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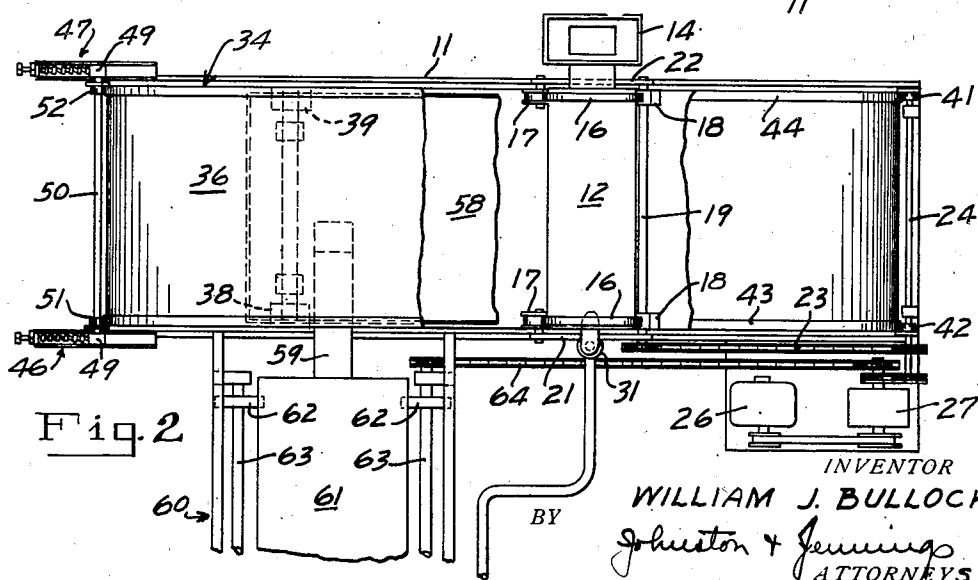
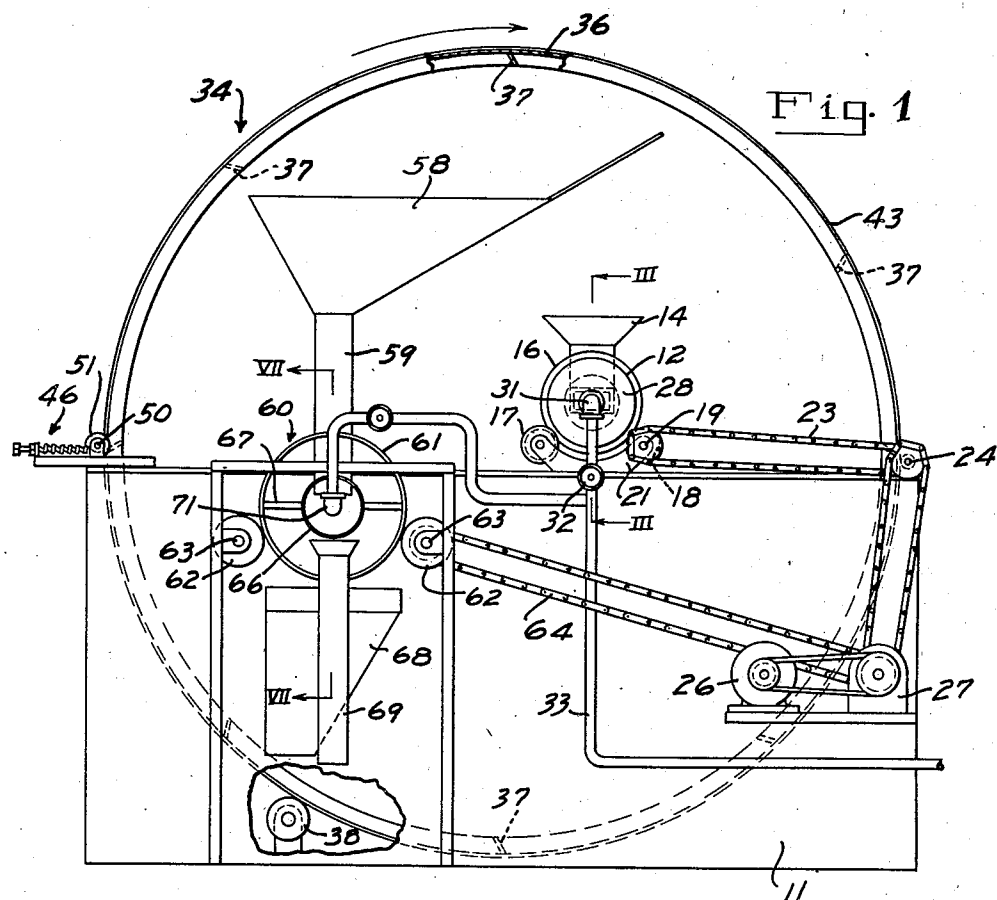
W. J. BULLOCK

