E. L. WOLFF.

METAL CASTING APPARATUS.

APPLICATION FILED AUG. 4, 1917.

1,294,742.

Patented Feb. 18, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

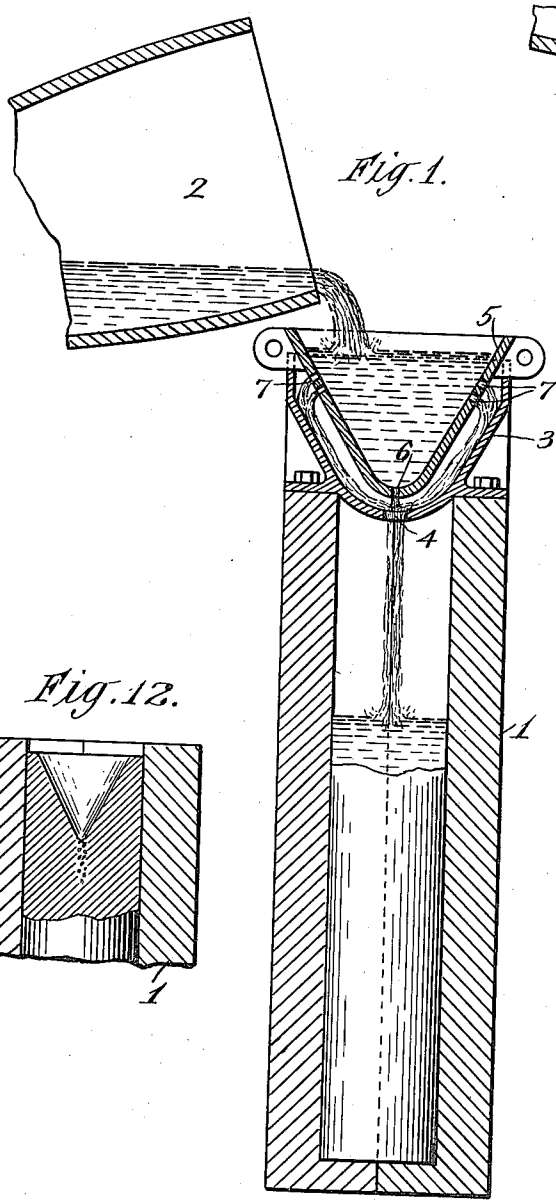


Fig. 2.

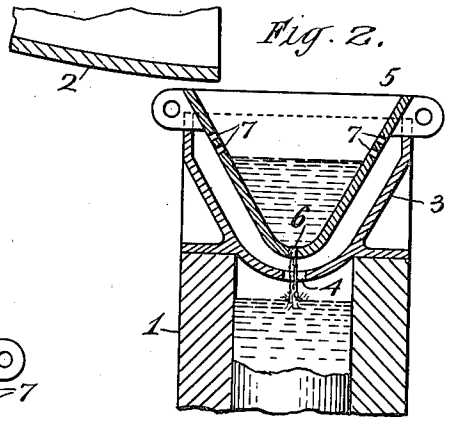


Fig. 12.

Fig. 4.

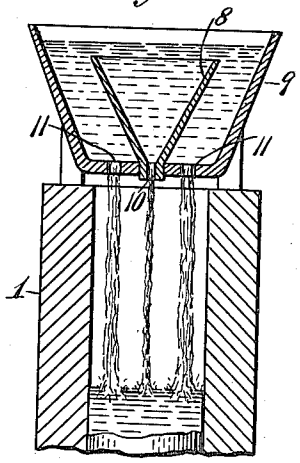


Fig. 5.

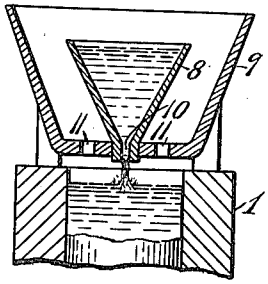
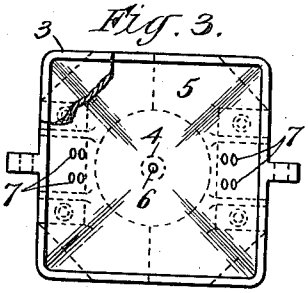


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 6.

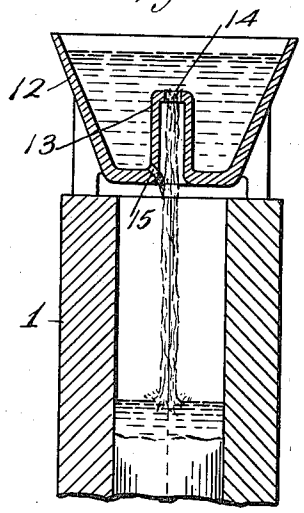


Fig. 7.

