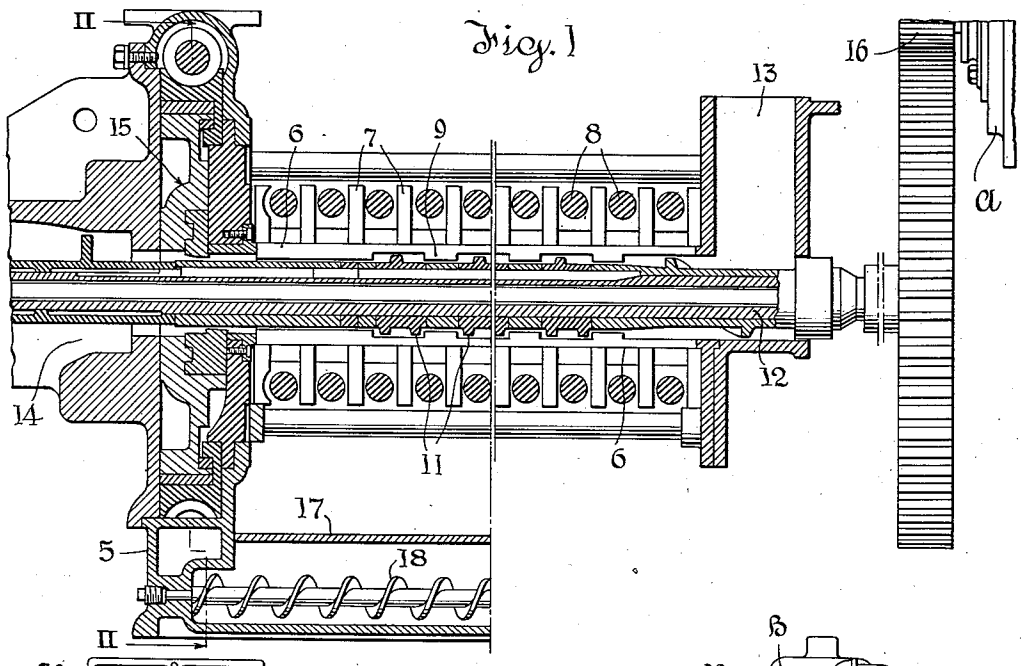
Nov. 7, 1939. R. T. ANDERSON 2,178,714

PRESS

Filed March 5, 1936 2 Sheets-Sheet 1

Fig. 1



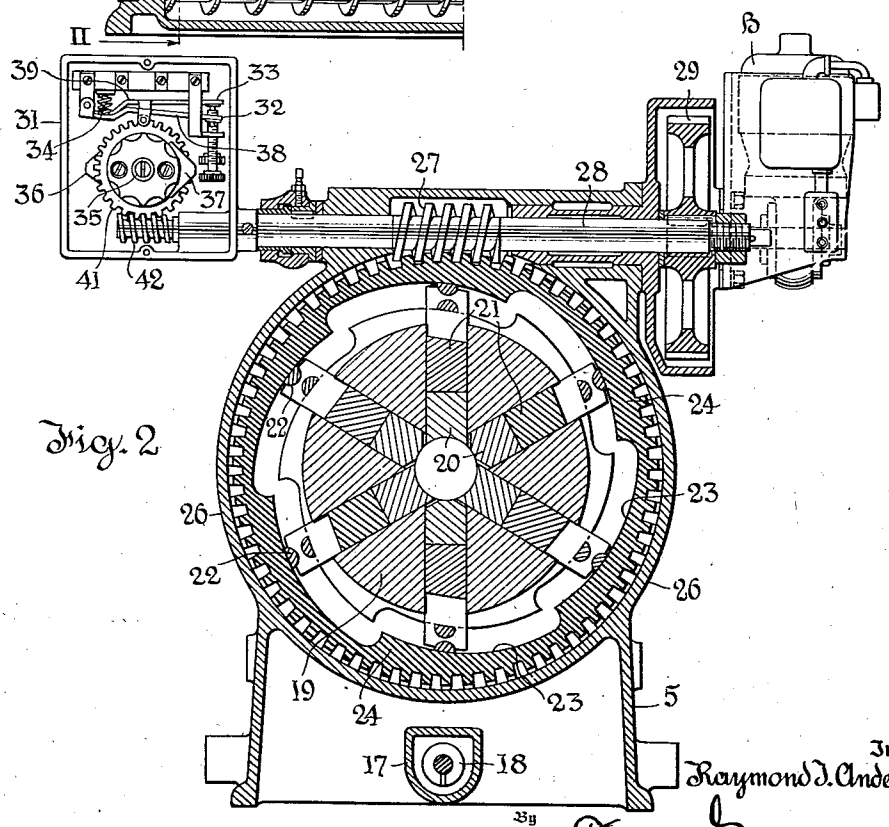


Fig. 2

Inventor
Raymond T. Anderson

By Dodge, Clay & Sons

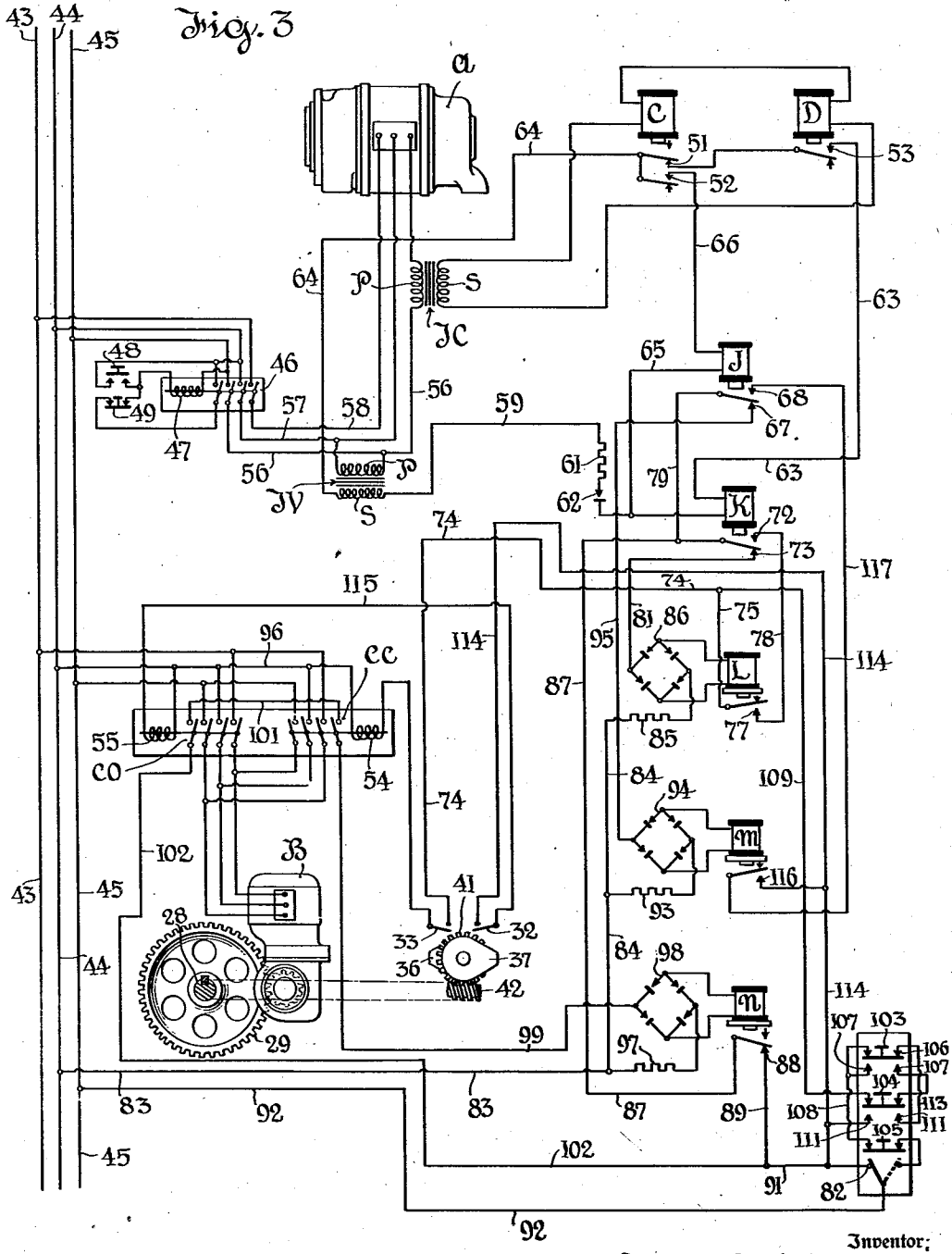
Attorneys

Nov. 7, 1939. R. T. ANDERSON 2,178,714

PRESS

Filed March 5, 1936 2 Sheets-Sheet 2

Fig. 3



Inventor:
Raymod T. Anderson

By Dodge and Dodge,

Attorneys

Patented Nov. 7, 1939 2,178,714

UNITED STATES PATENT OFFICE

2,178,714

PRESS

Raymond T. Anderson, Berea, Ohio, assignor to The V. D. Anderson Company, Cleveland, Ohio, a corporation of Ohio

