Dec. 17, 1940. L. H. MORIN 2,224,979

DIE CASTING MACHINE AND DUAL PNEUMATIC VALVE THEREFOR

Original Filed Feb. 8, 1938 2 Sheets-Sheet 1

Fig. 1.

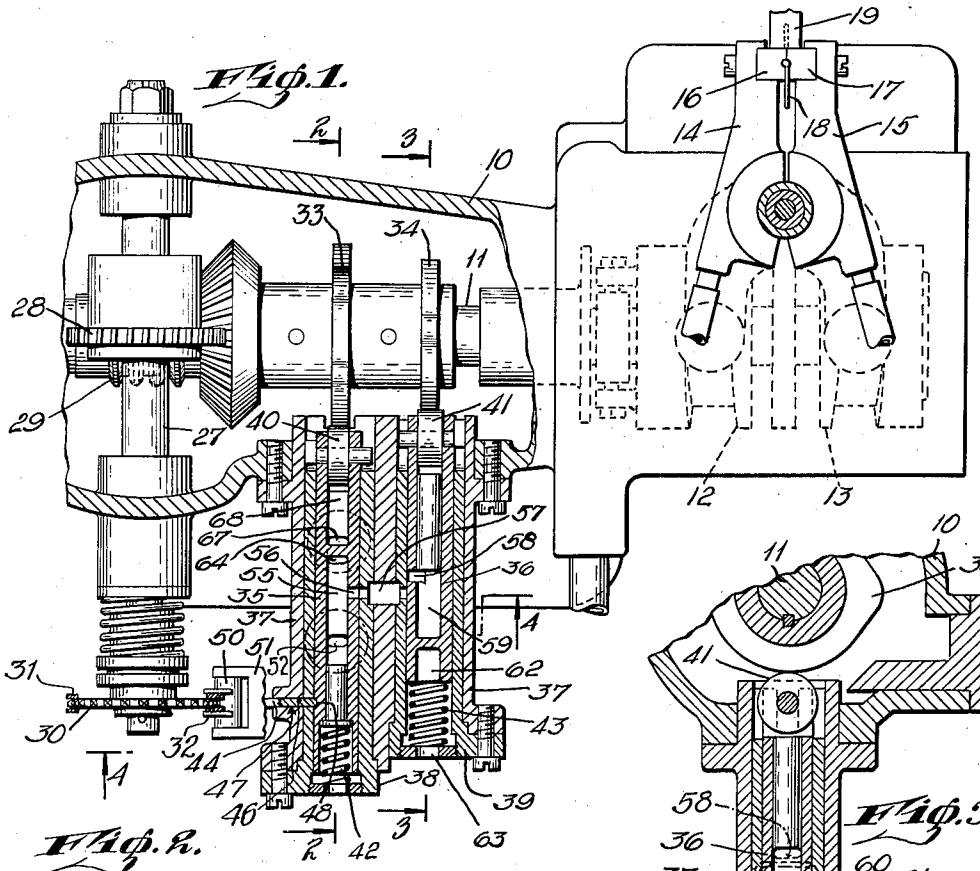


Fig. 2.

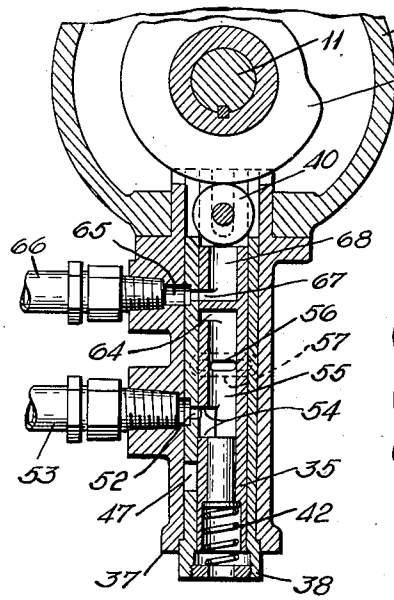
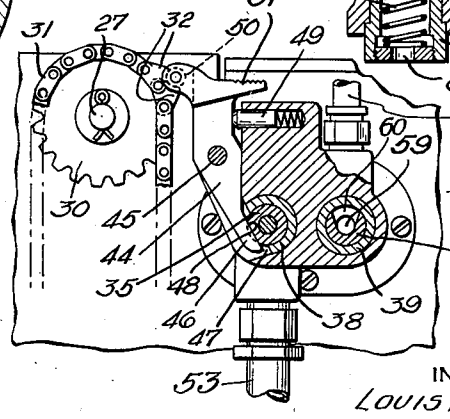


