

Jan. 10, 1933.

H. C. BOSTWICK

1,894,017

VULCANIZER

Filed Sept. 19, 1929

6 Sheets-Sheet 1

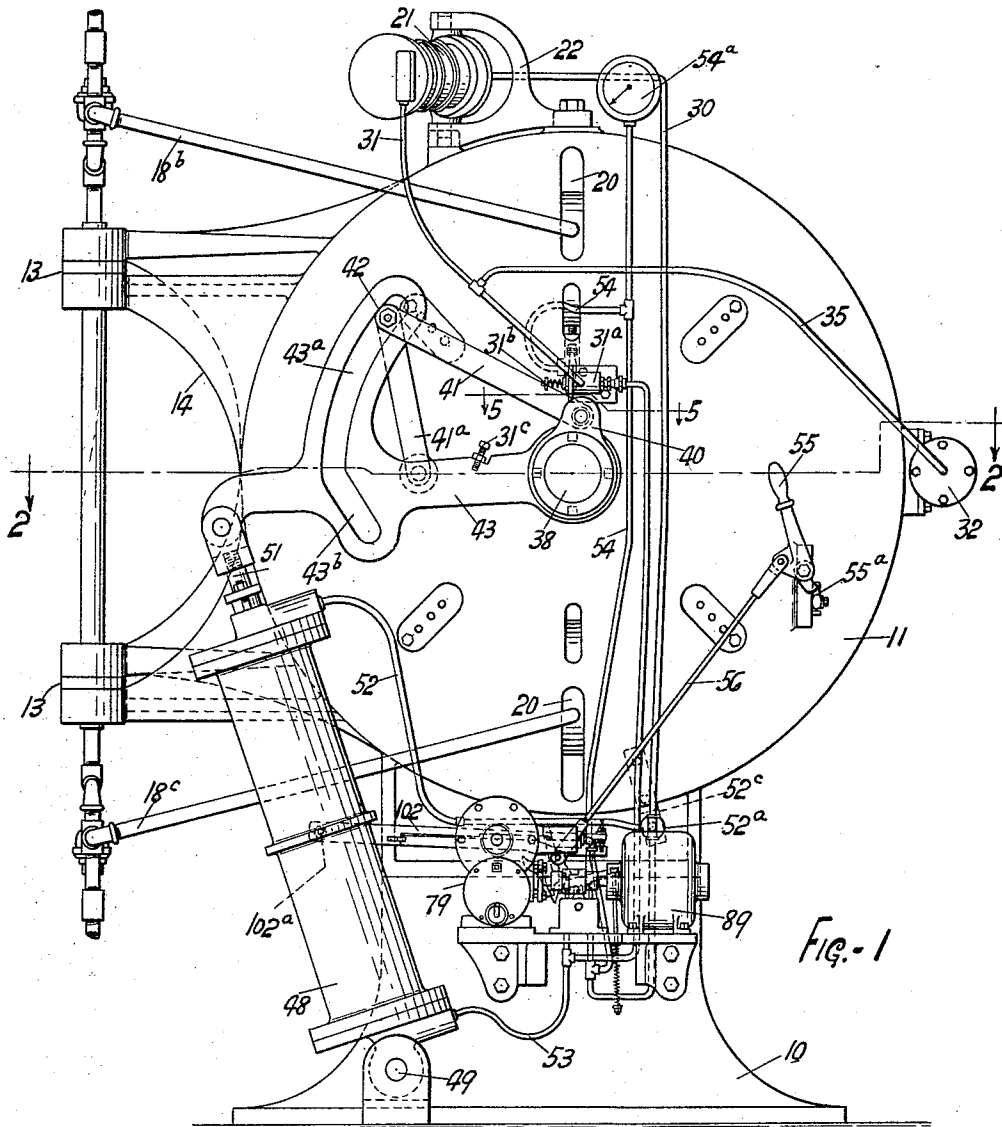


Fig. 1

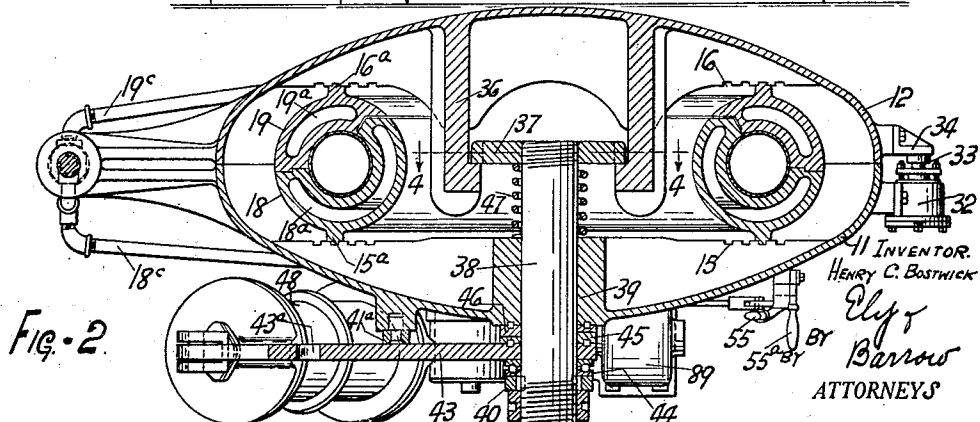


Fig. 2

INVENTOR.
HENRY C. BOSTWICK
Ely &
Barrow
ATTORNEYS

Jan. 10, 1933.

