

Sept. 22, 1925.

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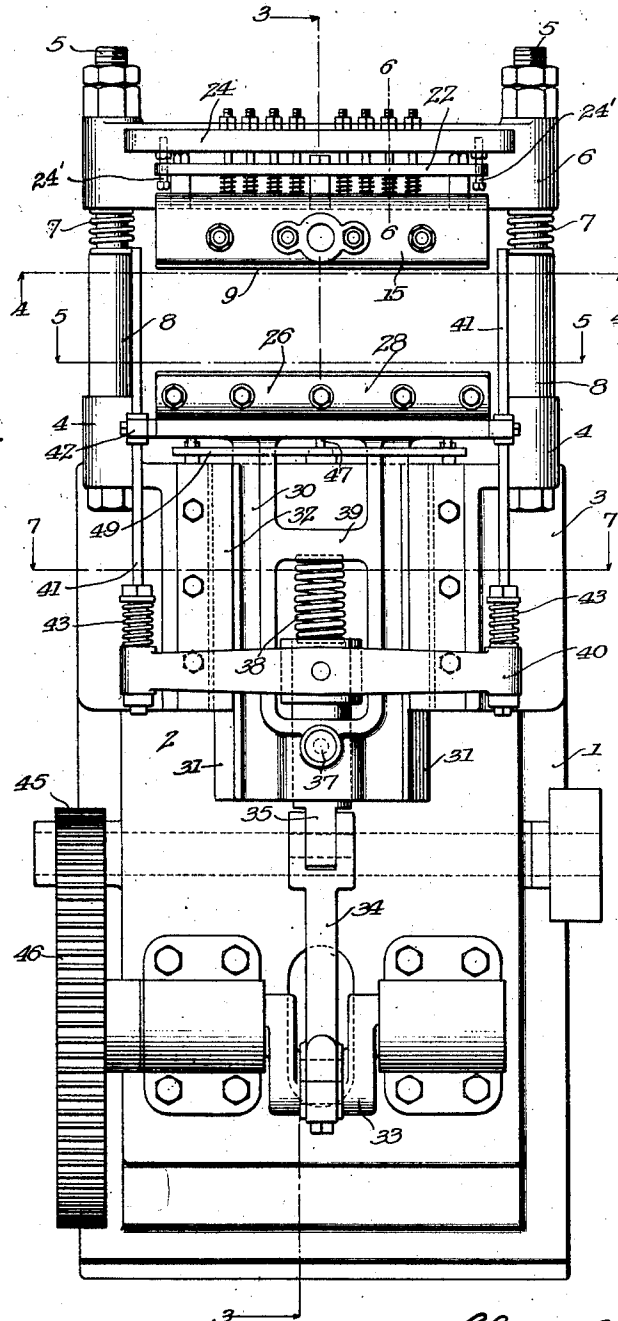
C. M. ANGELL ET AL

CASTING MACHINE

Filed Oct. 2, 1923

4 Sheets-Sheet 1

Fig. 1.



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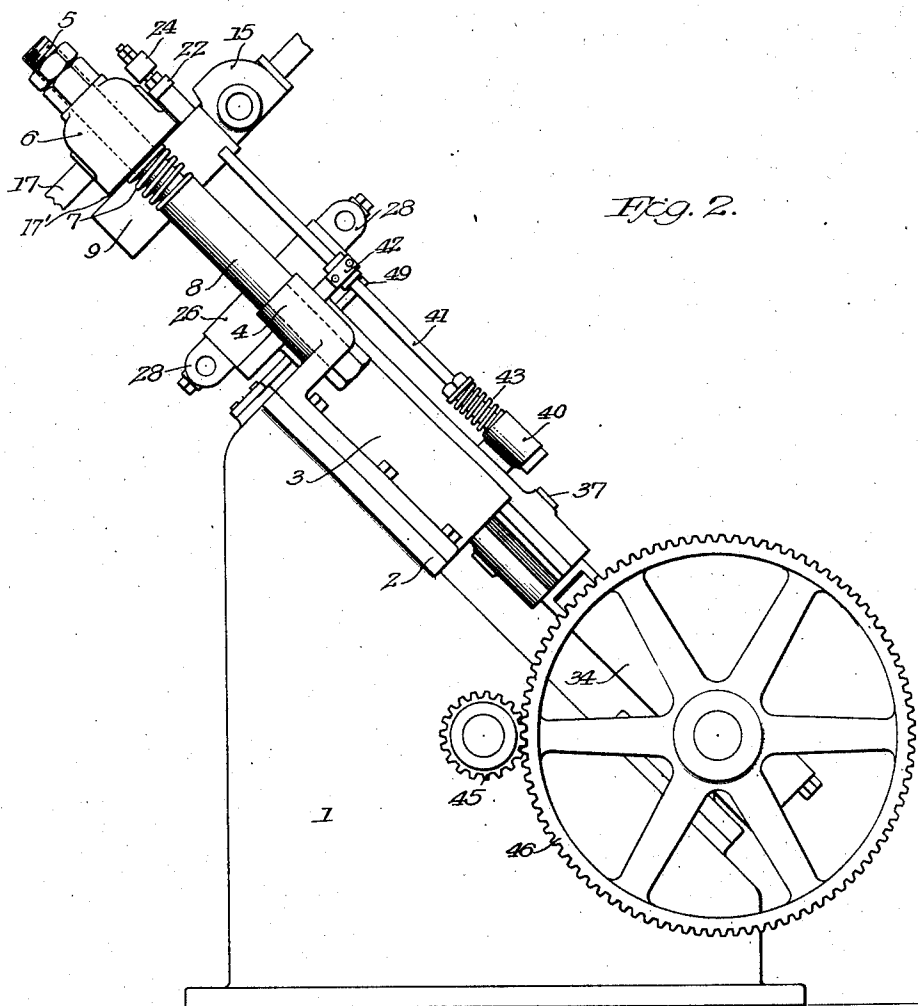
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4 Sheets-Sheet 2