Fig. 3.

Fig. 4.



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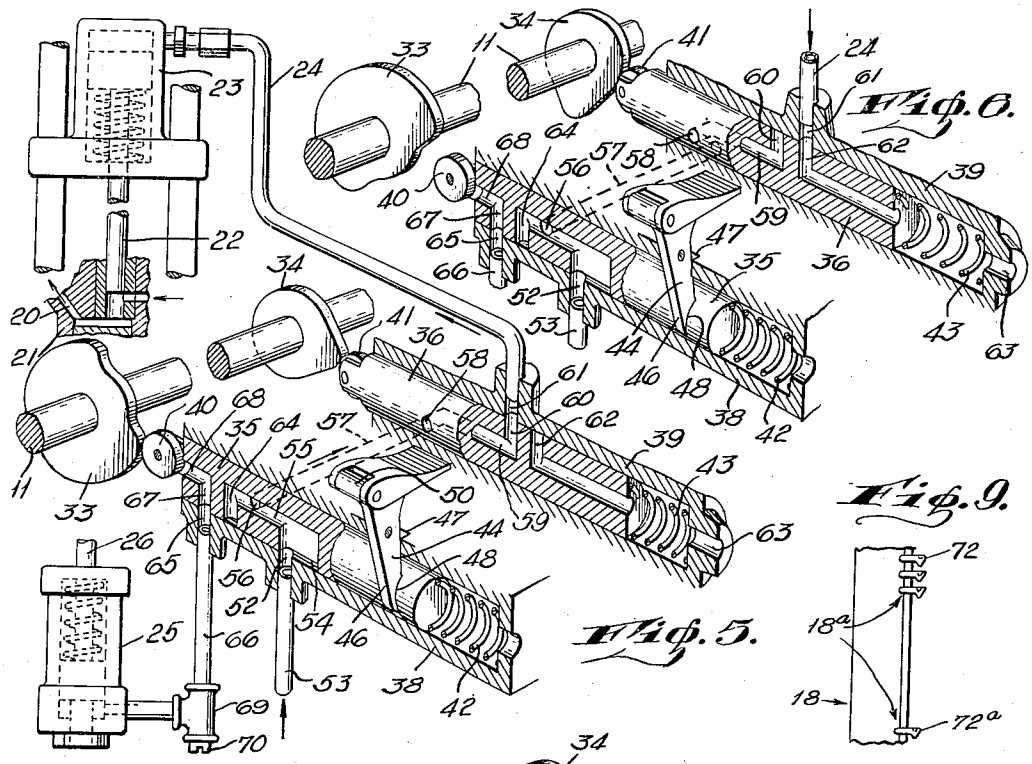


Fig. 5.

Fig. 9.

