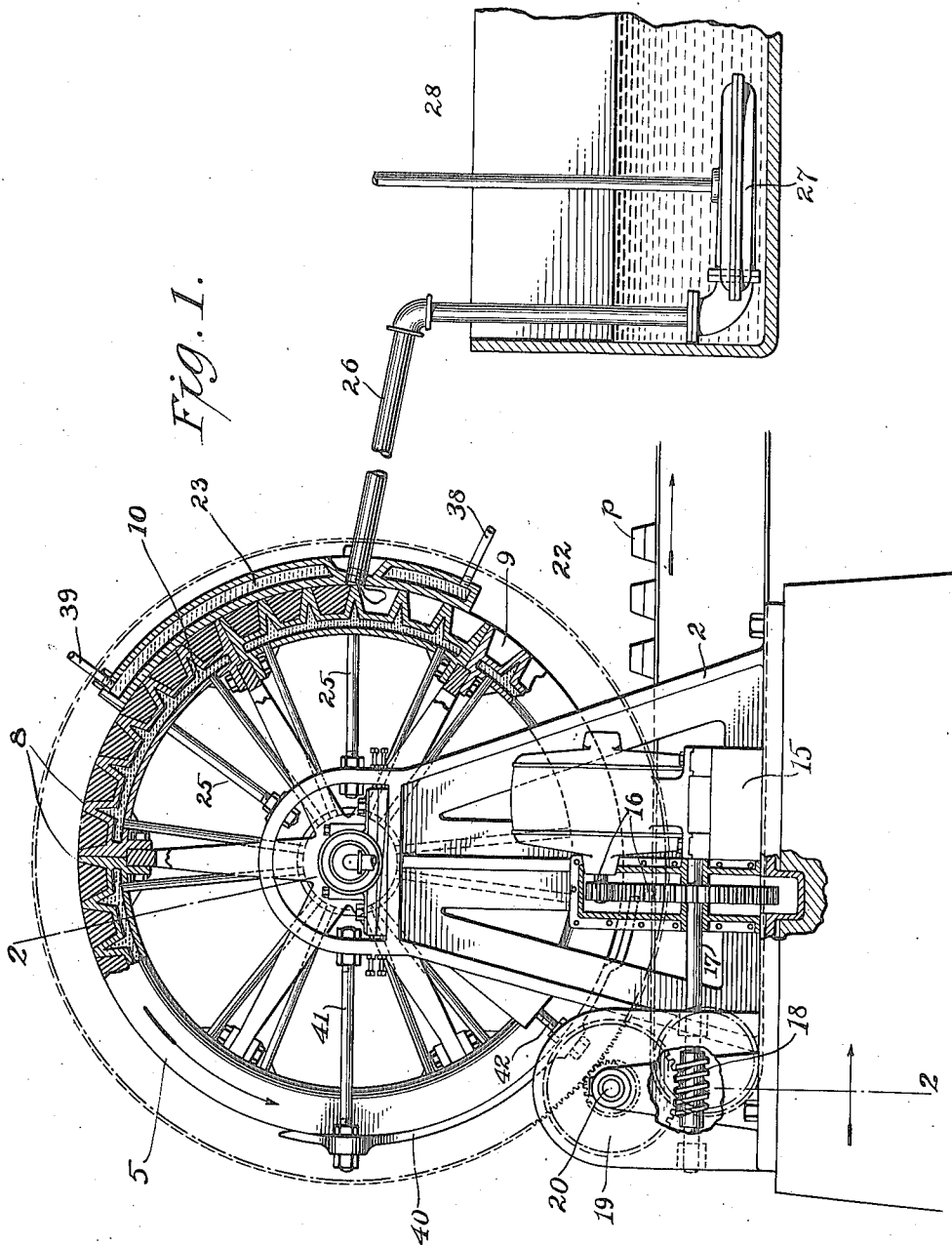


J. F. MILLER.  
MACHINE FOR CASTING LEAD PIGS.  
APPLICATION FILED JAN. 29, 1913.

1,157,794.