Application March 5, 1936, Serial No. 67,386

14 Claims. (Cl. 100—48)

This invention pertains to improvements in presses and more particularly to presses of that type wherein material having a liquid content is subjected to pressure and the liquid expressed therefrom. In the patent to Anderson 1,752,054 granted March 25, 1930, and the patents therein referred to, there is disclosed a shell having a series of worms or screws mounted therein. These screws feed the material along through the shell, compressing it and expressing the liquid contents, such as oil or the like. Working in conjunction with the outlet of the press, is a choke for retarding the outflow of the material from which liquid has been expressed and causing it to be held in the press or shell for the requisite period of time.

The choke disclosed in the above mentioned patent is manually adjustable to suit the operation of the press to the particular material being treated, and this adjustment may be made while the press is operating.

The present invention constitutes an improvement in presses of the above described types, and consists in the provision of an automatic discharge or choke control whereby the choke is automatically adjusted so that the proper size of discharge outlet is provided for the most efficient treatment of the particular material being pressed. Not only does this adjustment take place upon changing the material to be treated, but also upon any predetermined change in the character of any particular material. This device not only retains all of the advantages of the patents of the prior art but it has the additional advantage of completely automatic choke adjustment in accordance with the back pressure developed in the press by the material being pressed. Consequently the choke control may be made responsive to variations in the load on the press motor and will operate so as to maintain the load substantially constant. The parts may also be arranged to permit manual control of the choke at any time and for any period desired.

The invention will be described in the following specification together with the accompanying drawings, wherein:

Fig. 1 is a vertical sectional view of one form of press having an embodiment of this invention incorporated therein.

Fig. 2 is a sectional view on the line II—II of Fig. 1, showing the choke and its operating mechanism.

Fig. 3 is a diagram of one form of electrical circuit embodying this invention, and adapted for use with the mechanism illustrated in Figs. 1 and 2.

In describing the invention, reference will first be made to Fig. 1 of the drawings in which are shown only the essential operating parts of the press. Brief description of the general machine structure will be sufficient to give a clear understanding of the mechanism to which the present invention has been applied.

The press illustrated, comprises a base 5 upon which is mounted a shell or casing made up of a series of bars 6 spaced apart and extending longitudinally of the machine to form a cylindrical barrel. These bars are reinforced by suitable ribs 7 to prevent bursting of the shell under high pressure, and the assembly is held in place by means of cross bolts 8. Certain of the bars 6 carry the usual knives 9 extending between the worms 11 on the shaft 12 to prevent rotation of the material being pressed.

The casing is provided with an inlet 13 and an outlet 14, the outlet being controlled by adjustable choke mechanism designated generally by reference character 15.

The shaft 12, together with the worms 11 mounted thereon, may be caused to rotate by any suitable mechanism, such as spur gearing 16 driven by a motor A, only a portion of the motor being shown in Fig. 1 of the drawings. Material fed into the press through the inlet 13 is compressed by the worms 11, and the liquid contents of the material is pressed out and caught in a trough 17 containing the usual conveyor 18 for handling the foots extracted by the press.

The choke mechanism designated 15 may be of any suitable construction but for simplification of the description it is shown to be of the same construction as that disclosed in the above mentioned patent and, as such, may comprise a series of fixed blocks 19 between which are radial grooves or ways to receive radial jaws 21 carrying at their outer ends anti-friction bearing members 22 cooperating with cam surfaces 23 on a ring gear 24 mounted inside of the discharge shell 26. The inner ends 20 of the jaws 21 cooperate to form the variable choke opening.

Cooperating with the ring gear 24 is a worm 27 carried by a shaft 28. The shaft may be actuated by suitable back gearing designated generally by reference character 29 and driven by a motor B.

When the worm 27 is caused to operate in such a direction as to rotate the ring gear 24 in a clockwise direction, the radial jaws 21 are caused to move outwardly to open the choke, decrease the

pressure of the material in the press and hence to reduce the load on motor A. When the ring gear is moved in a counter-clockwise direction, the radial jaws move inwardly to close the choke, increase the pressure of the material in the press, and to increase the load on motor A.