2,224,424

SHOT MACHINE

Filed Jan. 20, 1940

2 Sheets-Sheet 1



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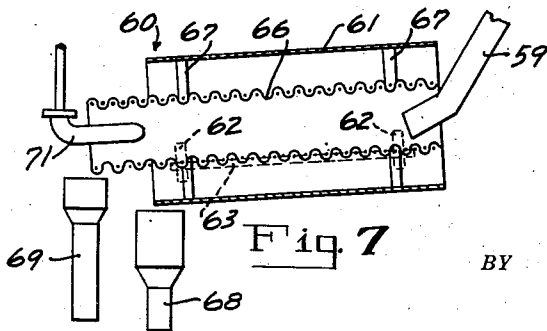
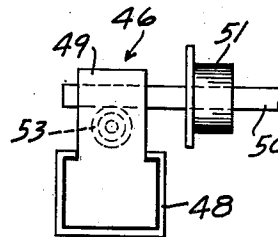
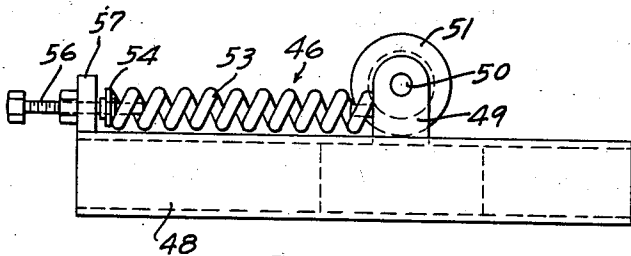
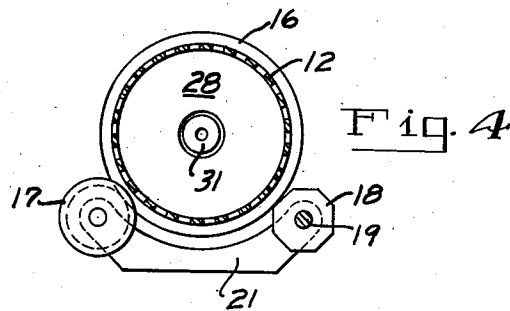
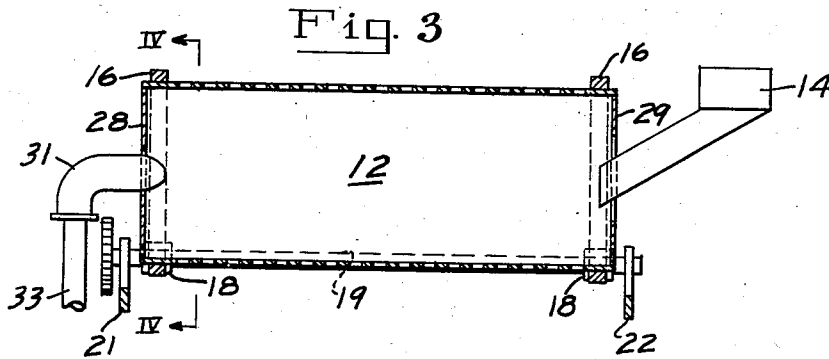
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2 Sheets-Sheet 2



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2,224,424

SHOT MACHINE

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Application January 20, 1940, Serial No. 314,885

6 Claims. (Cl. 83-91)

My invention relates to a machine for producing shot aluminum such as is used in metallurgy to deoxidize steel, and has for an object the provision of a machine of the character designated
5 embodying means whereby the fluidity of the molten metal is closely controlled up to the instant of dropping and is kept in the best possible condition for producing shot, and which at the same time prevents oxidation of the metal while
10 in the cylinder.

Another object of my invention is to provide a shot machine having a horizontally disposed, perforated cylinder into which molten metal is poured, and means to both rotate and shake the
15 cylinder so as to cause the drops of molten metal to pass more freely through the perforations, thereby increasing the capacity of the machine and the uniformity of the size of the shot.

Another object of my invention is to provide an
20 aluminum shot machine embodying a rotating, vibrating, perforated drum for dropping the shot, together with means to maintain the interior of the drum at a temperature at which the metal is in a fluid condition and in a reducing atmosphere during the dropping operation.

A further object of my invention is to provide an aluminum shot machine which comprises a rotating, vibrating, perforated cylinder for dropping the shot, a chilling tank, an elevator to collect the shot from the chilling tank, and a drier
30 into which the shot is automatically fed by the elevator.

