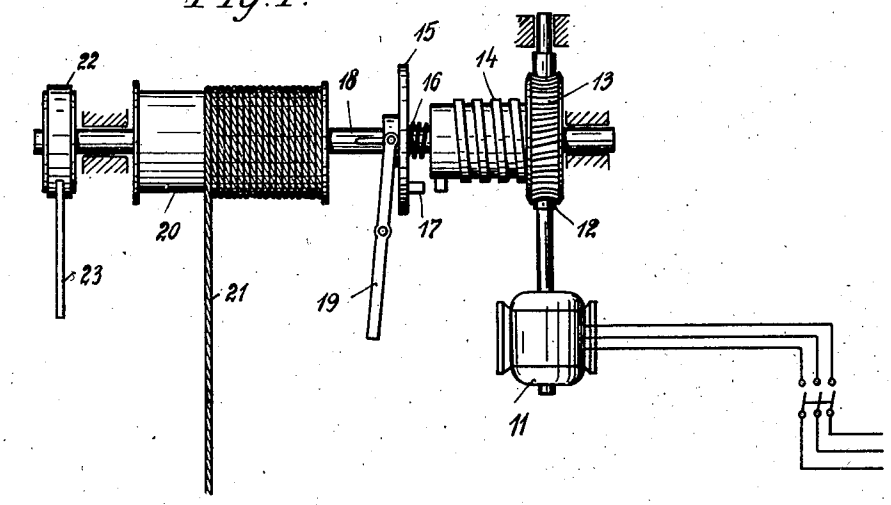
Jan. 8, 1929. 1,698,441

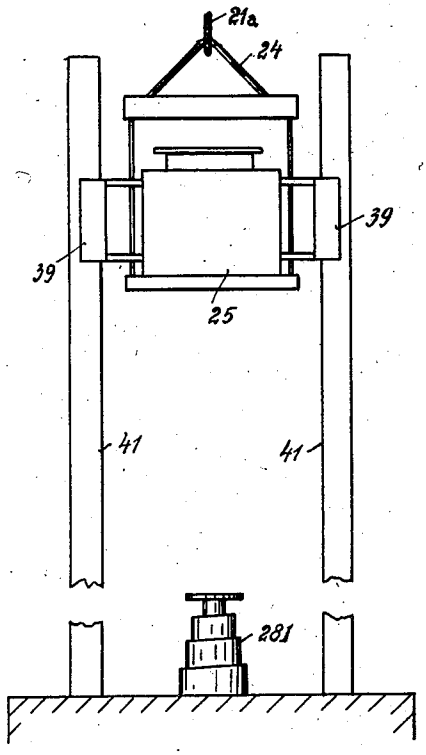
R. KOLB

DEVICE FOR CASTING METAL IN MOLDS

Filed Aug. 8, 1927 2 Sheets-Sheet 1

Fig. 1.





