Jan. 15, 1946. A. R. WILLARD 2,393,213

CASTING MACHINE

Filed Feb. 27, 1943 2 Sheets-Sheet 1

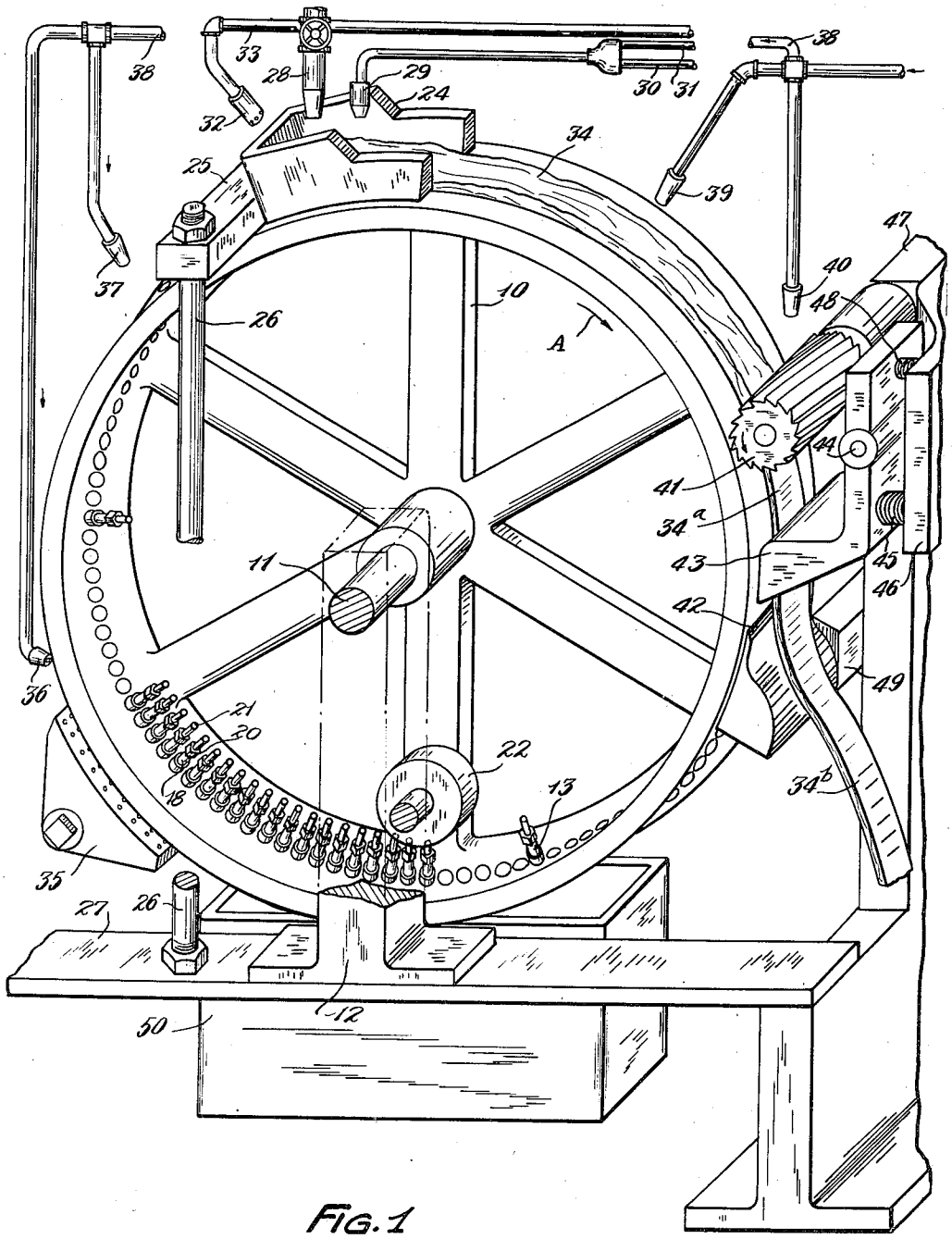


FIG. 1

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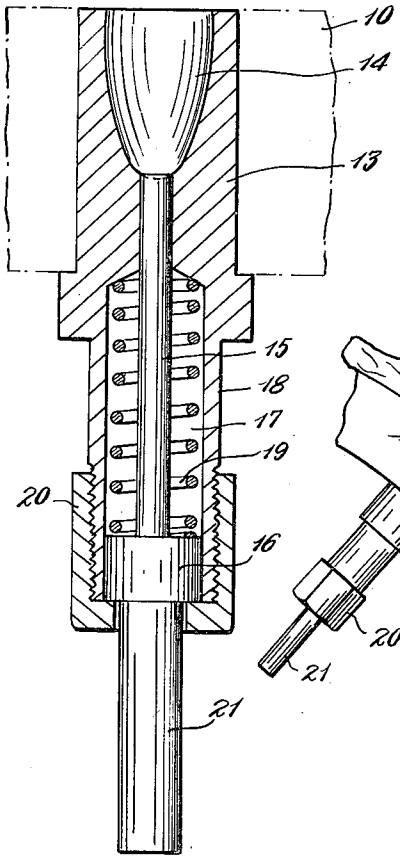


FIG. 2

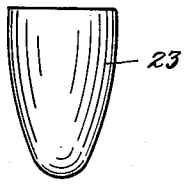


FIG. 3

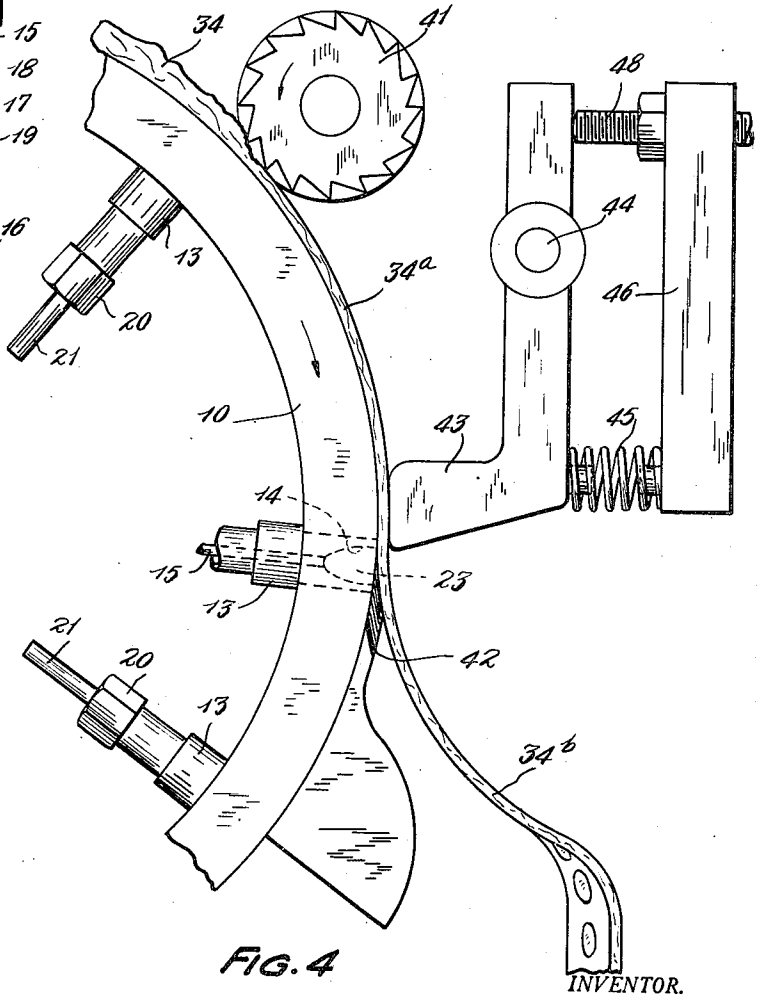


FIG. 4

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UNITED STATES PATENT OFFICE

2,393,213

CASTING MACHINE

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Application February 27, 1943, Serial No. 477,342

5 Claims. (Cl. 29—33)

This invention relates to a casting machine and has for its object to provide a machine having high efficiency and one wherein slugs, such as bullets, can be cast from molten lead with great accuracy and rapidity.

