rotatable cams are simultaneously actuated. The cam faces at one end of the elevating device

are reversely arranged with respect to the cam faces at the other end of the device in order that both ends of the device may be simultaneously elevated and depressed by the operation of a single piston 29 from which the piston rods 28 extend in opposite directions.

In practising my invention with this type of apparatus, one or more molds are placed upon the carriage 9 and the latter run onto the movable rails 7, after which the latter are depressed, in the manner hereinbefore described, until the car body or platform rests vertically upon the plunger head 6. The mold is then poured, and impacts may be applied to the casting in a vertical direction throughout the pouring and solidifying periods or during any stages thereof, by manipulation of the fluid actuated plunger 3 to successively elevate and drop the car and the casting resting upon the top or head of the plunger. It will of course be understood that the plunger is dropped until its bottom strikes the base 1 and, as the casting rests directly upon the casting plate 15, the latter directly upon the car body or platform, and the latter directly upon the head of the plunger, an impact is applied directly to the material of the casting when the plunger reaches the limit of its downward movement and strikes the base 1.

After completing the operation, the track section 7 is elevated so as to come into alignment with the permanent track 8, and the truck or car is run off onto the track, and another car, carrying a poured or empty mold or molds is run onto the movable track section 7, and the operation continued as hereinbefore described.

The duration of the impact treatment and the time of starting the same with respect to the pouring of the mold depends upon the size of the casting to be treated and the character of the metal used. In some instances the impacting operation is started at the initial pouring of the mold and in other instances probably a foot of metal is permitted to accumulate in the bottom of the mold before the impacting is commenced. The initial rate of the impacts is relatively high so as to obtain but slight vibrations in the molten material. As the level of the metal rises in the mold, the length of the strokes of the piston is increased while the rate is decreased, thereby obtaining a greater drop of the casting and consequently a more violent impact. The more violent impacts are required in the final stages of the treatment for the purpose of breaking down the bridges, hanging walls and the crust which form in the top of the ingot.

The cover 18 which fits in the open top of the mold has a working fit therein so as to

float upon the top of the molten metal and rise and fall therewith. The purpose of this cover is to prevent the escape of heat and thereby maintain the top portion of the metal in a molten condition. It also prevents splashing of the molten metal out through the top of the mold.

Any suitable means may be employed for regulating the movement of the piston or plunger 3. For instance, as shown in Fig. 6 the valve stem 32 of the valve in the chest 19 may be slidably connected with a horizontal lever 33, one end of which is fulcrumed from an upstanding link 34 hinged upon the chest 19, the other end of the lever being connected to the rod 20 which is carried by and moves with the reciprocating table. By adjustably swinging the link 34 upon its hinge, the distance between the fulcrum of the lever 33 and its connection with the valve stem 32 may be varied; whereby the throw of the valve will be changed and the admission and exhaust of the fluid pressure through the port 5 may be properly regulated.

What is claimed is:—

1. An apparatus for applying impacts to castings while solidifying including a reciprocatory mold support, and a fluid actuated piston connected directly to the support for reciprocating the same.

2. An apparatus for applying impacts to castings while solidifying including a reciprocatory mold support, fluid actuated means for reciprocating the support, and means for varying the reciprocating movement of the support while the apparatus is in operation.

3. An apparatus for applying impacts to castings while solidifying including a reciprocatory mold support, fluid actuated means for reciprocating the support, and means for controlling the stroke of the mold support while the apparatus is in operation.

4. An apparatus for applying impacts to castings while solidifying including a reciprocatory mold support, fluid actuated means for reciprocating the support, and means for varying the rate of reciprocation of the mold support while the apparatus is in operation.

5. An apparatus for applying impacts to castings while solidifying including a reciprocatory mold support, fluid actuated means for reciprocating the support, and

means for varying the rate of reciprocation and stroke of the mold support while the apparatus is in operation.

6. An apparatus for applying impacts to castings while solidifying comprising a reciprocating mold support, fluid actuated means for reciprocating the same, a valve for controlling the supply of fluid pressure, means for automatically actuating the valve to effect reciprocation of the mold support, and means for shifting the valve while the apparatus is in operation to vary the movement of the mold support.

7. An apparatus for applying impacts to castings while solidifying comprising a reciprocating mold support, fluid actuated means for reciprocating the same, a valve for controlling the supply of fluid pressure, means actuated by the reciprocating mold support to actuate the valve, and means for shifting the valve while the apparatus is in operation to vary the movement of the mold support.

8. An apparatus for applying impacts to castings including a reciprocating head, track rails at opposite sides of the head, a mold supporting car, and means to raise and lower the rails independently of the head to lower the car for placing the same upon the head, and to elevate the car and lift the same above the head.

9. An apparatus for applying impacts to castings comprising a vertically reciprocating head, track rails at opposite sides of the head, a mold carrying car to travel upon the rails, and cam mechanism for raising and lowering the track rails to lift the car above the head and to lower it into engagement with the head.

10. An apparatus for applying impacts to castings including a vertically reciprocating head, track rails upon opposite sides of the head, a mold supporting car to run upon the rails, fixed and rotatable cams for the respective rails, said cams having vertically inclined coacting faces, and means for simultaneously actuating the movable cams to raise and lower the rails.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

DAVID MAXWELL.

Witnesses:

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BEATRICE D. VERNON.