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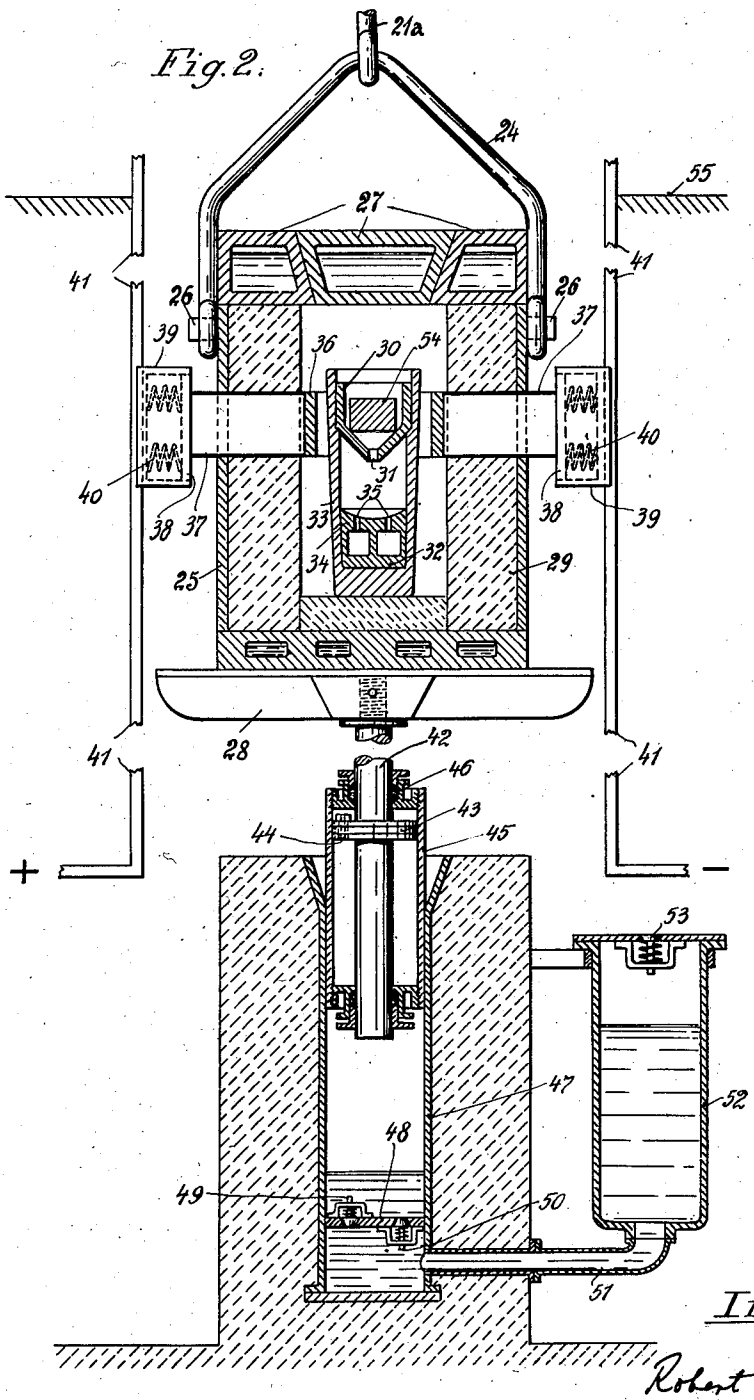
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DEVICE FOR CASTING METAL IN MOLDS

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Fig. 2.



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UNITED STATES PATENT OFFICE.

ROBERT KOLB, OF BERLIN, GERMANY.

DEVICE FOR CASTING METAL IN MOLDS.

Application filed August 8, 1927, Serial No. 211,476, and in Sweden August 25, 1926.

The object of the invention is to insure a perfect filling of the molds in casting metal and at the same time to effect a good compression of the metal. Unless special means are resorted to, slow-flowing metal fails to fully fill out the molds and becomes porous so that imperfect, or at the best, imperfect castings result. The invention consists in filling the mold and its sprue-hole with metal, then moving it downward and again stopping. In stopping the metal is then pressed into the mold by its inertia. In this process it is found most satisfactory to move the mold simultaneously and together with the smelting furnace, in order to prevent a premature hardening of the metal. The herein disclosed process and apparatus are not only adapted for casting of metals but fluid alloys, compositions or mixtures. The apparatus for carrying out the invention consists in a melting pot with an underneath outlet which is placed over a mold, the furnace being guided perpendicularly and locking and unlocking at the upper end of the guides.

The drawings illustrate an embodiment of the invention, whereby—

Fig. 1 is a view of the general arrangement of a furnace with shock-absorber, and Fig. 2 a longitudinal section with buffer-cylinder and pressure-compensation-tank.

