Jan. 6, 1953 J. J. GAPSTUR 2,624,441

RECIPROCATING FEED DEVICE

Filed Nov. 27, 1946 2 SHEETS—SHEET 1

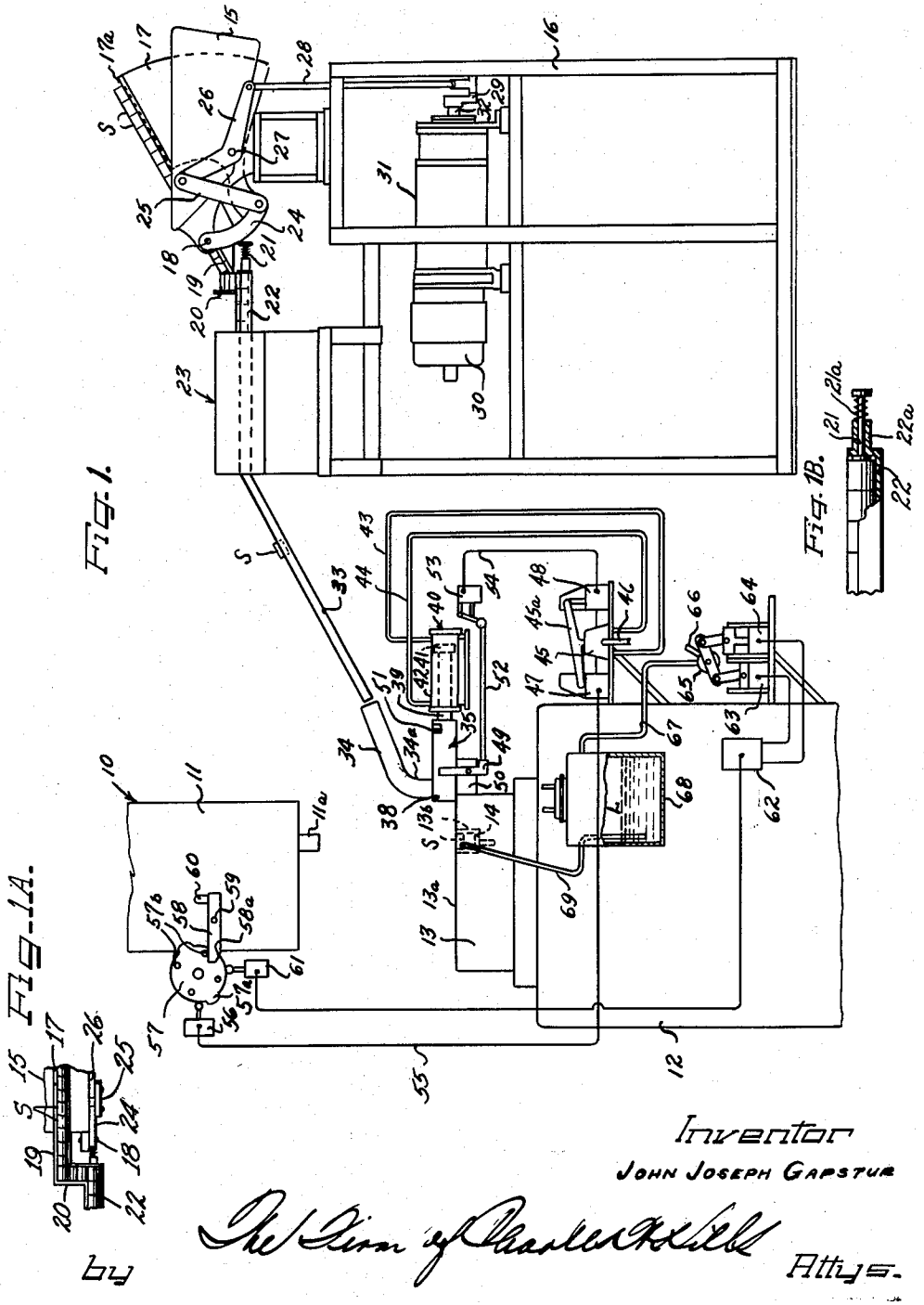

Fig. 1.

Fig. 1B.

Fig. 1A.

Inventor
JOHN JOSEPH GAPSTUR

by The Firm of Charles R. Fitch Attys.