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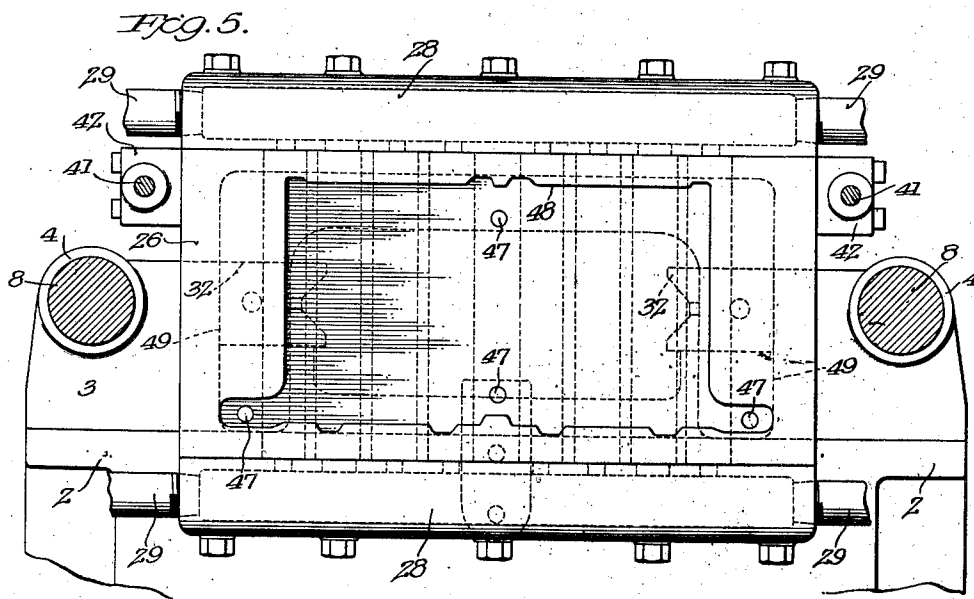
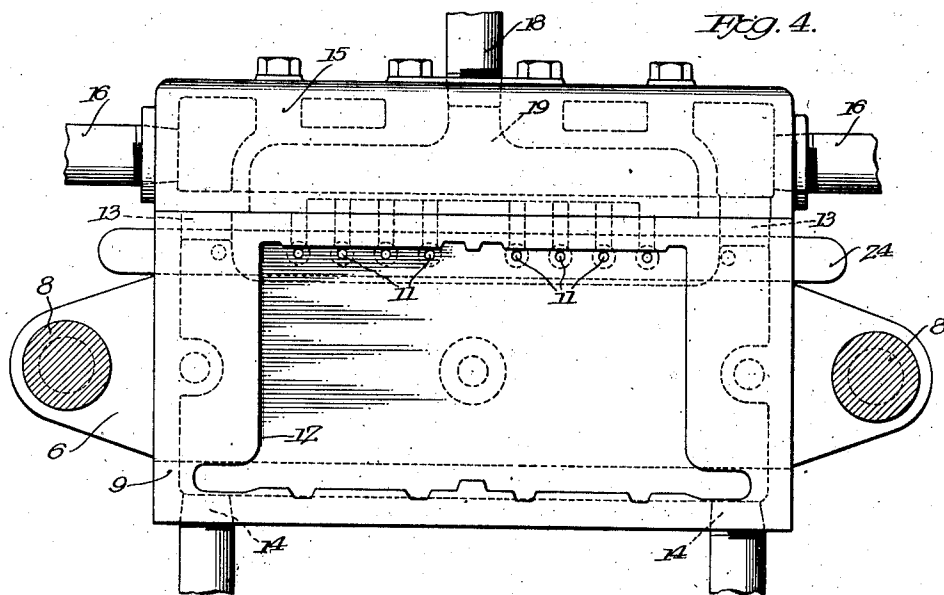
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CASTING MACHINE