In the device as shown in Fig. 1 a motor 11, driven by a three-phase current, for instance, rotates by means of the worm 13 and the worm-wheel 12 with a powerful spring 14 wound around its barrel. In front of the free, front end of this spring-drum a disk 15 on shaft 18 may be shifted longitudinally by moving the hand-lever 19 of the winch. This disk 15 is pressed away from the front side of the spring-drum by the cylindrical spiral spring 16, and by means of a groove, grasps a key secured to shaft 18. A tappet 17 on the disk 15, after overcoming the resistance of the compressible spring 16 comes within the range of the revolving spring 14 with the motor 11 running. In this position the winch is engaged and disk 15 as well as shaft 18 with the keyed-on rope-drum 20 participate in the rotary motion of the worm-wheel 13. Hereby the wire-rope 21 is wound up on the barrel of the rope-drum 20, lifting the load on the rope-hook 21^a. By moving hand-lever 19 into the off position the rope-drum 20 with the load suspended from hook 21 is locked by brake 22 by means of its operating lever 23. The winch is provided with an unlocking device which may also be a suitably constructed brake 22 so that the brake-lever 23 may simultaneously serve as an unlocking lever.

The hanger 24 of the furnace 25 is suspended from the hook 21^a, situated at the end of the rope, said furnace sliding up and down by means of shoes 39 on perpendicular rails 41 of a guide. These perpendicular guide rails 41 are securely set in foundation blocks, a shock-absorber, as, for instance, a spring-buffer 281 being interposed between the rails 41.

The furnace 25 shown in Fig. 2 is an electric resistance furnace and rests in its hanger 24 by means of supporting pins 26. It can be closed by removable hollow plates 27 with partially slanting lateral surfaces, is provided with a cross-girder 28 underneath and is lined with refractory bricks 29. In the interior chamber melting pots 30 with underneath outlet 31 and a mold 32 are contained jointly in a receptacle 33. The mold 32 is provided with a cover 34 which is preferably cast and made integral with the mold 32 and is only used once and is broken up when casting is obtained. Ingates 35 in the cover result in a sullage-piece when, in filling the mold, the metal fills the ingates as well. The part of the receptacle in which the melting pot 30 is located is surrounded by the annular heat resistance 36 of the resistance furnace so that this part of the receptacle is heated more, whereas on the other hand the part containing the mold is also heated, but to a lesser degree by radiation and convection. Two insulated current conductors 37 lead from the ring 36 and laterally out of the furnace, each ending in a plate 38 of rectangular or other suitable shape. The plates 38 constitute the covers of two boxes 39 which contain the springs 40 which press said boxes against the two guide rails 41. The guide rails 41 are encircled by the bottoms of the boxes 39 and are at the same time conducting rails conveying electric heating current from any desired current supply.

At the bottom of the furnace on the cross-girder 28 is a piston-rod 42 carrying a piston 43. A bolt 44 with a very narrow longitudinal cavity is screwed into the piston and may, when necessary, be interchanged with another bolt with a narrower or wider

cavity. The piston 43 is arranged to move air- and liquid-tight in a cylinder 45, through which the piston-rod 42 passes, fitting tight through its cover by means of the stuffing boxes 46. As may be necessary, the cylinder 45 may be filled with air or a liquid, and in turn forms the piston of a buffer-cylinder 47, somewhat widened at the top. At its lower end the buffer-cylinder 47 is closed by a plate 48 in which a suction-valve 49 and a relief or safety-valve 50 are provided. The buffer-cylinder 47 is supported in a foundation block of concrete as indicated. A pipe-conduit 51 leads into the chamber beneath the plate 48, connecting the latter with the lower part of a tank 52. Tank 52, located at the side of the foundation block, is fitted, in its cover, with a suction-valve 53. The lower portion of the buffer-cylinder 47, the tank 52, the pipe 51 and the chamber under plate 48 are filled with liquid.