Jan. 6, 1953 J. J. GAPSTUR 2,624,441

RECIPROCATING FEED DEVICE

Filed Nov. 27, 1946 2 SHEETS—SHEET 2

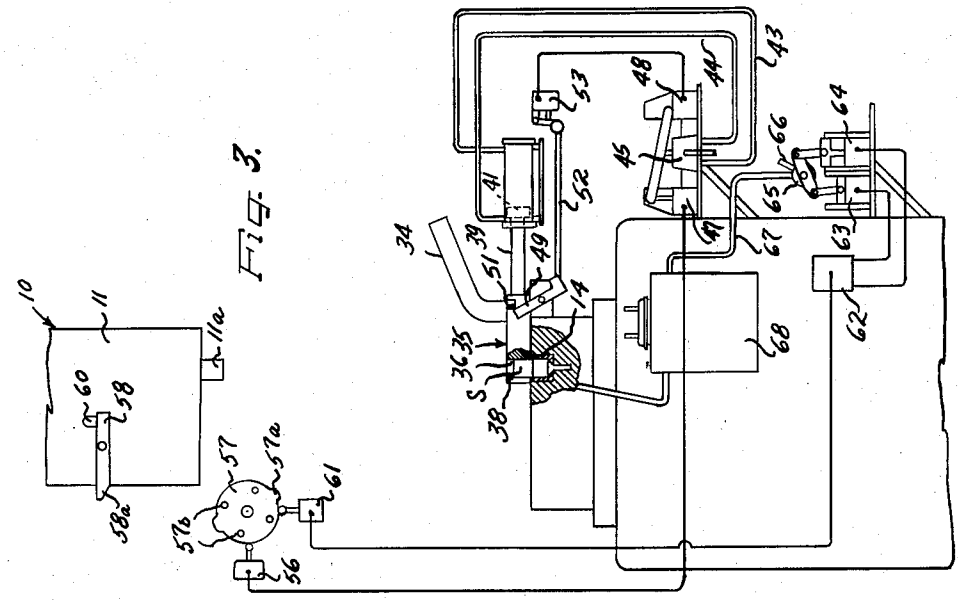

Fig. 3.

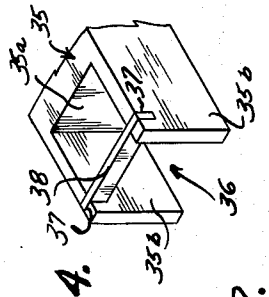

Fig. 4.

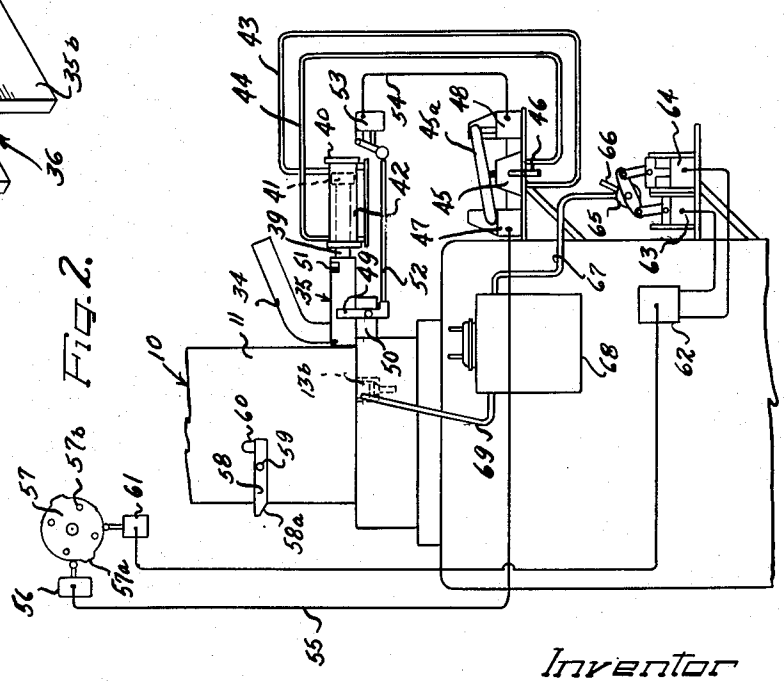

Fig. 2.

