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METHOD AND APPARATUS FOR CASTING METAL CUPS.

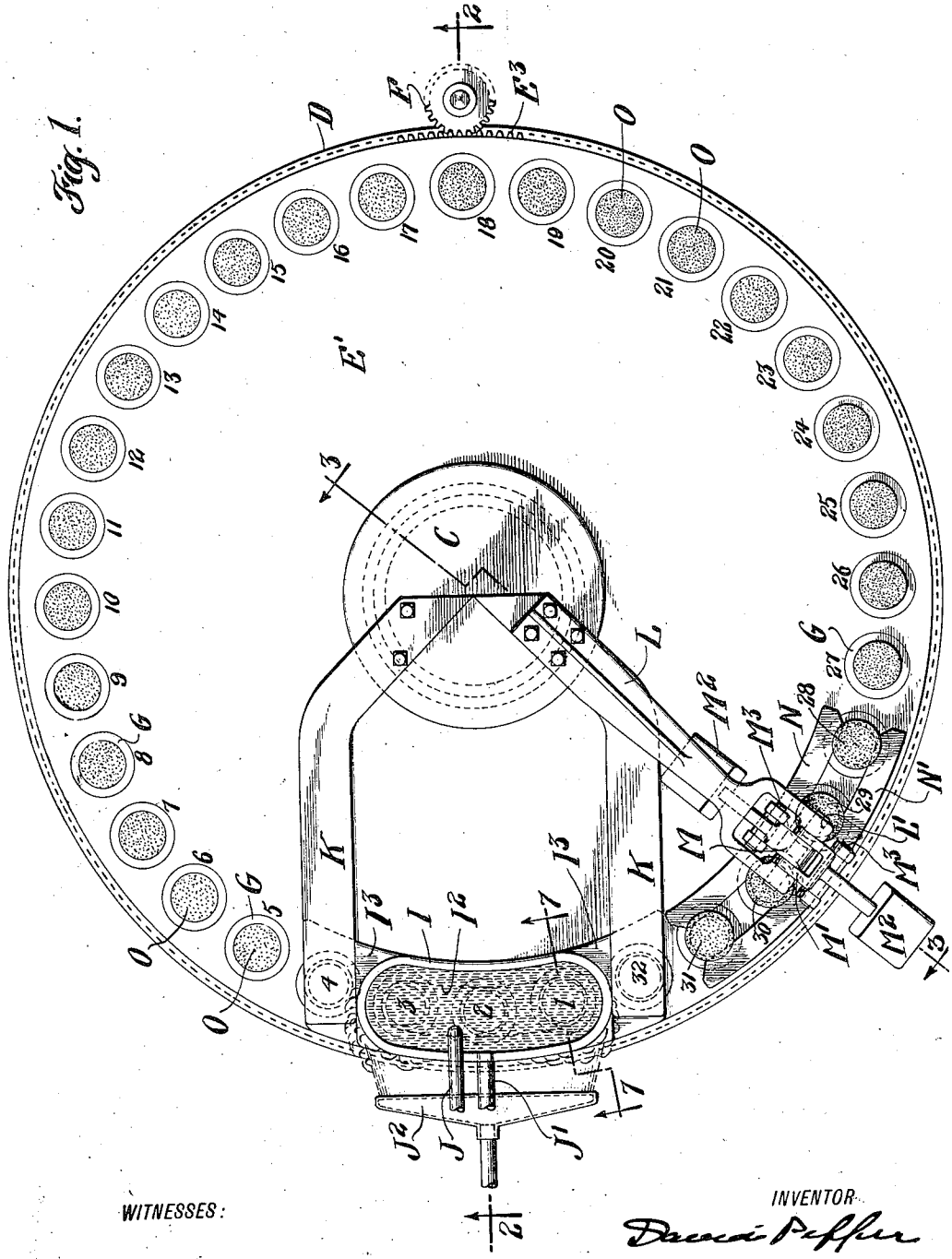
APPLICATION FILED DEC. 19, 1919.

1,387,864.

Patented Aug. 16, 1921.

4 SHEETS—SHEET 1.

Fig. 1.