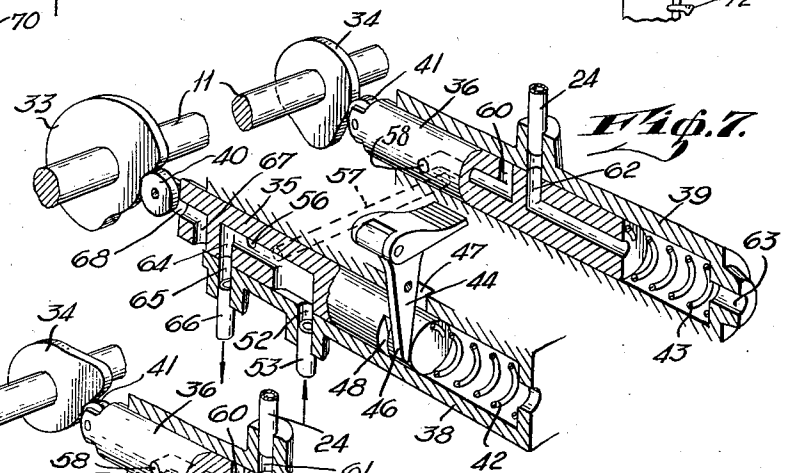


Fig. 7.

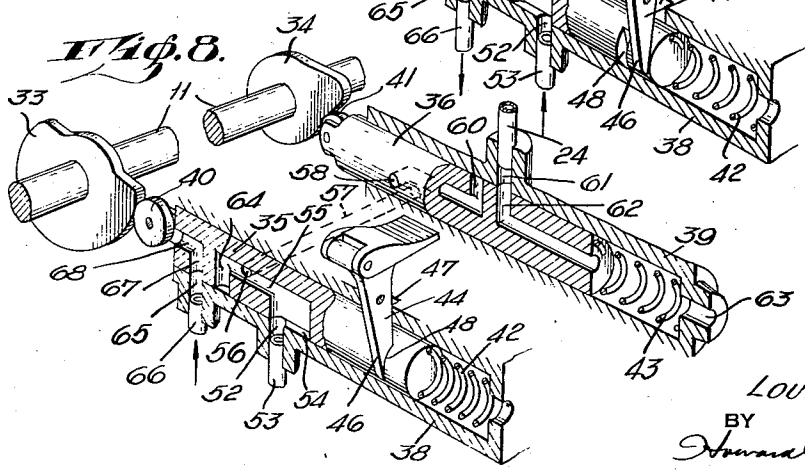


Fig. 8.

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UNITED STATES PATENT OFFICE

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DIE CASTING MACHINE AND DUAL PNEUMATIC VALVE THEREFOR

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Original application February 8, 1938, Serial No. 189,309. Divided and this application March 15, 1939, Serial No. 261,884

13 Claims. (Cl. 22—70)

This invention relates to dual pneumatic valves for controlling the operation of independent devices or mechanisms in a single machine, for example in controlling and operating the pressure discharge of heated casting material into the dies of a die casting machine while at the same time controlling and operating the means for feeding a tape or mounting member relatively to the dies in accordance with the teachings in my prior application, Serial No. 189,309 filed February 8, 1938 of which this application constitutes a division. The novel features of the invention will be best understood from the following description and annexed drawings in which certain embodiments of the invention are disclosed in which the separate parts are designated by suitable reference characters in each of the views, and in which:

Fig. 1 is a sectional plan view of a part of a die casting machine showing the arrangement of the dual valve mechanism thereon.

Fig. 2 is a partial section on the line 2—2 of Fig. 1.

Fig. 3 is a partial section on the line 3—3 of Fig. 1.

Fig. 4 is a section on the broken or irregular line 4—4 of Fig. 1.

Fig. 5 is a diagrammatic perspective and sectional view showing the dual valve in one position and indicating the connections to the injector plunger and tape feed rod of the machine.

Figs. 6, 7 and 8 are views similar to Fig. 5 but showing only the valve mechanism and illustrating different positions thereof, and

Fig. 9 is a detail view showing the spacing of castings on a mounting tape.

For the purpose of illustrating one method of carrying my invention into effect, the same has been shown diagrammatically as applied to a high speed die casting machine such as disclosed in the application hereinbefore identified. It will be understood, however, that the dual valve mechanism is applicable for use in connection with any type or kind of machine wherein it is desirable to perform two or more distinct functions or operations, or for the actuation of two or more independent mechanisms or devices.

