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E. GATES.

APPARATUS FOR CASTING ALLOYS.

APPLICATION FILED JAN. 13, 1903.

NO MODEL.

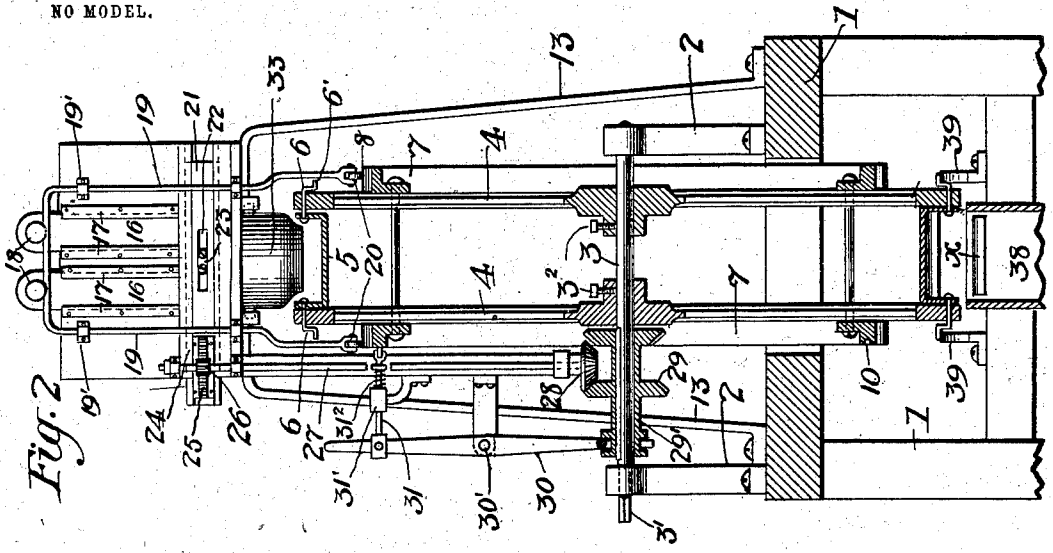

Fig. 2

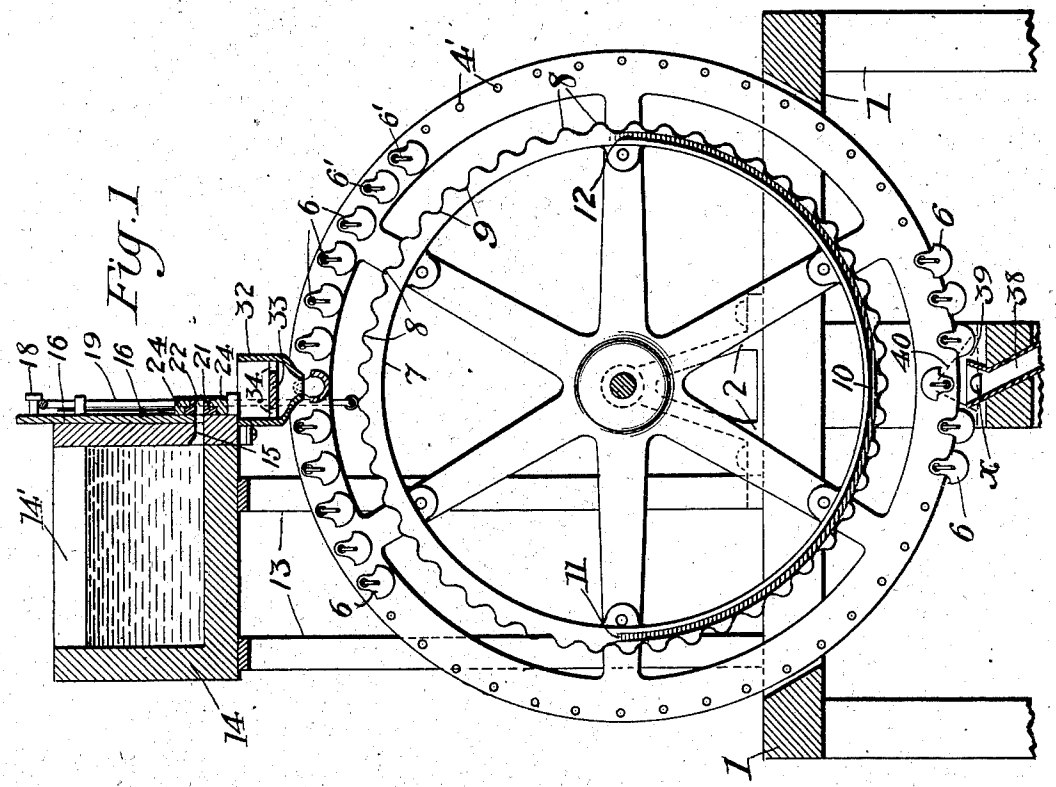

Fig. 1

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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR CASTING ALLOYS.

