Feb. 13, 1923. 1,444,905

E. C. DITTMAN

SLUG CASTING MACHINE

Filed Nov. 3, 1921 2 sheets-sheet 1

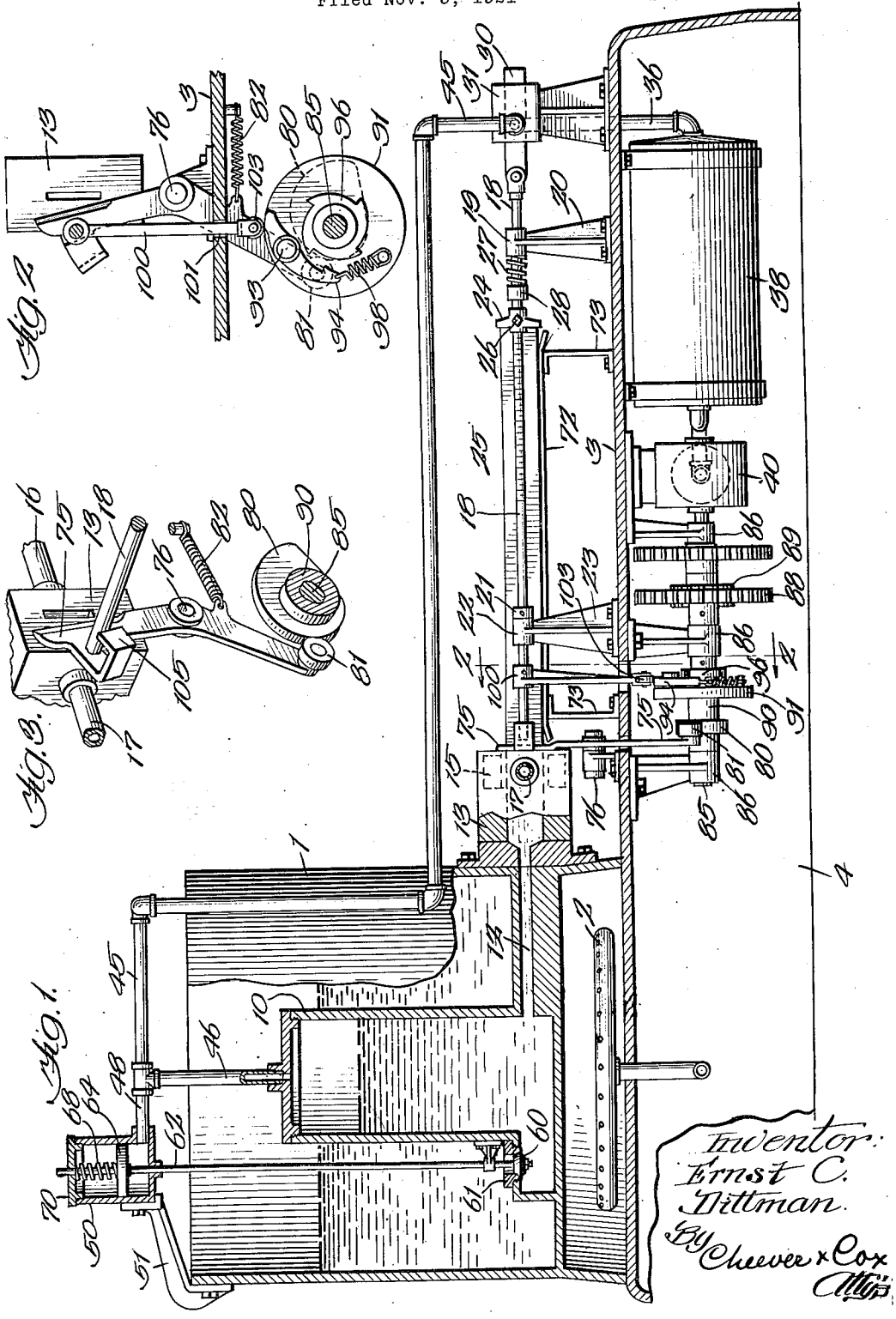


Fig. 1.

Fig. 2.

Fig. 3.