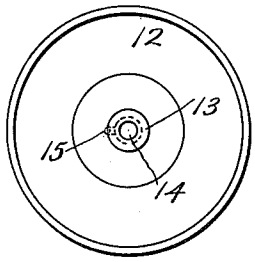


Fig. 8.

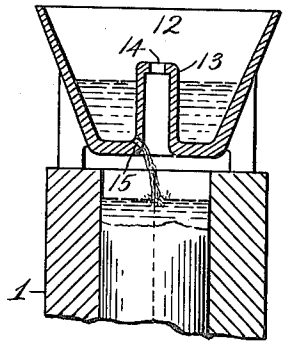


Fig. 9.

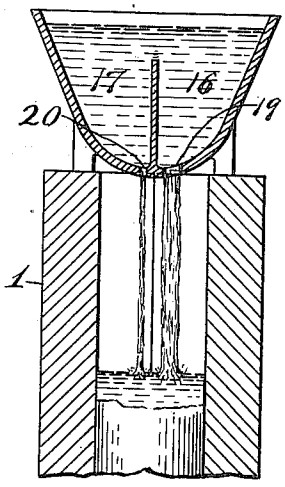


Fig. 10.

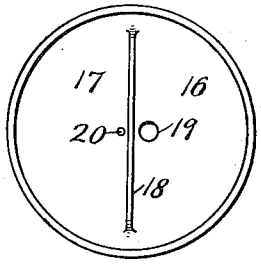
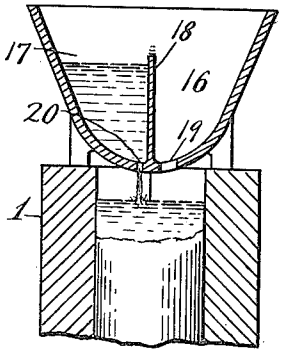


Fig. 11.



Inventor:

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UNITED STATES PATENT OFFICE.

EDWARD L. WOLFF, OF WATERBURY, CONNECTICUT, ASSIGNOR TO SCOVILL MANUFACTURING COMPANY, OF WATERBURY, CONNECTICUT, A CORPORATION OF CONNECTICUT.

METAL-CASTING APPARATUS.

1,294,742. Specification of Letters Patent. Patented Feb. 18, 1919.

Application filed August 4, 1917. Serial No. 184,406.

To all whom it may concern:

Be it known that I, EDWARD L. WOLFF, a citizen of the United States, residing at Waterbury, county of New Haven, and State of Connecticut, have invented certain new and useful Improvements in Metal-Casting Apparatus, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to certain improvements in apparatus for casting ingots, and is particularly applicable to casting ingots of brass, although it is not limited to casting such ingots.

In casting brass ingots of the kind sometimes known in the art as billets, that is, ingots say of six to seven feet long and about seven to eight inches in diameter and of circular cross-section, much difficulty has been experienced in producing sound ingots. The economical working of the casting plant requires that the hot metal for the ingots be poured as rapidly as possible, the rapidity of the pouring being largely governed by the necessity of permitting foreign matter in the hot metal to rise through the metal in the mold and to prevent the trapping of gases in the metal. The shrinkage which necessarily occurs, however, produces "piping," the pipes frequently extending a long distance into the ingot. This occasions considerable loss as before the ingot can be subjected to subsequent manufacturing processes a considerable portion of it has to be trimmed off. In the practical art such ingots or billets are cast by hand, that is, the metal is poured from a furnace or ladle into the molds by a skilled workman or caster. In the accepted practical method the hot metal is poured into the mold as rapidly as is consistent with the rise of the impurities through the hot metal and the avoidance of trapping of gases, until the molds have been sufficiently filled. The pouring is then stopped and the ingot allowed to shrink. As it shrinks, a cavity or "pipe" forms in the top. The workman then scrapes the top of the hot metal to clean the cavity, and pours in more hot metal When the pipe that has been formed is filled, he stops pouring and the ingot is again allowed to shrink until another pipe forms. The top is again cleaned and the pipe again filled, and this process is carried on until the ingot is completed. This method is slow on account of the interruption of the delivery of the metal for the shrinkage and the scraping, and, furthermore, the character of the ingot obtained depends largely on the judgment of the individual workman.

This invention consists in the provision of means whereby hot metal is continuously poured from the container, the hot metal being delivered to the mold at a rapid rate until the major portion of the ingot is formed, the rate of delivery being then changed so that the ingot is completed by delivering hot metal to the mold at a rate which will compensate for the shrinkage.

More specifically the invention consists in an improved cup or strainer for delivering metal to ingot molds which is provided with means for delivering the metal to the ingot mold at varying rates.

The invention further consists in certain features of construction which will be hereinafter pointed out and then fully described.

