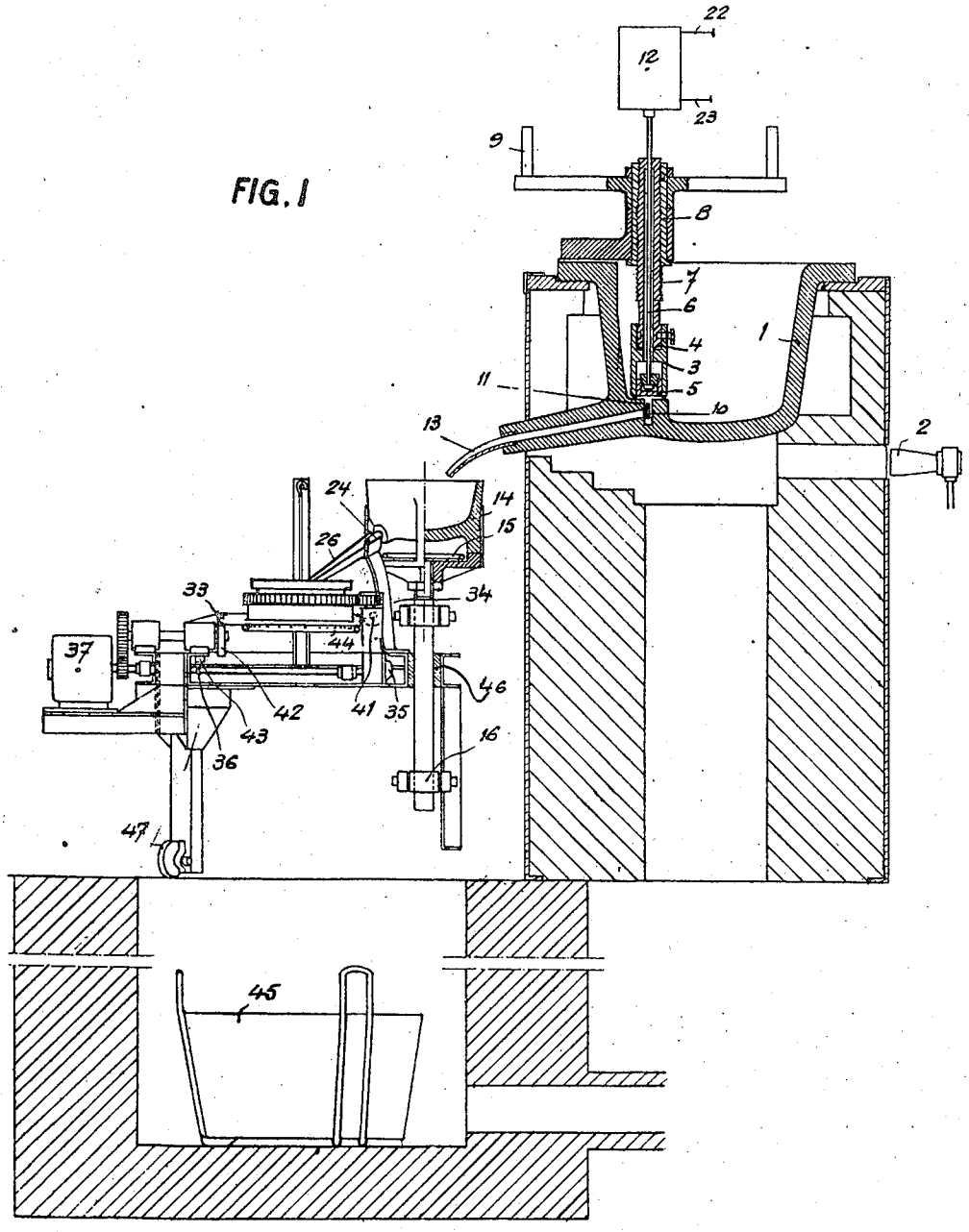
Dec. 14, 1948. R. MORANE ET AL 2,456,439