H. C. BOSTWICK

1,894,017

VULCANIZER

Filed Sept. 19, 1929

6 Sheets-Sheet 2

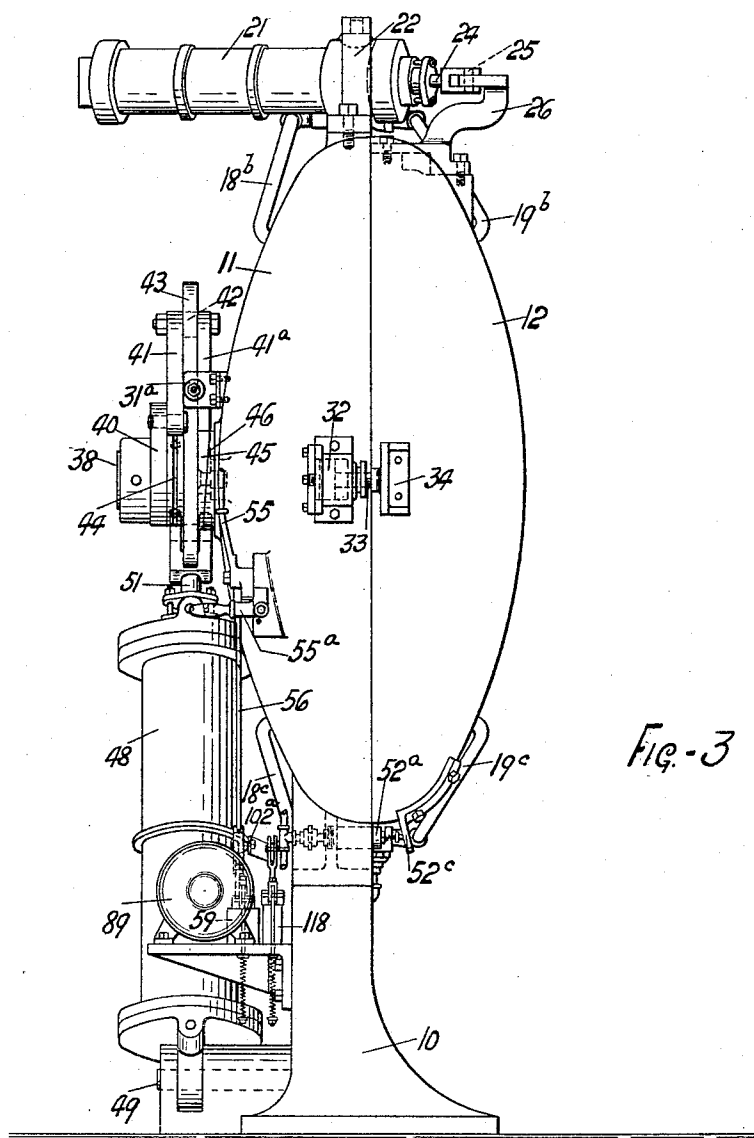


Fig. 3

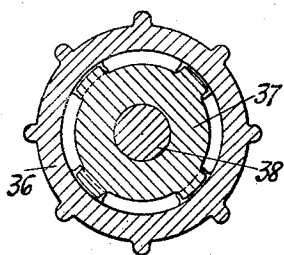


Fig. 4

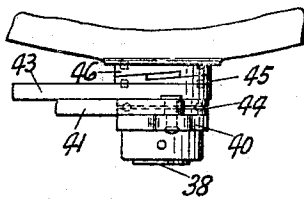


Fig. 5

BY

INVENTOR.
HENRY C. BOSTWICK.

Ely & Barrow

ATTORNEYS

Jan. 10, 1933.

H. C. BOSTWICK

1,894,017

VULCANIZER

Filed Sept. 19, 1929

6 Sheets-Sheet 3

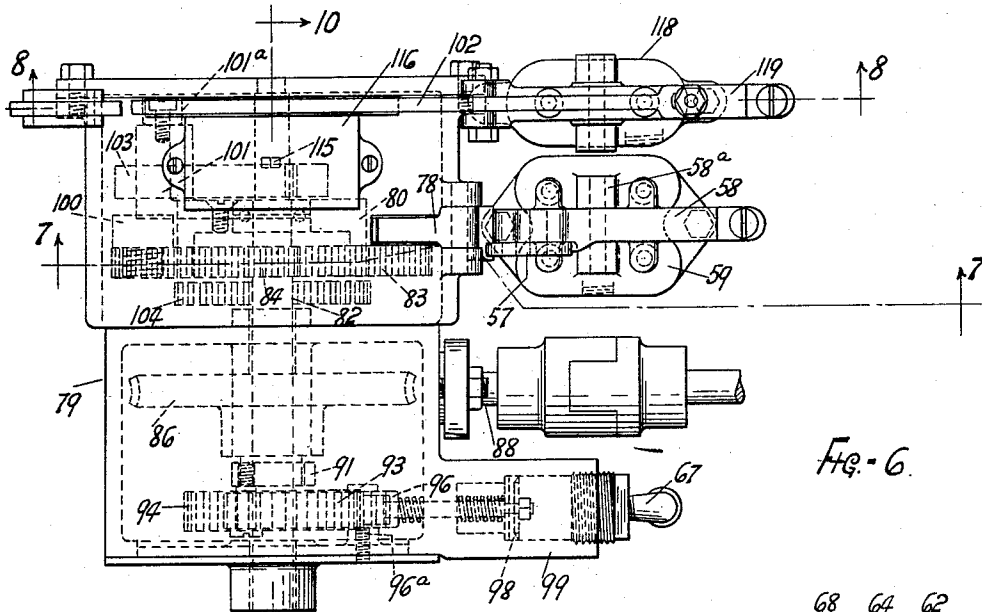


Fig. 6.