The radial movement of the jaws 21 is limited, and consequently, in order to prevent injury of the mechanism, means are provided to prevent the motor B from driving the worm 27 after the choke is fully opened or fully closed. For this purpose there are mounted on the end of the shaft 28, as indicated in Fig. 2 of the drawings, limit switches 32 and 33 in a housing 31. These limit switches are each biased to closed position by springs 34. Mounted on a shaft 35 are two diametrically disposed cams 36 and 37, cooperating with rollers associated with the two switch arms 38 and 39 to cause one of these switches 32 and 33 to be opened whenever the choke motor tends to over travel the fully-closed or fully-opened position of the choke. The two cams 36 and 37 are secured to a gear 41 on the shaft 35 and are driven by a worm 42 meshing with this gear.

One method of making the press operate at constant load and of securing automatic operation will now be described. It consists primarily in providing an electric motor B for operating the choke in response to variations in the load on the press motor A. Means are also provided to prevent hunting of the choke control when momentary variations in the load on the press motor occur. All of these factors are taken care of in the mechanism which is shown diagrammatically in Fig. 3 of the drawings.

Referring to Fig. 3, reference character A designates the press motor which may be supplied with three phase alternating current over a push button switch 46 controlling the current supplied from line wires 43, 44, and 45. Although in the system illustrated the source of current is indicated as three phase alternating current, it is obvious that single phase alternating current may be employed or direct current if desired. The inventive concept is generic, and any suitable source of current and any suitable control means may be provided to cause the choke motor to operate in response to the back pressure within the press.

The switch 46, associated with the motor A is biased to open position by any suitable and well known means. It is, however, provided with an operating coil 47 which, when energized, closes the switch. As shown, diagrammatically, 48 designates a starting push button for energizing the switch coil 47 by connecting it across line wires 44 and 45. The switch 46 includes the usual contact for establishing a holding circuit through the normally closed contacts of stop push button 49. In this way, the holding circuit makes it necessary to hold button 48 depressed only long enough to close the switch. The switch may be opened by pressing the button 49 to break the circuit of switch coil 47.

The choke motor B is operated selectively by current from the line wires in response to the action of a choke closing switch CC or a choke opening switch CO. When the coil 54 is energized, the switch CC is closed to cause the motor B to operate in such a direction as to move the choke in a closing direction. When coil 55 is energized, the motor B operates in a reverse direction to move the choke in an opening direction. The switches CC and CO associated with choke motor B are adapted to be operated either in response to manual push button control, or automatically in accordance with the position of a master control switch 82 later to be described. Inasmuch as variations in the load on motor A are utilized to actuate the control mechanism for choke motor B, the operation of this choke motor is made responsive to variations in the current supplied to the motor A.

Current is supplied to the motor A from line wires 43, 44 and 45 over wires 56, 57 and 58. Current for actuating the control relays of the system is supplied from the connections between switch 46 and the motor A by means of a current transformer TC and a voltage transformer TV. The primary P of transformer TC is connected in series with wire 56, while the secondary S supplies current to two alternating current control relays C and D. These relays are connected in series with each other and with secondary S and are responsive to variations in the load on motor A.

Transformer TV has a primary P connected across wires 56 and 57, and its secondary S supplies current through resistors and rectifiers to direct current relays J, K, L, M and N. These relays control the operation of motor B in response to the action of relays C and D.

Relay C has a front contact 52 and a back contact 51. When, for example, the relay is supplied with current at 30 amperes or over it picks up to open contact 51 and close contact 52. It remains picked up until the current falls below 28 amperes.

Relay D has a single front contact 53 which is closed when the relay is supplied with current of 25 amperes or more. When this current falls below 25 amperes the relay releases and the armature rests against a back stop as shown.

It will be understood that the characteristics of relays C and D may vary in accordance with the size of the motors A and B, and in accordance with the particular installation. Accordingly the current values given are merely assumed by way of illustration and are not to be regarded as limitations.

From the above it follows that when a current of less than 25 amperes flows in the secondary circuit S of transformer TC, and through the windings of relays C and D, both relays remain deenergized, as shown in Fig. 3. Consequently, front contact 52 of relay C is open and back contact 51 is closed. Front contact 53 of relay D is also open. When the current in this circuit increases to 25 amperes, relay D picks up, closing its front contact 53, but relay C remains released and its back contact 51 remains closed to complete a circuit for relay K.