Patented Oct. 26, 1915.  
3 SHEETS—SHEET 1.



Witnesses:  
A. R. Appleman  
S. Dunham

Inventor  
J. F. Miller  
By his Attorneys  
Kerr, Page, Cooper & Hayward

J. F. MILLER.  
MACHINE FOR CASTING LEAD PIGS.  
APPLICATION FILED JAN. 29, 1913.

1,157,794.

Patented Oct. 26, 1915.  
3 SHEETS—SHEET 2.

Fig. 2.

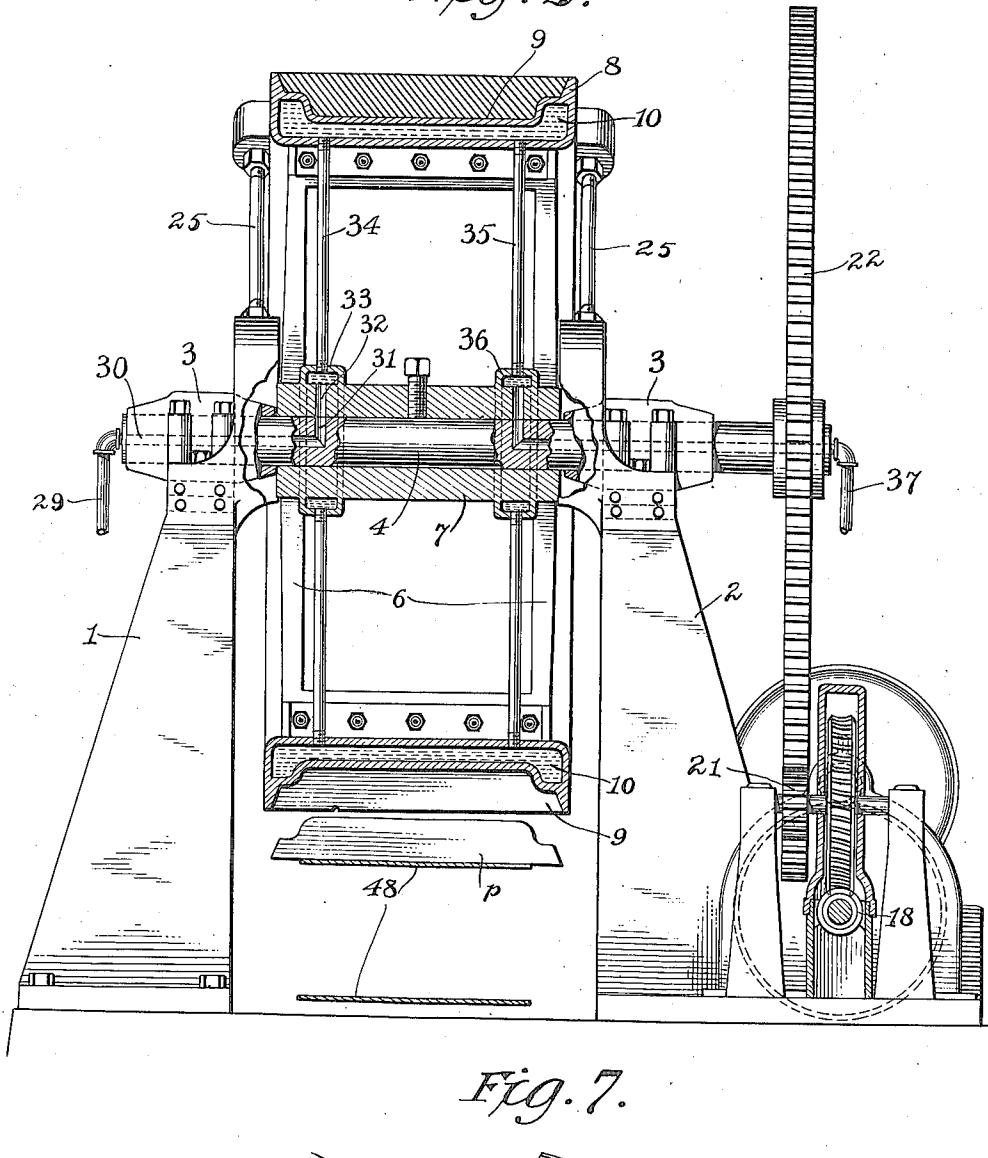
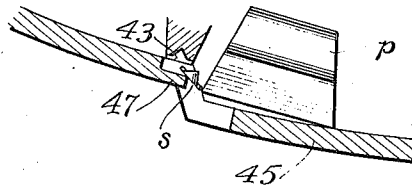


Fig. 7.