In Fig. 1 of the drawings 10 represents the casing of the swinging arm or frame of the die casting machine. At 11 is shown a cam shaft extending through the arm 10 upon which are arranged cams 12, 13 for actuating tong-like die supporting members 14, 15 to move dies 16, 17 supported therein toward and from each other and into engagement with a tape or other mounting member 18 upon which the castings are formed. The casting material is injected into the dies through a nozzle 19 partially shown in Fig. 1 and the supply of casting material to said nozzle is from a passage 20 in a gooseneck 21 partly illustrated in Fig. 5 of the drawings. The casting material is pressure discharged from the nozzle 19 in the descent of a plunger 22, the upper end of which extends into an air cylinder 23 to which compressed air is supplied through a pipe 24. The details of the gooseneck structure and cylinder 23 in itself forms no direct part of the invention and is merely illustrated in part to render the present adaptation of the invention understandable.

At 25 is shown diagrammatically a support for a rod or plunger 26 for actuating the tape feeding mechanism for feeding the tape 18 relatively to the dies, and especially in the wide space feeding of said tape between successive series of castings formed thereon in accordance with the teachings in said application above referred to and more particularly in accordance with the teachings in a companion application, Serial No. 268,517 filed April 18, 1939, constituting another division of said first named application and which the tape feeding mechanism is claimed per se. It will be understood that the rod 26 is moved in one direction by compressed air and in the opposed direction by a spring.

Arranged in the housing 10 at right angles to the cam shaft 11 is another shaft 27 having a worm wheel 28 thereon driven from a worm 29 on the cam shaft. The shaft 27 extends outwardly through the casing and has at one end thereof a sprocket 30 around which is passed a chain 31, note Fig. 4, having trip elements 32 thereon for purposes later described. On the cam shaft 11 are two cams 33 and 34 for the actuation of independent valves 35, 36 in a unitary valve casing 37 secured to one side of the arm 10 and extending therefrom substantially parallel to the shaft 27.

In the casing 37 are arranged bushings or liners 38, 39 in which the valves 35, 36 are mounted. However, in the diagrammatic illustrations of the valves as seen in Figs. 5 to 8 inclusive, these liners are omitted simply for clarification in the illustration, and as the several ports or passages employed extend through the liners as well as the casing, the reference to the ports with one character will be understood to cover the ports in the casing 37 and the liners 38, 39.

Each valve carries at its inner end a roller 40, 41 for engagement with the cams 33, 34. These rollers, including the valves, are urged in the di-

rection of the cams by springs 42, 43 in the outer ends of the valve cylinders. It will appear, however, that the valve 35 including the roller 40 thereof is normally held out of operative engagement with the cam 33 by a dog or catch device 44 pivoted to the valve casing as seen at 45, note Fig. 4, with the end 46 of the dog entering through an aperture 47 in the casing and liner 38 and disposed in a recess 48 in the side of the valve, as is clearly illustrated in the diagrammatic showings in Figs. 5, 6 and 8 of the drawings.

The end portion 46 of the dog is normally held in operative position by a spring actuated pin 49, and the upper outer end of the dog carries a roller 50 which is adapted to be engaged by the trips 32 to release the end 46 of the dog or catch preventing movement of the valve 35 by the cam 33. At this time it will be understood that any number of the trips 32 may be employed depending entirely upon the space desired on the tape 18. The dog or catch 44 also has an angularly extending finger piece portion 51 by means of which the dog may be released manually whenever it is desired to do so in the operation of a machine of the class under consideration.

On the casing 37 is an air admission passage 52 to which air under pressure is supplied from a suitable source, not shown, through the pipe or tube 53. The valve 35 has an elongated port 54 adapted at all times to register with the port 52 and with the chamber 55 of said valve. Extending from the chamber 55 of the valve is a port 56 adapted to register with a by-pass passage 57 extending to the valve 36, the by-pass passage being represented by dotted lines in Figs. 6 to 8 inclusive. The valve 36 has a port 58 which is adapted to register with the passage 57 and the chamber 59 of said valve has an outlet passage 60 which is adapted to register with a discharge passage 61 in the valve casing, with which communicates the pipe 24 which extends to the cylinder 23 for the actuation of the plunger 22 as diagrammatically illustrated in Fig. 5 of the drawings.