Briefly, my invention comprises a dropper in the form of a rotary, vibrating cylinder having
35 perforations of suitable size. A burner in the cylinder maintains the temperature high enough to insure proper fluidity of the molten metal and also maintains a reducing atmosphere within the cylinder. Suitable cooling, elevating, drying and screening means, to be particularly described, are associated with the dropper so that a continuous operation may be maintained.

Referring to the accompanying drawings forming a part of this specification and illustrating my
45 invention in its preferred embodiment only,

Fig. 1 is a side elevation of my improved shot machine with certain parts broken away to show interior parts;

Fig. 2 is a plan view with some of the parts
50 broken away;

Fig. 3 is a sectional view taken substantially on line III-III of Fig. 1 and showing the perforated cylinder;

Fig. 4 is a sectional view taken on line IV-IV of
55 Fig. 3;

Fig. 5 is an enlarged side elevation of one of the units which presses the elevator into engagement with its friction drive;

Fig. 6 is an end elevation of Fig. 5; and

Fig. 7 is a view taken on line VII-VII of Fig. 1
5 and showing the drier.

My improved machine comprises an open tank 11 substantially filled with water to suddenly chill the drops of molten metal. Mounted above the tank 11 and extending the width thereof is a
10 perforated cylinder 12 having its axis disposed substantially horizontal and adapted to receive molten metal from a hopper 14.

The cylinder 12 is provided at each end with riding rings 16 which rest on flanged idler rollers 17 and driven polyhedral rollers 18 mounted on
15 a common shaft 19 supported for rotation in bearings 21 and 22. Shaft 19 is driven by a chain 23 from a shaft 24, which latter shaft is driven by a motor 26 through a reduction gear box 27. It
20 will thus be seen that as the polyhedral rollers 18 turn they not only rotate the cylinder 12, but also give it a vibratory motion which shakes the molten metal from the perforated cylinder and causes it to quickly pass therefrom in pellets or
25 shot aluminum. I have found that this vibrating motion of the cylinder not only speeds up the formation of the pellets, but it also causes the pellets to be more uniform in size and shape than if the drum were simply rotated without
30 the vibratory motion.

Heretofore, losses have been experienced in forming shot aluminum because of the fact that molten aluminum readily oxidizes when exposed to air. A difficulty has been that molten
35 aluminum will quickly solidify so that when it is poured into the shot dropper it will not readily pass out in the form of drops. In order to overcome these objections I close the ends of the cylinder 12 with plates 28 and 29, and mount a
40 burner 31 at one end of the cylinder so that the flame therefrom is within the cylinder. I provide a valve 32 in the burner fuel line 33 so that the heat within the cylinder may be closely controlled to keep the molten metal in the best possible condition to form the shot. The positioning
45 of the burner 31 so that the flame is within the cylinder 12 prevents oxidation of the molten metal because the products of combustion from the burner maintain a reducing atmosphere within the cylinder 12. I have found that this construction completely prevents the formation of aluminum oxide and thus increases the efficiency of the machine.

In order to recover and collect the shot from 55

the chilling tank 11 continuously during the operation of the machine, I mount a rotary elevator within the tank 11. As seen, the elevator comprises a large open ended drum 34 substantially the width of the tank and having a peripheral cover 36 provided with a plurality of scoops or buckets 37 which pick up the shot as they fall from the cylinder 12. The elevator is mounted for rotation in the tank on rollers 38 and 39 and is driven by rollers 41 and 42 fast on the shaft 24. I provide peripheral strips 43 and 44 of friction material against which the driving rollers 38 and 39 bear, thus providing a friction drive for the elevator.

On the top of the tank at the end opposite the rollers 38 and 39, I provide units 46 and 47 which are adapted to bias the elevator always into frictional engagement with the driving rollers 41 and 42. Referring more particularly to Figs. 5 and 6, it will be seen that each of these units comprises a box channel 48 into which is slidably mounted a bearing block 49 for a shaft 50, carrying rollers 51 and 52. A compression spring 53 bears at one end against the bearing block and at the other end against a collar 54 on a pin 56 threaded into a nut 57 fast on the channel 48. The springs are tightly compressed and force shaft 50 and rollers 51 and 52 against the elevator, and thus force the elevator into driving engagement with rollers 41 and 42.

On top of tank 11 I mount a hopper 58 which is adapted to receive the shot as it falls from the elevator buckets 37. A chute 59 leads from the hopper 58 to a rotary drier 60. As seen in Fig. 7, the drier comprises an outer drum 61 mounted for rotation on rollers 62 fast on shafts 63. One of the shafts 63 is driven by a chain 64 from the reduction gear box 27.