Inventor

JOHN JOSEPH GAPSTUR

by Pollock, Vande Sande & Priddy Attys

Patented Jan. 6, 1953 2,624,441

UNITED STATES PATENT OFFICE

2,624,441

RECIPROCATING FEED DEVICE

John Joseph Gapstur, Euclid, Ohio, assignor to Thompson Products, Inc., Cleveland, Ohio, a corporation of Ohio

Application November 27, 1946, Serial No. 712,555

3 Claims. (Cl. 193—24)

1

This invention relates to apparatus for supplying blanks to a machine in timed relation with the operation of the machine.

Specifically, the invention deals with apparatus for feeding heated metal slugs to a forging die press.

According to this invention, metal slugs are dumped in hodge-podge relation in a receiving bin, and are automatically fed in end-to-end relation from this bin through a heating tunnel. The heated slugs then fall at timed intervals from the tunnel into a reciprocating carriage which intermittently feeds the slugs into the die recess of a forging die press. The plunger of the die press controls operation of the carriage, so that a slug is only fed to the die recess when the press is opened, and so that the carriage is always retracted out of the path of the plunger before the press closes. The feeding of the slugs through the heating tunnel is effected in timed relation with the speed of operation of the press, so that only one slug will be fed to the carriage after each feeding movement of the carriage.

A feature of the invention is the provision of quick-acting control devices and actuators for the carriage, so that the press can be operated at high speeds.

Another feature of the invention is the provision of a lubricant feeder for the die recess which operates in timed relation to the movement of the feeder carriage.

It is an object of the invention to provide an automatic feed system for presses, to replace heretofore-necessary manual feeding.

A further object of the invention is to provide a forging die press with an automatic feeder capable of supplying heated slugs in proper timed relation to the speed of operation of the press.

A still further object of the invention is to provide an apparatus which will successively feed heated blanks to a forging die without manual aid.

Another object of the invention is to provide a forging die press with a quick-acting feeder carriage that is controlled by the press plunger, so that it is always retracted out of the path of the plunger before the press starts to close.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings which, by way of a preferred example only, illustrate one embodiment of the invention.

On the drawings:

2

Figure 1 is a somewhat diagrammatic side elevational view of a feeder apparatus for a forging die press, and illustrating parts of the press.

Figure 1A is a plan view of a portion of the feeder apparatus.

Figure 1B is an enlarged detail view, partly in section, of plunger support structure in the feeder apparatus.

Figure 2 is a fragmentary diagrammatic view of a portion of the apparatus of Figure 1, and showing the positions of the parts when the press is closed.

Figure 3 is a view similar to Figure 2, but illustrating the positions of the parts when the press is fully opened.

Figure 4 is a fragmentary isometric view of the slug-receiving end of the feeder carriage.

As shown on the drawings:

In Figure 1, the reference numeral 10 designates generally a forging die press having a vertically movable plunger 11 and a stationary bed 12. The bed 12 carries a die block 13 with a flat horizontal top face 13*a* and a die recess 13*b* extending downwardly from said face and receiving removable dies 14 therein. The plunger 11 has a nose section 11*a* adapted to fit in the dies 14 for acting on a slug S deposited in the dies.

A bin 15 for receiving slugs S in hodge-podge relationship is provided adjacent the press 10, and is mounted on a supporting frame 16 to be disposed at a level above the top face 13*a* of the block 13. A vane 17 is fixed to an arm 24 which is pivoted about 18. The vane 17 extends through a slot in the bottom of the bin 15 and is movable between a raised position, shown in Figure 1, and a retracted position at the bottom of the bin. The top of the vane has a V-shaped trough 17*a* therein sized for receiving cylindrical pieces of the diameter of the slugs S only in end to end relationship, as shown in Figure 1. If the slugs fall crosswise of the trough 17*a*, or are in cocked relationship to the length of the trough, they will roll out of the trough back into the bin 15 when the vane is raised to position the slugs at levels above the top of the pile of slugs in the bin. The vane feeds the slugs to a stationary chute 19 communicating with the forward lower end of the trough 17*a* in its raised position of Figure 1 and projecting forwardly from the bin to a transversely extending inclined ramp 20. The slugs roll down this ramp in side by side relationship to a stop at the bottom of the ramp, and a plunger 21 then pushes the slugs in end to end relationship through a tray 22 into a heating tunnel 23. The heating tunnel has a track therethrough to

maintain the slugs in their end to end relationship.