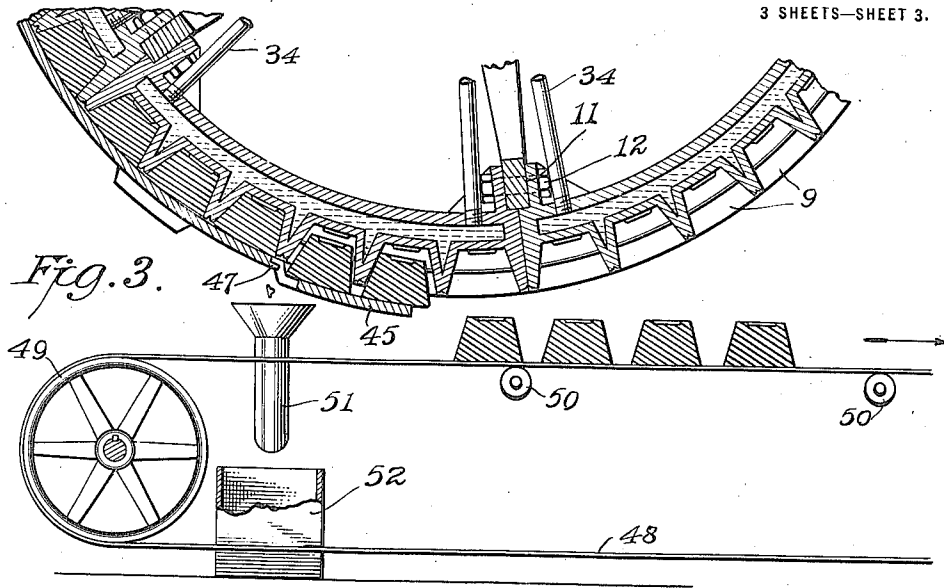
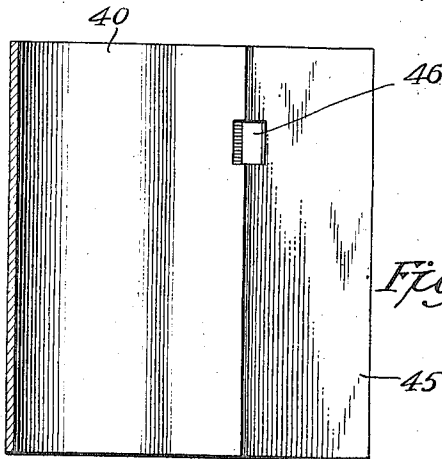
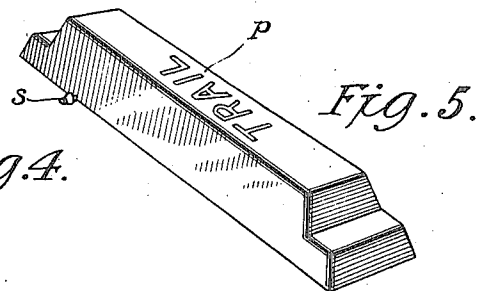
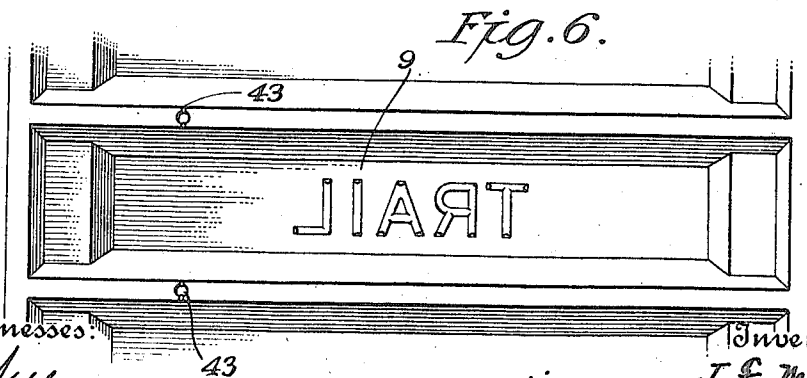
Witnesses:  
A. R. Appleman  
S. Dunham

