

Nov. 6, 1934.

F. J. BAST

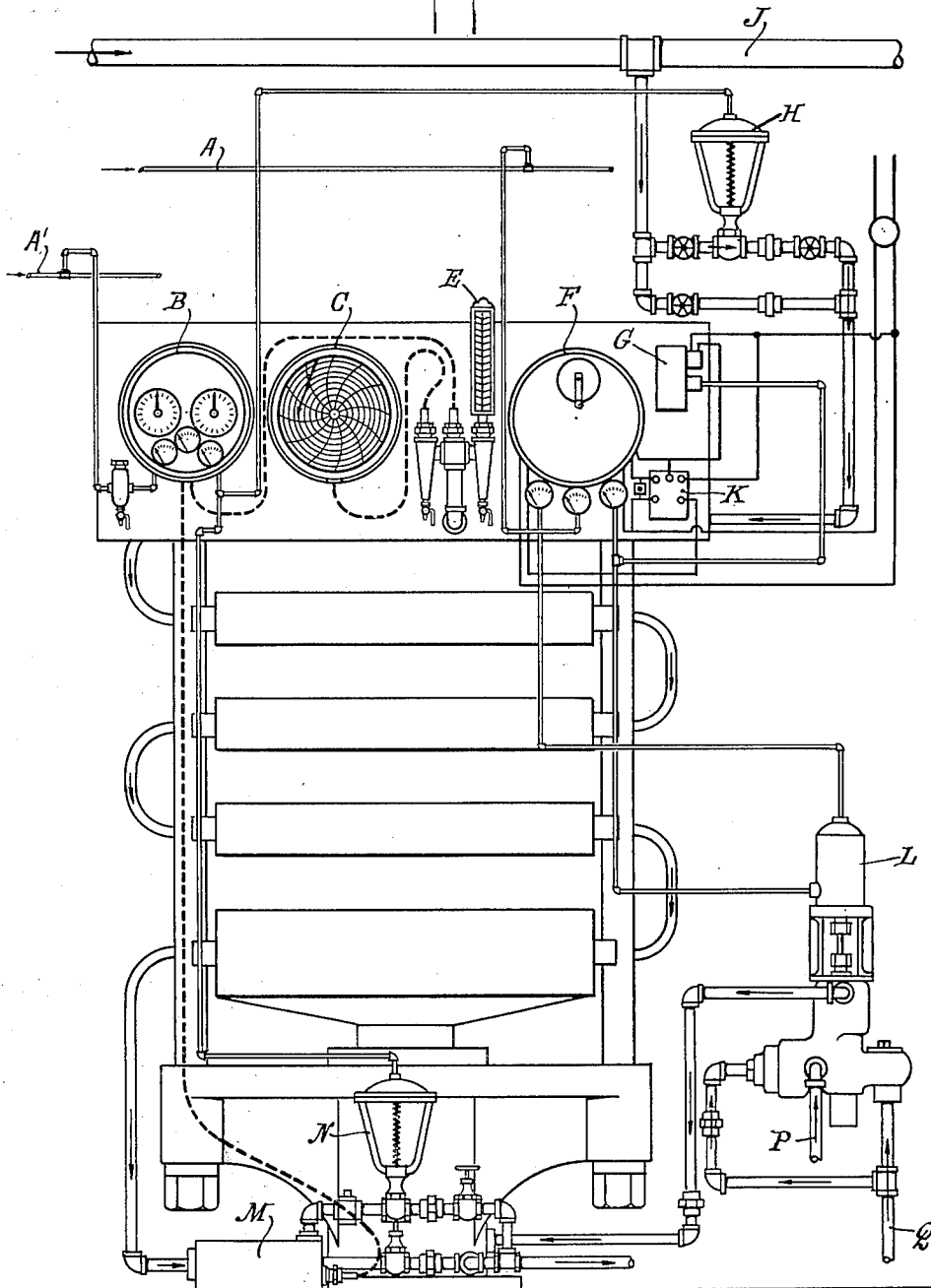
1,979,246

CYCLE CONTROLLER

Filed Oct. 10, 1931

3 Sheets-Sheet 1

Fig. 1.