MACHINE FOR THE MANUFACTURE OF METAL GRAINS

Filed March 17, 1945 3 Sheets-Sheet 1

FIG. 1



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MACHINE FOR THE MANUFACTURE OF METAL GRAINS

Filed March 17, 1945 3 Sheets-Sheet 2

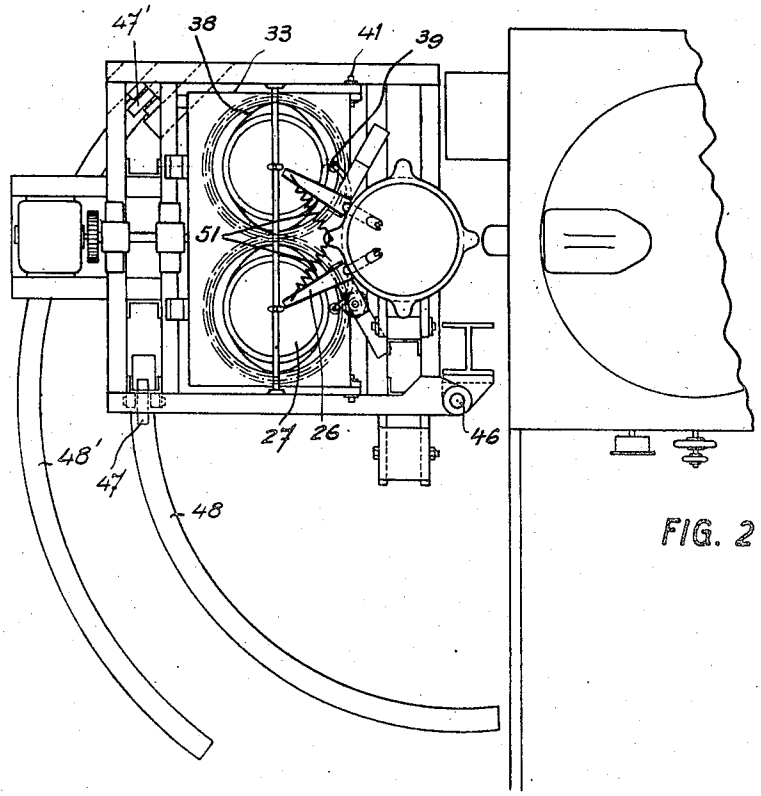
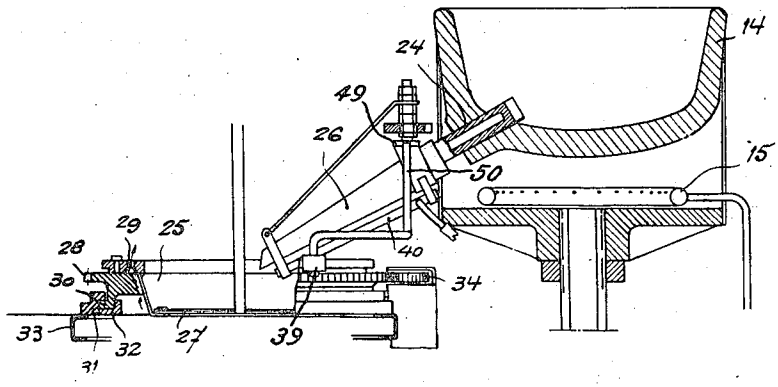


FIG. 2

FIG. 4



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MACHINE FOR THE MANUFACTURE OF METAL GRAINS

Filed March 17, 1945 3 Sheets-Sheet 3

FIG. 5

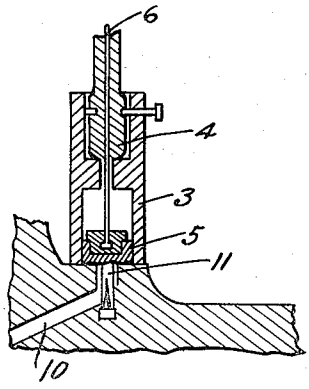


FIG. 3

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Patented Dec. 14, 1948 2,456,439

UNITED STATES PATENT OFFICE

2,456,439

MACHINE FOR THE MANUFACTURE OF METAL GRAINS

Roger Morane, Paris, and Roger Martinet, Ville D'Avray, France

Application March 17, 1945, Serial No. 583,268
In France January 20, 1943

Section 1, Public Law 690, August 8, 1946
Patent expires January 20, 1963

7 Claims. (Cl. 18—2.6)

1

Processes for the continuous manufacture of lead grains or pellets are already known, such processes essentially consisting in bringing molten lead from a melting pot into a perforated hopper whence the lead drops flow out and then become solidified into grains. The appliance used for this purpose sometimes also comprises a depressible contrivance applied to the cup carrying the perforated hopper so as to regulate the lead delivery. Such processes and appliances hardly lend themselves to the manufacture of shot but in any event they are entirely unsuitable for the manufacture of extremely fine grains or pellets of molten metals or alloys, particularly of lead or lead alloy, such for example as the metal substance used in the production of lead steels.