Referring to Figure 1b, the plunger 21 is slidable in a sleeve-like embossment 22a of the tray 22 and has an enlarged head at the right end thereof with a coiled compression spring 21a disposed between the head and the embossment 22a to urge the plunger 21 to the right and out of the path of slugs rolling from the ramp 20 into the tray 22.

The plunger 21 is aligned with and intermittently operated by the arm 24 acting as a pusher plate which is fixed to a portion of vane 17 and pivoted on the pivot 18. The pusher 24 reciprocates with the vane 17 and moves away from the plunger 21 each time the vane is raised. The operation is such that the ramp 20 is filled with slugs in side by side relationship by the vane 17, which lifts the slugs at a steep enough angle in the trough 17a so that they will slide through the chute 19 and be successively received in the upper end of the ramp 20 whenever the plunger 21 is retracted, to permit a new slug to roll into the bottom of the ramp. Thus the slug at the bottom of the ramp 20 is pushed out of the ramp into the tray 22 when the pusher 24 engages the plunger 21 to move it forwardly and, in this position of the pusher 24, the vane 17 is at the bottom of the bin, to receive slugs in its trough 17a. Then the vane is raised and the pusher 24 is moved away from the plunger 21, allowing the plunger to resume its retracted position out of the ramp 20, for allowing the next slug to roll into the bottom of the ramp, thereby advancing all of the slugs in the ramp, and making room for a new slug from the chute 19. The pusher 24 and vane 17 are operated by a link 25 from a bell crank 26 which is pivoted at 27 on the bin 15, and has its other arm raised and lowered by a rod 28. The rod 28 is driven by a crank 29 from an electric motor 30 operating through a gear reduction in a gear box 31 to rotate a drive shaft 32 on which the crank 29 is secured.

An inclined ramp 33 receives slugs S in succession from the discharge end of the heating tunnel 23 and feeds the slugs by gravity to the upper end of a chute 34. This chute has a vertical leg 34a terminating above and adjacent one side of the top 13a of the block 13. This leg 34a is out of the path of movement of the plunger 11.

A transfer carriage 35 operates along the top 13a of the block 13 and under the leg 34a of the chute 34. This carriage 35, as best shown in Figure 4, has an open-ended slug-receiving chamber 36 in the front end thereof bounded by a back wall 35a and side walls 35b. The chamber 36 is open not only at the top and bottom thereof, but also at the front end thereof except for a shear bar 38 which is replaceably seated in slots 37 in the upper forward ends of the side walls 35b and spans the open front of the chamber at the top of the chamber. This shear bar 38 prevents slugs from tipping into the chamber and, as will be hereinafter more fully described, permits retraction of the carriage as soon as a slug begins to drop out of the bottom of the chamber 36 and clears the bottom edge of the bar. The bar is preferably replaceable, so that, in the event of failure of retraction of the carriage 35 out of the path of the plunger nose 11a when the press closes, it will be the only portion of the carriage engaged by the plunger nose and, if damaged, is easily repaired or replaced. The carriage 35 has the end thereof remote from the chamber 36 defining end secured to a piston rod 39 of a pneumatic jack 40. The jack has a piston 41 on the end of the rod 39 slidable between the ends of the cylinder 42 thereof. Tubes 43 and 44 supply compressed air to opposite sides of the piston 41 in the cylinder 42, thereby reciprocating the piston and shifting the carriage 35 between the positions shown in Figures 2 and 3. An air valve 45 selectively controls flow from a compressed air pipe 46 to either of the tubes 43 and 44. The valve 45 is operated by solenoids 47 and 48 which shift the valve lever 45a between a position for connecting the tube 43 with the atmosphere and the tube 44 with the compressed air pipe 46, to a position for connecting the tube 44 with the atmosphere and the tube 43 with the pipe 46.