WITNESS

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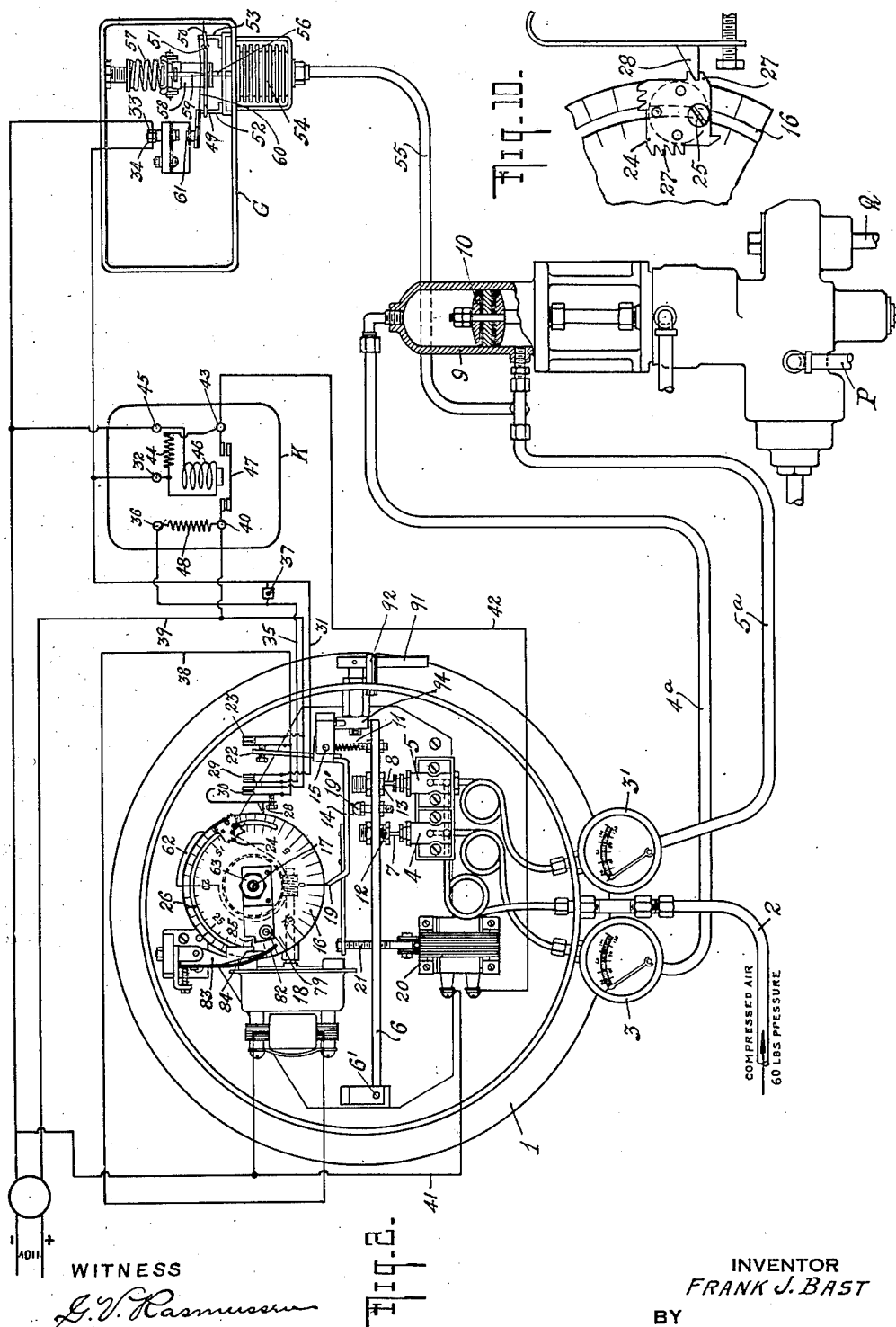
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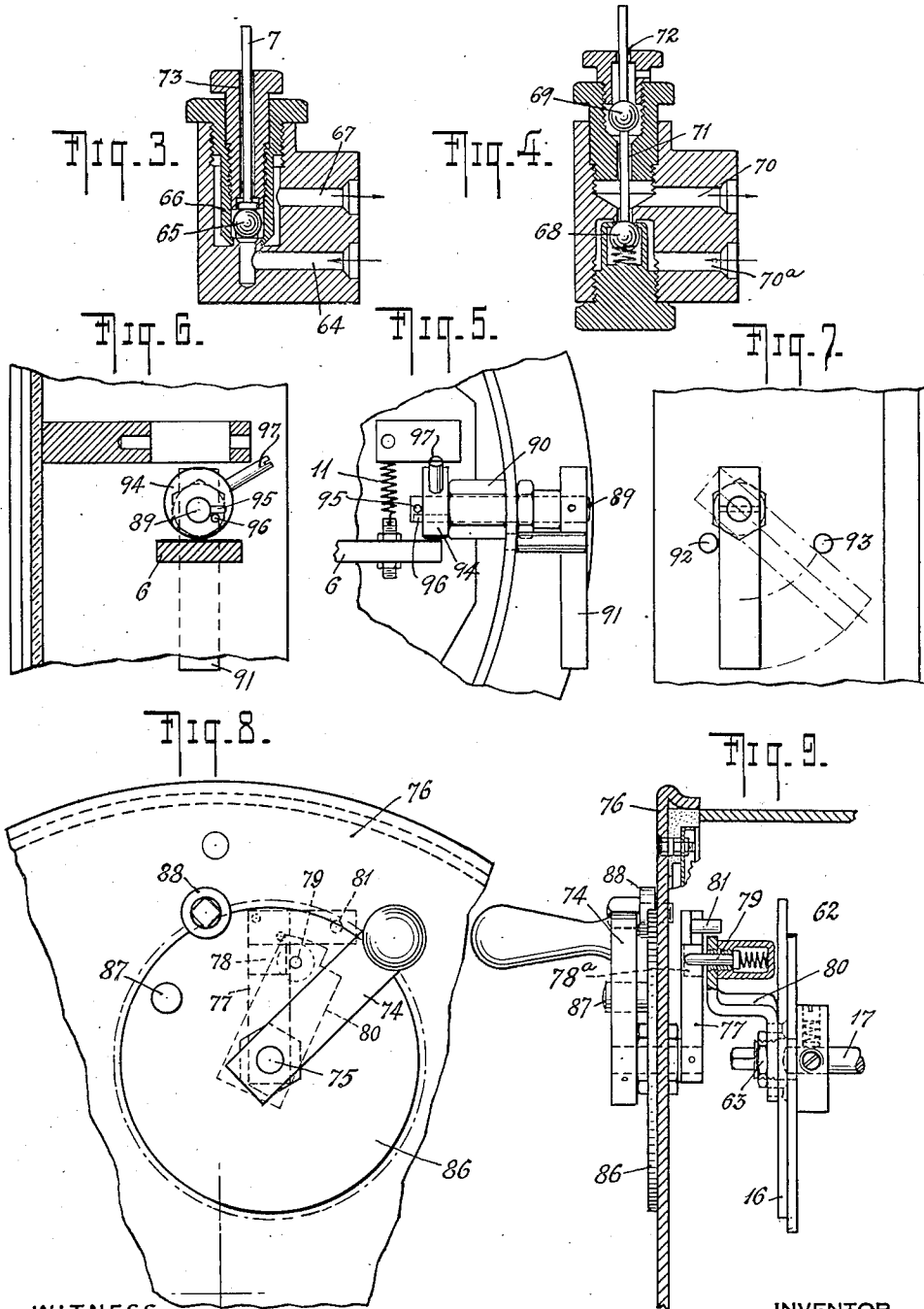
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CYCLE CONTROLLER