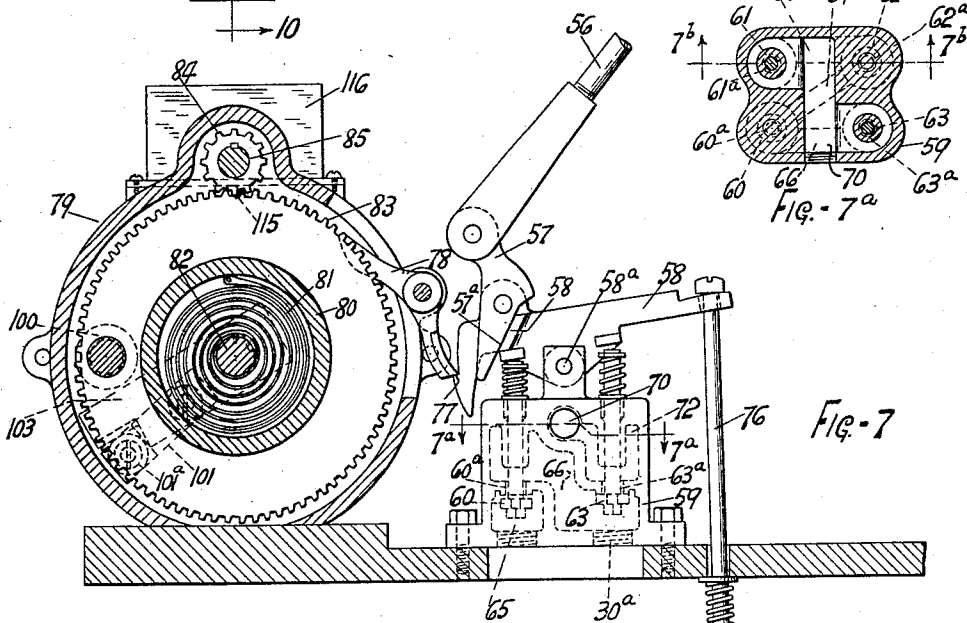


Fig. 7

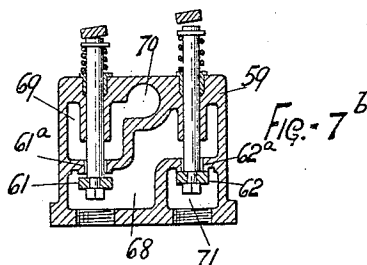


Fig. 7^b

INVENTOR.
HENRY C. BOSTWICK
Elyt
Barrow
ATTORNEYS.

Jan. 10, 1933.