A lever 49 is pivotally mounted on a support 50 under the carriage 35 and is adapted to be tripped by an extension 51 on the side of the carriage for pushing a rod 52 against the control plunger of a switch 53. This switch 53 is energized and is connected by a wire 54 with the solenoid 48. The other solenoid 47 is connected through a wire 55 with an energized switch 56 having its operating plunger actuated by lobes 57a on a rotatably mounted cam 57. The cam 57 has pins 57b lying in the path of an arm 58 which is pivoted at 59 on the plunger 11. As shown in Figure 1, the cam plate 57 overlies a face of the plunger 11 and the arm 58 is spaced from this face of the plunger to overlie the cam plate and have one end thereof move in a plane traversed by the pins 57b. A stop 60 is secured on this same face of the plunger 11 to overlie the other end of the arm 58. This construction is such that downward movement of the plunger will merely bring a beveled edge 58a of the arm 58 against a pin 57b to tilt the arm without rotating the cam plate 57. However, upward movement of the plunger 11 will bring the top of the arm 58 against a pin 57b and, since the abutment 60 will prevent the arm from tilting downwardly, continued upward movement will rotate the plate 57. The four pins are positioned in equally spaced relationship around the forward face of the plate, as shown, and therefore each upward stroke of the plunger will effect 90° of rotation of the plate. Since the plate only has two diametrically opposed cam lobes 57a, and since the plunger only moves the plate 90° on each upward stroke, it follows that the switch 56 will only be closed once by the cam lobes for each two strokes of the plunger. When the switch 56 is closed, the solenoid 47 is energized to position the air valve 45 as shown in Figures 1 and 2, thereby admitting air to the tube 43 to force the piston to the position shown in Figure 3. This moves the carriage over the block 13 to shift its chamber-defining end from slug-receiving position under the chute 34, to slug-dumping position over the die recess 13b. When, as shown in Figure 3, the transfer carriage aligns the chamber 36 thereof with the die recess, the slug S immediately drops by gravity into the dies 14 and shortly thereafter the abutment 51 trips the lever 49 for closing the switch 53 thereby energizing the solenoid 48 and changing the setting of the valve 45 to admit air to the tube 44 under the rod side of the piston 41 to retract the carriage 35 out of the path of the plunger 11.

It will be noted that the lobes 57a on the cam plate 57 are offset peripherally from the pins 57b so that the switch 56 will only be temporarily closed by a cam lobe 57a as this lobe moves past the switch during the time the plate 57 is being rotated by the arm 58. This momentary closing of the switch, however, is sufficient to set the

valve in the position shown in Figures 1 and 2 and effect a quick shifting of the carriage 35 to the position shown in Figure 3. Before the switch 53 is closed by the tripping of the lever 49, the switch 56 is again opened to de-energize the solenoid 48. Conversely, the tripped lever 49 resumes its initial position to permit the switch 53 to open as soon as the carriage 35 starts back to its retracted position and the abutment 51 moves out of engagement with the lever. In this manner, only one solenoid 47 or 48 for the valve 45 is energized at any one time.

Since, as explained above, the plunger 11 must drive two pins 57b for each closing of the switch 56 by a cam lobe 57a, the carriage 35 is only moved into the position shown in Figure 3 on every second stroke of the press, thereby permitting an operator to remove a formed member from the dies 14. It should be appreciated, of course, that the timing of the carriage relative to the operation of the press can be varied at will by change of the cam arrangement.

The cam lobes 57a also close a second switch 61 for energizing a timer switch 62 which alternately energizes solenoids 63 and 64 of a second air valve 65. Compressed air from a feed pipe 66 is intermittently fed through a tube 67 by the valve 65 into a closed pressure tank 68 containing lubricant L. A tube 69 communicates with the lubricant in the tank 68 and with the die recess 13b to supply lubricant to the die whenever the valve 65 is opened to admit air pressure into the tank for ejecting the lubricant through the tube 69. This air valve 65 is shifted between open and closed positions by the two solenoids 63 and 64 and remains opened for a predetermined period of time, controlled by the timer switch 62 after this switch has been energized by the switch 61. Thus, when the timer switch is first energized by the switch 61, the valve 65 is opened by energization of the solenoid 64 and remains opened until the timer switch energizes the solenoid 63 after an elapsed time period.

The speed of the motor 30 is regulated relative to the speed of the forging die press 10 to actuate the pusher 24 only at such periods when the carriage 35 is being retracted to its slug-receiving position after it has deposited a slug in the die. The plunger 21 thereupon advances the next slug into the tray 22, and all of the slugs ahead of this advancing slug, in turn, coact to push the end slug at the discharge end of the heating tunnel 23 into the ramp 33. The slug thereupon slides down the ramp into the chute 34 and out of the vertical leg 34a of the chute into the chamber 36 behind the shear bar 38. The bottom of the chamber 36 is at least partially closed by the support 50 so that the slug cannot drop through the chamber. The heating tunnel 23 can conveniently take the form of an induction furnace, and is regulated so that it will heat the slugs S to forging temperature during the time interval they remain in the tunnel.