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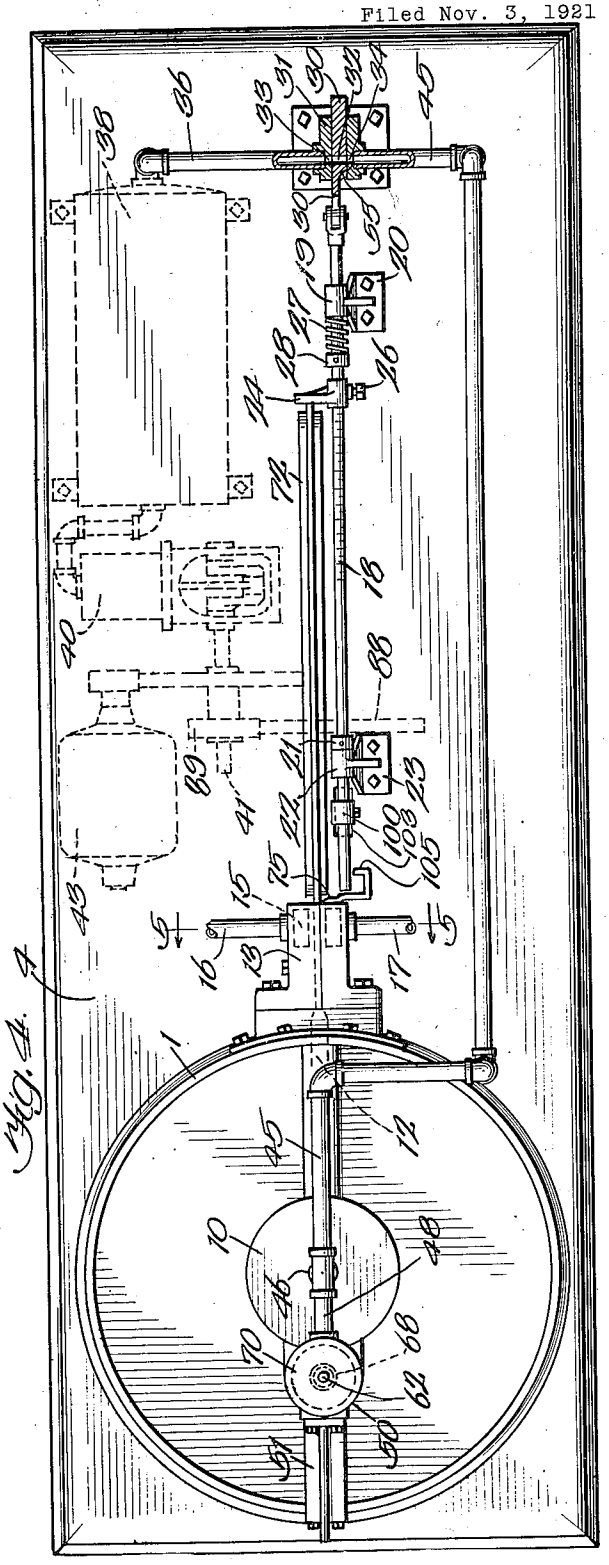


Fig. 4.

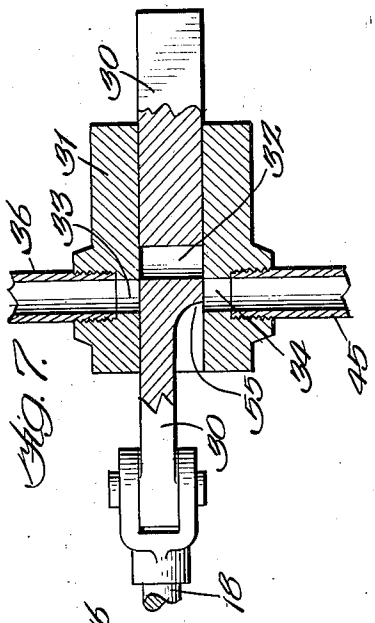


Fig. 7.