SPECIFICATION forming part of Letters Patent No. 729,755, dated June 2, 1903.

Application filed January 13, 1903. Serial No. 138,815. (No model.)

*To all whom it may concern:*

Be it known that I, ELMER GATES, a citizen of the United States, residing at Chevy Chase, county of Montgomery, State of Maryland, have invented certain new and useful Improvements in Apparatus for Casting Alloys; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The primary object of my present invention is to provide facilities for the production, preferably at a single casting operation, of a series of small ingots, exhibiting in succession a great many different alloys of two or more metals selected for the purpose, each alloy containing a different percentage of the component metals, whereby at a minimum expenditure of time and labor and at small expense the operator has at hand an entire series of different combinations of the metals chosen, and is therefore in a position to make a comprehensive study thereof, so as to determine their several physical properties and their availability for use in the arts.

In the accompanying drawings, Figure 1 is a side elevation, partly broken away, of an apparatus constructed and arranged in accordance with my invention. Fig. 2 is a front elevation thereof, partly in section.

Similar numerals of reference indicate similar parts throughout both views.

Preliminarily to a more detailed description it may be stated that in the practice of my invention I employ at a suitable height or elevation a tank or reservoir containing in separate compartments the metals from which the alloy bars or pigs are to be made, each compartment being provided with an outlet or discharge opening. The metals flow from the tank or reservoir into a mixing-chamber, wherein they become thoroughly commingled or combined, and from said chamber they discharge into the casting-mold, which is adapted to produce a series of alloy pigs in which the relative proportions of constituent metals vary in a predetermined manner from one pig to another of the series.

In the drawings I have shown one form of my invention, wherein I employ a rotary mold-carrier supporting a series of molds in which alloy pigs are cast. The operation of the parts is automatic, and the pigs are successively discharged from the molds into a hopper or other suitable receptacle therefor.

Referring to the figures, 1 indicates a base which is provided with a longitudinal opening and which is supported in a raised position by means of suitable legs. The rotary mold-carrier comprises two disks or rings 4, each having a central hub and radial spokes, the two rings being mounted upon a revolving shaft 3 and adjustably secured thereon by means of set-screws $3^2$. The shaft is operated in any suitable way and is supported in bearings at the upper ends of vertical supports 2. The said rings are each provided with a series of corresponding openings 4', and passing through each of said openings is a pin 6, each pin being provided at its outer end with a crank 6'. Corresponding pins 6 of each ring are secured at their inner ends to the opposite ends of molds 5, in which the alloy pigs are cast. The said molds are each so suspended between the rings as to have a free swinging motion, and they are thus rendered self-adjusting in conformity with the constantly-changing positions into which they are brought by the revolution of the rings. At each half-revolution of the said rings each of the molds is tilted upside down, so as to discharge its contained pig, after which the mold resumes its former position and is carried on to be again filled with the fluid metals. Different means may be used for tilting the molds to discharge their contents, but preferably I employ beneath the base or platform 1 two stationary cams 39, which are secured to a cross-brace connecting two of the supporting-legs of the base, which cams are each provided with an inclined surface 40. As each mold is carried around to the cams the cranks 6' ride upon the said inclined surfaces 40 and the mold is tilted upside down, whereupon the alloy $x$ is discharged into the hopper or other receptacle 38 and the said mold is carried all the way over by the highest point of the cam and again resumes its upright position as before.

The tank for the fluid metals is indicated

at 14, and the same is held in position above the mold-carrier by means of supports 13, secured to the base or platform 1. The tank 14 is divided by a partition 14′ into two compartments, each compartment being provided with a discharge-opening 15, formed in the front wall of the tank, and each of said openings discharges into a mixer 32, which in turn discharges the metals in a mixed condition into the molds as the mold-carrier is revolved. The discharge-openings 15 are controlled by the gates 16 16, respectively, which are opened and closed automatically with the filling of each mold, to effect which I employ the following devices: Fastened concentrically to the outer side of each disk or ring 4 is a smaller ring 7, having on its circumference a continuous series of raised surfaces or cams 8, the edges of which are slightly inclined in opposite directions, with intervening notches 9.