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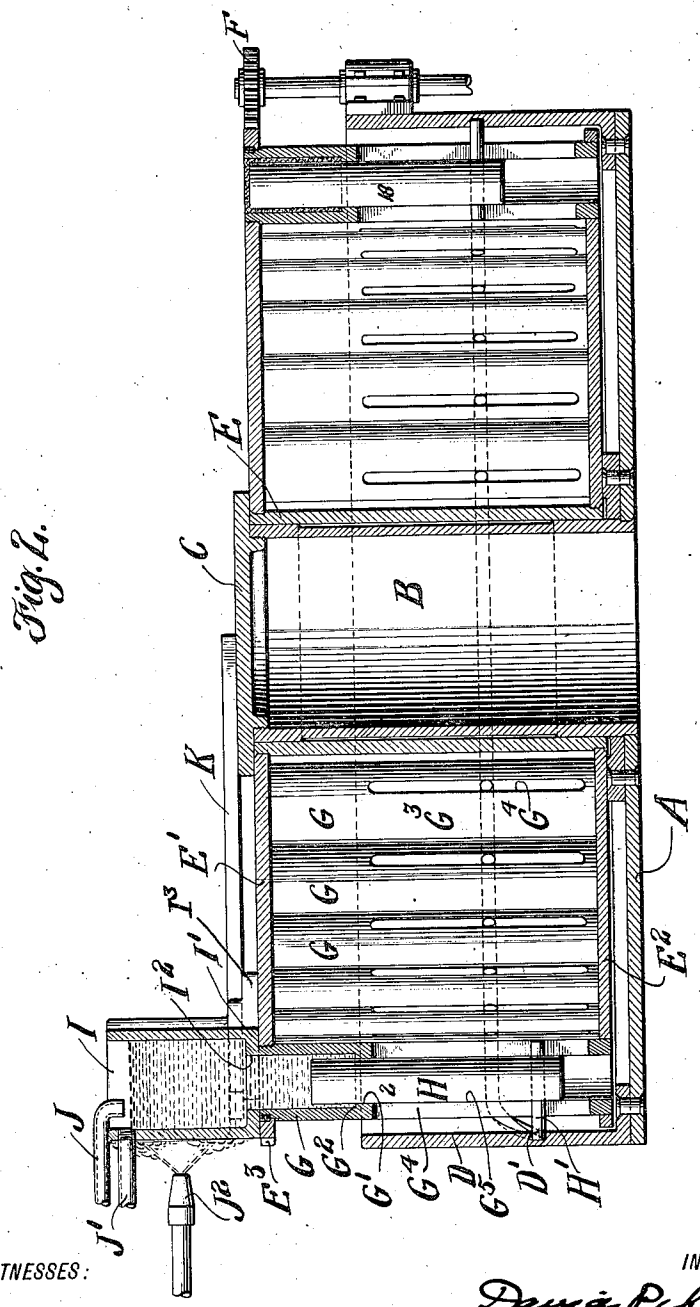
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.