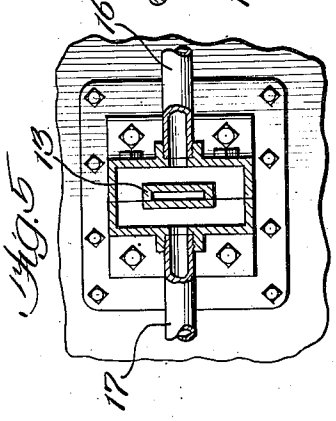


Fig. 5

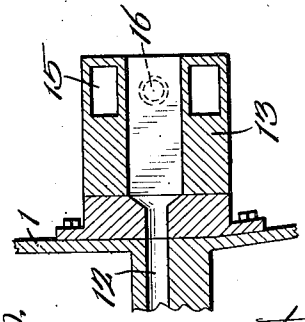


Fig. 6.

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UNITED STATES PATENT OFFICE.

ERNST C. DITTMAN, OF CHICAGO, ILLINOIS.

SLUG-CASTING MACHINE.

Application filed November 3, 1921. Serial No. 512,619.

To all whom it may concern:

Be it known that I, ERNST C. DITTMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Slug-Casting Machines, of which the following is a specification.

My invention relates to machines for casting "slugs", by which I mean to include various metallic strips such for example as rules, leads, etc. for printers' use. It will be understood by those familiar with the art that various methods have been employed for producing such slugs, and according to one of them the slugs are cast in sections which are afterward fused together to obtain the desired length. One of the objects of my invention is to provide means for casting, in one continuous piece, slugs of any desired length. Another object is to provide means whereby the length of the slug may be accurately gaged. In carrying out my invention, I have provided a machine in which the cutting off mechanism is itself controlled by the slug, which thus temporarily becomes, as it were, a part of the machine. One of my objects is to produce a machine having this characteristic. Still another object of the invention is to provide a positive acting means for cutting off the desired length of slugs. Other objects of the invention will become apparent as the description proceeds.

I accomplish my objects by the mechanism illustrated in the accompanying drawings, in which

Figure 1 is a general assembly view, the melting pot and other portions of the machine being shown in section to better reveal the construction.

Figure 2 is a detail view of the knife-operating mechanism, (cutting off mechanism) the view being taken on the line 2—2 Figure 1.

Figure 3 is a perspective view of certain parts of the mechanism shown in Figure 2.

Figure 4 is a plan view of the parts shown in Figure 1.

Figure 5 is a sectional view on the line 5—5 Figure 4.

Figure 6 is a vertical sectional view of the die or mold through which the slug metal emerges from the melting pot.

Figure 7 is a plan section of the main air valve and associated parts.

Like numerals denote like parts throughout the several views.

In the form illustrated in the drawing, the melting pot 1 is kept hot by a gas burner 2 or other appropriate type of heater. It is mounted upon a platform 3 which forms the top of a chambered main frame 4. Within the melting pot is a well or pressure chamber 10 which communicates through a passage 12 with a die 13. This die is water cooled, having an annular chamber 15 surrounding the mouth of the die as shown in detail in Figures 5 and 6. The water or other cooling fluid is led into this water jacket by a pipe 16 and led out of it by a pipe 17.

According to the present design, the die is rectangular in cross section and arranged "on edge" in the sense that the breadth of the slug is vertical. The die is formed in two parts which part along a plane located at one side of the aperture, whereby one side of the die is plain and the other has a groove equal to the thickness of the strip. Thus it is necessary to form a channel in only one side and when changing sizes of strip it is necessary to remove only one half of the die. The die is removable, being bolted to the side of the melting pot, and dies having various types of cross section may be substituted. It will be observed that the water jacket or cooling chamber 15 is located at the mouth of the die and hence the metal does not become chilled until just as it emerges from the die.

Mounted on the platform 3 in line with the mouth of the die but at a distance therefrom, is a push rod 18 which is slidingly mounted in a bearing 19 formed at the top of a small pedestal 20 supported upon the platform 3. At its rear end said push rod has a tappet 24 adapted to be engaged by the forward end of the slug 25. The push rod 18 is threaded and the tappet screws upon it, thus making it possible to produce very fine adjustments of the tappet lengthwise of the rod. The position of the tappet upon the rod determines the length of the slug, and hence it will be evident that the length of the slug may be predetermined to a nicety. In order to prevent displacement of the tappet after it has been adjusted it may be secured upon the rod by a set screw 26. The push rod is yieldingly held in normal position by a helical compression spring 27 which surrounds the rod and at one end abuts the bearing 19 and at the other end abuts a collar 28 rigidly

fastened to the rod. The movement of the rod under the action of the spring is limited by a stop collar 21 rigidly fastened to the rod and adapted to engage a bearing 22 thru which the rod passes, said bearing is formed at the top of a pedestal 23 resting upon the main frame.