Referring to the accompanying drawings—

Figure 1 represents in vertical section a mold for casting ingots, such as has been referred to, the mold being of the ordinary two-part type and being provided with one form of improved cup or strainer.

Fig. 2 is a detail view illustrating the construction shown in Fig. 1 but showing the operation of the construction after the rate of delivery has been changed.

Fig. 3 is a plan of the cup or strainer construction shown in Fig. 1 with certain parts broken away.

Figs. 4 and 5 illustrate a modified form of construction for carrying the invention into effect.

Figs. 6 and 7 represent in vertical section and plan respectively another form of construction for carrying the invention into effect.

Fig. 8 illustrates the operation of the construction shown in Fig. 6 after the rate of delivery has been changed.

Figs. 9, 10 and 11 are views similar to

Figs. 6, 7 and 8 but showing another form of construction which may be employed for carrying the invention into effect.

Fig. 12 represents in vertical cross-section the top of a completed ingot and mold illustrating the "piping" which it is the purpose of this invention to avoid.

Referring to the drawings, 1 represents the usual two-part mold ordinarily employed in casting ingots such as have been referred to, and 2 indicates a container from which the hot metal is poured to form the ingot. Such molds are usually from six to seven feet long, are circular in cross-section, and from seven to eight inches in diameter.

In carrying the invention into effect, means will be provided for delivering the hot metal to the mold until the ingot is completed, said means, however, delivering the material first at a rapid rate or rates until the ingot is nearly formed, and then at a slower rate, the ingot being completed at this slower rate which is so determined as to compensate for the shrinkage.

In what is regarded as the best construction for carrying the invention into effect, a cup or strainer will be employed which will deliver the metal to the mold at varying rates, and the drawings illustrate various forms of cups or strainers which may be employed.

In the form of strainer illustrated in Figs. 1, 2 and 3, the cup or strainer consists of an outer compartment or chamber 3 which is superposed upon the mold, this compartment having a delivery opening, as 4. In this form of construction, an inner compartment or chamber 5 is provided, this chamber having delivery openings, as 6 and 7, the opening 6 being located in the bottom of the compartment and the openings 7 at a considerable distance up the sides. In this construction, the combined delivery area of the openings 6 and 7 is such that when the strainer is full of hot metal the metal will flow through these openings and into the outer compartment and then into the mold at as rapid a rate as is consistent with the proper introduction of the metal into the mold to permit the rise of impurities and the avoidance of the trapping of gases. In the operation of the construction the metal is poured from the container into the strainer as rapidly as possible without causing it to overflow the top of the strainer. When the container is empty regardless of whether the mold is filled or not, or when sufficient metal has been introduced into the mold to nearly complete the ingot, the pouring from the container into the strainer is stopped or slowed down. The metal will continue to run out through the openings until its level is below the openings 7, after which, of course, the remainder of the metal in the strainer will flow out only through the opening 6. The area of this opening is so calculated as to deliver the metal slowly and at such a rate as to complete the ingot and at the same time compensate for the shrinkage.

In the construction shown in Figs. 4 and 5, the compartments are somewhat differently arranged. The inner compartment 8 is formed by a circular partition which stops short of the top of the outer compartment 9. The delivery openings 10 and 11 are in the bottom of the compartments. In using this construction, the metal should be poured from the container into the inner compartment 8, whence it overflows into the outer compartment, the pouring being continued as before until the major portion of the ingot is completed, or until the container is emptied. The pouring from the container is then stopped or slowed down. The subsequent action is the same as that previously described, that is, the metal will run out of both compartments until the supply in the outer compartment is exhausted after which the ingot is completed by the metal which runs out of the inner compartment. As before, the opening 10 should be calculated to deliver the metal for the completion of the ingot at a rate which will compensate for the shrinkage of the ingot.

In the construction shown in Figs. 6, 7 and 8, a compartment 12 is provided which has an upwardly extending boss 13 in the top of which is located a large opening 14. The bottom of the compartment is provided with a small opening as 15. The operation of this construction will be readily understood from what has been before said. Both openings in the cup deliver metal to the mold until the major portion of the ingot is nearly formed, when, after the pouring from the container is stopped or slowed down, and the level of the metal is below the top of the boss 13, the delivery is effected only by the smaller opening 15.

In the construction shown in Figs. 9, 10 and 11, the cup or strainer is formed into two compartments 16 and 17 by a web or partition 18 which extends across the cup and stops short of its top. The compartment 16 is provided with a delivery opening 19 of large area and the compartment 17 with an opening 20 of smaller area. The operation is the same as the construction hereinbefore described, the ingot being completed by the metal which is delivered at the slower rate from the compartment 17.

It will be observed that in the operation of all these constructions, a reserve supply of metal is established in the cup or strainer for the completion of the ingot which reserve supply is delivered to the mold at the proper rate to compensate for the shrinkage. Further, this reserve supply is kept hot so that "freezing" is avoided.

