

A. F. ROCKWELL.
CENTRIFUGAL CASTING MACHINE.

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1,403,347.

Patented Jan. 10, 1922.

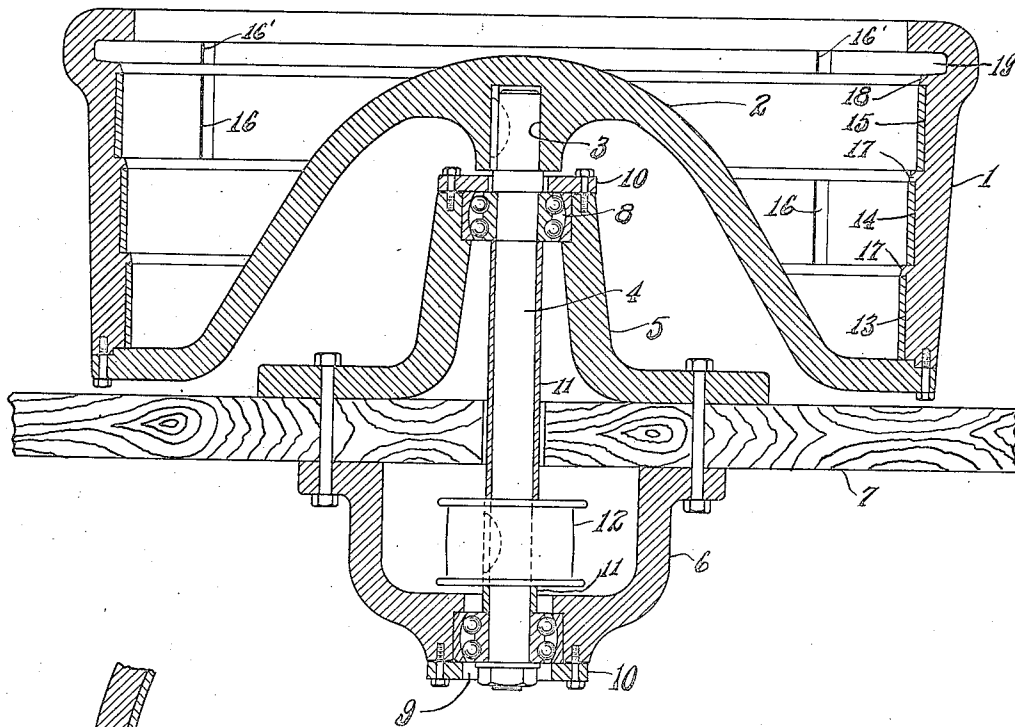


FIG. 1

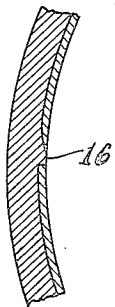


FIG. 2

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CENTRIFUGAL CASTING MACHINE.

1,403,347.

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To all whom it may concern:

Be it known that I, ALBERT F. ROCKWELL, a citizen of the United States, and a resident of Bristol, in the county of Hartford and State of Connecticut, have invented a certain new and useful Improvement in Centrifugal Casting Machines, of which the following is a specification.

This invention relates generally to metal casting, and more particularly to an improved casting apparatus of the centrifugal type.

In the casting of brass by ordinary methods for subsequent use as a basis from which to form thin sheets, such, for example, as are employed in forming the cellular units of radiators for use in connection with water-cooled gas engines, the rolling operations that are employed in reducing ingots to their final sheet form invariably disclose blow-holes, particles of dross-material, and other imperfections in the metal which is being reduced. This has resulted, not only in a very considerable waste of material in proportion to the net amount actually available for use at the completion of the finishing operations, but it has heretofore been difficult to produce thin sheets of metal for the particular purpose referred to, and for a wide variety of other uses, that were sufficiently free from flaws and imperfections to meet such exacting requirements as are called for, for instance, in the production of the liquid-tight cellular radiator construction referred to.

In my prior Patent No. 1,095,523 of May 5, 1914, I have disclosed a casting apparatus of the centrifugal type which is designed to produce ingots of steel possessing very desirable characteristics with respect to density, homogeneousness, and freedom from flaws, and which, by reason of their special formation, are adapted to be easily rolled and otherwise manipulated in subsequent operations.

I have discovered that a machine of this general type can, with certain modifications, be utilized for the production of ingots of brass and the like, that will have a uniformly pure and homogeneous character together with a remarkable freedom from the objectionable blow-holes and other imperfections characteristic of sheet metal produced from ingots cast by methods hereto-

fore known and used. With this end in view, I have produced a centrifugal casting device having a circumferential mold-forming rim of sufficient width to provide a plurality of casting grooves extending about the inner face thereof. The ingots produced by this apparatus preferably have a split-ring formation by reason of an interruption in each groove taking the form of a ridge of metal integral with the body of the mold and completely filling the cross-section of the groove. This ridge or dam in the groove or channel has an abrupt face on one side formed substantially on a radius of the mold member as a whole, while on the other side it has a gradually curved or tapered formation by means of which a correspondingly tapered end is formed on the split-ring-shaped ingot strip, which facilitates the passing of the strip through the reducing rolls in a subsequent rolling operation.