It is an object of the present invention to provide an improved apparatus for manufacturing metal grains or pellets of extremely fine nature and particularly grains of non-ferrous metals or alloys. As distinguished from the method and apparatus for the manufacture of shot described and claimed in our co-pending application Ser. No. 582,938 filed March 15, 1945, the present said apparatus has been specially devised to avoid the aforesaid disadvantages, and to permit the quick and automatic production of metal grains or pellets of well defined uniform size. Whereas in the co-pending application the metal layer in the cup should be relatively thick, in the present invention, on the contrary, the setting of the apparatus must be such as to maintain only a thin layer in the cup.

Another object of the invention is to provide an apparatus as aforesaid wherein the improved result is obtained notably by discharging the molten metal from the melting pot in the form of thin streams and by causing them to reach the perforated bottoms of dividing rotary cups as a thin layer, said cups being subjected to impacts while their rotary motion is combined with an oscillatory motion of their feeding chutes to ensure correct distribution of the molten metal over their perforated or dividing bottoms.

A further object of the invention is to provide, a new machine made up of a minimum number of simple and rugged parts and lending itself to an automatic actuation while requiring a minimum of supervision and labor, said machine including a melting pot, a ladle and a plurality of metal-dividing revoluble cups fed from the ladle and subjected to the action of a jolting system.

2

With these and such other objects in view as will incidentally appear hereafter, the invention comprises on the one hand the novel features which characterize the novel structure of the machine as exemplified in the accompanying diagrammatic drawings forming a part of the present disclosure.

In the drawings:

Fig. 1 is a vertical sectional view of the appliance built according to the invention and adapted for the manufacture of grains or pellets of lead alloy.

Fig. 2 is a plan view thereof.

Fig. 3 is an elevational view showing how the distributing ladle is mounted on a depressible contrivance.

Fig. 4 is a sectional view drawn on a larger scale showing the distributing ladle and a cup having a perforated bottom.

Fig. 5 is a sectional view drawn on a larger scale showing the valves which control the flow of molten metal from the pot.

As illustrated in the drawings, the appliance used for the manufacture of grains or pellets made of a lead alloy, for example an alloy of lead and arsenic such as may be utilized for the production of lead steels i. e. grains of extreme fineness, primarily comprises a pot 1 for melting the alloy, the said pot being heated for example by a burner 2 or by any other means, whether electrically or otherwise. The pot 1 may be fitted with a pyrometer enabling the temperature of the alloy to be constantly observed.

The pot 1 is provided with a double system of valves including a first valve 3 mounted on a socket joint 4 and a second valve 5 arranged for example inside the first-cited valve.

The valve 3 has a cylindrical cutting periphery and a central guiding member along the steel rod 6 which controls the second valve 5. The upward and downward motions of the valve 3 are controlled by means of a finely threaded screw 7 arranged in turn for being operated from a nut 8 driven by a hand wheel 9. The valve 3 permits a rapid and complete closure of a port 10 formed at the lower end of the pot 1 for the discharge of the molten alloy, the said closure being performed by tightening the screw 7.

The second valve 5 is guided by a stem 11 which partly closes the outlet port 10 for the melting pot while allowing a thin stream of alloy to pass therethrough. The valve 5 is controlled by a rod 6 which is received in the screw 7 operating the other valve, the said rod 6 being

in turn controlled by an electromagnet 12 which is excited under conditions that will be hereinafter set forth. This device permits molten metal to be discharged from the pot at 10, either automatically or intermittently.

When being discharged from the melting pot, the metal is guided through a downtake chute 13 into a regulating ladle 14 of suitable capacity. This ladle is heated by any appropriate means, for example by a gas range 15 or by an electric or other heater, to a suitable temperature, for example in the example being considered to 450° C.

In contradistinction to what takes place in the manufacture of shot, which manufacture calls for an important and regular delivery, the above-described device permits the regulating or distributing ladle 14 to be fed only with a small quantity of lead just as soon as the metal level in the ladle 14 sinks by a small extent, whereby extremely fine metal grains or pellets without any large diameter grains can be obtained.

As is shown on Fig. 3, the distributing ladle 14 is mounted on a depressible contrivance 16 which is balanced by a counterweight 17. The rocking axes may be mounted on bearings so as to increase the sensitiveness of the depressible carrier. The rod 18 which carries the ladle 14 has mounted thereon a finger 19 which comes into contact with a switch 20 connected by a wire 21 to a source of current S and by a wire 22 to the electromagnet 12 which controls the valve 5. A further wire 23 interconnects the source of current S and the electromagnet 12. Alternatively the return of the current may be ensured by proper grounding.