Working in suitable guides 19′, secured to the front of the tank, is a vertically-movable frame or yoke 19, which is spread so as to bring the two ends thereof in proper position to be engaged by the cams 8, while the upper cross-piece of said frame comes directly beneath pins or projections 18 on the front faces of the gates near the upper edges of the latter. The lower ends of the said movable frame are each provided with a small roller 20, which rollers ride the two series of cams. It is evident that as the rings 4 are revolved the frame is given a rising-and-falling motion and the gates are raised and lowered therewith, it being understood that the gates are permitted to fall by their own weight in the guides 17 therefor, arranged on the front of the tank. It will be noted that when a mold has been brought into position for filling the bottom of said mold is directly over one of the notches 9, while the cam 8, which succeeds said notch, has raised or lifted the gates to their highest position. As the motion of the rings is continued the frame is lowered into the next notch and the gates are closed until the next mold is brought into position, and thus is the operation adapted to be carried on continuously. The revolution of the rings can be easily regulated or timed in manner to prevent flooding of the molds, and when it is desired to use molds of smaller size the rings 4 are merely moved closer together by releasing and afterward resetting the set screws $3^2$.

In order to carry out the primary object of my invention, it is essential that the metals be mixed or combined in constantly and reciprocally varying percentages or proportions as they leave the tank, and to attain this end I provide means (operating during the discharge of the metals from the outlets 15) for gradually closing one of said outlets and correspondingly opening the other.

The means for effecting the gradual opening of one outlet 15 and gradually closing the other simultaneously consists of a slide 21 moving transversely across said outlets, which slide is provided with an elongated orifice 22, within which projects a small plate or block 23, secured to the front of the tank by screws. This plate serves as a stop to limit the movement of the slide 21 in either direction and also to divide the elongated slot into two ports, which are adapted to register with the outlets from the respective compartments of the tank 14 when said slide is in mid-position, as indicated in Fig. 2. The slide 21 is retained in position by two angle-plates 24, also secured to the front face of the tank.

The movable slide 21 is operated by a toothed rack 25 near one end, which is engaged by a pinion 26, carried by a vertical shaft 27, provided at its lower end with a beveled gear-wheel 28, which is adapted to engage and operate one or the other of the beveled gears 29, thereby reversing the movements of said parts automatically without reversing the motion of the main operating-shaft. The reversing means consist, preferably, of a sleeve 29′, movable lengthwise on the shaft 3 and having a spline fitting a longitudinal groove in the shaft, by which the said sleeve is caused to turn with said shaft. The sleeve is provided with two beveled gear-wheels 29, adapted to engage the beveled gear-wheel 28 on the lower end of shaft 27, and the said shaft will be made to revolve in one direction or the other, according to which one of the movable gears is in engagement with said gear-wheel 28. Pivoted at 30′ is a lever 30, the lower bifurcated end of which embraces the outer end of sleeve 29′ between two collars or flanges thereon, and normally the said lever is in a substantially vertical position, with one of the gears on the sleeve in engagement with gear-wheel 28. Now to reverse the motion of shaft 27, and consequently to change the direction of movement of slide 21, it is merely necessary to move the lever to shift the sleeve 29′, and this is done automatically each time that the slide 21 reaches the limit of its travel in either direction. This is accomplished by ring 7, adjacent to the lever, which ring is provided on the outer side with a groove or cam 10, beginning at 11, say, and extending around and ending at the diametrically opposite point 12, and said groove or cam is for the purpose of engaging or operating upon the inner end of a movable rod 31, supported and guided in a bearing 31′ and provided with a spring $31^2$, exerting its tension between the inner end of said bearing and a nut on the rod. Said rod at its outer end is connected to the lever 30 by means of a collar having a set-screw. The tendency of the spring is to force the inner end of the rod against the side of the ring 7, and the rod is provided with a roller which moves upon the surface of the said ring during one half-revolution of the mold-carrier and in the groove of the cam during the remaining half-revolution of said carrier. Therefore during the time the inner end of the rod 31 is in contact with the flat surface

of the ring 7 the lever 30 will be substantially in the position shown, and one of the gears 29 will be in engagement with gear-wheel 28 to operate shaft 27 to move the slide 21 in one direction across the outlets 15 of the tank. By the time the said slide has reached the limit of its movement in this direction the roller on the end of rod 31 will enter the groove 10 and lever 31 will be rocked to shift the sleeve 29′ to change the gear connection with shaft 27. This reverses the motion of said shaft, and consequently reverses the movement of the slide, thereby producing a second series of pigs, with the proportion of the respective metals in the various alloys in the reverse order.