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3 Sheets-Sheet 3



WITNESS

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1,979,246

CYCLE CONTROLLER

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Application October 10, 1931, Serial No. 568,027

23 Claims. (Cl. 18—17)

My invention relates to automatic controllers of the type which controls the sequence and duration of a series of operations to be performed within an apparatus under control.

In certain types of treatment of materials, such as vulcanization or curing of rubber articles or pressure molding or baking of synthetic resins and the like, it is necessary to open the platen press or equivalent apparatus in order to discharge the gases that are formed during the treatment, so that such gases may not prevent the molded article from taking the form of the mold or in other ways render the article defective. To accomplish such result it is necessary to open the press and suspend the operations therein for one or more intervals after the press has been set into operation and before the treatment is complete. This timing of the opening of the press and of the interval during which the operations are suspended to permit escape of gas generated in the press, has heretofore been done manually under the control of the attendant. Such control by human agency was subject to the errors commonly attributable to human fallibility and the personal equation, and frequently resulted in improper curing or treatment of the material.

It is accordingly an object of the present invention to provide an improved control mechanism whereby the instant or instants at which the platen press or similar apparatus is opened to permit discharge of the generated gases may readily be predetermined and the press automatically opened and held open for any desired interval or intervals of time, the press being automatically closed after each discharge of gases and the treatment continued as before.

It is also an object of the invention to provide a safety device which can be operated manually to open the press quickly and independently of the timing mechanism of the controller in the event that the hand of the attendant is caught within the press.

It is a further object of the invention to provide improved re-setting mechanism whereby the controller is re-set to zero or initial position from the exterior of the controller casing, the door of the latter remaining closed.

Other objects of the invention will be apparent from the following description and the features of novelty will be set forth in the appended claims.

The accompanying drawings illustrate my invention as embodied, by way of example, in a platen press for curing rubber articles. In said drawings.

Fig. 1 is a diagrammatic view, in elevation, of a platen press having my improved controller mechanism associated therewith;

Fig. 2 is an enlarged view in elevation of the controller mechanism in the zero or starting position;

Figs. 3 and 4 show sectional views, respectively, of a direct acting and a reverse acting valve forming part of the controller mechanism;

Fig. 5 is a front view of a detail illustrating a manually operable safety device for opening the press in case of emergency;

Fig. 6 is a side view in elevation of the mechanism shown in Fig. 5, the view being taken interiorly of the controller casing;

Fig. 7 is an external end view of Fig. 5;

Figs. 8 and 9 are, respectively, a front view and a side section of the re-setting mechanism for returning the timing cam to zero position from a position where the timing cam was initially set to complete its cycle after a little more than a quarter of a revolution, instead of, as in Fig. 2, about a half revolution; and

Fig. 10 is an enlarged view of the bumper cam for opening the press one or more times in the course of a cure or other treatment, the timing cam having moved a predetermined distance from its starting position.

As above indicated, my invention will be described in connection with a platen press for curing rubber goods, but it will be understood that my invention is not limited to this type of apparatus but may be employed in connection with other processes in which the treatment is to be interrupted at selected intervals for the purpose indicated or for other purposes.

The apparatus shown in Fig. 1 illustrates a more or less standard steam heated platen press which is operated by hydraulic pressure, the apparatus being provided with a double system temperature controller B operated from a low pressure (15 lbs.) air line A', a recording thermometer C, one or more indicating thermometers E, a diaphragm motor valve H for controlling the steam admission from a steam line J, a condensation chamber M and a diaphragm motor valve N for controlling the discharge of the condensed steam. The cycle controller is represented at F and is arranged to control the operation of a Stuart two-pressure hydraulic operating valve L, the controller mechanism having associated therewith a three-wire relay K and a snap-on pressure switch G. As will be described in detail hereinbelow, the cycle controller determines the total duration of the cure and introduces the "bumping" operation, i. e.

the opening of the press to discharge the generated gases, at predetermined intervals. The Stuart valve is equipped with a piston and cylinder in place of the regular hand lever, the operation of the valve being rendered automatic, as will be described below.