I provide a casting machine consisting of a member in the form of a wheel rotatable about a horizontal axis and which is provided on its periphery with a large number of equally spaced molds in which the castings are made, these molds having cavities arranged peripherally of the wheel annulus and each carrying an ejector which at a given point is depressed to eject the casting from the mold.

The invention comprises the general arrangement of parts illustrated and described, as well as numerous details of construction including the gate which is in the form of an open-ended trough which is arranged at the periphery of the wheel to the left of the center with the wheel traveling in a clockwise direction, and also certain other details comprising devices for cutting from the periphery of the wheel the excess metal which is cast thereon.

The invention may be further briefly summarized as consisting in certain details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheets of drawings which show the preferred embodiment of the invention,

Fig. 1 is a perspective view of the casting machine, certain parts not essential to an understanding of the operation of the machine being omitted;

Fig. 2 is a sectional view on a slightly enlarged scale showing one of the mold pins provided with a cavity for forming the casting and showing also a portion of the ejecting means;

Fig. 3 is an elevation on a slightly enlarged scale showing a bullet which is cast in the mold cavity; and

Fig. 4 is a fragmentary detail view showing the devices for removing the excess metal which is cast onto the periphery of the wheel.

Referring now to the drawings, 10 represents a wheel at the periphery of which the castings are to be made. This wheel is rotatable upon a horizontal shaft 11 which may be supported on a post 12 and is driven by a motor (not shown). Tightly fitted into the periphery of the wheel where the casting is done are a large number of equally spaced mold pins 13 (see Fig. 2) each having a cavity 14 which is open at the wheel periphery and each provided with an ejector pin 15 provided with a shoulder 16 arranged to move axially in a cylindrical socket 17 in a reduced extension 18 of the mold pin 13. A coil spring 19 extends between and engages the base of the socket 17 and the shoulder 16 and is adapted to be compressed when the ejector pin is operated. Screwed externally onto the end of the extension 18 of the mold pin is a nut 20 having an inwardly extending flange against which the shoulder 16 of the ejector pin 15 normally engages. The nut 20 has an opening through which an extension 21 of the ejector pin 15 extends inwardly toward the axis of the wheel so that it may be engaged by an ejector 22 which is in the form of a rotatable wheel or roller and which may also be supported by the post 12, the ejector 22 being rotatably positioned at the inner periphery of the wheel 10 in a position to engage the extension 21 of each ejector pin 15 as it passes underneath the ejector. In Fig. 3 is shown at 23 one of the bullets which is cast in the mold cavity 14.

Coming now to an important feature of my invention, it will be noted that I provide at 24 a novel form of pouring gate for the molten metal. This pouring gate is open at one end so that the width of the strip of metal which is cast onto the periphery of the wheel is determined by the width of the opening at the open end of the gate. The gate 24 is secured to a supporting member 25 which is mounted on a bolt 26 extending upwardly from a lower frame piece 27 to which the post 12 is secured. The rear end and the two parallel sides of the gate engage the periphery of the wheel. The position of the gate 24 is important, it being noted that it is located not immediately above the axis of the wheel but to the left of the vertical axis opposite the direction of rotation of the wheel which is indicated by the arrow A.

Molten metal, in this instance lead, is supplied to the gate 24 by a vertically arranged nozzle 28 located somewhat near the closed end of the gate, this nozzle being connected to a pipe which extends from the melting furnace (not shown). I employ what may be termed a high gate which permits the formation of a substantial pool of lead and the development of pressure which is desirable for good casting.

A flame from a gas jet 29 keeps the molten lead in the gate in very fluid condition, as is desirable. This jet 29 is supplied with gas and air which make a hot flame, the gas being supplied through a pipe 30 and the air through a pipe 31. The flame is directed onto the molten lead in the gate immediately in advance of the closed end of the gate. A second nozzle 32 also supplies gas from

a pipe 33, this nozzle 32 being arranged at the rear part of the gate so that a flame from this nozzle keeps the gate in heated condition.

In view of the position of this gate in advance of the highest point of the wheel, the lead flows into each cavity from a point where the head of the lead is the greatest. The lead fills the various cavities and spreads onto the periphery of the wheel in the form of a strip 34 which is of irregular height and of a width determined by the spacing of the side plates of the gate at the open end, the strip emerging from the end at about the highest point of the wheel, the strip 34 being integral with the castings in the molds.