The circuit for relay K is from the secondary S of transformer TV over line wire 59, resistor 61, rectifier 62, winding of relay K, wire 63, front contact 53 of relay D, back contact 51 of relay C, and wire 64 back to secondary S. This circuit is closed whenever relay C releases and relay D is picked up, but it opens when relay C picks up or relay D releases. When the current flowing to motor A rises to a value of 30 amperes or more, relay D remains picked up and relay C also picks up, opening its back contact 51 and closing its front contact 52 to complete a circuit for relay J. The circuit of relay J is from the secondary S of transformer TV over wire 59, resistor 61, rectifier 62, wire 65, winding of relay J, wire 66, front contact 52 of relay C and wire 64, back to the secondary of transformer TV. This circuit re-

mains closed so long as relay C is energized above its assumed releasing value of 28 amperes. When the current supplied to relay C drops below 28 amperes, the relay releases to open the front contact 52 and thereby cause relay J to release.

The rectifier 62 associated with relays J and K, is preferably of the copper-copper oxide type and the current flowing to it is limited by resistor 61. A rectifier of this type is shown in the patent to Lars O. Grondahl, No. 1,640,335, granted August 23, 1927. Similar resistors and rectifier units are employed in connection with the relays L, M and N.

The circuits for relays J and K have already been traced. Relay J has a front contact 68 for controlling the choke-opening circuit over the back contact of relay M. Back contact 67 of relay J completes the circuit for the winding of relay M.

Similarly front contact 72 of relay K controls the choke-closing circuit over the back contact 77 of relay L. The back contact 73 of relay K completes the circuit for the winding of relay L.

The relays L, M and N each have slow acting characteristics as indicated by the conducting face plates, that is, when the circuit for the winding of any one of these relays is made or broken the armature does not respond to pick up or release until a predetermined time interval has elapsed. Consequently these relays introduce a time lag in the operation of choke motor B and permit the choke mechanism to obtain a complete adjustment to a new condition before another and further adjustment can be carried out. In this way continuous hunting of the mechanism is avoided. A retarded relay of a general type applicable to this invention is well illustrated in the patent to Hovey, No. 1,922,089, August 15, 1933, although other relays of this type or similar types might obviously be used.

The relays L and M are normally picked up as shown in Fig. 3, and each closes a control circuit on back contact. For this purpose relay L is controlled over the front contact of relay K in response to pick up of relay D so long as relay C remains released. Relay M, upon release, closes a circuit which is completed by pick up of relay J in response to pick up of relay C so as to close its front contact 52.

Relay N which is normally released, has its circuit controlled by the operation of the control switches for motor B, and the relay is normally released when both of the switches CO and CC are open.

All description of operation so far made is based on the assumption that the switch arm 82 is in its full line position so as to cause automatic operation of the circuits. When the switch 82 occupies its dotted line position, the choke mechanism is adjusted only in response to operation of manual switching means which will later be described in detail.

Relay L normally remains picked up over a circuit from line wire 44, over wires 83 and 84, resistor 85, rectifier 86, winding of relay L, rectifier 86, wire 81, back contact 73 of relay K, wire 87, back contact 88 of relay N, wires 89 and 91, switch 82 and wire 92, to line wire 45. This circuit remains closed as long as relays N and K remain released. In a similar manner relay M normally remains picked up over a circuit which leads from line wire 44 over wires 83 and 84, resistor 93, rectifier 94, winding of relay M, rectifier 94, wire 95, back contact 67 of relay J, wires 79 and 87, back contact 88 of relay N, wires 89 and 91, switch 82, and wire 92 to line wire 45. This circuit remains closed so long as relays J and N are released, but is opened whenever either of these relays picks up.

Relay N is normally released to complete the circuits of L and M over back contact 88. Whenever either of the switches CO or CC is closed to operate the motor B, relay N is caused to operate after a predetermined interval to break the circuit for either of the coils 55 or 54, so that the operation of motor B will be only momentary.

The circuit for choke closing coil 54 controlled by relays K and L is as follows:

Line wire 44, wire 96, coil 54, limit switch 33, wires 74 and 75, back contact 77 of relay L, wire 78, front contact 72 of relay K, wire 87, back contact 88 of relay N, wires 89 and 91, switch arm 82, and wire 92 to line wire 45. This circuit remains closed so long as relay K remains picked up and relay N released, and also so long as the current supplied to motor A is such as to maintain relay C released and relay D picked up. Obviously, this circuit may be opened by limit switch 33 should the choke be closed to its full limit of travel so as to cause cam 36 to open its associated switch. When this circuit for switch coil 54 is closed, after the time delay interval determined by the slow acting characteristics of relay L, the relay N will be energized to pick up and open the contact 88 and thus stop the motor B. The circuit for relay N, when the choke closing circuit is operating, is from line wire 44, over wire 83, resistor 97, rectifier 98, winding of relay N, rectifier 98, wire 99, one arm of switch CC, wires 101, 102 and 91, switch arm 82, and wire 92 to line wire 45.