The automatic controller 1 shown in Fig. 2 controls the flow of compressed air at, say 60 pounds pressure, which is introduced by the pipe 2 from the air line A, to the direct acting pilot air valve 4 and the reverse acting valve 5, from which it is conducted by conduits 4a and 5a into the cylinder 9 of the Stuart valve L either above or below the piston 10. The pressure in the conduits 4a and 5a is registered by gauges 3 and 3'. The valves 4 and 5 are operated by a lever 6 arranged to engage with stems 7 and 8 which are movable to control the flow of compressed air through the valves to the Stuart valve L or the discharge of air from such valve.

In the valve mechanism illustrated, upon entry of compressed air through pilot valve 4 into the valve cylinder of valve L above the piston, the latter valve is opened and water (or other fluid) at low pressure is charged to the press to close the same in known manner from a low pressure hydraulic line Q (Fig. 1). The valve automatically controls a high pressure hydraulic line P which charges water at high pressure to hold the press in closed position. When compressed air is introduced into the valve cylinder below the piston 10, the valve is closed, whereupon the hydraulic pressure is released and the press is opened.

The lever 6 is fulcrumed at 6' upon the casing of the controller and is urged toward raised position by a spring 11 which engages its free end. The lever is provided with two adjustable abutments 12 and 13 which are arranged to engage the stems 7 and 8 of valves 4 and 5 and lower such stems upon depression of the lever.

A cam lever 14 is pivoted at 15 in the controller casing and bears against the periphery of a timing cam 16 mounted upon a shaft 17 and driven by a clock mechanism 18, the cam being suitably graduated, as in minutes. An abutment 19' on the lever 6 engages the cam lever 14 and urges the latter against the cam 16. The lever 14 is under the control of a solenoid 20 with whose armature it is connected by a link 21. Downward movement of lever 14 under the action of solenoid 20 is thus transmitted to lever 6 and effects operation of valves 4 and 5 to cause the Stuart valve L to close and thus open the press. Lever 14 is provided with an extension 22 which upon depression of the lever permits spring contact 23 to open.

A "bumper" cam 24 is adjustably mounted upon the timing cam 16 by means of a screw 25 which engages in a circular slot 26 in the latter cam, so that the bumper cam may be adjusted for any predetermined time interval from the starting position of cam 16. The cam 24 is provided with groups of one, two, three, four, or more "bumps" 27, and may be adjusted by loosening screw 25 and rotating such cam to present one, two or more bumps above the periphery of cam 16.

The bumper cam 24 operates after a predetermined interval has elapsed to shift a rider 28 to the right and thereby close contacts 29 and 30. Contact 29 is connected by a wire 31 with the terminal 32 of a three-wire relay K and with a terminal 33 of a snap switch G, the other terminal 34 of which is connected with the negative line of a source of current. Contact 29 is also connected

by conductor 35 with the terminal 36 of the relay K. Wires 31 and 35 are short-circuited by a push button switch 37 whose function will be explained below. Contact 30 is connected by conductor 38 with the coil of the electric clock 18 and by conductor 39 with the positive line of the source of current and with a terminal 40 of relay K. As shown, contacts 23 and 30 are connected in parallel.

The coil of solenoid 20 is connected by wire 41 with the negative line, and by wire 42 with terminal 43 of relay K, said terminal being connected through a resistance 44 with the terminal 32. Between the terminal 32 and a terminal 45 is connected an electromagnetic coil 46 whose armature 47 in its attracted position connects terminals 40 and 43. Terminals 36 and 40 are connected by a resistance 48; while terminal 45 is connected to the negative line.

The switch G is under the influence of the air pressure in pipe 5a and is designed to connect the terminals 33, 34 with a rapid snap movement when the pressure in said pipe reaches a predetermined value. The switch may be of any suitable construction; the switch illustrated in Fig. 2 is of the general construction described and claimed in my copending application Serial No. 548,520, filed July 3, 1931. Briefly described, the switch comprises two plates 49 and 50 abutting at a knife edge 51, the opposite edges of the plates bearing along knife edges against two resilient supports 52, 53. The normal distance between the supports is less than the total length of the plates, so that as the plates move toward a central or neutral position, the supports are flexed outwardly until the plates reach or just pass such neutral position, whereupon they are rapidly snapped to a reverse position by the energy stored in the resilient supports. Initial movement of the plates in one direction is effected by a capsular spring or pressure diaphragm 54 which is connected by pipe 55 with pipe 5a; upon expansion of the spring a rod 56 connected therewith lifts plate 49 toward the neutral position. This movement is opposed by an adjustable spring 57 mounted upon a yoke 58 which bears upon the rod, the latter having a portion passing through the yoke so as to be capable of engaging the plate 49. When the latter reaches or just passes the neutral plane, it snaps freely to reverse position. Initial movement of the plate in the reverse direction is produced by the spring 57 upon fall of pressure in member 54, such spring urging a rod 59 against the plate. To the shorter plate 50 is connected a spring arm 60 provided at its free end with a jumper 61 adapted to bridge the terminals 33, 34. Upon snapping movement of the plates 49, 50 in the upward or downward direction the terminals 33, 34 are rapidly connected or disconnected with a minimum of arcing. Suitable means such as stops (not shown) may be provided for limiting the vertical movement of the plates.