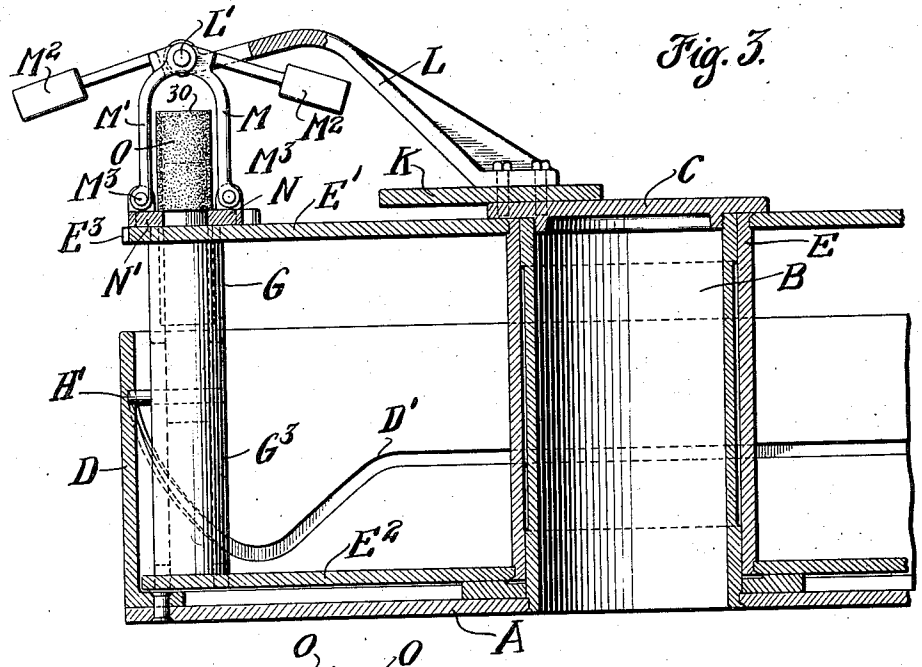


Fig. 6

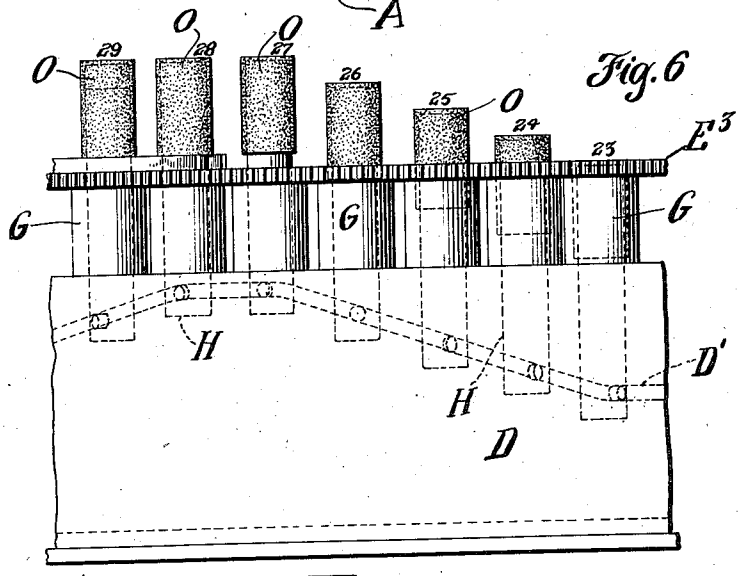
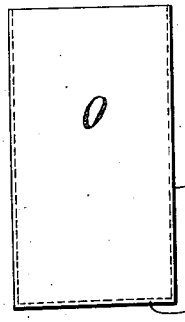


Fig. 8



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4 SHEETS—SHEET 4.

Fig. 4.

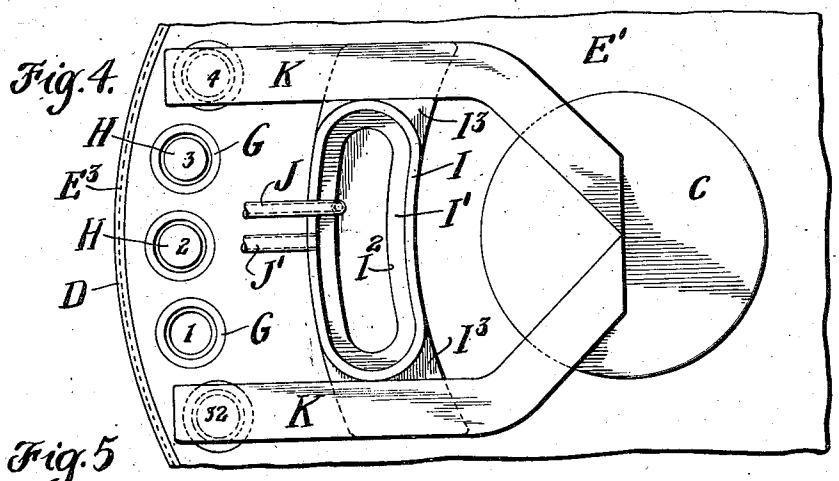


Fig. 5

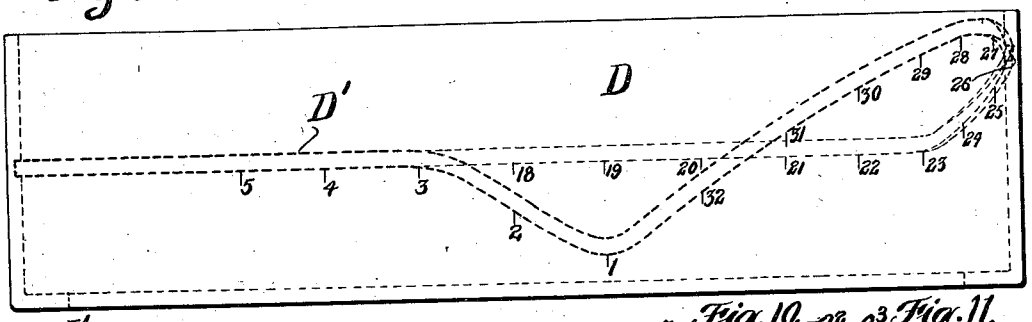


Fig. 7.