H. C. BOSTWICK

1,894,017

VULCANIZER

Filed Sept. 19, 1929

6 Sheets-Sheet 4

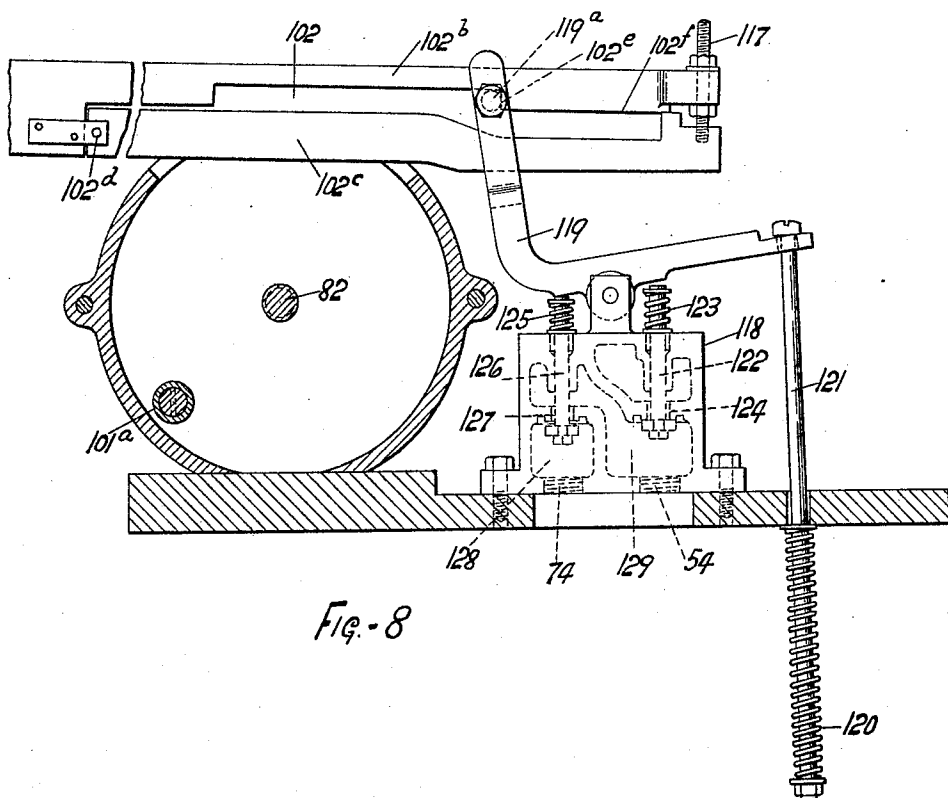


Fig.-8

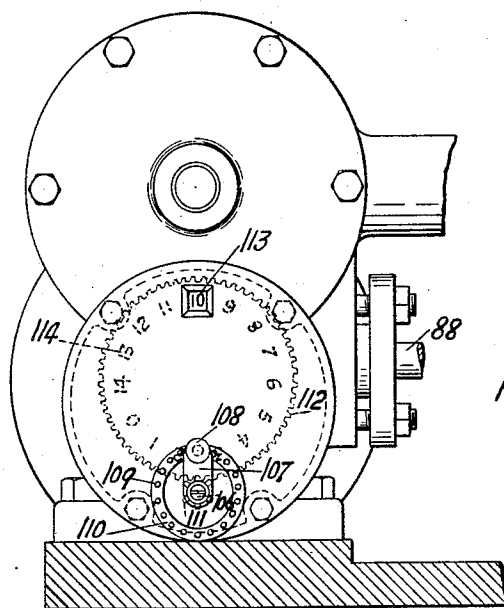


Fig.-9

INVENTOR.
HENRY C. BOSTWICK.
BY *Ely & Barrow*