The total time interval controlled by the cam 16 is determined by the position of stop segment 62 which projects above the periphery of the main portion of the cam. The segment 62 may be readjusted by loosening a clamping nut 63 on the shaft 17.

When the cam 16 is brought to its zero position, as described below, the lever 14 is moved by spring 11, through the medium of lever 6 and abutment 19, in a clockwise direction from the periphery of segment 62 to that of cam 16, whereupon contact 23 is closed by extension 22 and the clock 18

is started. The cycle is terminated when lever 14 rises on cam segment 62 and breaks contact 23.

The upward movement of lever 14 when cam 16 is returned to initial or zero position is followed by lever 6, so that valve stems 7 and 8 are permitted to rise. Compressed air from pipe 2 thereupon enters channel 64 of direct acting valve 4 (Fig. 3) and, lifting ball 65, passes through slots in a member 66 into channel 67 whence it is conducted by pipe 4a to cylinder 9 of Stuart valve L above piston 10. At the same time, the ball valves 68 and 69 of valve 5 (Fig. 4) are lifted by their spring, so that the lower ball becomes seated and the upper ball unseated; the supply of air from pipe 2 is thus cut off, while the air below the piston 10 is exhausted through channel 70 and bores 71 and 72 into the atmosphere. Piston 10 thereupon descends and valve L opens, whereupon a pressure fluid, such as water under pressure, is caused to act upon the ram of the press and closes the same; at the same time the valve L causes a fluid under high pressure to keep the press closed.

When the bumper cam 24, after the cam 16 has rotated from its zero position for a predetermined interval of time, engages the rider 28, contacts 30 and 29 are closed. Contact 30 when so closed maintains the coil circuit of clock 13 closed, and so keeps the latter running, even after contact 23 has been opened during subsequent events. Upon the closing of contact 29, current at 110 volts passes from the positive line through the terminal 40, resistance 48, terminal 36, wire 35, contact 29, wire 31, terminal 32, coil 46, and terminal 45 to the negative line. Armature 47 is thereupon attracted and connects terminals 40 and 43. A new path for current to the relay coil 46 is now provided: from the positive line through terminal 40, armature 47, terminal 43, resistance 44, coil 46, and terminal 45 to the negative line. The circuit between terminals 36 and 32, or through relay contact 29, can now be opened, but the relay will remain energized.

Upon the raising of the armature 47, a circuit was also established through the solenoid 20 as follows: positive line, terminal 40, armature 47, terminal 43, wire 42, solenoid 20, and wire 41 to the negative line. The solenoid thereupon attracts its armature and lowers lever 14. This movement is transmitted to lever 6 which then depresses stems 7 and 8. Ball 65 of direct acting valve 4 (Fig. 3) is thereby seated and interrupts the communication between channels 64 and 67; the latter channel is simultaneously connected with the atmosphere through the enlarged bore 73 in which the stem 7 moves, so that the space above the piston 10 of the valve L is relieved of air pressure. At the same time the ball 68 of the reverse acting valve 5 (Fig. 4) is unseated while ball 69 is seated, so that compressed air from pipe 2 passes through channels 70a and 70 to the space below the piston 10. The valve L is thus closed and the hydraulic pressure in the press relieved, whereupon the press opens and any generated gases are discharged. Upon fall of the pressure in the space above the piston 10, the bellows 54 contracted and the switch 60, 61 snapped to the open position.

The lowering of lever 14 causes opening of contact 23, but as above described, the clock continues to run since the parallel contact 30 is closed.

Approximately 30 seconds may elapse before each "bump" on the bumper cam 24 passes the rider 28; this time interval may be varied by suitably designing the bumps. As the rider drops

from the top of a bump onto the periphery of cam 16, contacts 30 and 29 are opened, whereupon the clock stops. The relay, however, remains energized, as above described. The rate of flow of air through valve 5 into the space below piston 10 is such that at the expiration of 30 seconds the pressure in said space has built up to the degree at which the capsular spring or pressure diaphragm 54 of the switch G has expanded sufficiently to cause the plates 49, 50 to snap upwardly and thus close terminals 33, 34. The latter are connected in parallel with the terminals 32, 45 of the relay coil 46 and, when closed, short-circuit the latter. The armature 47 thereupon falls, the solenoid 20 is de-energized and the lever 14 is permitted to re-engage the cam 16, and the lever 6 rises simultaneously. Contact 23 is closed and the clock starts again, while the flow through the valves 4 and 5 is reversed, so that the piston 10 falls and opens the valve L. The press is again closed and the cam 16 continues to run until the next bump is encountered by the rider 28, if the cam 24 is set to bump more than once, until finally stop cam 62 forces the lever 14 down and the clock is stopped, whereupon the cycle is completed. It will be clear that the duration of each bumping operation will depend upon the rate at which the pressure air is fed by pipe 5a, and that such duration may be varied by suitably throttling the flow of air to or through pipe 5a.

Upon reversal of the valve L and discharge of pressure from the space below the piston 10 the capsular spring 54 becomes deflated and the arm 60 is returned by spring 57 to its lower, inoperative position wherein terminals 33 and 34 are electrically disconnected.

It will be understood that rider 28 is so positioned as not to be engaged by stop cam 62, while lever 14 is not engaged by the bumper cam 24.