From the above descriptions it will be understood that this invention provides an automatic feeder capable of receiving slugs in hodge-podge fashion, and feeding them in succession in properly timed relationship to a forging die press, thereby obviating the necessity for heretofore-required manual feeding. The automatic feed device of this invention makes possible high speed operation of forging die presses and the like, prevents overheating of the slugs to be forged, and maintains steady output for the press.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise then necessitated by the scope of the appended claims.

I claim as my invention:

1. A device for successively feeding slugs at desired intervals and in identical positions from a source of slugs in hodge podge relation which comprises a bin having a slot in the bottom thereof, a vane in said slot pivotally mounted at the front end of said bin for swinging from a retracted position in the bottom of the bin to a raised inclined position, said vane having a top edge with a trough therein sized for receiving from said bin slugs in longitudinal end to end relation only and adapted to discharge back to the bin any slugs raised thereby above the level of slugs in the bin which are not in said longitudinal end to end relation, a stationary inclined chute at the forward lower end of the vane to receive slugs from said trough, a tranversely extending inclined ramp receiving slugs from said chute in side by side relation, a stop at the lower end of said ram in laterally spaced relation from said chute, a plunger movable against that slug in said inclined ramp which is bottomed on said stop to push the slug forwardly from the ramp, a pusher plate pivoted coaxially with said vane and reciprocating therewith for engaging said plunger, a bell crank pivoted on the bin, a link joining one arm of the bell crank with the pusher plate, a rod connected to the other arm of the bell crank, a gear reduction unit having an input shaft and an output shaft, a crank on said output shaft connected to said rod for reciprocating said rod, and an electric motor coupled to said input shaft for driving said unit, whereby reciprocation of said rod by said crank will rock the bell crank to reciprocate the vane and pusher plate for respectively feeding slugs in end to end relation to said chute and for advancing slugs forwardly out of the lower end of the ramp.

2. A device for successively feeding slugs at desired intervals and in identical positions from a source of slugs in hodge podge relation which comprises a bin having a slot in the bottom thereof, a vane in said slot pivotally mounted at the front end of said bin for swinging from a retracted position in the bottom of the bin to a raised inclined position, a trough in the upper edge of said vane adapted to receive slugs in longitudinal end to end relation from said bin and slide said slugs forwardly when in raised position, a transversely extending inclined ramp communicating with the forward lower end of said vane trough to receive slugs therefrom, said ramp having a stop at the lower end thereof and being arranged to advance the slugs in side by side relation for successive deposit against said stop, a plunger movable against the end of a slug bottomed on said stop to push the slug forwardly out of the path of the other slugs in the ramp, and means for reciprocating said plunger and for raising and lowering said vane between slug-receiving and slug-discharging positions in said bin, whereby slugs will be successively fed in end to end relation out of the front end of the bin and will advance laterally in side by side relation to the lower end of the ramp to be successively discharged forwardly out of the lower end of the ramp by said plunger.

3. An automatic feeder for presses and the like which comprises a bin, a blade in said bin having a trough along the upper edge thereof for receiving slugs from the bin in longitudinal end to end relation, means for raising and lowering the blade to position the trough at a slug-receiving level and at a slug-discharging incline to slide slugs in end to end relation out of the forward end of the bin, a transversely inclined ramp communicating with the forward end of the trough and a reciprocating plunger at the lower end of said ramp for advancing slugs therefrom, whereby slugs will move down the ramp in side by side relationship and will be successively ejected from the lower end of the ramp, cam means for operating said plunger and means operably connecting said cam means and said blade for operation of said plunger and said blade in timed relation.

JOHN JOSEPH GAPSTUR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
133,066	Stetson	Nov. 12, 1872
821,946	Marshall	May 29, 1906
915,542	Biertuempfel	Mar. 16, 1909
1,252,562	Fassinger	Jan. 8, 1918
1,311,590	Bingham	July 29, 1919
1,336,171	Trace	Apr. 6, 1920
2,327,849	Wolfe	Aug. 24, 1943
2,347,875	Bratz	May 2, 1944