ATTORNEYS

Jan. 10, 1933.

H. C. BOSTWICK

1,894,017

VULCANIZER

Filed Sept. 19, 1929

6 Sheets-Sheet 5

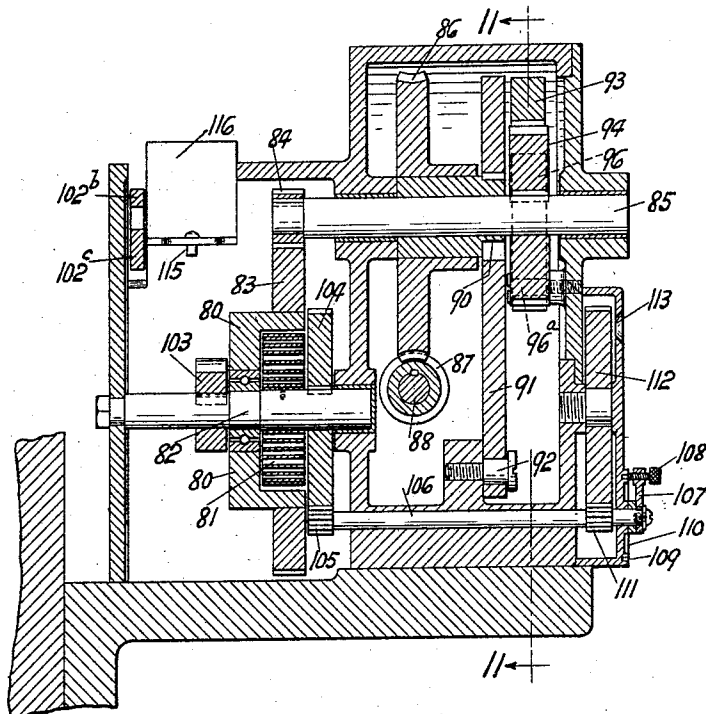


Fig. 10.

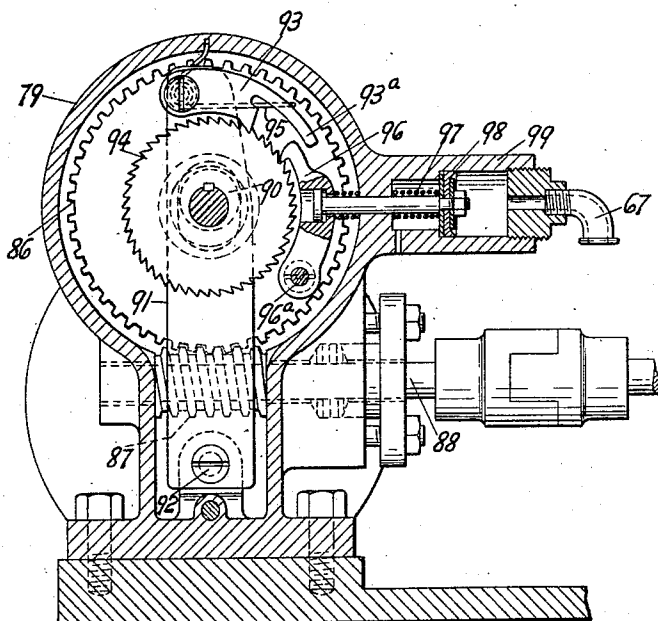


Fig. 11.