By manual depression of the push-button switch 37, the terminals 36 and 32 of the relay K are connected electrically, the coil 46 energized, the armature 47 raised and the circuit of the solenoid 20 closed, so that the apparatus under control can be opened to discharge any generated gas independently of the pumping cam 24.

The mechanism by which the cam 16 is returned to its zero or starting position is illustrated in Figs. 8 and 9. In these two Figures 8 and 9, for the sake of more clearly illustrating the structure, a cam setting different from that shown in Fig. 2 is used. In Fig. 2 the cam completes its cycle in a little less than one-half of a revolution of the cam 16. In Figs. 8 and 9, a cam setting is assumed in which the cam 16 completes its cycle after a little more than one-quarter of a revolution, i. e. at a time when the pin 79 has passed a little beyond the vertical axis as shown in Fig. 8. It will be understood that the zero setting mechanism will function in the same way irrespective of what the cam setting may be and that the particular cam setting selected for Figs. 8 and 9 was chosen primarily because of its capacity of more clearly illustrating the mechanism than if any other cam setting were used for these two figures.

The zero setting mechanism illustrated in Figs. 8 and 9 involves the following structural elements: A hand crank 74 is pinned to a shaft 75 which passes through a bearing in the door 76 of the controller casing and is in axial alignment with the shaft 17 of cam 16. An arm 77 is rigid with the shaft 75 inside the casing and is provided

with a cam slot 78 adapted to receive a spring-pressed latch pin 79 projecting from a housing mounted upon an arm 80 fixed to shaft 17. The arm 77 is beveled as shown at 78a to enable it to pass the pin 79 in one direction.

When the cam 16 has been stopped by the rise of lever 14 onto cam segment 62, the crank 74 is rotated counterclockwise until the arm 77, as shown in Fig. 8, has passed the pin 79 (which was depressed by the bevel surface 78a) and the arm 77 is then rotated clockwise by clockwise movement of the crank 74, whereupon the pin 79 is engaged by the rear face of the arm 77 behind the cam 78a, the arm 80 being thereby carried along and, with it, the cam 16. The rotation is continued until a pin 81 on arm 77 engages behind a spring-pressed cam member 82 (Fig. 2) and pushes a latch 83 to the right where its shoulder 84 engages a shoulder 85 on the arm 80, whereupon the zero position of cam 16 is reached and further movement prevented. A circular disc 86 loosely mounted on shaft 75 is provided with a stop 87 for the crank 74, the disc being held in adjusted position against the outer surface of the casing door by a clamping nut 88. The weighted handle of the crank 74 normally brings the latter to the vertical position.

The cam 16 can thus be reset to zero position from outside the casing without opening the door of the latter. It will be understood that the zero-setting mechanism moves the cam 16 in the same direction as does the clock 18, a friction gearing being provided between the clock and cam shaft.

Figs. 5, 6 and 7 illustrate a novel form of safety device whereby the press may be quickly opened independently of cam 16 in case of emergency. A shaft 89 passes through a bearing 90 in the side of the controller casing. The shaft is rotatable by a hand crank 91 from the exterior of the casing, the movement of the crank being limited by stops 92 and 93. A circular cam 94 is loosely mounted eccentrically upon the inner end of shaft 89. Upon rotation of crank 91 in a counterclockwise direction, a pin 95 on shaft 89 engages a pin 96 on cam 94 and rotates the latter to cause depression of lever 6. Upon release of crank 91, it returns to its vertical position (Fig. 7) without affecting the position of cam 94, the pins 95 and 96 constituting in effect a one-way clutch. The stops 92 and 93 prevent the crank 91 from being rotated so as to return cam 94 to its original position, so that the lever 6 remains depressed until the casing is opened and the cam 94 rotated by the foreman or other person in charge who moves lever 97, which projects from the cam, to the raised position shown in Fig. 6. Depression of lever 6 causes closing of valve L and opening of the press in the manner described above.

It will be clear from the above that the only supervision that the attendant performs is to set the stop cam 62, the bumper cam 24 and the disc 86 to meet the required conditions, after which the controller door is kept locked. Once the cams have been adjusted, the control of repeated, similar treatments requires only the operation of the crank 74 to return the mechanism to zero and simultaneously start the clock.

Where in the claims I refer to a platen press, I contemplate as equivalents all types and forms of apparatus which are designed and adapted to be subjected to a certain condition or conditions and to be relieved temporarily of such condition or conditions one or more times at arbitrarily selected periods.

Variations from the specific construction and arrangement illustrated may be resorted to within the scope of the appended claims without departing from the spirit of the invention. For example, one of the pilot valves 4 and 5 and associated air conduit 4a or 5a could be replaced by a spring acting on the piston 10.

I claim:

1. A controller mechanism comprising a controlled member arranged to regulate the flow of a fluid to an apparatus under control, a timing cam, a clock mechanism for driving the same, means controlled by said cam for bringing said controlled member to one position for a predetermined interval of time, and automatic means operative to bring said member temporarily to a reverse position within said interval and subsequently to restore said member to the control of said cam, and means for timing the operation of said last-mentioned means.

2. A controller mechanism comprising a controlled member arranged to regulate the flow of a fluid to an apparatus under control, a timing cam, a clock mechanism for driving the same, means controlled by said cam for bringing said controlled member to one position for a predetermined interval of time, automatic means for temporarily interrupting the control of said member by the cam within said time interval and for temporarily setting said member to a different position, means for timing the operation of said last-mentioned means, and means for restoring said member to the control of said cam.