Having thus described my invention, what I claim is—

1. In an apparatus for making alloys, a series of receptacles for molten metals, each having a metal-discharging outlet, means for gradually and simultaneously opening one outlet and closing the other during the discharge of the metals therefrom, and a rotary mold for receiving the metals discharged.

2. In an apparatus for making alloys, a series of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets automatically at intervals, means for gradually and simultaneously opening one outlet and closing the other during the discharge of the metals therefrom, and a rotary mold for receiving the commingled metals.

3. In an apparatus for making alloys, a series of receptacles for molten metals, each having a discharge-outlet, means for gradually and inversely varying the discharge of metals from said outlets, a mixing vessel receiving the discharge, and a rotary mold for receiving the commingled metals.

4. In an apparatus for making alloys, a series of receptacles for molten metals, each having a discharge-outlet, means for gradually and inversely varying the discharge of metals from said outlets, a mixing vessel receiving the discharge, and a rotary carrier supporting a series of molds into which said vessel discharges.

5. In an apparatus for making alloys, a series of receptacles for molten metals, each having a metal-discharging outlet, a movable slide for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metals therefrom, a movable mold-carrier, and means for reversing the movement of the slide automatically when it reaches the limit of its movement in either direction.

6. In an apparatus for making alloys, a series of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets automatically at intervals, a movable slide for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metals therefrom, a movable mold-carrier, and means for reversing the movement of the slide automatically when it reaches the limit of its movement in either direction.

7. In an apparatus for making alloys, a series of receptacles for molten metals, each having a metal-discharging outlet, a movable slide for gradually and simultaneously opening one outlet and closing the other, a mixing vessel receiving the discharge, a rotary mold-carrier supporting a series of molds into which said vessel discharges, and means for reversing the movement of the slide automatically when it reaches the limit of its movement in either direction.

8. In an apparatus for making alloys, a series of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets simultaneously at intervals, a movable slide for gradually and simultaneously opening one outlet and closing the other, a mixing vessel receiving the discharge, a rotary mold-carrier supporting a series of molds into which said vessel discharges, and means for reversing the movement of the slide automatically when it reaches the limit of its movement in either direction.

9. In an apparatus for making alloys, a series of receptacles for molten metals, each having a metal-discharging outlet, a rotary mold-carrier supporting a series of molds, means operated automatically from said carrier for shutting off the outlets simultaneously at intervals, a movable slide for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metals therefrom, and means operated from said carrier for reversing the movement of the slide automatically when it reaches the limit of its movement in either direction.

10. In an apparatus for making alloys, a series of receptacles for molten metals, each having a metal-discharging outlet, sliding gates for shutting off such outlets at intervals, a slide for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metals therefrom, a mixing vessel receiving the discharge, a rotary mold-carrier supporting a series of swinging molds, rings on the sides of the carrier each having a series of cams on its circumference, a movable yoke or frame operated by said cams to raise and lower the gates, and means for reversing the movement of the slide when it reaches the limit of its movement in either direction.

11. In an apparatus for making alloys, a series of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets at intervals, a movable slide for gradually and simultaneously opening one of the outlets and closing the other, during the discharge of the metals therefrom, a main shaft carrying a rotary mold-carrier supporting a series of molds, a vertical shaft operating the slide, a sleeve on the main shaft carrying reversing-gears adapted to en-

gage a gear on said vertical shaft, a lever having a movable connection with the sleeve, a spring-actuated rod pressing against the side of the mold-carrier and connected with the lever, and a groove or semicircular cam arranged on the same side of the mold-carrier, and adapted to engage the inner end of said rod during one half-revolution of said carrier.

12. In an apparatus for making alloys, a series of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets at intervals, means for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metals therefrom, a mixing device for the metals, a rotary mold-carrier supporting a series of independently-swinging molds, and means for tilting or turning the molds successively to empty the same of the molded alloys.

In testimony whereof I affix my signature in presence of two witnesses.

ELMER GATES.

Witnesses:
EDWIN S. CLARKSON,
JOHN C. PENNIE.