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

CHESTER M. ANGELL AND HARRISON H. HOOD, OF CHICAGO, ILLINOIS, ASSIGNORS TO VESTA BATTERY CORPORATION, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CASTING MACHINE.

Application filed October 2, 1923. Serial No. 666,169.

To all whom it may concern:

Be it known that we, (1) CHESTER M. ANGELL, and (2) HARRISON H. HOOD, citizens of the United States, residing at (1) Chicago, (2) Chicago, in the county of (1) Cook, (2) Cook, and State of (1) Illinois, (2) Illinois, have invented certain new and useful Improvements in Casting Machines, of which the following is a specification.

10 This invention relates to casting machines and particularly to machines for casting relatively small articles in permanent molds.

Objects of the invention are to provide a simple and efficient machine which will be automatic in operation and in which cast articles may be made at a rapid rate. A further object of the invention is to provide a casting machine in which the mold cavity will be completely and quickly filled with the molten metal, thus insuring the production of perfect castings. More specifically, an object is to provide a casting machine having a pair of complementary mold sections, one of which is heated to insure a quick and complete filling of the mold cavity and the other is cooled to promote the rapid solidification of the cast metal.

These and other objects of our invention which will be apparent from the following description are attained in the embodiment of our invention which is illustrated in the accompanying drawings in which,

Fig. 1 is an elevation of the machine as seen when looking down upon the same at an angle of 45°;

Fig. 2 is a side elevation;

Fig. 3 is a vertical section taken on line 3—3 of Fig. 1;

Fig. 4 is a section taken on line 4—4 of Fig. 1 and showing a bottom elevation of the upper mold section;

Fig. 5 is a section taken on line 5—5 of Fig. 1 and showing a top elevation of the lower or movable mold section;

Fig. 6 is a vertical section taken on line 6—6 of Fig. 1 and illustrating one of the valves and associated elements;

Fig. 7 is a section taken on line 7—7 of Fig. 1 and illustrating details of the cross-head construction and valve operating mechanism; and

Fig. 8 is a fragmentary vertical section showing the arrangement of the knock-out pins in the movable mold section.

In the drawings, the supporting base 1 of the casting machine is shown as a hollow casting having an inclined upper face 2 upon which the mold supporting elements are mounted. A plate 3 which is attached to the upper or rear portion of the top face of the base 1 is provided with a pair of sleeves 4, through which pass rods 5 upon which the hollow cooling head 6 of the upper mold section is mounted. The cooling head 6 is not rigidly connected to the base but is slidable upon the rods 5 and is pressed upwardly against the nuts or heads of the rods 5 by springs 7 which are arranged between the lower face of the head 6 and enlarged portions 8 formed on the rods 5 and resting upon the upper faces of the respective sleeves 4 of the supporting plate. The upper mold section 9 is attached to the lower face of the cooled head 6, as by bolts 10, and the mold section is provided with a plurality of passages 11 for the introduction of molten metal into the relatively shallow mold cavity 12. The mold section 9 comprises a hollow casting having sets of openings 13, 14 through the front and rear walls, respectively, of the casting. The openings 13 are in alignment with similar openings in the rear face of the molten metal supply manifold 15 which is connected to the front face of the mold section 9. The heating passages in the manifold 15 are provided with suitable ports to which pipes 16 may be attached. These pipes, together with pipes which are fixed in the openings 14 of the casting 9 provide for the circulation through the mold section and manifold of a suitable heating medium, such as gaseous products of combustion. The head 6 is cooled by water which is circulated through the head by means of pipes 17 and a sheet of mica 17' is placed between the adjacent faces of the cooled head 6 and the heated mold section 9 to prevent the conduction and dissipation of heat into the machine itself. The manifold 15 is provided with an inlet 18 for the molten metal and an internal chamber 19 which has ports commu-