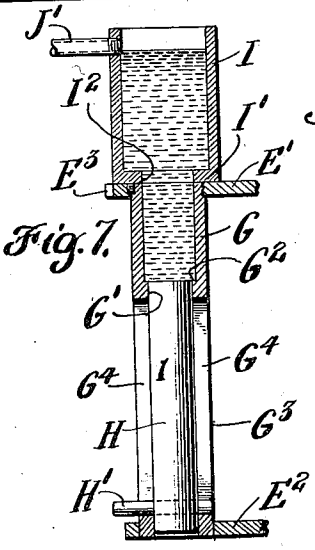


Fig. 9.

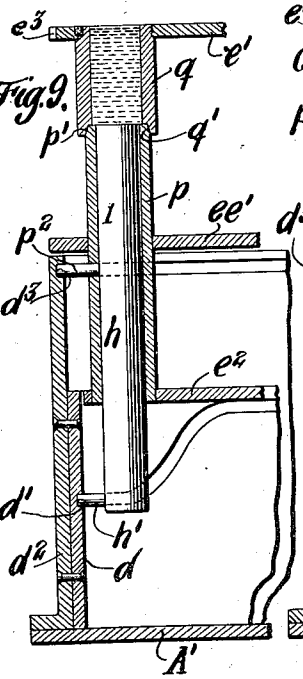


Fig. 10.

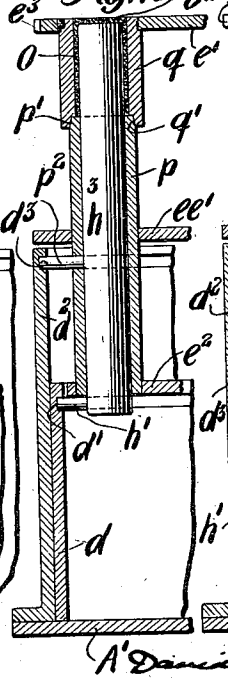
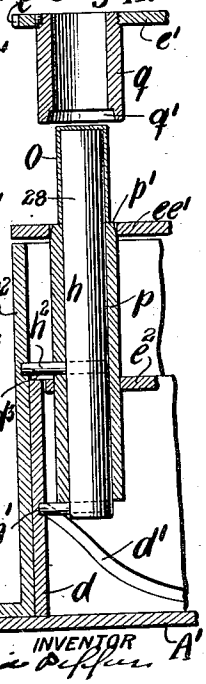


Fig. 11.



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UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR CASTING METAL CUPS.

1,387,864. Specification of Letters Patent. Patented Aug. 16, 1921.

Application filed December 19, 1919. Serial No. 346,138.

To all whom it may concern:

Be it known that I, DAVID PEPPER, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Methods and Apparatus for Casting Metal Cups, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to the casting of very thin walled metal cups and has especial, though not exclusive, reference to the casting of cups of lead or zinc forming the container and a part of the operative structure of electric batteries. By known methods of manufacture cast cups can, of course, be made with thick walls, resulting in a consumption of metal which is undesirable and in most cases prohibitive in cost, but such known methods are unsuitable for the manufacture of thin walled cups unless they are apt to result in a very large proportion of defective unusable cups. The object of my invention is to provide a method of manufacturing thin walled cups adapted for the rapid and accurate manufacture of sound and usable cups, and to provide also all apparatus adapted to carry my new method into practical operation, and, broadly speaking, my new method of casting metal cups consists in first filling a cup mold with molten metal by placing it in communication with a reservoir of fused metal and then forcing a plunger having the form of the inside of the cup into the mold so as to press the excess of molten metal in the mold back into the reservoir; then cutting off the molten metal above the top of the plunger to form the bottom of the cup, allowing the casting to solidify, and finally stripping the finished cup from the plunger.

The nature of my invention and of the mechanism devised to carry it into effect will be best understood as described in connection with the drawings in which such mechanism is illustrated and in which—

Figure 1 is a plan view of my machine.

Fig. 2 a vertical section on the line 2—2 of Fig. 1.

Fig. 3 a vertical section on the line 3—3 of Fig. 1.

Fig. 4 a fragmentary plan view showing the reservoir for molten metal shifted out of operative position.

Fig. 5 is an elevation showing the cam ring which constitutes a part of the machine with the cam groove indicated in dotted lines.

Fig. 6 is a fragmentary elevation showing the movements of the plungers which work in connection with the cup molds during the period when they carry the cups out of the molds and on to the stripping devices.