At 35 I show a heater which is employed to preheat the wheel and the mold cavities when the casting machine has been inoperative for a time and is cold. After the wheel is in operation, the gas to this heater is shut off, in fact to avoid excessive heat in the mold cavities and the wheel prior to pouring of the metal, water is sprayed onto the periphery of the wheel from a pair of nozzles 36 and 37 which are connected to a water pipe 38. Connected to this same pipe 38 are a pair of nozzles 39 and 40. Water from the nozzle 39 insures the rapid solidifying of the metal before it is engaged by a milling cutter 41 which is located approximately 90° from the location of the pouring gate 24. Water from the nozzle 40 is used to cool the milling cutter and also helps to keep the lead trimmings from sticking to the milling tool.

The milling cutter forms one element of an important part of this invention which pertains to the removal of the cast strip 34 from the castings 23 cast in the mold cavities 14. I utilize two cutting elements one of which is the milling cutter 41 and the second of which is a shaving tool 42 which is located further around the wheel. As shown in Fig. 4, the function of the milling cutter is to cut off a large amount of excess lead so that the shaving tool has only a relatively small amount of lead to remove. By reference to Fig. 4 it will be seen that the milling tool which rotates at high speed in the same direction that the wheel 10 is moving mills off all but a small amount of lead 34, reducing it in thickness to a thin strip 34a so that the shaver, as stated above, has only a relatively small amount of lead to remove and therefore is not subjected to those forces which would tend to disturb its accurate setting or alignment, as would be the case if it were required to remove the entire amount of excess lead which is of irregular thickness.

Just in advance of the shaving tool 42 I provide a pressure shoe 43 which is pivoted at 44, the shoe portion being urged toward the strip 34a by a rather stiff coil spring 45 arranged between the lower end of the shoe and a member 46 which, as shown, is supported near the top of a support 47. The function of this shoe is to press the strip toward the periphery of the wheel, not only to retain the castings in the mold but to insure that they are retained in their proper position so that an accurate cutting is performed by the shaving tool. The shoe insures precision cutting. A stop pin 48 prevents the shoe from engaging the periphery of the wheel should the wheel continue its rotation after the casting operation has been discontinued. It might be stated at this point that the high speed milling tool may also be supported on the upright supporting member 47, as indicated in Fig. 1, and the shaving tool 42 is mounted on a supporting member 49 which is also secured to the supporting member 47, as also indicated in Fig. 1. The milling tool may be rotated by the same motor which rotates the wheel 10 but of course at a much higher speed than the wheel is rotated. However, it is preferably driven by a separate motor.

The operation of the machine is as follows:

Molten lead is supplied by the nozzle 28 to the rear part of the gate 24, and, as the wheel 10 is rotated, the mold cavities are successively filled with the molten lead at the rear part of the gate and with an excess of metal the width of which is determined by the width of the gate at the open end forming the strip 34 which connects the metal occupying the mold cavities. Obviously, the thickness of the strip is dependent upon the amount of lead flowing into the rear part of the gate and out of the open end of the gate. The metal is solidified by a spray of water from the nozzle 39, and when the strip 34 reaches the milling cutter the top of the strip is milled off, leaving the relatively thin strip 34a. When the strip 34a reaches the shaving tool 42, the strip 34a is cut off, leaving the castings 23 in the cavities of the different mold pins 13. The pressure shoe which is just in advance of the shaving tool 42 serves to retain the castings in the mold pins and the cutting of the strip from the castings is exactly at the periphery of the wheel. As indicated in the drawings, the shaving tool engages the periphery of the wheel on a bias of several degrees so as to have a better shaving action on the strip 34a.

As the wheel continues its rotation, carrying downwardly the castings in the cavities of the mold pins, the castings now being freed of the strip 34a, the ends 21 of the ejector pins 15 successively engage the ejector wheel 22, causing the ejector pins 15 to be moved radially outward, thereby ejecting the castings from the cavities of the mold pins, and the castings fall into a suitable receptacle 50.