Inventor  
J. F. Miller  
By his Attorneys  
Kerr, Page, Cooper & Hayward

J. F. MILLER,  
MACHINE FOR CASTING LEAD PIGS.  
APPLICATION FILED JAN. 29, 1913.

1,157,794.

Patented Oct. 26, 1915.  
3 SHEETS—SHEET 3.



Witnesses:  
*A. R. Appelman*  
*A. Dunham*

Inventor  
*J. F. Miller*  
By his Attorneys  
*Kenn. Page, Cooper & Hayward*

# UNITED STATES PATENT OFFICE.

JOHN FORSYTH MILLER, OF TRAIL, BRITISH COLUMBIA, CANADA.

## MACHINE FOR CASTING LEAD PIGS.

1,157,794.

Specification of Letters Patent.

Patented Oct. 26, 1915.

Application filed January 29, 1913. Serial No. 744,883.

*To all whom it may concern:*

Be it known that I, JOHN F. MILLER, a citizen of the United States, residing at Trail, British Columbia, Canada, have invented certain new and useful Improvements in Machines for Casting Lead Pigs, of which the following is a full, clear, and exact description.

This invention relates to machines for casting lead alloys for bearings, and similar metals capable of being cast in metal molds, and has for its object to provide a machine which is entirely automatic in its operation and obviates the necessity of hand labor from the melting pot to the delivery of the finished cast.

In my present application I have disclosed my invention as applied to a machine for casting lead bullion in pigs.

At the present time the lead bullion from the smelters is cast in open iron molds successively filled through an open spout with the molten metal. The lead in running down the spout and in the open mold presents a large surface in contact with the air whereby there is formed a dross of oxid amounting to approximately 1% of the lead, which floats on the surface of the hot lead and must be skimmed off by hand. After the lead solidifies in the open mold it is frequently rough at its edges resulting from the uncertainties of hand pouring, and also has a depression in its upper surface due to the shrinkage of the lead on solidifying. Rough and irregular pigs are not as acceptable as when perfectly symmetrical, and it is frequently necessary to trim the pigs by hand before removing them from the mold. After the trimming operation the pigs are taken from the mold by hand and loaded on trucks by means of which they are conveyed to railroad cars or other points of delivery.

By my improved machine the formation of the dross referred to is prevented, thereby effecting a saving of a considerable portion of the metal; also the mold is so filled as to compensate for the shrinkage on solidifying and the top surface of the pig is as smooth as the other surfaces so the trimming operation heretofore necessary may be dispensed with; and after the pig is cast and cooled it is automatically delivered to a continuously moving conveyer which transports it to any desired point of delivery without hand operation.

Another important advantage of my ma-

chine is that it automatically breaks from each pig one or more samples of the same and collects such samples in a suitable receptacle so that they may be cast together into a single bar for assay.

Other features of my invention will be apparent from the following description when read in connection with the accompanying drawings wherein I have illustrated a preferred embodiment of my invention.

In the said drawings Figure 1 represents in side elevation and partly in section my improved casting machine; Fig. 2 is a transverse vertical section on line 2—2 of Fig. 1 looking in the direction of the arrow; Fig. 3 is an enlarged sectional detail of the lower portion of the mold wheel showing the sample collecting apparatus; Fig. 4 is a detailed view of a portion of a sample collecting device; Fig. 5 is a perspective view of a pig cast in my improved machine before the sample is detached as hereinafter described; Fig. 6 is a plan view on an enlarged scale of a section of the mold wheel, and Fig. 7 is a detailed view illustrating the operation of the sample taking device.