Fig. 7 is a sectional elevation through the reservoir and one of the molds in connection therewith showing the plunger in full lines.

Fig. 8 is an elevation of the cups formed on the machine shown on a larger scale than in the other figures of the drawing.

Figs. 9, 10 and 11 are sectional elevations illustrating a modification of the machine shown in the other figures of the drawing and showing its mode of operation.

A indicates the base of the machine and B a drum extending upward from the center of the base and serving as a pivotal support for the rotating parts of the machine. C is a cover covering the upper part of the drum, D a cam ring secured to the outer edge of the base A and formed with a cam path indicated at D′. E is a cylinder rotating on the drum B and having attached to it the plates E′ and E², the plate E′ having formed on or attached to its periphery a toothed wheel as indicated at E³ which is in engagement with the driving gear F. Near the outer edge of the plate E are formed a series of openings extending through the plate in which are secured the upper ends of the series of molds G. These molds have circular openings G′ formed in their bottoms the edges of which have a narrow annular flange indicated at G² between them and the sides of the mold; this flange having a breadth equal to that of the thickness of the sides of the cup to be formed. The material of the molds is continued downward as indicated at G³ and formed with a cylindrical perforation as indicated at G⁵ slotted as indicated at G⁴. H, H, etc., are pistons or plungers (the upper or operative parts of which have the form of the inside of the cup to be made) working through the openings G′ in the bottoms of the molds, and guided in the cylindrical bores G⁵ of the extensions G³, pins H′ extending from the bottom of the plungers through the slots G⁴ and into engagement with the cam slot D′.

I indicates the reservoir for melted metal,

the bottom I′ of which rests upon the flat top of the plate E′, a slotted opening I² being formed through the bottom of the reservoir in line to register with the tops of the molds when the reservoir is in operative position, as indicated in Fig. 1. It is desirable to keep the metal in the reservoir at a substantially fixed level, and I have indicated a metal supply pipe J and metal overflow pipe J′, and at J² I have indicated a gas nozzle for keeping the reservoir and its contents at proper temperature. I³, I³, indicate extensions of the bottom of the reservoir I which lie beneath guides K, K, secured to the cover C as indicated. L is a bracket also secured to the cover C and supporting at its end pivot pin L′, on which are pivoted levers M and M′, each provided with a counter weight as indicated at M², which tends to press the levers inward toward each other. Each lever M and M′ is connected by a pivot at M³ to stripper plates N and N′ which rest upon the top of the plate E′ and function, as will be hereafter described.

O, best shown in Fig. 8, is the finished cup made in my machine by my method, O′ indicating the thin walls and O² the thin bottom of the cup.

Before describing the modifications illustrated in Figs. 9 and 10 I will describe the operation of the machine shown in Figs. 1 to 7, inclusive.

When the machine is not in use the reservoir I is shifted out of registry with the molds, as indicated in Fig. 4, and when it is desired to start the machine in operation the reservoir is filled with molten metal and then slid forward to the position indicated in Fig. 1; the metal in the reservoir, of course, flowing freely into the molds which are in communication with the slot I² in the bottom of the reservoir. The driving gear indicated at F being set in operation, the plates E′ and E² and the molds carried by these plates, are given a rotative movement, and as the molds are rotated the plungers H are actuated by the engagement of their pins H′ with the cam groove D′, this cam groove being so formed that when any given mold is in the position indicated at 1 the plunger is fully retracted so that its top comes substantially flush with the bottom ledge G² of the mold, as shown in Fig. 7, and the mold being in communication with the reservoir is completely filled with molten metal, as also indicated in Fig. 7. The forward movement of the mold to the positions indicated at 2 and 3 causes the plunger to move upward in the mold, pressing the surplus metal back into the reservoir which still is in free communication with the mold as indicated at the left hand side of Fig. 2, which shows the position of the plunger at the point marked 2, while at point marked 3 the plunger is forced up to a position in which its top lies below the top of the mold by a distance equal to the thickness of the bottom to be formed in the cup, this position being indicated at the right hand side of Fig. 2, which shows in effect the plunger at the point marked 18, but which in relative position in the mold is in the same position it occupies at point marked 3. The movement of the mold from point 3 to point 4 cuts off the molten metal at the level of the top of the mold, leaving in the mold and on the plunger, which acts as the core of the mold, a completed cup O. The further travel of the mold from the point marked 4 to the point marked 23 leaves the plunger in fixed position in the mold and gives the casting time to cool and solidify. On reaching the point marked 23 the cam finger H′ of the mold comes under the influence of the parts of the cam groove indicated in Fig. 5 as extending from point 23 to point 1, the plunger being forced up through the mold, carrying the cup with it, as indicated in Fig. 6, until the cup is carried up to a distance above the top of the plate E′, which enables its edges to pass over the edges of the strippers N and N′, and then in passing from point 28 the plunger is drawn downward leaving the cup supported on the strippers from which it can be readily removed, while the plunger continues its downward movements until it reaches the point indicated at 1 where it is completely retracted from the mold.