The circuit for relay N is closed whenever the contact for motor B is closed, but its operation to open the circuit at 88 depends upon the time interval required for the relay to act, but when it does act, the circuit for coil 54 is opened. Thus the relay N is timed to a definite operating interval, for example five seconds. Consequently, when relays D and K are energized to cause operation of the choke motor B in a choke closing direction, the motor B is operated intermittently for short intervals, determined by the operation of relay N, and this "cycling" operation continues so long as the current drawn by motor A remains at a value to keep relay K energized.

The circuit for relay N is controlled in a similar manner when the motor B is being operated in a choke opening direction as a result of increase in the load on the motor A. The circuit for the relay N is as before, but it is now responsive to the action of relays J and M, as well as to the action of limit switch 32.

So long as relay J remains picked up and relay M released the motor B will operate intermittently in response to the opening and closing of contact 88 of relay N.

In describing the operation of the system shown diagrammatically in Fig. 3, it will be assumed that the parts all occupy the positions shown in the drawings. Switch 46 for controlling motor A is open and relays C, D, J, K and N are all in their released positions. Relays L and M are picked up as shown with their armatures against the stops and their back contacts open.

When push button 48 is depressed to close switch 46 the press motor A starts and the transformers TV and TC become energized. As the material passes through the press it will be subjected to pressure by choke 15, and this pressure

will also vary in accordance with the characteristics of the particular material under treatment. As long as the current supplied to motor A is below a predetermined value which, for the purpose of this description will be assumed to be 25 amperes, all of the relays will maintain the positions in which they are shown.

When the back pressure within the press increases and the load on motor A increases until the current supplied to relay D from the transformer TC exceeds 25 amperes but does not exceed the pick up value of 30 amperes for relay C, relay D will pick up closing its front contact 53 to energize relay K. Variation in the load on motor A will cause the choke to close in order to bring the load to an average value, and this is brought about by closing the switch CC associated with choke motor B. As soon as relay K picks up, the circuit of relay L is opened at the back contact 73 of relay K causing relay L, after a predetermined and definitely timed interval, to drop its armature and close its back contact 77, thereby completing the circuit for coil 54 of switch CC. This circuit leads from line wire 44 over wire 96, coil 54, limit switch 33, wires 74 and 75, back contact 77 of relay L, wire 78, front contact 72 of relay K, wire 87, back contact 88 of relay N, wires 89 and 91, switch 82 in full line position, and wire 92 to line wire 45. This circuit remains closed and causes choke motor B to operate in choke closing direction until cycling relay N picks up to break the circuit at back contact 88 of relay N or until the choke reaches its fully closed position so as to open the limit switch 33. The cycling relay N is slow in acting and is set to operate at predetermined time intervals, for instance, every five seconds, so that the choke motor B operates intermittently to adjust the choke. When the choke reaches such a position that the load on motor A is reduced sufficiently to cause relay D to release, relay K also releases and at back contact causes relay L to pick up again and this breaks the choke-closing circuit. This circuit could also be reopened by relay C picking up in response to an increase in load on motor A.