Referring now to the drawings in which like characters indicate like parts throughout the several views, 1 and 2 indicate standards provided with journal boxes 3 at their upper ends in which is rotatably mounted a shaft 4 to which is rigidly attached the hub of the mold wheel 5. The mold wheel shown comprises spiders 6 of preferably six spokes each adjacent the ends of the hub 7 and integral with or rigidly attached to the hub in any approved manner.

Attached to the ends of the spokes of the spiders are segmental rim portions 8 having outwardly opening molds 9 forming their outer periphery and provided on their inner surfaces with water jackets 10 forming a backing for the back and the adjacent portions of the end and side faces of the mold, as clearly illustrated in Figs. 2 and 3.

The ends of the segmental mold sections are provided with seats 11, see Fig. 3, fitting over the ends of the spokes to which they are connected by means of bolts 12 passing through the flanges of the seats and the ends of the spokes, forming in effect a rigid mold wheel having a continuous periphery with uniformly spaced molds throughout its entire circumference.

The shaft 4 of the mold wheel is rotated continuously at a comparatively slow speed

by any suitable mechanism. In the drawings I have illustrated for this purpose an electric motor 15 driving, through intermediate reducing gears 16, a shaft 17 having a worm 18 meshing with a worm wheel 19 rigidly attached to a shaft 20 parallel with the shaft 4 and adjacent the periphery of the mold wheel. Also attached to the shaft 20 is a spur gear 21 meshing with a large gear 22 rigidly attached to the projecting end of the shaft 4 of the mold wheel as shown most clearly in Fig. 2 of the drawing. The mold wheel is rotated in the direction indicated by the arrow in Fig. 1, and engaging a portion of its periphery on the ascending side of the mold wheel is a segmental water jacket 23 having its inner face curved to fit the outer periphery of the mold wheel and of a width sufficient to entirely cover the outer open side of the molds.

The water jacket is mounted on suitable screw-threaded rods 25 attached to the standards 1 and 2 so that the water jacket may be adjusted slightly toward or from the periphery of the mold wheel. Tapped through the water jacket at a point somewhat above its lower edge is a pipe 26 through which the molten lead is delivered to the molds.

Any suitable pump or other pressure feeding device may be used for forcing the molten lead through the pipe 26, but I prefer to use a centrifugal pump as shown at 27 in Fig. 1 of the drawings, the said pump being submerged in the molten metal in the melting pot 28 and driven at a speed to maintain about twenty pounds pressure per square inch on the lead delivered through the pipe. It will be observed that around the supply pipe 26, hermetically fitted to the inner wall of the outer water-jacket 23 by means of screw-threads, is a depression in the outer wall of the jacket thereby separating the inner water-space of the jacket from the pipe. This construction has the advantage of diminishing the cooling effect of the jacket upon the pipe 26, thereby lessening the danger of the metal solidifying or "freezing" at the outlet end of the pipe; particularly at starting, when the parts are cold. The centrifugal pump further decreases this danger by supplying a steady stream of molten metal at substantially constant pressure instead of the intermittent or pulsating stream at varying pressure given by a piston pump, so that even at starting there is no building up of a ring of solid metal around the orifice of the pipe, thereby diminishing the effective area of the orifice and sometimes filling it entirely.

The water jackets of the segmental mold sections of the mold wheel are maintained charged with water in constant circulation from any suitable source, through a pipe

29 having fluid tight connection with an axial bore 30 in the rotating shaft 4. A transverse bore 31 in the shaft connects with the bore 30 and registers with a similar bore 32 in the hub of the mold wheel leading to a circumferential manifold 33 surrounding the hub adjacent one end thereof. Pipes 34 connect the manifold 33 with the water jackets of the mold sections, there being preferably at least two pipes to each section in order to deliver the water uniformly to all parts of the mold section. Water delivered through the pipes 34 circulates from one side to the other of the mold wheel and discharges through pipes 35, similar to the pipes 34, leading to the manifold 36 similar to the manifold 33 and connected by suitable bores in the hub and shaft with a discharge pipe 37. The water jacket 23 is also provided with suitable intake and delivery pipes indicated in Fig. 1 as 38 and 39 respectively, through which a continued circulation of water may be effected.