It will be understood that, normally, the compressed air entering the valve 35 and extending through the passage 57, is sealed by the valve 36 as seen in Fig. 6 of the drawings. However, when the valve 36 is moved into the position shown in Fig. 5 by the cam 34, the port 58 is brought into registering position with the passage 57 and the port 60 into registering position with the passage 61, and air will pass to the cylinder 23 to actuate the plunger 22. Immediately thereafter, the valve is returned to the position shown in Fig. 6, in which position a port 62 is brought into registering position with the passage 61 so that the compressed air may be exhausted from the cylinder 23 through the pipe 24 and out through a port 63 in the end of the valve 36, as will appear in Fig. 6 of the drawings.

In these successive or repeated operations of the machine in forming a series of successive castings, the valve 35 is held in the position shown in Figs. 5, 6 and 8, and when so held, the cam 33 rotates idly and the port 64 communicating with the passage 55 of the valve is maintained out of registering position with a discharge passage 65 with which communicates a discharge pipe 66 which extends to the casing 25 for the actuation of the rod 26 which operates the mechanism feeding the tape 18. However, at predetermined intervals controlled by the trip devices 32 on the chain 31 and on the length of said chain, the dog or catch 44 is moved into inoperative position as shown in Fig. 7 of the drawings, in which position the spring 42 moves the valve 35 to maintain the roller 40 in operative engagement with the cam 33. In the proper cycle of operation or successive operations, which is controlled by said cam, the port 64 is brought into registering position with the passage 65 so that compressed air will be directed to the casing 25 to actuate the rod 26.

Intermediate successive operations of the tape feeding mechanism for feeding predetermined lengths of the tape, the air supply to the casing or cylinder 25 is exhausted by movement of the valve 35 into a position similar to that shown in Fig. 8 so as to bring a port 67 into registering position with the passage 65 to exhaust the air from the cylinder 25 and pipe 66 through a discharge 68 in the end of the valve. Immediately thereafter, the dog is again released to perform the next feeding operation of the tape. During this tape feeding operation, it will be understood that no air is supplied to the cylinder 23 in that the forward movement of the valve 35 breaks the communication of the port 56 with the passage 57. While the valve 36 will be operated through the cam 34, nevertheless, the lack of supply of air to this valve will render the plunger 22 inoperative and therefore no castings will be formed. In other words, in the tape feeding operations of the machine, the valve 36 will perform the same functions as it would in making a series of castings by supplying air to the cylinder 23, but by reason of the fact that the supply of compressed air is cut off to the valve 36, as seen in Fig. 7, the machine will function simply as a tape feeding machine for as many operations or cycles of operations as are necessary to provide the desired spacing of the tape 18.

When the last trip 32 has passed the roller 50 of the dog or catch 44, this catch will then automatically drop into the recess 48 of the valve 35 and again hold this valve in its non-functioning position, from the tape feeding standpoint, until such time as the trips 32 on the chain 31 again engage and operate said dog or catch 44. At this time it is well to call attention to the fact that various lengths of chains may be employed on the sprocket 30 to control the spacing of the tape or other mounting member after producing a predetermined number of successive die castings. For example, if one hundred successive castings are to be made on a mounting member before providing the space on the member, and the repeated formation of another hundred castings, then a so-called hundred-casting chain will be employed. Where a large number of castings are desired, and the length of a chain would be excessive, the timing of the drive of the shaft 27 may be modified so as to operate, let us say, at a two to one ratio, thereby permitting the use of shorter chains. In this connection it will be apparent, however, that any different types and kinds of machines where different mechanisms or devices are actuated, the control and operation of the dog or catch 42 may be modified to suit such machines or apparatus, and the specific illustrations herein submitted are to be regarded solely as illustrative of one method of carrying the invention into effect. In other words, the units 23, 25 including the operative elements 22, 26 thereof may control devices or mechanisms of any type and kind.