Should the load on motor A increase sufficiently to cause the current supplied to it to exceed 30 amperes and to cause relay C to pick up, this would cause relay J also to pick up. Relay M would then release to close the switch CO and operate the choke motor B to open the choke and thereby reduce the load on motor A. The operation of the choke-opening circuit is similar to the choke-closing circuit except that different relays are utilized. When relay C picks up its back contact 51 is opened so that relay K remains released even though the current is sufficient to maintain relay D picked up. When front contact 52 of relay C is closed, relay J picks up to close the front contact 68 and to open back contact 67. The opening of back contact 67 breaks the circuit of the winding of rely M causing it to release after a predetermined timed interval. When relay M releases to close its back contact 116 and complete the choke-opening circuit, it thereby causes the energization of switch coil 55. The choke-opening circuit leads from line wire 44 over wire 96, switch coil 55, wire 115, limit switch 32, wire 114, back contact 116 of relay M, wire 117, front contact 68 of relay J, wires 79 and 87, back contact 88 of relay N, wire 91, switch arm 82, and wire 92 to line wire 45. This choke-opening circuit is subject to the action of cycling relay N in the same manner that has been described in connection with the choke-closing circuit, and will be understood without further explanation. Consequently choke motor B is subject to intermittent operation for predetermined time intervals until the choke has been opened sufficiently to restore the load of motor A to such a condition that the current applied to this motor is of normal value. This choke-opening circuit may be opened by release of relay C in response to a drop in the current value supplied to motor A, thereby causing relay J to drop and relay M to pick up when relay J closes its back contact 67. The choke-opening circuit may also be opened by limit switch 32 when the choke reaches its fully-opened position. In any case the slow acting characteristics of relays L and M are such as to cause choke motor B to be operated only when the current supplied to motor A increases above or decreases below the normal value for a substantial period of time. Momentary variations in the motor load do not result in operation of the choke motor B.

Under some conditions, it may be found desirable to exercise manual control of the choke motor B, and when this is to be done, the switch 82 is moved to the dotted line position. Push button 103 is normally biased to the position shown in Fig. 3. When, however, it is desired to open the choke of the press, the operator pushes the push button 103 out of engagement with the upper contacts 106 and into engagement with lower contacts 107. This completes the circuit for coil 54 over limit switch 33. This circuit is from line wire 45, wire 92, switch 82 in dotted line position, stop switch 105, wire 108, contacts 107, choke-closing push button 104, wires 109 and 74, limit switch 33, coil 54, wire 96 to line wire 44. This circuit remains closed so long as the push button 103 is held in engagement with contacts 107 or until cam 36 strikes limit switch 33 to open it. Release of push button 103 restores the parts to the position shown in the figure.

The choke-closing circuit may be controlled manually by the push button 104, which is normally biased to a position in which it bridges the upper contacts, as shown. When it is depressed it engages and bridges contacts 111 to complete the choke-closing circuit from line wire 45 over wire 92, switch arm 82 in dotted line position, stop switch push button 105, wire 108, push button 103 in top position, wire 113, contacts 111, wire 114, limit switch 32, wire 115, coil 55 to line wire 44. This circuit remains closed so long as button 104 is depressed or until cam 37 opens limit switch 32 as the choke reaches its full open position. When the motor B is started manually by depressing push button 103 or 104, the operation may be stopped at any time by depressing push button 105 which breaks a portion of the circuit which is common to both the choke-opening and choke-closing circuits. It will be obvious that the mechanism just described is not only capable of automatically maintaining a constant load on the press motor A, but also of permitting assumption of manual control when and if desired.

It will be understood that in the foregoing description arbitrary current values have been assumed, but that in practice any desired characteristics may be imparted to the motors and their controlling circuits to maintain any desired condition of the product which is being treated in the press. The limits between which the relays C and D operate may readily be altered or varied to suit any particular conditions of operation,

and such variations and alterations are within the scope of this invention. Therefore, it is to be understood that all such variations are intended to be included within the scope of the appended claims except when statements in such claims obviously preclude such interpretation.

While the invention has been illustrated and described as applied to the press mechanism of Patent Number 1,752,054, it is to be understood that it is in no way limited to use with that particular structure but is of broad general application to presses having an adjustable choke of any type to which the control described herein may be applied. The term "choke" as used herein is employed in its board sense to cover a cone or other outlet control mechanism of well known type in the art which can be adjusted to vary the pressure applied to the material in the press. Examples of different types of choke which may be employed are shown in Anderson Patents 647,354, April 10, 1900; 731,734 and 731,737 issued June 23, 1903, and Anderson Patent 829,314, August 21, 1906.

What is claimed is:

1. In a press, a casing; expressing means in said casing; driving means for said expressing means; a discharge for the press; motor operated means for controlling said discharge; and electrical means for controlling said motor in accordance with the back pressure exerted on the driving means by the material passing through the press.

2. In a press, a casing having an adjustable choke controlled outlet; expressing means in said casing; an electric motor for driving said expressing means; and electric means controlled in accordance with the load on said motor for adjusting said choke.

3. In a press for material having a fibrous content, a casing having an adjustable choke controlled outlet; expressing means in said casing; an electric motor for actuatng said expressing means; electric motor actuated means for adjusting said choke; and electrical means controlled in accordance with the load on the expressing motor for controlling said choke motor to adjust said choke.