At its forward or outer end the push rod is connected to a valve 30 shown in detail in Figure 7. This valve is slidingly mounted in a casing 31 and has a port 32 adapted to be brought into and out of register with ports 33 and 34 in the valve casing. These ports are in line with each other. Air under pressure is supplied to the port 33 by a pipe 36 which leads from a pressure tank 38 supported within the main frame, as best shown in Figures 1 and 4. Suitable air pressure is maintained within the tank by an air compressor 40 which, according to the present design, is driven by a shaft 41 geared to an electric motor 43. The port 34 connects with a pipe 45 which leads through a branch 46 to the top of the pressure chamber 10 in the melting pot. Another branch 48 leads to the bottom of a valve control chamber 50 carried by a bracket 51 mounted on the melting pot. When valve 30 is in a position which for convenience will be referred to as the "normal position" the port 32 will be in line with the ports 33 and 34, and will thus make it possible for the air pressure from tank 38 to pass through pipe 45 and the branches 46, 48 to the chambers 10 and 50 respectively. When the valve is in abnormal position (shown in Figure 7) which occurs during that period of the cycle during which the slug is to be cut off, the valve cuts off port 33 and shuts off the air supply; but the valve has a shoulder 55 so located that when the valve is in abnormal position the port 34 will be open to the atmosphere, thus releasing the pressure in the pipe 45 and its branches. Sufficient air pressure is carried in the system to force the molten metal from chamber 10 out through the die 13. When the pressure is released, however, by the moving of the air valve 30 to the abnormal position shown in Figure 7, a fresh supply of molten metal will flow from pot 1 to chamber 10 provided the inlet valve 60 is open. This valve is shown at the left end of Figure 1 and cooperates with the bottom of a ported valve seat 61 which forms a communication between the melting pot and the interior of the pressure chamber. Valve 60 is operated by a vertically movable rod 62 which is fastened to a plunger 64 slidingly mounted in chamber 50. When the lower end of the chamber 50 is under pressure from branch 48 the rod 62 will be held elevated and will hold valve 60 up in closed position. As soon as the pressure in chamber 50 is released by the opening of valve 30 a compression spring 68 presses the valve 60 to open position. The compression spring 68 rests upon the top of plunger 64 and abuts the cover 70 which closes the upper end of the chamber. A table 72 resting upon standards 73 mounted upon the main frame is located in front of the mouth of the die 13 and serves to support the slug while it is moving toward the tappet 24.

I will now describe the mechanism by which the cutting off knife 75 is controlled and operated. This knife, which is shown in plan in Figure 4 and in perspective in Figures 2 and 3 is adapted to slide upon the outer end surface of the die 13 across the die opening therein for the purpose of cutting off the slug. It is fulcrumed upon a stationary shaft 76 and is operated by a cam 80 which cooperates with a friction roller 81 mounted at the lower extremity of the knife. A tension spring 82 tends to draw the knife to the non-acting position shown in Figures 2 and 3. It also tends to hold the anti-friction roller in contact with cam 80. The cam is loosely mounted on a shaft 85. Said shaft is journaled in suitable hangers 86 and is connected by gears 88, 89 to the shaft 41 previously mentioned. As shaft 41 is geared to the motor shaft, it follows that under normal running conditions of the machine the shaft 85 rotates continuously. Cam 80 is rotated at the proper time by clutch mechanism which will now be described.