3. The combination with a platen press, of means for regulating the flow of a pressure fluid to said press to effect closing or opening thereof, and a controller for said regulating means comprising a timing mechanism for maintaining said means for a predetermined interval of time in a position of adjustment wherein said press is closed, means operative to bring said regulating means temporarily, before the expiration of said time interval, to a position in which the press is opened to effect discharge of gases generated therein, and mechanism for timing the operation of said last mentioned means.

4. The combination with a platen press, of means for regulating the flow of a pressure fluid to said press to effect closing or opening thereof, and a controller for said regulating means comprising a timing mechanism for maintaining said regulating means for a predetermined interval of time in a position of adjustment wherein said press is closed, means operative temporarily before the expiration of said interval to suspend the control action of said timing mechanism on said regulating means, and means for restoring said regulating means to the control of said mechanism.

5. The combination with a platen press, of means for regulating the flow of a pressure fluid to said press to effect closing or opening thereof, and a controller for said regulating means comprising mechanism operative to bring said regulating means to one position of adjustment to effect closing of the press, means for temporarily adjusting said regulating means to a reverse position to effect opening of the press, means for restoring said regulating means to its first-mentioned position, and means for returning the said regulating means to said reverse position at the end of a predetermined interval.

6. The combination with a platen press, of a hydraulic valve operative in its open position to effect closing of said press and in its closed posi-

tion to effect opening of said press, and a controller for said valve comprising timing mechanism for determining the duration of a treatment in said press, and pneumatic mechanism controlled by said timing mechanism for operating said valve, said timing mechanism including means operative upon said pneumatic mechanism to effect closing of the valve and opening of the press to permit the gases generated in the latter to be discharged.

7. The combination as set forth in claim 6, wherein said means comprises a bumper cam operatively associated with said pneumatic mechanism to adjust the latter in a reverse sense with reference to the adjustment normally established by said timing mechanism.

8. The combination with a platen press having a pressure-operated ram, of a pressure fluid conduit leading to said ram, a hydraulic valve in said conduit adapted in its open position to charge a fluid under pressure to the ram of a press to effect closing of the press and in its closed position to cut off the supply of pressure fluid to the ram and thereby effect opening of said press, and a controller for said valve comprising a piston connected to said valve to operate the same, air valve mechanism operable to admit compressed air to one or the other side of said piston to open or close the hydraulic valve, and timing mechanism for controlling said air valve mechanism to open said valve for a predetermined time interval and including means automatically operative before the expiration of said interval temporarily to close said hydraulic valve and effect opening of the press to permit discharge of the gases generated therein.

9. The combination with a platen press having a pressure-operated ram, of a pressure fluid conduit leading to said ram, a hydraulic valve in said conduit adapted in its open position to charge a fluid under pressure to the ram of a press to effect closing of the press and in its closed position to cut off the supply of pressure fluid to the ram and thereby to effect opening of said press, and controller mechanism for said valve comprising a cylinder, a piston in said cylinder connected to said valve to operate the same, an air line, pilot valves connected with said line and controlling the flow of air to and the discharge of air from the cylinder above and below said piston to open or close the hydraulic valve, a lever mechanism arranged to control said pilot valves, a timing cam operative to effect movement of said lever mechanism in one direction to cause opening of the valve, a bumper cam arranged in predetermined time relationship with reference to said timing cam, and mechanism controlled by the latter for moving said lever mechanism in the reverse direction to effect closing of the valve and thereby open the press to permit discharge of gases generated therein.

10. The combination as set forth in claim 9, wherein the mechanism controlled by the bumper cam comprises a contact actuated by said bumper cam, and a solenoid controlled by said contact and arranged to move the lever mechanism in the said reverse direction.

11. The combination with a platen press having a hydraulic ram for closing the same, of a pressure fluid conduit leading to the ram, a hydraulic valve in said conduit adapted in its open position to charge a fluid under pressure to the ram to effect closing of the press and in its closed position to cut off the supply of pressure fluid to the ram and thereby effect opening of said press, and

a controller for said valve including a piston connected to said valve to operate the same, an air line, pilot valves connected with said line and controlling the flow of air to and the discharge of air from the spaces above and below said piston to open or close the hydraulic valve, a lever mechanism arranged to control said pilot valves, a timing cam operative to effect movement of said lever mechanism in one direction to cause opening of the valve, an electric clock for driving said timing cam, an electric contact in the circuit of said clock and arranged to be closed by the lever mechanism when the latter is in position to effect opening of the valve and to be open when said mechanism is in the reverse position, a bumper cam arranged in predetermined time relationship with reference to said timing cam, mechanism controlled by the bumper cam and operative to move said lever mechanism in the reverse direction to effect closing of the valve and thereby opening of the press to permit discharge of gases generated therein, a contact controlled by said last-mentioned mechanism to close a parallel circuit for said clock, and means for restoring the lever mechanism to the control of the timing cam.

12. The combination as set forth in claim 11 wherein said means comprises a switch responsive to the pressure of the air operating to close the hydraulic valve.