To prevent the pigs dropping out of the molds prematurely when they reach the lower half of their circle of movement, I provide a shield or guard 40 fitting the periphery of the wheel and suitably supported closely adjacent the outer face of the molds by means of rods 41-42 attached to the standards 1.

In order to permit the air to escape from the molds while being filled, the edges of the divisions between the molds are provided with small notches 43 leading from one mold to the other. After the mold is filled these notches will become filled with molten metal which on solidifying forms a small projecting prong on the rear edges of the pigs *p*. These small portions of lead must be removed from the pig before they are marketed and I have provided means for collecting these pieces when the pigs are delivered so that they may be utilized as samples for assaying to determine the percentage of gold and silver in the run of lead. To collect sufficient lead for a sample, I preferably form a slight recess in each notch 43, as shown in Fig. 6.

In order to break off the projecting samples as the pigs are delivered from the machine I form the guard 44 at its lower end with an offset portion 45 connected with the main portion of the guard by an abrupt shoulder. A hole 46 is cut in the guard and offset portion 45 at the shoulder as shown more particularly in Figs. 3 and 4, and projecting into this hole is a finger 47 integral with the guard 40, and positioned to be immediately under the notches 43 on the mold wheel. Beneath the mold wheel a conveyer belt running on suitable pulleys 49 and idlers 50 is provided for delivering the pigs of lead as they drop from the mold wheel, and adjacent the belt with its mouth under

the hole 46 a funnel 51 is mounted in any suitable manner to collect the samples as they are broken from the pigs in the manner hereinafter described, and deliver them to a

only requires a great deal of time and labor but also mars the appearance of the pigs.

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

1. In a machine for casting lead pigs, the combination of a vertical mold wheel having outwardly open molds in its periphery and having a water-jacket backing for said molds, an outer water-jacket snugly fitting the periphery of the mold-wheel on one side thereof and extending above the horizontal diameter of the wheel to close the molds as they pass, a pipe opening into the molds through the outer water-jacket to deliver molten lead to the molds, and a stationary shield fitting the periphery of the wheel on the side opposite the outer water-jacket to prevent premature discharge of the pigs, the said shield being spaced from the outer water-jacket at the top to permit radiation from the lead-filled molds directly into the air and at the bottom to permit emptying of the molds by gravity and permit radiation from the empty molds directly into the air.

2. In a machine for casting lead pigs, the combination of a mold-wheel having a series of outwardly open molds on its periphery and having a water-jacket backing for the molds, an outer water-jacket snugly fitting the periphery of the mold-wheel on one side thereof and extending above the horizontal diameter of the wheel to close the molds as they pass, and a supply pipe for molten lead extending through the outer water-jacket and opening into the molds to supply molten lead thereto, the pipe being hermetically fitted to the inner wall of the outer water-jacket and the latter being outwardly recessed to provide a space around the supply pipe, whereby to diminish the cooling of the adjacent portion of the pipe by the water-jacket.

3. In a machine for casting lead pigs, the combination of a mold-wheel having a series of outwardly open molds on its periphery and having a water-jacket backing for the molds, an outer water-jacket snugly fitting the periphery of the mold-wheel on one side thereof and extending above the horizontal diameter of the wheel to close the molds as they pass, a supply-pipe for molten lead extending through the outer water-jacket and opening into the molds to deliver molten lead thereto, the pipe being hermetically fitted to the inner wall of the outer water-jacket and the latter being outwardly recessed to provide a space around the supply pipe whereby to diminish the cooling of the adjacent portion of the pipe by the water-jacket, and a centrifugal pump connected with the pipe to deliver a stream of molten lead thereto at substantially constant pressure.