The counterweight 17 corresponds with the weight of the movable assembly plus the weight of the molten metal. As soon as the ladle 14 is full, the depressible carrier comes into operation and opens the switch 20, thereby cutting off the exciting current from the electromagnet 12 and consequently allowing the valve 5 controlled by the said electromagnet to fall back. As soon as the weight of the ladle 14 diminishes, the counterweight 17 drives it, allowing the said ladle to go up, while the finger 19 comes into contact with the switch 20 in the opposite direction, thereby closing it back and reestablishing the exciting current through the electromagnet and consequently opening the valve 5.

The ladle 14 is provided at its lower end with one or more nozzles 24, the number of which matches that of the dividing cups 25 arranged underneath the ladle 14 (see Figs. 1 and 2), the said nozzles being preferably made of steel and advantageously having such a conical shape as will permit easy dismantling and accordingly easy cleaning thereof (see particularly Fig. 4). These nozzles have a hole made on caliber through which, during a time unit, a quantity of metal may flow which exactly corresponds with the delivery of each dividing cup 25. As the level of molten lead alloy remains practically constant in the ladle 14, due regard being paid to the relation which prevails between its diameter and its height, the delivery through the nozzles 24 is therefore practically always the same.

Downtake chutes 26 made for example of sheet steel take the molten metal which is ejected from the nozzles 24 into the cups 25. Such cups have a suitable diameter, their bottom being formed with a large number of holes of suitable sectional area. In order to permit extremely fine metal grains or pellets being manufactured, the cups 25 are internally provided with several sieves 27 made of perforated sheet metal arranged in superimposition, the perforations being located in staggered relation. Such sieves are held down on the bottom of each cup 25 by a steel ring or any other suitable means. The molten lead alloy is distributed in a correct way throughout the area of the sieves 27 owing to the rotary motion which is imparted to the said cups. To that effect, the cups are arranged on a driving toothed ring 28 and insulated by vents 29 or by any other means capable of preventing the temperature of the cup from being transmitted to the disk 28. This driving disk 28 is made of cast iron and is provided at its lower end with a shoe 30 formed integral therewith. This shoe is guided by a pair of rings 31, 32 arranged on a jolting table 33 to which reference will be made hereafter.

The rings 28 are driven at a suitable speed by means of a pinion 34 which is driven in turn by a speed-reducing gear 35 including a worm. Such reducing gear is housed in a water tight casing which is secured to a part of the machine not subjected to jolts or vibrations.

The reducing gear 35 is controlled by a hollow shaft 36 driven by a motor 37. Such an assembly permits each cup to be rotated at a suitable speed while imparting to them proper vibratory motion. For the sake of clarity, it may be mentioned that a universal joint, hidden by the uprights supporting ladle 14, is inserted between reducing gear 35 and shaft 41.

Such rotary motion as is imparted to the cups may be combined with an oscillatory motion imparted to the downtake chutes 26, in which case the latter should be mounted for pivoting inside a hole provided in a plane member 49 of shaft 50. Such a motion is accomplished by means of a cam 38 which is in frictional relation with a roller 39 supported by shaft 50. The downtake chutes are urged back by a return spring 51, when the rollers have been driven away through the action of cam 38 on roller 39. Moreover the downtake chutes are heated by means of a gas range 40, thereby preventing the molten alloy from cooling while it flows. Cams 38 may be secured to cups 25 by welding or other suitable means or may be machined integrally thereon.

It will be seen that, owing to the described device, only a very small quantity of molten metal can be supported by the bottom of each cup 25, the said metal being perfectly distributed over the whole area. Moreover, owing to the automatic inflow of metal such as hereinbefore described, the feed is caused to correspond with the delivery of each cup. Even delivery for each 25 is thereby ensured which prevents the formation of such numerous wastes as might arise from an unduly large or uneven feed.

As there is but a very small quantity of molten metal on the bottom of each cup 25, it is necessary, in order to allow proper flow of the metal through the holes in each cup, and consequently to give the ensuing grains or pellets extreme fineness, that all the cups should be subjected to jolts or impacts of suitable rapidity and proper extent. To that effect, the several cups are mounted on a common frame 33 which may be for example pivoted at 41 to the machine frame and which has vibrations imparted thereto by means of a rotary cam 42 operated for example by means of the electric motor 37 which controls the revolution of the cups or alternatively by any other suitable electrical, mechanical or

pneumatic means. This cam may be mounted on roller bearings. The movable assembly 33 is first lifted by this cam and then falls upon wedges 43 the height of which may be adjusted, this permitting the amplitude of the jolts or impacts being regulated.