The cam has an elongated hub 90 at the other end of which is a disc 91. Ordinarily the cam, hub and disc will be cast in a single piece. Extending from the side of the disc is a pin 93 upon which a pawl 94 is pivotally mounted. This pawl is located in the same plane with and is adapted to move into and out engagement with a toothed driving wheel 96 which is rigidly fastened to shaft 85. Shaft 85 rotates in a counter-clockwise direction, Figure 2, and hence it will follow that the driving wheel will rotate continuously in a counter-clockwise direction. The teeth of this wheel are faced in such direction that they will drive the pawl and pin 93 and disc 91 in a counter-clockwise direction when the pawl is in engagement with the teeth. In reality, therefore, the parts 94 and 96 constitute two cooperating elements of a clutch for operatively connecting and disconnecting the continuously rotating shaft 85 to and from the cam 80. Pawl 94 is constantly urged to acting position (in engagement with the driving clutch wheel 96) by a tension spring 98, one end of which is connected to the pawl and the other end is anchored to the disc. The parts are so constructed and arranged that when the clutch is "in" the cam 80 will be caused to rotate

and force the blade of the knife 75 across the opening in the die 13.

The knife is held in retracted position while a slug 25 is emerging from the die by hold-out mechanism which will now be described.

An arm 100 is rigidly fastened to push rod 18 and extends down through a slot 101 in the platform 3, as best shown in Figures 1, 2 and 4. At its lower end it has an anti-friction roller 103 adapted at times to engage the tail of the pawl 94 to disengage the latter from the driving cluth element 96 as illustrated in Figure 2. The roller is shiftable into and out of the plane of the pawl by the movements of the push rod 18, and the arrangement is such that under normal conditions when the rod is at the left (Figure 1) the roller will be in the plane of the pawl and will engage it and hold it out of connection and when the push rod is in abnormal position with pipe 45 open to the atmosphere the roller 103 will shift out of the plane of the pawl and permit spring 98 to bring the pawl into engagement with the driving wheel 96, which will then carry the pawl with it and rotate disc 91 and cam 80 and cause the knife to move across the mouth of the die opening and sever the slug.

I have provided safety mechanism for preventing the tappet 24 from moving prematurely and turning ou the air pressure prematurely, that is, before the knife 75 has returned to non-acting position. This safety mechanism includes a stop 105 which is mounted upon the knife, as shown in perspective in Figure 3 and in plan in Figure 4. This stop is adapted to move into and out of the line of push rod 18, and the proportion and arrangement are such that the push rod may pass the stop when the knife is in retracted or non-acting position, otherwise the stop will block the return movement of the rod to normal position and thus prevent premature turning on of the air pressure and premature emergence of the forward end of the next slug.

The opeatiton of the machine as a whole will now be readily understool. The operator first lights the burner 2 and brings the metal in the melting pot and pressure chamber 10 to molten condition. He then starts the motor 43 whereupon the pump will fill the air tank 38 and bring it to the proper degree of pressure, for example, 20 pounds. During the period when the pressure is building up in the storage tank the operator will manually hold the push rod 18 toward the right, Figure 4 so as to hold the air valve 30 in the position shown in Figure 7. This will leave the lower end of valve control chamber 50 open to the atmosphere so that the spring 68 may hold the valve 60 open and will keep the upper end of pressure chamber 10 open to the atmosphere so that the molten metal may readily flow from the melting pot into the pressure chamber until the levels within and without the pressure chamber are the same. When the apparatus is thus primed and the operator is ready to have the mechanism commence functioning he releases the push rod 18, thus permitting spring 27 to shift it toward the left, Figures 1 and 4. This brings the arm 100 and roller 103 into the plane of pawl 94 with the result that the pawl is disengaged from the driving clutch wheel 96 and hence the disc 91 and knife actuating cam 80 remain still. The spring holds the knife retracted, as shown in Figures 2, 3 and 4. At the same time the rod holds air valve 30 in such position that its port 32 will register with the ports 33, 34, thus permitting the full air pressure to enter pipe 45. The compressed air accomplishes two things, first, it holds plunger 64 elevated and the inlet valve 60 closed; second, it exerts pressure in the chamber 10 on top of the molten metal therein and thus forces the molten metal out through the opening in die 13. As the metal emerges it slides along the table 72 toward the tappet 24 and finally engages the latter and pushes it and the rod 18 to the right when viewed as in Figures 1 and 4. This immediately shuts off the air supply from tank 38 and vents the chambers 10 and 50 through pipe 45 which is now open to the atmosphere. This shifting of the push rod toward the right brings the arm 100 and roller 103 out of the plane of pawl 94, thus releasing the latter and permitting spring 98 to bring the pawl into engagement with the constantly rotating clutch element 96. The latter now drives the pawl, causing disc 91 to rotate and with it the cam 80. The action of the cam is to force the knife gradually across the opening in die 13, after which the knife is quickly released and retracted under the action of spring 82. The knife not only cuts off the metal, but pushes it aside in preparation for the succeeding slug. As soon as the first slug is severed it, of course, releases tappet 24; but the push rod on which the tappet is fastened cannot turn on the air prematurely because the stop 105 will block the return of the rod to normal position until the knife has completely returned to non-acting position.