The operation of the mechanism will now be described. The mold wheel is rotated slowly to carry the molds successively past the pipe 26 through which the lead is forced by the pump 27. The size of the pipe and pressure exerted by the pump are such that the mold is substantially filled as soon as the end of the pipe comes clear of the division between the molds. As the mold is water jacketed on substantially all the sides the metal begins to solidify and contract immediately so that the continued pressure of the molten metal forces more metal into the mold to fill the voids left by the contraction of the metal. By the time the mold passes beyond the end of the pipe the pig will have substantially solidified so that no further contraction takes place after the feed is fully cut off. The continued movement of the filled mold in contact with the water jacket 25 and continued circulation of the water in the jackets of the mold wheel rapidly reduces the temperature of the metal so that by the time the molds reach the shield 40 the pigs are ready to drop from their molds. As explained above the notches and recesses 43 between the several molds will be filled with the metal so that when the pigs reach the shoulder of the offset portion 45 they will drop slightly out of their molds bringing the samples formed in the recesses against the finger 47, breaking off the samples which will drop through the funnel while the continued motion of the mold wheel carries the pigs off the end of the part 45 permitting them to drop on the belt 48 by which they are conveyed to any suitable point of delivery.

It will be observed that the lead is conveyed to the mold wheel through a closed pipe and that the molds themselves are completely closed by the water jacket 25 so that the lead is not exposed to the oxidizing effect of the air until it has cooled well below the temperature at which the dross will form on its surface. The water jacket 25 forms the fourth side to the molds so that the outer face of the pig is as smooth and symmetrical as the other faces, particularly as the filling of the molds under pressure continues until substantially all the metal in the mold has solidified.

A further advantage of my improved machine is the automatic collecting of samples from each pig as it passes from the machine. This feature of my machine entirely obviates the tedious process of hand sampling which heretofore has been necessary. This hand sampling consists in chipping or boring a small piece out of each pig and not

4. In a machine for casting lead pigs, the combination of a mold-wheel having a rim composed of segmental rim-sections provided with outwardly open molds, each rim-section having a separate inner water-space behind its molds; radial inlet and outlet pipes connected at their outer ends to the respective water-spaces; means for supplying water to the inlet pipes at their inner ends; and means connected to the inner ends of the outlet pipes for carrying away the water discharged thereby.

5. In a machine for casting lead pigs, the combination of a mold wheel having on its periphery a series of outwardly open-pig-molds and a plurality of outwardly open-sample-molds each connected to one of the pig-molds; means for rotating the mold wheel; stationary means for closing the pig-molds and sample-molds while the same are passing a given portion of their path; and means for filling with molten lead pig-molds and sample-molds while the same are closed by said stationary means.

6. In a machine for casting lead pigs, the combination of a mold wheel having on its periphery a series of outwardly open pig-molds and outwardly open sample-molds between the successive pig-molds; means for rotating the mold wheel; stationary means for closing the pig-molds and sample-molds as they pass a given portion of their path; and means for filling with molten lead the pig-molds and sample molds as they pass said stationary means.

7. In a machine of the class described, the

combination of a traveling carrier provided with a plurality of molds, each having a small connected pocket, means for successively filling said molds and pockets, means for delivering the articles from said carrier and means for detaching from said articles the projections formed in said pockets and collecting such detached projections.

8. In a machine for casting lead pigs, the combination of a rotary mold wheel provided with a plurality of pig-molds each having a small connected sample-mold, means for successively filling the pig-molds and sample-molds, means for causing discharge of the pigs and samples by gravity as the molds pass a given point in their path, and means for breaking off the samples as the pigs fall from the molds.

9. In a machine for casting lead pigs, the combination of a vertical mold wheel having a plurality of pig-molds each having a connected sample-mold, means for successively filling the pig-molds and sample-molds, and a guard associated with the mold wheel to permit discharge of the pigs and samples by gravity at a certain point in their path, said guard being provided with means for detaching the samples from the pigs as they fall from the molds.

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

JOHN FORSYTH MILLER.

Witnesses:

L. O. BLACKMAN,  
JOHN GRANT.