I have succeeded in producing a structure in which a plurality of rings, wholly independent of each other and unconnected by stretches of metal that would interfere with the separation of the rings at the finish of a casting operation, can be produced. For this purpose, the ring-forming channels or grooves are formed in a relatively offset or stepped relation so that the tendency of a connecting film of metal to be deposited in a bridging and connection relation between the masses of metal in the grooves and across the ridges separating the grooves, is overcome.

I also provide in the device a self-contained waste-receiving chamber in which the comparatively light dross and slag material that is usually present in the metal, is displaced by the heavier pure metal and driven upwardly across the filled grooves and into the chamber provided to receive it. By means of this arrangement I do away with the necessity for providing shields or other protecting means, separate from the device, to prevent the scattering and flinging of portions of the molten liquid from the rapidly rotating device.

Due to the forces set up by the rotation of the mold member, I provide a special form of mounting to insure the stability of the device at the desired speeds.

In the drawing,—

Fig. 1 is a vertical, sectional view of a

centrifugal casting machine embodying my invention and showing castings in place; and

Fig. 2 is a sectional detail view showing the means for interrupting the casting groove and forming a tapered end on the split-ring-shaped casting.

In the drawing I have shown a casting apparatus in which a mold member 1 having the form of a circumferential rim or flange is fitted to the edge of a base or liquid-directing member 2. The base member 2, as will be seen, is provided with a dome-shaped elevated central portion on the under side of which is a socket 3 adapted to be fitted over the end of a vertically-mounted drive-shaft 4, the effect of which is to bring the center of gravity of the mold chamber very low as compared with its point of support and thereby produce in the mold member an exceedingly stable equilibrium and consequent steady and well-balanced action under the high speed of rotation attained in actual operation.

In order to still further insure the steadiness of running of the device under a high operating speed, I provide for mounting the drive-shaft 4 in substantial supporting brackets 5 and 6 which are preferably mounted on opposite faces of a wooden floor or platform 7 in such a way as to provide support for the shaft at comparatively widely separated points shown. Preferably, ball-bearing units 8 and 9 are provided, which are fitted into suitable seats provided for the purpose in the bracket members and held in place by the locking-plates 10. Distance or spacing sleeves 11 are fitted to the shaft 4 for the purpose of suitably spacing the bearing units 8 and 9, and an interposed driving pulley 12, from each other.

As has been already indicated, the rim or flange member 1 is the casting member proper and is provided with a plurality of casting grooves 13, 14 and 15 on the inner face thereof and in which the casting liquid is deposited, in the outwardly-directed movement imparted thereto through the centrifugal action developed by the rapidly rotating device. It will be seen that the casting metal, which is thus deposited in the grooves by centrifugal action when the mold member is rotated at high speed, is subjected to a substantial centrifugal pressure, and that the density of the casting thus produced is proportionately increased over the density of castings produced by ordinary methods. As a direct result of this, the imperfections characteristic of ingots as ordinarily produced are eliminated and a pure, dense, and uniformly homogeneous metal, well adapted for the exacting use to which it is to be put, is obtained.

In order to interrupt the annular con-

tinuity of the ingots to thereby produce split rather than complete rings, not only to facilitate the removal of the finished castings from the molding grooves, but also to put the castings into suitable formation for subsequent operation, I provide ridges or dams 16 in the channels that are integral with the wall of the mold member, and these may be formed by the discontinuing of the groove-cutting operation just before a complete circuit of the inner circumference is made. As has been already indicated, the groove-interrupting ridges 16 have a gradual and preferably curved inclination from the bottom to the top of the channel on the side that is the advancing side with relation to the direction of rotation of the mold member, while the remaining side may be more abrupt and formed substantially on a radius of the mold chamber. By this construction, I succeed in producing ingots having one end formed with a thin knife edge which permits of their ready insertion between the rolls of the reducing apparatus in the subsequent operation of rolling the ingots down to their final sheet form.

Reference has already been made to the low-hung mounting of the rotatable mold device by which a very high degree of stability is attained with a corresponding steadiness of operation under rotation at high speed. In addition, the slight tendency toward unbalancing the mold which would normally be exerted by the presence of the groove-interrupting ridges 16, is wholly overcome by distributing the ridges in the different grooves in a mutually-balanced relation with respect to each other about the inner circumference of the mold member.

In the operation of the device a molten mass of metal or other casting liquid is poured into the mold chamber and is directed by the dome-shaped base member 2 into engagement with the mold-forming rim member 1. The rapid rotation of the rim member and the centrifugal action thereby produced acts to drive the casting liquid upwardly along the inner face of the rim member and into the casting grooves formed therein. It will be seen that the lowermost groove 13 will first be filled and that the centrifugal action will quickly displace the comparatively light dross material which may be contained in the metal and fill the groove with the heavier and denser pure metal, whereupon the lighter discarded material together with additional metal that is being poured into the mold chamber, will be carried across the ledge 17 separating the casting groove 13 from the next groove 14 above. This action is repeated from groove to groove until all the grooves are filled, when the discarded waste material from all the grooves is driven across the uppermost

groove-defining ledge 18 into the waste-receiving chamber 19. The chamber 19 may conveniently be interrupted by dams 16' which are in mutual balance with the dams 16 so that the excess metal may be removed when cold. It will be clear that the most effective operation is secured by pouring into the mold chamber a measured quantity of metal such that a surplus amount over and above what is needed to fill the grooves will be provided, the surplus amount being substantially equal to or a little less than the average proportion of waste usually found in the amount of metal used in a casting operation.