Referring now to the modification illustrated in Figs. 9, 10 and 11, the rotative carrier is here shown as made up of three parts, e', ee' and e^2, the upper carrier e' having a toothed circumference, as indicated at e^3, and carrying the mold, one of which is indicated at g, and which is here formed with a cylindrical wall terminating in the outwardly flanged bottom indicated at g'. When the mold is in casting position a tubular guide p fits into its flanged bottom g', this guide being vertically guided in the plates ee' and e^2, and having a cam pin p^2 extending from it into engagement with the cam groove d^2 in the plate d^3 secured to the base A′. h is a plunger working in the guide p and having a cam pin h' fitting in the cam groove d' of a cam plate d. Fig. 9 shows the parts in the position they occupy when the mold is first filled with molten metal from a reservoir I. After this filling of the mold the plunger h moves upward to the position shown in Fig. 10, and after a time, soon after the hardening of the casting the guide p and plunger h move downward to a position indicated in Fig. 11, where the cup is entirely free of the mold, after which, as indicated in Fig. 11, the cam groove d' carries the plunger h still farther downward, withdrawing it from the finished cup O,

which is stripped off by its lower edges resting in contact with the top of the guide *p*.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. The method of casting metal cups which consists of first filling a cup mold by placing it in communication with a reservoir of fluid metal, then forcing a plunger having the form of the inside of the cup into the mold, so as to press the excess of melted metal in the mold back into the reservoir, then cutting off the molten metal above the top of the plunger to form the bottom of the cup allowing the casting to solidify and finally stripping the cup from the plunger.

2. The method of casting metal cups which consists of first filling a cup mold by placing its top in communication with a reservoir of fluid metal, then forcing a plunger having the form of the inside of the cup upward through the bottom of the mold, so as to press the excess of melted metal in the mold back into the reservoir, then cutting off the molten metal above the top of the plunger to form the bottom of the cup allowing the casting to solidify and finally stripping the cup from the plunger.

3. A cup casting machine comprising in combination a reservoir for melted metal, a relatively movable cup mold registering with said reservoir in certain positions, a plunger having the form of the inside of the cup to be cast, means for reciprocating the plunger in the mold whereby it is forced into the mold while said mold is in registry with the reservoir, so as to force the displaced molten metal in the mold back into the reservoir and whereby it is moved out of the mold together with the cast cup after said casting has solidified, and means for stripping the cup from the plunger.

4. In a cup casting machine a mold in combination with a reservoir from which the mold receives molten metal, a plunger having the form of the inside of the cup to be cast movable from a position in which its upper end merely closes the bottom of the mold to a position in which it fills the inside of the mold, and to a third position in which its core forming portion lies entirely outside of the mold, means for moving the mold and plunger relatively to the reservoir to cut off communication with the mold, means for moving the plunger as described and stripping means for separating the cast cup from the plunger.

5. In a cup casting machine a rotating mold carrier having a flat top, a series of molds secured to said carrier and opening through said flat top, core plungers vertically movable in the molds, a reservoir for molten metal resting on the flat top of the carrier and registering with the molds as they move beneath it, plunger actuating means acting to withdraw the plunger to the bottom of the molds as they come into registry with the reservoir and to force them up into the molds while such registry continues, and to withdraw the core forming portions of the plungers from the molds after the castings have solidified.

6. In a cup casting machine a rotating mold carrier having a flat top, a series of molds secured to said carrier and opening through said flat top, core plungers vertically movable in the molds, a reservoir for molten metal resting on the flat top of the carrier and registering with the molds as they move beneath it, plunger actuating means acting to withdraw the plunger to the bottom of the molds as they come into registry with the reservoir and to force them up into the molds while such registry continues, and to withdraw the core forming portions of the plungers from the molds after the castings have solidified, and stripping means acting to separate the cups from the plungers.

DAVID PEPPER.