Thus it will be evident that the action of the machine after it has once started is entirely automatic, and that the lengths of the slugs may not only be varied to suit requirements, but that the length of the slug may be regulated with great accuracy owing to the fine adjustment possible of the tappet 24 upon the push rod 18. It will also be evident that misoperation is effectually guarded against due especially to the

presence of the stop 105 which operates in synchronism with the knife. Owing to the fact that the metal is not chilled until it is about to leave the die, friction is reduced to a minimum and under ordinary circumstances the metal will not become hard until it is just about to leave the die. It will also be evident that the machine is comparatively simple and is positive in its action, especially with respect to the cutting off knife, for said knife is not operated by air pressure, which is elastic, but is operated by positive acting mechanism which is capable of exerting great force when necessary.

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

1. A machine for casting metal strips having an apertured die, means for forcing the metal through said die, and means controlled by the strip for terminating the action of said forcing means.

2. A machine for casting metal strips having a pressure chamber adapted to contain molten metal, an apertured die in communication with said chamber, means for exerting pressure in said chamber to force the metal out through the die, and means controlled by the strip for releasing the air from said chamber to thereby terminate the movement of the metal through the die.

3. A slug casting machine having an apertured die, an air tight chamber communicating with said die and adapted to contain molten metal, a compressed air receptacle communicating with the top of said chamber, and a valve for alternately shutting off the communication between the receptacle and the chamber and simultaneously opening the chamber to the atmosphere to thereby terminate the issue of metal out of the die, said valve being controlled by the strip.

4. A machine for casting metal strips having an apertured die, pneumatic means for forcing molten metal through said die, and an air valve for controlling said pneumatic means, said air valve being controlled by the metal issuing from the die.

5. A machine for casting metal strips having an apertured die, pneumatic means for forcing the molten metal through said die, an air valve for controlling said pneumatic means, a push rod for controlling said valve, and a tappet on said push rod adapted to be engaged by the metal strip as it issues from the die for operating rod, said tappet being adjustable lengthwise of the rod.

6. A machine for casting metal strips having an apertured die, a melting pot, a pressure chamber communicating with the melting pot and with the die for receiving metal from the pot and forcing it out through the die, a valve for admitting the metal to the pressure chamber from the melting pot, and means controlled by the strip for simultaneously exerting pressure on the valve to close it and on the metal within the pressure chamber to force it out through the die opening.

7. In combination, a melting pot, a pressure chamber, a normally open valve for admitting the metal from the pot to said chamber, a piston chamber, a piston in said chamber for closing the valve when air under pressure is admitted, an apertured die communicating with the inside of the pressure chamber, pneumatic means for conveying air to the pressure chamber and to the piston chamber for actuating the piston to close the valve and simultaneously pressing on the metal in the chamber to force it to extrude through the die, a source of motive air and an air valve for controlling the motive air, said air valve being adapted to be controlled by the strip issuing from the die.

8. A machine for casting metal strips having an apertured die for permitting the strip to issue from it, a knife for cutting off strips, means controlled by the strip for controlling the issuance of metal from the die, and means operating synchronously with the knife for controlling the first mentioned means.

9. A machine for casting metal strips having an apertured die, means for forcing metal through said die, a push rod for controlling said means, said push rod being adapted to be controlled in part by the metal issuing from the die, a knife for cutting off the metal from the die, and a stop moving in synchronism with the knife for detaining the rod when the knife is in acting position.

In witness whereof, I have hereunto subscribed my name.

ERNST C. DITTMAN.