nicating with the several passages 11 of the mold section. Each of the passages 11 terminates in a seat which is located substantially at the mold cavity, each seat being
 5 provided with a valve 20, the stem of which extends above the mold section 9 and is provided with suitable packing. The several valves are urged towards closed position by
 10 22 and glands 23 through which the valve stems pass. The valve stems pass through the bar 22 and project above the valve lift bar 24, the upper ends of the stems being provided with adjusting nuts 25. Headed
 15 rods or bolts 24' which are fixed to the valve lift bar 24 and slide through openings in the valve spring bar 22 serve as guides and adjustable stops limiting the upward movement of the valve lift bar.

20 The lower or movable mold section 26 is provided with a plurality of passages 27 through which water or other cooling fluid may be circulated by means of the headers 28. The pipes 29 which are connected to
 25 the ports of the headers are provided with flexible or telescoping sections, not shown, to permit the circulation of fluid through the movable mold section. The mold section 26 is carried by a cross-head 30 having lateral V-shaped flanges 31 which are
 30 slidably mounted in adjustable bearing plates 32 on the plate 3. The cross-head 30 is reciprocated by a crank 33 through an arm 34 and rod 35, but is not positively connected to the rod 35. The rod 35 passes
 35 through the lower end of the cross-head 30 and is provided with a slot 36 through which passes a pin 37 which is fixed to the cross-head. A spring 38 arranged between
 40 end of the rod 35 and a transverse bar 39 on the cross-head tends to force the cross-head upwardly. This yieldable connection between the crank arm and the cross-head provides for a period of dwell during which
 45 the two mold sections remain in engagement.

The mechanism for operating the valves comprises a cross-bar 40 fixed to the head of the reciprocating rod 35 and two rods
 50 41 which are carried by the cross-bar and guided by bearing sleeves 42 mounted on the plate 3. The upper ends of the rods 41 engage the valve lift bar 24 to open the valves 20 after the two mold sections en-
 55 gage, the valves remaining open for the major portion of the period of dwell during which the mold sections are in engagement. Preferably the rods 41 are not rigidly connected to the cross-bar 40 but are slid-
 60 able therein and are yieldably held by springs 43. The crank shaft 33 may be operated in any suitable manner as from a drive shaft 44 through gears 45, 46.

To remove the completed article from the
 65 lower mold section, knock-out pins 47 are

provided, which pins are normally held with their upper faces flush with the mold cavity 48 by springs 49. As the mold section 26 approaches its lowermost position the knock-out pins 47 engage the plate 49
 70 and the further movement of the mold section ejects the finished casting from the mold. Due to the inclined arrangement of the mold section, the casting can readily slide from the mold onto an inclined dis-
 75 charge chute 50.

As one example of articles which may be formed in the casting machine, Figs. 4 and 5 show the outline of complementary mold
 80 cavities 12, 48 which will produce two battery grids joined at their lower edges. In actual use for this purpose it is obvious that the mold sections are provided with suitable projecting ridges or surfaces to form the desired grid-work but these details have
 85 been omitted from the drawings since this specific use of the machine is not an essential feature of our invention.

The operation of the casting machine will now be described. A heating medium is
 90 circulated through the stationary mold section 9, the molten metal manifold 15, while water or other cooling liquid is circulated through the movable mold section 26 and the upper header 6. The temperature of
 95 the upper mold section should be somewhat higher than the melting point of the metal to be cast before the machine is started. Molten metal is piped into the manifold 15 from a large melting pot under pressure
 100 (gravity or otherwise) which need not be great since the high temperature of the upper mold section insures a rapid and complete filling of the mold cavity. When power is applied to the drive shaft 44, the
 105 crank arm operates through the rod 35 and cross-head 30 to move the lower mold section into engagement with the stationary mold section, and these sections remain in engagement for an appreciable period due to the yielding of the spring 38. The continued movement of the rod 35 after the mold sections are in engagement operates, through the cross-bar 40 and rods 41, to
 110 raise the valve lift bar 24 and open the several valves. The continued rotation of the crank 33 moves the rod 35 downwardly to withdraw the valve operating rods 41 and thereafter to lower the movable mold section when the upper wall of the slot 36 en-
 115 gages the pin 37 on the cross-head. As the movable mold approaches its lowest position the knock-out pins 47 eject the casting which falls upon the discharge chute 50. The speed of operation of the machine is such that the period of dwell after the mold is completely filled is of such duration that the cold mold section 26 chills the casting to such an extent that it will hold its shape
 120 as the mold sections separate. As soon as
 125
 130