It will also be understood that a T-coupling 69 may be arranged in the pipe 66, note Fig. 5, and in the present illustration, the end 70 of this

T-coupling is plugged as at 71 so that air is supplied only to the cylinder 25. However, another pipe line may be coupled with the end 70 and extend to any other device or mechanism on the machine to actuate the same, or simply to supply a charge of air to the dies; that is to say, the impressions thereof, to keep said impressions clear and clean. As a matter of fact, from a practical standpoint, each discharge 61, 65 may extend to as many devices or mechanisms as desired by utilizing suitable piping. Still further, it will be apparent that an exhaust pipe or tube may be placed in communication with the discharge 63 of the valve 36 and utilized for any desired purpose. This would be especially true in valves of the type and kind under consideration controlling high pressure air, especially where the exhaust pressure is sufficient to perform a definite function.

For the purpose of illustrating what is meant by a wide spacing of the tape or mounting member, I have illustrated in Fig. 9 of the drawings a part of the tape 18 and the section thereof designated by the arrows 18a or between end castings 72, 72a, is the wide spaced portion of the tape. It will be understood that the casting 72 represents the end casting in a series of any desired number, whereas the casting 72a represents the first casting of the next successive series of the same number, as long as a chain 31 of one length is employed in the machine. In other words, in making separable fastener stringers, the wide spacing of the tape forms between each stringer length, end portions which facilitate attachment of various devices and also the mounting of the stringers in connection with supports. The spacing 18a is preferably provided by a series of operations of the valve 35 controlled by the number of trips 32 employed.

In the present illustration the valves are directly coupled in a single casing, but here again, this is not absolutely essential, as these valves may be positioned in different places on a machine, and connected by a by-pass equivalent to the by-pass 57. It will be apparent that the dual valve construction materially simplifies the control and operation of two or more different devices, mechanisms, or the like, especially when actuated at different time periods throughout the operation of an automatic machine. It will of course be apparent that the valve may be used in conjunction with air, gas, or any suitable fluid in the various uses of the device.

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

1. In a die casting machine employing a compressed air actuated plunger for the discharge of heated casting material from a container through an injection nozzle into the dies employed, an air valve mechanism controlling the supply of compressed air to said plunger to regulate the successive operations thereof, said mechanism comprising a pair of valves, cams for actuating said valves in the operation of the machine, means for holding one of said valves in inoperative position with respect to the corresponding cam during a predetermined number of successive casting operations, the other of said valves controlling the supply of air to said plunger, and means for shutting off the supply of air to the second named valve when the first named valve is in operative engagement with the cam for actuating the same.

2. In a die casting machine employing a compressed air actuated plunger for the discharge of heated casting material from a container through an injection nozzle into the dies employed, an air valve mechanism controlling the supply of compressed air to said plunger to regulate the successive operations thereof, said mechanism comprising a pair of valves, cams for actuating said valves in the operation of the machine, means for holding one of said valves in inoperative position with respect to the corresponding cam during a predetermined number of successive casting operations, the other of said valves controlling the supply of air to said plunger, means for shutting off the supply of air to the second named valve when the first named valve is in operative engagement with the cam for actuating the same, and means including a chain having trip elements thereon for controlling the operation of said first named valve.

3. A dual valve mechanism for controlling compressed air operation of independent devices in a machine, said mechanism comprising independent valves, independent means for actuating said valves, means forming a constant supply of compressed air to one of the valves, each valve having a discharge passage leading to independent devices to be operated, means involving a catch device normally supporting the first mentioned valve in position to seal the discharge therefrom to the device controlled thereby, and means involving a by-pass between said valves for placing the discharge of the other of said valves in operative communication with said supply of compressed air whereby in successive operations of said last mentioned valve, compressed air will be intermittently discharged therethrough to actuate the device controlled thereby.