In constructing the cup or strainer, the size of the openings and their number will be determined by practical considerations well understood by those skilled in the art. As has been indicated, the combined area of the openings which are delivering the metal during the formation of the major portion of the ingot should be such as to deliver the metal to the mold as rapidly as possible consistent with allowing for the rise of impurities and the prevention of the trapping of gases, and the smaller opening should be such as to deliver at such rate as is consistent with allowing sufficient time for the ingot to shrink. Of course, in determining the area of the holes such factors as the temperature of the metal being poured and the surface of the ingot exposed to shrinkage should be taken into consideration.

Practical experience has shown that not only does the invention permit the working of the furnace at much higher speed than has heretofore been possible but the ingots produced are practically free from "piping". Not only, therefore, does the machine enable the working of the plant to be speeded up, but its use effects great savings, as little or no trimming of the tops of the ingots is necessary before they are subjected to the subsequent manufacturing processes.

As has been indicated, changes and variations may be made in the constructions by which the invention is carried into effect, and the invention is not, therefore, to be limited to the specific constructions which have been heretofore described.

What is claimed is:—

1. The combination with a mold, of means for continuously delivering hot metal thereto until the ingot is completed, said means operating to deliver the metal at a rapid rate until the ingot is nearly formed and then at a slower rate which will compensate for the shrinkage of the ingot.

2. The combination with a mold, of means for continuously delivering the hot metal thereto until the ingot is completed, said means operating to deliver the metal at a rapid rate until the ingot is nearly formed and then to automatically slow the rate of delivery to a rate which will compensate for the shrinkage of the ingot.

3. The combination with a mold, of means for continuously delivering hot metal thereto until the ingot is completed, said means operating to deliver the metal at a rapid and constant rate until the ingot is nearly formed, and then at a slower rate which rate will compensate for the shrinkage of the ingot.

4. The combination with a mold, of a delivery device having a delivery opening or openings which will deliver sufficient metal to the mold during the completion of the ingot to compensate for the shrinkage, and an opening or openings delivering an increased supply of metal during the formation of the major part of the ingot.

5. A cup or strainer for ingot molds having a plurality of openings, said openings being arranged so that all of them are delivering metal during the major part of the casting operation and a part only is delivering the metal during the remainder of the casting operation.

6. A cup or strainer for ingot molds having a delivery opening of the proper size to deliver metal at the end of the casting operation at a rate which will compensate for the shrinkage of the ingot and an additional opening or openings located so as to be in operation simultaneously with said opening during the formation of the major portion of the ingot.

7. A cup or strainer for ingot molds having a plurality of delivery openings all of which deliver metal to the mold when the strainer contains a certain amount of metal and a part only of which delivers metal to the mold when there is less than a certain amount in the strainer.

8. A cup or strainer for ingot molds having a plurality of delivery openings the combined area of which is sufficient to deliver metal to the mold at the proper rate during the casting of the major portion of the ingot, and part of which has sufficient area to supply metal to complete the ingot at the proper rate to compensate for the shrinkage, all of said openings being accessible to the metal in the strainer during the major part of the casting operation, and said part only being accessible to the metal during the completion of the casting operation.

9. A cup or strainer for ingot molds having openings the combined area of which is sufficient to supply hot metal to the mold at the proper rate during the casting of the major portion of the ingot, and part of which has sufficient area to supply metal to complete the ingot at the proper rate to compensate for the shrinkage, and means for establishing a reserve supply of metal in the strainer which is in communication with said part.

10. A cup or strainer, for ingot molds, said cup or strainer being divided into compartments, each compartment having a delivery opening or openings, the delivery opening areas of the compartments being different and being arranged so that one compartment continues to deliver metal to the mold after the other has ceased delivering.

11. A cup or strainer divided into compartments, each compartment having a delivery opening or openings, the compartments being in communication with each other, the combined delivery area of all the compartments being such that metal is de-

livered to the mold at the proper rate for casting the major portion of the ingot, and the delivery area of one compartment being such as to deliver the metal for the completion of the ingot at a rate which will compensate for the shrinkage of the ingot.

12. A cup or strainer for ingot molds divided into two compartments by a web or partition stopping short of the top of the cup or strainer, so that metal can flow from one compartment to the other, said compartments having delivery openings the combined area of which is sufficient to supply the metal at a proper rate for casting the major portion of the ingot, the area of delivery opening or openings of one compartment being sufficient to deliver metal to the mold after the major portion of the ingot is cast which will complete the ingot at the proper rate to provide for shrinkage.

In testimony whereof, I have hereunto set my hand.

EDWARD L. WOLFF.

Witnesses:

HARRIET GOODYEAR,

CHARLES FEHL.