the sections separate the chilling effect is greatly increased as the newly cast article lies entirely on the cold section of the mold and the metal solidifies quickly. By the time that the casting is ejected by the knock-out pins the metal has completely solidified and cannot be damaged by the ejecting operation. Within the limits of adjustment afforded by the clearance of the pin 37 in slot 36, the period of dwell for a given speed of rotation of the crank shaft 33 may be controlled by raising or lowering the upper mold section by adjusting the position of the nuts on the upper ends of the rods 5.

In forming battery grids a suitable lead-antimony alloy is employed but obviously the machine may be employed for casting other articles of this or of other metals and alloys. It will be understood that the invention is not limited to the specific embodiment herein described as various changes may be made in the several parts, their relative size, shape, and location.

We claim:

1. A casting machine comprising a pair of relatively movable sections defining a mold cavity at their adjacent faces, a passage through one of said sections for introducing molten metal to said mold cavity, means for heating the said mold section and means for cooling the other mold section.

2. A casting machine comprising a pair of relatively movable sections defining a shallow mold cavity at their adjacent faces, a plurality of passages through one of said sections for introducing molten metal into said cavity, means for heating the said mold section and means for cooling the other of said sections.

3. A casting machine comprising a pair of relatively movable sections defining a shallow mold cavity at their adjacent faces, a plurality of passages through one of said sections for introducing molten metal into said cavity, means for heating the said mold section, means for cooling the other of said sections, means for moving said sections into and out of engagement and means operative to permit the flow of metal through said passages after the sections come into engagement.

4. A casting machine comprising a heated mold section, a passage in said mold section for introducing molten metal into the mold cavity, a valve in said passage, a cooled mold section, means for moving said mold sections into engagement and means for operating said valve.

5. A casting machine comprising a heated mold section, a passage in said mold section for introducing molten metal into said mold cavity, said passage terminating in a valve seat located substantially at the mold cavity, a valve for cooperation with said seat, a

cooled mold section, means for moving said sections into engagement and means for operating said valve.

6. A casting machine comprising a supporting base, a mold section carried thereby, a passage through said mold section, a valve in said passage, a movable mold section, means including a yielding element for translating said movable mold section, and valve operating mechanism carried by said means.

7. A casting machine comprising a supporting base, a heated mold section carried thereby and having passages therein for introducing molten metal into the mold cavity, a cooled mold section carried upon a reciprocating cross-head, crank mechanism for operating said cross-head and adapted to be continuously rotated, a yieldable connection between said cross-head and said crank mechanism, and means operated by said crank mechanism for controlling the flow of molten metal through said passages and into the mold cavity.

8. In a casting machine, a longitudinally movable cross-head, a mold section carried thereby, a reciprocating rod, a yieldable element between said cross-head and said rod and means carried by said rod adapted to operate valve mechanism for controlling the flow of metal into said mold section.

9. A casting machine comprising a supporting base, a stationary mold section, a movable mold section, a reciprocating cross-head upon which said movable mold section is mounted, a reciprocating rod, a yieldable element between said cross-head and said rod, a passage for introducing material into the cavity between said mold sections, a valve in said passage and valve operating mechanism carried by said rod.

10. A casting machine comprising an upper and a lower mold section, means for moving the lower mold section into and out of engagement with the upper mold section, means for heating the upper mold section, means for cooling the lower mold section and means for ejecting a cast article from the mold cavity of the lower mold section, the upper face of said lower mold section being inclined to the horizontal, whereby the ejected casting may drop away from said lower mold section.

11. A casting machine comprising a supporting frame, a fixed and a reciprocating mold section carried by said frame, the movable section being arranged below the fixed section and with its upper face inclined to the horizontal, a cooling head positioned between said fixed section and the supporting frame, means for heating said fixed section, passages in said fixed section for introducing molten metal into the mold cavity, said passages terminating in valve seats located substantially at the mold cavity, valves cooper-

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ating with said valve seats, means for cooling said movable section, a cross-head by which said movable section is carried, crank mechanism for reciprocating said cross-head and adapted to be continuously operated, a yieldable connection between said crank mechanism and cross-head, and means oper-

ated from said crank mechanism for controlling said valves.

In testimony whereof, we affix our signatures.

(1) CHESTER M. ANGELL.
(2) HARRISON H. HOOD.