4. In a press for material having a fibrous content, a casing having an adjustable choke controlled outlet; expressing means in said casing; an electric motor for actuating said expressing means; electric motor actuated means for adjusting said choke; and electric current controlled means in circuit with both of said motors for causing said choke motor to adjust said choke in accordance with the load on said expressing motor.

5. In a press for material having a fibrous content, a casing having an adjustable choke controlled outlet; expressing means in said casing; an electric motor for actuating said expressing means; electric motor actuated means for adjusting said choke; automatic means for causing said choke motor to adjust the choke in accordance with the load on said expressing motor; manually operated switching means for causing operation of said choke; and means for selectively rendering either said automatic means or said manually operated means effective.

6. In a choke controlling mechanism for presses of the electric motor driven type in which material is compressed to remove the liquid therefrom and a choke retards the outflow of compressed material, a choke motor having a choke-closing circuit and a choke-opening circuit; and electric current controlled means responsive to variations in the load on the press motor, for selectively controlling said choke motor circuits to maintain substantially a constant load on said press motor.

7. In a choke controlling mechanism for presses of the electric motor driven type in which material is compressed to remove the liquid therefrom and a choke retards the outflow of compressed material, a choke motor having a choke-closing circuit and a choke-opening circuit; a plurality of relays responsive to variations in the load on said press motor; a relay in each of said choke motor circuits, said relays being responsive selectively to the operation of said load responsive relays; and still another relay adapted to operate cyclically when either of said choke motor circuits is closed to produce intermittent operation of the choke motor.

8. In a choke controlling system for presses of the electric motor driven type, a choke motor having a choke-closing and a choke-opening circuit; a slow-acting relay in each of said choke motor circuits; a control relay for each of said slow-acting relays and relay means responsive to variations in the load on said press motor for causing operation of said control relays selectively to open or close said choke.

9. An automatic control system for motor driven presses of the type in which material is compressed to remove the liquid therefrom and a choke retards the outflow of material compressed comprising, a press motor a choke motor; a plurality of relays in circuit with the windings of the press motor; means responsive to the operation of one of said relays for causing said choke motor to open said choke; means responsive to the operation of the other of said relays for causing said choke motor to close said choke; and additional means for causing cyclic operation of said choke motor when said motor is energized in response to either of said first mentioned means.

10. An automatic control system for electric motor driven presses of the type in which material is compressed to remove the liquid therefrom having an adjustable choke for retarding outflow of compressed material, said press comprising, a press motor; a motor for operating said choke; relay operated means for causing operation of said choke motor in a choke closing direction; relay operated means for causing operation of said choke motor in a choke opening direction; and current responsve means in circuit with said press motor for causing selective operation of said two relay operated means to control said choke.

11. In a control circuit for presses having an adjustable choke; a press motor; a choke motor; a plurality of relays for causing said choke motor to close said choke; a plurality of other relays for causing said choke motor to open said choke; and two series connected relays connected in circuit with said press motor, one of said relays being responsive to current values within a predetermined range to operate said choke closing relays, and the other of said relays being responsive to current values within a second range to operate said choke opening relays.

12. An automatic control system for electric motor driven presses of the type in which material is subjected to pressure to remove liquid therefrom and having an adjustable choke for retarding the outflow of material to subject the same to pressure, said press comprising, a press

motor; a motor for operating said choke; relay operated means for causing operation of said choke motor in a choke closing direction; relay operated means for causing operation of said choke motor in a choke opening direction; current responsive means in circuit with said press motor for causing selective operation of said two relay operated means to control said choke; and means operated in accordance with the extent of movement of the choke operating means for rendering either of said relay operated means ineffective when the choke reaches either of its extreme positions.

13. In a press, an enclosing structure with liquid escape openings therein; a shaft in said structure supported against longitudinal movement; expressing means composed of a plurality of separated rotatable worms mounted upon and secured to said shaft; a choke disposed in the outflow end of said structure to retard the discharge of material therefrom; an electric motor for driving said expressing means; an electric motor for operating said choke; and electrical means controlled by the load on said driving motor for controlling said choke motor.

14. In a press of the continuous high compression type, a casing having liquid discharge openings therein and an adjustable choke controlled outlet for exerting pressure on the material in the casing; motor operated expressing means in said casing and comprising a plurality of separated rotatable worms; a motor for operating said choke; and relay operated means responsive to variations in the load imposed on said expressing motor by the material in the casing for controlling said choke motor.

RAYMOND T. ANDERSON.