Inside the drum 61, and rotatable therewith, is a wire basket 66 mounted by spiders 67. The size of the meshes of basket 66 are large enough to permit passage therethrough of shot which are properly formed by the perforated drum 12, but are too small to pass oversized or misshapen shot. The shot which passes through the basket 66 will fall into the drum 61 and pass into a chute 68, thence to any suitable container, while the remainder will continue to the end of basket 66 and fall into a chute 69. A burner 71 serves to heat the interior of the drier and dries the shot as it rotates. The drier, therefore, serves the double purpose of drying and screening the shot so that the final products from my machine are two sizes of shot all ready for the market.

The operation of my device is as follows: Burner 31 is lighted and motor 26 is started. Sufficient molten metal is poured into the cylinder 12 through hopper 14 to fill the cylinder substantially up to the burner and hopper openings in the end plates 28 and 29. As the polyhedral rollers 18 rotate they impart both a rotating and vibrating motion to the cylinder 12 which shakes off drops of metal through the perforations in the cylinder. The shot falls into the tank of water 11 and into the buckets 27 on the elevator, from whence it falls into hopper 58 as the buckets reach the top. From the hopper the shot goes into the drier where any remaining moisture is removed by heat from burner 71, and thence into the chutes 68 and 69 to any suitable container.

It will be noted that my improved shot machine permits production of shot over continuous periods without the necessity of stopping the machine either to supply the molten metal or to remove the finished shot from the tank. It is only nec-

essary to continuously pour molten metal into the hopper 14 and the shot will be continuously formed, chilled, dried and sorted.

From the foregoing it will be apparent to those skilled in the art that I have devised an aluminum shot machine which is capable of producing shot without oxidation of the molten metal, which has increased capacity over shot machines now in use, and which is simple and inexpensive to manufacture and operate.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. A shot machine comprising a rotary cylinder having a perforated peripheral wall, the axis of said cylinder being disposed substantially horizontal, means to feed molten metal into the cylinder to leave the same through the peripheral perforations, means to heat the cylinder and maintain a reducing atmosphere in the interior thereof, means to vibrate the cylinder as it rotates, a chilling tank beneath the cylinder, and an elevator associated with the chilling tank to collect and remove the chilled shot.

2. A shot machine comprising a cylinder having a perforated peripheral wall and having its axis disposed substantially horizontal, means to feed molten metal into the cylinder to leave the same through the peripheral perforations, a burner adapted to keep the molten metal in the cylinder in a molten condition and to maintain a reducing atmosphere in the interior of the cylinder, driven polyhedral rollers adapted to both rotate and vibrate the cylinder, a chilling tank beneath the cylinder, and an elevator associated with the chilling tank to collect and remove the chilled shot.

3. A shot machine comprising a peripherally perforated cylinder with its axis disposed substantially horizontal, means to feed molten metal into the cylinder to leave the same through the peripheral perforations, a flame burner adapted to heat the interior of the cylinder and maintain a reducing atmosphere therein, a driven polyhedral roller at each end of the cylinder adapted to both rotate and vibrate the cylinder, a chilling tank beneath the cylinder, and an elevator associated with the chilling tank to collect and remove the chilled shot.

4. A shot machine comprising a peripherally perforated cylinder having its axis disposed substantially horizontal, means to feed molten metal into the cylinder to leave the same through the peripheral perforations, a flame burner adapted to heat the interior of the cylinder and maintain a reducing atmosphere therein, a driven polyhedral roller at each end of the cylinder adapted to both rotate and vibrate the cylinder, a chilling tank beneath the cylinder, an elevator associated with the chilling tank to collect and remove the chilled shot, and means to dry and screen the shot.

5. A shot machine comprising a peripherally perforated cylinder having its axis disposed substantially horizontal, means to feed molten metal into the cylinder to leave the same through the peripheral perforations, means to maintain the metal in a molten condition while in the cylinder,

means to maintain a reducing atmosphere in the interior of the cylinder, polyhedral rollers at each end of the cylinder to both rotate and vibrate the cylinder, said rollers being mounted on a common driven shaft, a tank of water beneath the cylinder, an elevator associated with the tank to collect and remove the chilled shot, and a drier adapted to receive the shot from the elevator.

6. A shot machine comprising a peripherally perforated cylinder having its axis disposed substantially horizontal, means to feed molten metal into the cylinder to leave the same through the

peripheral perforations, a burner adapted to both maintain the metal in a molten condition in the cylinder and maintain a reducing atmosphere within the cylinder, driven polyhedral rollers at each end of the cylinder adapted to both rotate and vibrate the cylinder, a tank of water beneath the cylinder, a conveyor associated with the tank to collect and remove the shot, a hopper to receive the shot from the conveyor, and a rotary drier to receive the shot from the hopper.

WILLIAM J. BULLOCK.