4. A dual valve mechanism for controlling compressed air operation of independent devices in a machine, said mechanism comprising independent valves, independent means for actuating said valves, means forming a constant supply of compressed air to one of the valves, each valve having a discharge passage leading to independent devices to be operated, means involving a catch device normally supporting the first mentioned valve in position to seal the discharge therefrom to the device controlled thereby, means involving a by-pass between said valves for placing the discharge of the other of said valves in operative communication with said supply of compressed air whereby in successive operations of said last mentioned valve, compressed air will be intermittently discharged therethrough to actuate the device controlled thereby, and means for exhausting air from the device controlled by the second mentioned valve intermediate successive operations of said valve.

5. A dual valve mechanism for controlling compressed air operation of independent devices in a machine, said mechanism comprising independent valves, independent means for actuating said valves, means forming a constant supply of compressed air to one of the valves, each valve having a discharge passage leading to independent devices to be operated, means involving a catch device normally supporting the first mentioned valve in position to seal the discharge therefrom to the device controlled thereby, means involving a by-pass between said valves for placing the discharge of the other of said valves in operative communication with said supply of compressed air whereby in successive operations of said last mentioned valve, compressed air will be intermittently discharged therethrough to actuate the device controlled thereby, means for exhausting

air from the device controlled by the second mentioned valve intermediate successive operations of said valve, means controlling the operation of said catch device to periodically release the first mentioned valve for a series of intermittent operations whereby in each of said operations, compressed air will be discharged to the device controlled thereby and exhausted therefrom, and said by-pass to the second mentioned valve being shut off in each of the intermittent operations of the first mentioned valve.

6. In a die casting machine of the class described employing a plunger for the pressure discharge of heated casting material and a device for operating a mounting member upon which castings are formed, a dual valve mechanism controlling the operation of said plunger and device by the supply of compressed air thereto, one valve controlling the supply of air to the plunger, the other valve controlling the supply of air to said device, means involving cams for actuating each of said valves, means providing a constant supply of air to the second named valve, means for bypassing the air from said valve to the first mentioned valve, a catch device supporting the second mentioned valve in inoperative position with respect to the cam controlling the same and to shut off supply of air to the device controlled thereby during a series of successive discharges of air through the first mentioned valve to said plunger in forming a predetermined number of castings on said mounting member, and automatically actuated means for releasing the catch device to place the second named valve in operative engagement with its cam to provide a series of successive compressed air operations of the device for feeding said mounting member while simultaneously cutting off the by-pass to the first named cylinder.

7. In a die casting machine of the class described employing a plunger for the pressure discharge of heated casting material and a device for operating a mounting member upon which castings are formed, a dual valve mechanism controlling the operation of said plunger and device by the supply of compressed air thereto, one valve controlling the supply of air to the plunger, the other valve controlling the supply of air to said device, means involving cams for actuating each of said valves, means providing a constant supply of air to the second named valve, means for by-passing the air from said valve to the first mentioned valve, a catch device supporting the second mentioned valve in inoperative position with respect to the cam controlling the same and to shut off supply of air to the device controlled thereby during a series of successive discharges of air through the first mentioned valve to said plunger in forming a predetermined number of castings on said mounting member, automatically actuated means for releasing the catch device to place the second named valve in operative engagement with its cam to provide a series of successive compressed air operations of the device for feeding said mounting member while simultaneously cutting off the by-pass to the first named cylinder, said last named means comprising an endless chain having a series of trip elements thereon cooperating with and releasing said catch device, and means in successive operations of each of said valves for exhausting compressed air from the means actuating the plunger and the device actuating said mounting member.

8. A dual valve mechanism for automatic machines of the character described comprising two cylinders, valves reciprocating in said cylinders, means for operating the valves in one direction, cams for actuating said valves in the opposite direction, means retaining one of said valves out of operative engagement with its cam, said last named valve having a compressed air chamber, means providing a constant supply of air to said chamber, the cylinder controlled by said first named valve having a discharge passage normally sealed to the air chamber thereof by said valve when supported by said retaining means, means comprising a by-pass placing the chamber of the first named valve in communication with the other of said valves, the cylinder controlled by the last named valve having a discharge passage through which compressed air is discharged in the registering of the second named valve with said by-pass, means for exhausting the air from the discharge passage in each cycle of operation of said second named valve, and means whereby in the release of the retaining means for the first named valve, communication to said by-pass is closed and the discharge passage of the cylinder of said first named valve is placed in communication with the compressed air chamber of the first named valve.