INVENTOR.

HENRY C. BOSTWICK.

BY

Cly & Barrow

ATTORNEYS.

UNITED STATES PATENT OFFICE

HENRY C. BOSTWICK, OF AKRON, OHIO, ASSIGNOR TO THE AKRON STANDARD MOLD COMPANY, OF AKRON, OHIO, A CORPORATION OF OHIO

VULCANIZER

Application filed September 19, 1929. Serial No. 393,694.

This invention relates to vulcanizers such as used in the manufacture of tires and inner tubes therefor. The invention, in part, is a continuation of my co-pending application for Letters Patent, Serial No. 284,996, filed June 13, 1928.

The general purpose of the invention is to provide a simple, compact vulcanizer unit including relatively movable sections, such as hinged sections, and improved means for locking the sections together.

A particular object of the invention is to provide in combination with such locking means, a means for exerting heavy pressure on the vulcanizing sections to insure effective seating of the mold sections on each other.

A further object of the invention is to provide in combination with the locking device, a means for inflating a tube or the like in the mold.

A further object of the invention is to provide automatic operating and control means for operating and controlling the vulcanizer throughout a curing cycle from the time the vulcanizer is closed with the article to be vulcanized therein, the vulcanizer opening automatically at the completion of a cure.

The foregoing and other objects are attained in the vulcanizer shown in the accompanying drawings and more fully described below. It is to be understood that the invention is not limited to the specific form thereof shown and described.

Of the accompanying drawings, which show the vulcanizer during a curing operation,

Figure 1 is a side elevation of a tube vulcanizer embodying the invention;

Figure 2 is a section on line 2—2 of Figure 1;

Figure 3 is a right end elevation thereof as shown in Figure 1;

Figure 4 is a section on line 4—4 of Figure 2;

Figure 5 is an enlarged sectional plan on line 5—5 of Figure 1;

Figure 6 is a top plan view of the actuating and control device;

Figure 7 is a section on line 7—7 of Figure 6;

Figure 7^a is a section on line 7^a—7^a of Figure 7;

Figure 7^b is a section through the four-way control valve along line 7^b—7^b of Figure 7^a;

Figure 8 is a section on line 8—8 of Figure 6.

Figure 9 is a front view of the timer comprising a part of the actuating and control means.

Figure 10 is a section on line 10—10 of Figure 6.

Figure 11 is a section on line 11—11 of Figure 10.

Figure 12 is a piping diagram showing the connections of the actuating and control mechanism with the various actuating cylinders, certain control valves in said connections.

Figure 13 is a diametral section through a head of the vulcanizer door actuating cylinder.

Referring to the drawings, the numeral 10 designates a suitable standard on which is mounted a vulcanizing unit comprising a fixed section 11 and a hinged section or door 12, the hinges being at 13, 13 on a member 14 which may be integral with section 11 whereby the sections are relatively movable to and from mating relation.

The vulcanizer is arranged to replaceably receive different types and sizes of molds, a series of concentric grooves 15, 15 and 16, 16 being provided opposite each other in the sections 11 and 12 respectively to receive circumferential tongues 15^a and 16^a respectively on mating mold sections 18 and 19, here shown as an inner tube mold. The mold sections 18 and 19 are chambered as indicated at 18^a and 19^a for the reception of a vulcanizing medium such as steam, steam and drain connections to these chambers being provided by piping 18^b and 18^c and 19^b and 19^c, the piping 19^b and 19^c being of the flexible jointed type to permit swinging of the vulcanizer section 12. The steam connections to the molds are made through slots, such as indicated at 20, 20, in the vulcanizer sections 11 and 12.

For actuating the door section 12 of the

vulcanizer, a double acting fluid pressure cylinder 21 is provided, this cylinder being mounted on a swivel mounting 22 on section 11 to adapt it to the hinge movement of the door 12 and having its piston 23 connected by piston rod 24 by means of a pivot pin 25 to a bracket 26 mounted on door 12. Each head of cylinder 21 is provided with a main duct 27 (Figure 13) on which is a check valve 28 closing to pressure within the cylinder and a small relief duct 29 by-passing the valve to the piping connection 30 at the front end of the cylinder and to a piping connection 31 at the other end of the cylinder. This provides a double acting cushioning or dash pot action in the cylinder preventing sudden closing or opening movement of the door.