13. The combination with a platen press having a hydraulic ram for closing the same, of a pressure fluid conduit leading to the ram, a hydraulic valve in said conduit adapted in its open position to charge a fluid under pressure to the ram to effect closing of the press and in its closed position to cut off the supply of pressure fluid to the ram and thereby effect opening of said press, and a controller for said valve including a piston connected to said valve to operate the same, an air line, pilot valves connected with said line and controlling the flow of air to and the discharge of air from the spaces above and below said piston to open or close the hydraulic valve, a lever mechanism arranged to control said pilot valves, a timing cam operative to effect movement of said lever mechanism in one direction to cause opening of the valve, an electric clock for driving said timing cam, an electric contact in the circuit of said clock and arranged to be closed by the lever mechanism when the latter is in position to effect opening of the valve and to be open when said mechanism is in the reverse position, a bumper cam adjustably mounted on said timing cam, a rider controlled by said bumper cam, a solenoid circuit controlled by said rider for moving the lever mechanism to the reverse position to effect closing of the valve and thereby opening of the press to permit discharge of gases generated therein, a contact controlled by said rider to close a parallel circuit for said clock, said second contact being opened when said rider falls off said bumper cam to stop said clock, and a switch responsive to the pressure of the air being built up on the hydraulic valve piston as the valve is closed and operative to effect deenergization of said solenoid and return of said lever mechanism to the position in which it effects opening of the valve and closing of the first-mentioned clock circuit contact.

14. The combination as set forth in claim 9, including a manually operable safety mechanism for moving the lever mechanism to the position in which it causes closing of the valve.

15. A controller as set forth in claim 1 wherein said timing cam is adjustable for effecting control

for variable intervals of time, measured from a fixed starting position of the cam, said controller housed within a closed casing, and means operable from the outside of said casing for returning the cam to said starting position.

16. A controller as set forth in claim 11, wherein said timing cam is adjustable for effecting control for variable intervals of time, measured from a fixed starting position of the cam, said controller housed within a closed casing, and means operable from the outside of said casing for returning the cam to said starting position.

17. A controller comprising a casing, a rotatable timing member in said casing, clock mechanism for rotating said member for selectively varying degrees from a predetermined starting position and means operable from the outside of said casing for returning said member to the starting position, said means including a shaft passing through the casing, a handle on said shaft outside the casing, and a one-way latch between said member and said shaft.

18. A controller comprising a casing, a rotatable cam shaft in said casing, clock mechanism for rotating said cam shaft for selectively varying degrees from a predetermined position, and means operable from the outside of said casing for returning the cam shaft to the starting position, said means comprising a shaft passing through the casing, a handle on said shaft outside the casing, cooperating one-way latch members on said shafts, whereby upon initial movement in one direction the latch element on the second-mentioned shaft passes the latch element on the cam shaft but engages the latter element when moved subsequently in the reverse direction, and stop mechanism for stopping the cam shaft in the starting position.

19. The combination of a pressure fluid-controlled element, a controller for governing the flow of pressure fluid to and from said element, comprising a casing, valve means in said casing for controlling the flow of said fluid, and means in said casing for controlling said valve means and movable to positions corresponding to the operative and inoperative conditions of said element; conduits leading from said valve means to said element; and a safety mechanism for quickly restoring said element to its inoperative position after it has been placed in the operative position by said second-mentioned means, comprising a shaft extending through the controller casing, a manually operable crank on said shaft externally of the casing, and means associated with said shaft internally of the casing and operable to shift said second means to the position in which said element is brought to the inoperative position.

20. The combination as set forth in claim 19, including stops for limiting the movement of said crank in both directions, and a one-way clutch

between said shaft and said last-mentioned means, whereby after the safety mechanism has been operated said element cannot be moved into operative position without opening the casing.

21. The combination with an apparatus adapted to be subjected to a selected condition for a predetermined interval of time and to be relieved temporarily of such condition before the expiration of said time interval, of a controller mechanism for establishing said selected condition in said apparatus and for interrupting said established condition one or more times within said time interval, comprising a device movable to different positions to produce correspondingly different conditions in said apparatus under control, means for maintaining said device in one position for a predetermined interval of time, means for temporarily suspending the control of said device by said first means before the expiration of said time interval and moving said device temporarily into another position and returning the same to the first-mentioned position, and means for timing the operation of said last-mentioned means.

22. The combination with an apparatus adapted to be subjected to a selected condition for a predetermined interval of time and to be relieved temporarily of such condition before the expiration of said time interval, of a controller mechanism for establishing said selected condition in said apparatus and for interrupting said established condition one or more times within said interval, comprising a controlled member movable to different positions to produce correspondingly different conditions in said apparatus under control, timing mechanism associated with said member to move the latter to one position and maintaining the same therein for a predetermined interval of time, means for moving said member temporarily into another position and returning the same to the first-mentioned position within said predetermined time interval, and a timing device for said means synchronized with said timing mechanism for determining the operation of said means.

23. In an apparatus of the type described, the combination of a press having a ram, mechanism for controlling the flow of pressure fluid to the ram of said press and the discharge of said fluid therefrom to effect closing and opening of the press, means for maintaining said mechanism in a position corresponding to the closing position of the press for a predetermined interval of time, means operating automatically within said predetermined time interval to cause opening of said press and subsequently restore the latter to the control of said first-mentioned means and thereby effect re-closing of the press, and means for timing the operation of said means according to a predetermined plan.

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