Considering the small delivery of the cups 25, they are heated (for example to 450° C. in the example being considered) by a gas range 44 or by any other equivalent means.

The drops of molten alloy which flow through the perforated bottom of the cups 25 fall from an appropriate height, are cooled into solid form and are collected in a receiving container 45 made of sheet metal and accommodated in a pit, the said container being filled with water for completing the cooling of the metal grains. The whole assembly comprising the distributing ladle 14 and the cups 25 also the jolting system may revolve about an axis 46 (see particularly Fig. 2) the frame carrier comprising castors 47, 47' which can roll on corresponding runways 48, 48'. This permits the receiving container 45 to be taken away at any suitable time or at the end of the day by means of any suitable form of tackle or by any other method and the manufactured product to be laid into the chute leading for example to a drying apparatus.

It will be understood from the foregoing that, owing to the hereinbefore described organization and manufacturing process, it is possible to manufacture such extremely fine metal grains or pellets as will be suitable for several uses and particularly to the production of lead steels.

Obviously the invention is not limited to this use and the apparatus which has just been described may be used with advantage for the manufacture of miscellaneous metal grains or pellets made from metals or alloys of different categories.

It is also obvious that the hereinbefore described apparatus as shown in the drawings was given merely by way of example and that modifications might be introduced into its constructional details without departing from the scope of the invention.

What is claimed is:

1. An apparatus for manufacturing metal grains and particularly grains of non-ferrous metals or alloys, comprising a pot of molten metal, a metal-distributing ladle, a conduit provided at said pot for feeding said ladle, rotatable cups with sieve bottoms for dividing said metal into grain, said ladle having detachable nozzles the openings of which are calibrated to the openings in the cups to give uniform discharge from the cups, each nozzle having a chute for feeding said cups; a drive for imparting to said cups a rotational motion at uniform speed and jolts at certain intervals of time and means for adjusting the extent of the jolts.

2. An apparatus for manufacturing metal grains and particularly grains of non-ferrous metal or alloys, comprising a pot for molten metal, a metal distributing ladle, a conduit provided at said pot for feeding said ladle, rotatable cups with sieve bottoms for dividing said metal into grain, said ladle having nozzles and a chute for each nozzle for feeding said cups; said ladle and said cups carried by a structural unit; said unit also carrying means for heating said chutes and said ladle, a drive likewise carried on said structural unit for imparting to said cups a rotational motion at uniform speed and an oscillatory motion to said chutes, and means connected to said drive for imparting jolts to said cups at certain intervals of time with means for adjusting the extent of the jolts.

3. The combination with an apparatus for manufacturing metal grains and particularly grains of non-ferrous metal or alloys comprising a pot for molten metal, a metal distributing ladle, a conduit provided at said pot for feeding said ladle, an assembly of cups with sieve bottoms for dividing said metal into grain, said ladle having nozzles and a chute for each nozzle for feeding said cups and driving means for imparting to said cups a rotational motion at uniform speed and an oscillatory motion to said chutes, of a frame common to and supporting said cup assembly, cam means adapted to be driven by said drive and to impart impacts to said frame and cup assembly, and means for regulating the extent of said impacts.

4. An apparatus for manufacturing metal grains and particularly grains of non-ferrous metals or alloys, comprising a pot for molten metal, a metal-distributing ladle, a conduit provided at said pot for feeding said ladle, rotatable cups with sieve bottoms for dividing said metal into grain, said ladle having nozzles and a chute for each nozzle for feeding said cups, said conduit having associated therewith a set of double valves for controlling the passage through said conduit, said set consisting of a primary valve adapted to permit a rapid closing of said conduit, and a secondary valve adapted to throttle said passage of the conduit to let the metal flow in a thin stream.

5. An apparatus as set forth in claim 4 wherein a depressible counterweighed carrier is provided supporting said ladle, furthermore switch means operable responsive to the depression of said carrier with said ladle and adapted to control said secondary valve.

6. An apparatus as set forth in claim 4 wherein said secondary valve is provided with an electromagnet and adapted to be operated thereby, and wherein a depressible counterweighed carrier is provided supporting said ladle, furthermore switch means operable responsive to the depression of said carrier with ladle and adapted to control said electromagnet.

7. An apparatus as set forth in claim 4 wherein said structural unit caries a depressible counterweighed carrier supporting said ladle furthermore switch means operable responsive to the depression of said carrier with ladle; said conduit having passage controlling means associated with said switch means and adapted to be controlled thereby.

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