To assist in the opening of the door to break the adhesion of the vulcanized goods to the molds, a vulcanizer "breaking" cylinder 32 is mounted on the vulcanizer section 11 and its piston operates a plunger 33 arranged to coact with a bracket 34 fixed onto the door 12. A pipe connection 35 from line 31 is provided to supply fluid under pressure to this cylinder. A valve 31^a is provided on line 31, this valve normally being closed by a spring 31^b, the stem 31^b thereof being arranged to be engaged by a set screw 31^c on the cam member 43 to open the valve as the vulcanizer is unlocked.

The locking device for the vulcanizer comprises a fixed bayonet joint socket member 36 on section 12 and a cooperating rotatable bayonet joint member 37 secured on a rotatable shaft 38 journaled in a bearing 39 in section 11. Shaft 38 has an arm 40 secured thereto to which is connected a link 41 having a follower 42 engaged in the cam slot 43^a of a cam member 43 journaled on shaft 38. Link 41 is supported at its free end by an arm 41^a pivoted onto section 11. Slot 43^a is concentric with shaft 38 except at the portion 43^b which is designed to rotate shaft 38 through link 41 and arm 40 during the first part of the movement of cam member 43 from the unlocked position to the locked position shown in the drawings. A thrust bearing for the cam member 43 is provided at 44 and member 43 carries pressure cam 45 engaging a cam 46 fixed on section 11. A spring 47 on shaft 38 is interposed between the bayonet member 37 and the section 11 to compensate for the relative shifting of the shaft in section 11 under the action of the pressure cam which draws section 12 against section 11.

To actuate cam member 43, a fluid pressure cylinder 48 is provided, it being pivotally mounted at 49 on standard 10, and having its piston 50 connected to cam 43 by rod 51. Piston 50 is double acting, flexible, fluid pressure connections 52 being made to the cylinder at the top end thereof and flexible connections 53 being made to the cylinder at its

bottom end. A valve 52^a is provided in piping 30 to connect line 52 thereto, this valve normally being closed by a spring 52^b and arranged to be engaged and actuated to its open position shown (Figure 12) by being mounted on vulcanizer section 11 in such relation to a lug 52^c fixed on the door 12 of the vulcanizer to be engaged by said lug as the door 12 of the vulcanizer shuts.

Supply of air or pressure medium to a tube or bag in a tube or tire mold is provided for by piping 54 extending into the vulcanizer through section 11 and having a pressure gage 54^a connected thereon.

The main operating and control mechanism includes a manually operable starting lever 55 adapted to be held against operation by a manually operable latch 55^a whereby both of an operative's hands are required to start the operating and control mechanism to function. Lever 55 is connected by a link 56 to a lever 57 pivoted on the lever 58 of a four-way valve mechanism 59 (Figures 6 and 7). Lever 58 cooperates with four valve stems in pairs of two respectively on the left and right of the valve mechanism (Figure 7), the pivot 58^a for lever 58 being between the pairs. The valve stems of the valve mechanism 59 are all urged upwardly tending to hold the valves closed. The valves at the left are numbered 60 and 61 and those at the right 62 and 63. The former are for controlling supply of fluid under pressure to close and lock the vulcanizer and to start the timer, and the latter are for unlocking and opening the vulcanizer after the timer has operated a predetermined time. Valve 60 controls a port 60^a for delivering air under pressure supplied through a duct 64 to the chamber 65 beneath said port to the front chamber 66 of the valve and thus to piping 30 connected to the valve at 30^a and also to piping 67 connected to the timer actuator as will be described, and valve 61 controls a port at 61^a from which air pressure in the system connected by piping 31, 35, and 53, that is the rear of cylinder 21, the breaking cylinder 32 and the bottom of the locking cylinder 48 is relieved through the rear valve chamber 68 to an exhaust chamber 69 having an outlet at 70.