It will be noted that the casting grooves have a relatively stepped arrangement, each groove being formed on a larger circumference than the groove just beneath. The purpose of this is two-fold in that the break produced between each set of adjacent grooves by the stepped formation produces a complete separation of the castings from each other and, in addition, the progressively-increasing diameter of the grooves from the lowermost to the uppermost aids in the distribution of the metal across the inner face of the mold under the action of centrifugal force.

I have discovered that the separating action produced in the castings by the relatively-stepped grooves is enhanced to a certain extent by the outwardly-sloping faces of the groove-defining ledges 17 and 18, in that the centrifugal action has the effect of clearing the faces of the ledges by throwing off any casting liquid that might otherwise be deposited thereon. The result is that the finished castings are completely separated and unconnected by fragments of metal that would interfere with the removal of the castings from their groove and their separation from each other.

What I claim is:—

1. A centrifugal casting-machine comprising: a rotatable mold member having a circumferential rim, a plurality of annular casting grooves formed along the inner face of said rim, and means in each groove for forming a break in the length of the casting formed therein.

2. A centrifugal casting-machine comprising: a rotatable mold member having a circumferential rim, a plurality of annular casting grooves formed along the inner face of said rim in an outwardly-stepped relation from the lowermost to the uppermost groove, and means in each groove for forming a break in the length of the casting formed therein.

3. A centrifugal casting-machine comprising: a rotatable mold member having a circumferential rim, a plurality of annular casting grooves formed along the inner face

of said rim in an outwardly-stepped relation from the lowermost to the uppermost groove, means in each groove for providing a break in the length of the casting formed therein, and a waste-receiving chamber formed in the rim above the uppermost casting groove.

4. A centrifugal casting-machine comprising: a rotatable mold member having a circumferential rim, a plurality of annular casting grooves formed along the inner face of said rim in an outwardly-stepped relation from the lowermost to the uppermost groove, defining ledges for said grooves having outwardly-sloped faces, and means in each groove for providing a break in the length of the casting formed therein.

5. A centrifugal casting-machine comprising: a rotatable mold member having a circumferential rim, a plurality of annular casting grooves formed along the inner face of the rim in an outwardly-stepped relation from the lowermost to the uppermost groove, defining ledges for said grooves having outwardly-sloping faces, means in each groove for providing a break in the length of the casting formed therein, and a waste-receiving groove formed in the rim above the uppermost casting groove and adapted to receive dross material displaced from the casting grooves by the centrifugal action.

6. A centrifugal casting-machine comprising: a rotatable mold member having a circumferential rim, a plurality of annular casting grooves formed along the inner face of the rim, interrupting means in each groove for providing for a break in the length of the casting formed therein, said interrupting means in the several grooves being arranged in a mutually-balanced relation.

7. A centrifugal casting-machine comprising: a rotatable mold member having a base formed with an elevated central portion and a depressed marginal portion, a circumferential rim mounted on the marginal portion, a plurality of casting grooves formed along the inner face of said circumferential rim, said base member being rotatably supported at the elevated portion whereby the center of gravity of the mold member is maintained below the point of support to thereby produce a high degree of stability.

8. A centrifugal casting-machine comprising: a rotatable mold member having a base formed with an elevated central portion and a depressed marginal portion, a circumferential rim mounted on the marginal portion, a plurality of casting grooves formed along the inner face of said circumferential rim, a vertical drive-shaft for said mold member, bearings spaced a substantial distance apart in which said drive-shaft is journaled, and said base member being

keyed to the upper end of said shaft at the elevated portion thereof, whereby the center of gravity of the mold member is maintained below the point of support to thereby produce a high degree of stability.

9. A centrifugal casting-machine comprising: a rotatable mold member having a circumferential rim, a casting groove formed along the inner face of said rim, a dam or filler member in the groove to form a break in the length of the casting formed therein, said dam having one face gradually sloping to the bottom of the groove for the purpose described.

10. A centrifugal casting machine comprising: a rotatable mold member having a circumferential rim, and a series of casting grooves formed along the inner surface of said rim, said casting grooves having a

progressive outwardly-stepped relation from one end to the other of the series.

11. A centrifugal casting machine comprising: a rotatable mold member having a circumferential rim, a plurality of casting grooves formed along the inner surface of said rim, and an overflow chamber arranged to receive waste material discharged from said casting grooves by the effect of centrifugal action.

12. A centrifugal casting groove comprising: a rotatable mold member having a circumferential rim, a plurality of casting grooves formed along the inner face of said rim, and an overflow chamber formed in said rim and arranged to receive the waste material discharged from said casting grooves by the effect of centrifugal action.

ALBERT F. ROCKWELL.