The mold pins are arranged closely together in the periphery of the wheel 10, as shown at the lower part of Fig. 1, but in the drawings they have been omitted from the major part of the casting wheel.

In the event that castings of different sizes are to be made, the mold pins are removed, and mold pins having the desired cavity size are substituted therefor.

In the drawings I have shown a casting wheel having only one annular row of mold pins with their ejectors, but the number of rows may be increased if desired. For example, up to six or more rows may be employed. If the number of rows of mold pins is increased to two or up to six, the width of the gate, the width of the milling tool, the width of the shoe, and the width of the shaving tool will be increased accordingly. If the number of rows of pins is increased beyond six, it will generally be desirable to provide two gates, two milling tools, two shoes, and two shaving tools to accommodate the larger machine. However, I regard it within the scope of the invention to provide separate gates, milling tools, shoes, and shaving tools for one or more of the rows regardless of the number of rows of mold pins.

Thus it will be seen that I have provided a casting machine which is efficient in operation and is especially desirable for the casting of slugs, such as bullets, from molten lead with great accuracy and rapidity.

While I have shown the preferred construction of my casting machine, I do not desire to be confined to the precise details illustrated and de-

scribed but regard my invention as including such changes and modifications as do not constitute a departure from the spirit and the scope of the invention.

Having thus described my invention, I claim:

1. In a casting machine, a wheel rotatable about a horizontal axis and provided on its periphery with one or more rows of article forming cavities, a pouring gate near the top of the wheel for supplying molten metal to the cavities and forming a strip of metal on the periphery of the wheel integral with the articles, a rotary milling tool on the descending side of the wheel for reducing the thickness of the strip, a shaving tool beyond and below said milling tool constructed and arranged for severing the strip, as a continuous strip, from the articles and wheel, said shaving tool deflecting the severed strip away from the wheel, and means for ejecting the castings from the wheel.

2. In a casting machine, a rotatable wheel provided with one or more rows of cavities, a pouring gate for supplying molten metal to the cavities and forming a strip of metal on the surface of the wheel, a milling tool for reducing the thickness of the strip, a shaving tool for shaving the strip from the wheel, and a pressure shoe yieldingly engaging the strip and pressing the same against the surface of the wheel, said shoe being located between the milling tool and the shaving tool.

3. In a casting machine, a wheel having a row of cavities in the periphery thereof and rotatable about a horizontal axis, a pouring gate resting upon said wheel and having a closed end and an open end and arranged at one side of the vertical axis of the wheel in a direction opposite the direction of rotation of the wheel, means for supplying molten lead near the closed end of the pouring gate so that a head will be created therein, means for rotating the wheel so that the cavities are successively brought under said pouring gate thereby filling the cavities and producing a layer of cast lead joining the lead in the cavities, means for spraying a cooling medium onto the strip after the same emerges from the pouring gate, a tool for cutting the top from the strip, and a second tool for shaving the remainder of the strip from the periphery of the wheel.

4. In a casting machine, a wheel having a row of cavities in the periphery thereof and rotatable about a horizontal axis, a pouring gate resting upon said wheel and having a closed end and an open end and arranged at one side of the vertical axis of the wheel in a direction opposite the direction of rotation of the wheel, means for supplying molten lead near the closed end of the pouring gate so that a head will be created therein, means for rotating the wheel so that the cavities are successively brought under said pouring gate thereby filling the cavities and producing a layer of cast lead joining the lead in the cavities, means for spraying a cooling medium on the strip after the same emerges from the pouring gate, a milling cutter for cutting the top from the strip, a shaving tool for shaving the remainder of the strip from the periphery of the wheel, and a pressure shoe yieldingly pressing the strip against the wheel periphery in advance of the shaving tool.

5. In a casting machine, a wheel rotatable about a horizontal axis and provided on its periphery with one or more rows of article forming cavities, a pouring gate near the top of the wheel for supplying molten metal to the cavities and forming a strip of metal on the periphery of the wheel integral with the articles, a tool on the descending side of the wheel for reducing the thickness of the strip, a shaving tool beyond and below said tool constructed and arranged for severing the strip, as a continuous strip, from the articles and wheel, said shaving tool deflecting the severed strip away from the wheel, and means for ejecting the castings from the wheel.

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