9. A valve mechanism for controlling supply of compressed air to independent discharges leading to independent devices to be actuated by compressed air, said valve mechanism comprising independently actuated valves, one controlling one discharge and the other the other discharge, means providing a constant supply of compressed air to one of said valves, a catch device supporting said valve in position to seal the supply of compressed air to the discharge controlled thereby, means forming a by-pass extending from said valve to the other of said valves and constantly maintained in communication with the compressed air supply of the first named valve when said first named valve is held by said catch device, whereby a series of compressed air charges may be passed through the discharge controlled by the second named valve in a series of operations thereof, and means whereby the release of said catch device will place the compressed air supply chamber of the first named valve in position to register with the discharge controlled thereby and to simultaneously shut off the supply of air to said by-pass.

10. A valve mechanism for controlling supply of compressed air to independent discharges leading to independent devices to be actuated by compressed air, said valve mechanism comprising independently actuated valves, one controlling one discharge and the other the other discharge, means providing a constant supply of compressed air to one of said valves, a catch device supporting said valve in position to seal the supply of compressed air to the discharge controlled thereby, a by-pass extending from said valve to the other of said valves and constantly maintained in communication with the compressed air supply of the first named valve when held by said catch device, whereby a series of compressed air charges may be passed through the discharge controlled by the second named valve in a series of operations thereof, means whereby the release of said catch device will place the compressed air supply chamber of the first named valve in position to register with the discharge controlled thereby and to simultaneously shut off the supply of air to said by-pass, and each valve having means cooperating with

the discharge thereof for exhausting compressed air previously injected into the discharge in the operations of said valves.

11. A valve mechanism for controlling supply of compressed air to independent discharges leading to independent devices to be actuated by compressed air, said valve mechanism comprising independently actuated valves, one controlling one discharge and the other the other discharge, means providing a constant supply of compressed air to one of said valves, a catch device supporting said valve in position to seal the supply of compressed air to the discharge controlled thereby, a by-pass extending from said valve to the other of said valves and constantly maintained in communication with the compressed air supply of the first named valve when held by said catch device, whereby a series of compressed air charges may be passed through the discharge controlled by the second named valve in a series of operations thereof, means whereby the release of said catch device will place the compressed air supply chamber of the first named valve in position to register with the discharge controlled thereby and to simultaneously shut off the supply of air to said by-pass, each valve having means cooperating with the discharge thereof for exhausting compressed air previously injected into the discharge in the operations of said valves, and automatically actuated means controlling the operation of said catch device at predetermined intervals with respect to a series of successive operations of the second named valve.

12. In combination, two independent devices adapted to be actuated by compressed air, two valves, each associated with one of said devices and adapted to control the passage of compressed air thereto, a source of supply of compressed air, means forming a connection from said source through one of said valves and thence through the other valve to the device associated with said other valve, means to operate both of said valves, and means to hold said first named valve in an inoperative position, said first named valve being constructed and arranged when in said inoperative position to provide for the exhaust of air from the device associated therewith and to maintain open said connection to the said other valve.

13. In combination, two independent devices adapted to be actuated by compressed air, two valves, each associated with one of said devices and adapted to control the passage of compressed air thereto, a source of supply of compressed air, means forming a connection from said source through one of said valves and thence through the other valve to the device associated with said other valve, means to operate both of said valves, and means to hold said first named valve in an inoperative position, said first named valve being constructed and arranged when in said inoperative position to prevent passage of compressed air to the device associated therewith but to maintain open said connection to the said other valve and when in operation to simultaneously close said connection and provide for the passage of air to said associated device.

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