The invention is applied in the following manner: A block 54 of the metal to be fused is placed in the melting pot 30 whereupon the furnace is closed and the electric current turned on. The fusing metal drips through the outlet 31 onto the cover of the mold 32, flowing through the ingates 35 into the mold. The size of the metal block 54 is always such as to fill the form with a slight excess. This excedent, together with an amount of metal corresponding to the incomplete filling out of the mold, fill the ingates 35 of the cover 34, to their inner upper edge more or less. As soon as the mold is filled as far as is necessary, the unlocking device of the winch is set in action, the furnace drops without the boxes 39 leaving the guide rails 41 or the current being interrupted. At the bottom the cylinder 45 penetrates into the buffer-cylinder 47. Hereby it compresses the air in the buffer-cylinder to a pressure which opens the relief or safety-valve 50. At this point liquid passes from the buffer-cylinder 47 into the tank 52, compressing the air in tank 52. This causes cylinder 45 to retard its movement, while piston 43 continues to move, but slowing down in proportion as the resistance due to the passing of the charge of cylinder 45 through the cavity of bolt 44. The furnace and the mold 32 contained therein are held up in their movement to the same degree. The energy of the mass contained in mold 32, thus released, exerts on the metal such a pressure that it fills out the still remaining cavities of the mold and the pores of the metal, whereby the ingates 35 are emptied either entirely or partially. The winch is then set going and again hoists the furnace. Here the piston 43 first rises in cylinder 45. Then cylinder 45 is lifted and drawn out of the buffer-cylinder 47, whereby liquid flows back from the tank 52 thru the suction-valve 49 into the buffer-cylinder 47. Finally the furnace again reaches its upper position above the intermediate floor 55. It is here emptied and recharged.

Having now more fully described and ascertained the nature of my invention and in what manner the same is to be performed, I declare that I claim:

1. Device for casting metal in molds, consisting in a combined movable furnace and mold, a perpendicular guide for said movable furnace and mold, and means for locking and unlocking the furnace and mold at the upper end of said guide to sustain said combined furnace and mold at the upper end of said guide and freely gravitate toward the lower end of said guide, when unlocked from said guide.

2. Device for casting metal in molds, consisting in a movable furnace, a melting pot with underneath outlet, a mold, means for supporting the melting pot in said furnace over the above mentioned mold, a perpendicular guide for the furnace and means for locking and unlocking the furnace at the upper end of said guide.

3. Device for casting metal in molds, consisting of a movable electric resistance furnace, a receptacle in which a melting pot with underneath outlet is supported over a mold, whereby the annular heat-resistance of the furnace surrounds the part of the above-mentioned receptacle in which said melting pot is located; a perpendicular guide for said furnace, said guide forming the current-conductor, and means for locking and unlocking the furnace at the upper end of said guide.

4. Device according to claim 2, in which a shock-absorber is arranged at the bottom of said furnace.

5. Device for casting metal in molds, embracing a furnace, movable up and down on a perpendicular guide, a piston rod, running parallel to said guide on the bottom of said furnace; a piston with a narrow adjustable cylindrical cavity on said piston-rod, a closed cylinder surrounding said piston, passages for the piston-rod in cover and bottom of said cylinder, a buffer-cylinder somewhat widened at the top, fitting the outer circumference of said cylinder and located at the lower end of the furnace guide above referred to; and a plate closing said buffer-cylinder at bottom and provided with a suction- and a safety-valve.

6. Device according to claim 5, comprising a closed chamber below the plate containing the suction- and safety-valves and closing said buffer-cylinder at bottom, a tank beside said buffer-cylinder, a connecting conduit emptying below into said tank and leading to said chamber below valve plate of the buffer-cylinder and a plate closing said tank at top and provided with a suction-valve,

whereby the lower portion above said valve-plate, of the interior chamber of said buffer-cylinder, the said chamber under the valve-plate, said connecting conduit and the lower portion of the interior chamber of said tank are filled with liquid.

7. Device for casting metal in molds, consisting in a movable furnace, a melting pot with underneath outlet, a mold, means for supporting the melting pot in the furnace over a mold, a perpendicular guide for the furnace, a hanger on the furnace, a winch above the furnace, from the load-hooks of which winch the furnace is suspended; and an unlocking device for the winch.

In testimony whereof I have affixed my signature.

ROBERT KOLB.