Valve 62 controls a port at 62^a, which when open, delivers air under pressure from a chamber 71 below said port into the valve chamber 68 and from it into pipes 31, 35 and 53, and valve 63 controls a port 63^a for connecting chamber 66 and consequently connecting piping 30 and 67 to a front exhaust chamber 72 connected to the exhaust outlet 70. Duct 64 connects the pressure chambers 65 and 71 and air under pressure may be supplied to pressure chamber 71 by a duct at 73 connected to a main pressure line 74. (See Figure 12.)

A spring 75 acting on a rod 76 connected to one end of valve lever 58 serves to urge the valve lever downwardly to the right (Figure 7) to hold valves 62 and 63 open and permitting valves 60 and 61 to be kept shut by their springs. Lever 57 has a projection 57^a thereon adapted to engage a shoulder 58^b on lever 58 to actuate this lever to the position shown in the drawings to close and lock the vulcanizer and start the cure. The left end of lever 58 is provided at 77 with a shoulder adapted to be engaged by a latch lever 78 to hold lever 58 depressed to the left, as shown, throughout a predetermined period, latch lever 78 being designed and freely pivoted to swing by gravity to a position above shoulder 77 when lever 58 is depressed to the position shown. Latch 78 is mounted in relation to and adapted to be controlled by a timer indicated generally at 79.

The timer 79 (Figures 6, 7, 10 and 11) includes a spring drum 80 having a clock spring 81 therein, the outer end of which is secured to the drum and the inner end to a shaft 82 upon which the drum is journaled. Drum 80 has a timer gear 83 secured thereto and meshed with a pinion 84 on a timer shaft 85. Shaft 85 has a worm gear 86 journaled therein and driven by a worm 87 on the shaft 88 of a motor 89 which is continuously driven. Gear 86 drives an eccentric 90 thereon, which is engaged with an oscillatable lever 91 pivoted at 92. Lever 91 has a pawl 93 pivoted on its upper end and adapted to be urged into engagement with a ratchet wheel 94 by a spring 95, an extension 93^a on the pawl 93 being arranged to be engaged by a pawl 96 pivoted at 96^a to hold the pawl 93 out of operative engagement with the ratchet 94 when the vulcanizer is open, during which time the lever 91 oscillates to no effect. Pawl 96 is so arranged as to be urged toward engagement with extension 93^a of pawl 93 by means of a spring 97 and to be urged out of engagement therewith to permit operation of the timer by means of a piston 98 in a fluid pressure cylinder 99 comprising the timer actuator referred to previously as having piping 67 connected thereto. In the last-named position of pawl 96 as shown in the drawings, it is adapted to engage with ratchet wheel 94 to prevent retrograde movement thereof.

The timer gear 83 has a pin or roller thereon at 100 adapted to engage latching lever 78 at the end of a predetermined cure to release lever 58 of the valve mechanism. The time of cure is determined by the angular initial position of this roller with respect to the lever 78, the timer gear traveling counter-clockwise as appears from Figure 7. This timer gear is also designed for controlling supply of air to an inner tube, air bag or other inflatable objects in the vulcanizer mold so

that this air supply will be cut off before the vulcanizer is opened. Accordingly an arm 101 is secured to the spring drum and has a pin or roller 101^a on its outer end adapted to engage a lever 102 of an inflation valve mechanism to be described (Figure 8). The roller 101^a is employed to cooperate also with an arm 103 fixed onto shaft 82 to determine the initial setting of both rollers 100 and 101^a. Shaft 82 is adapted to be rotated to set arm 103 in any determinate angular position by means of a gear 104 meshed with a pinion 105 on a shaft 106 operable to adjusted position by a crank 107 at the front of the timer which has a spring-pressed pin 108 thereon for engaging in apertures 109 in an annular plate 110. To indicate the adjustment of the timer, a pinion 111 on shaft 106 is meshed with a gear 112 in back of the front face of the timer, a peep hole 113 in said front face of the timer rendering visible calibrations 114 on the face of gear 112 which may be numbers representing minutes, the number appearing in the peep hole representing the adjusted curing period in minutes. It will be apparent that when the pawls 93 and 96 are disengaged from the ratchet wheel 94, the spring 81 will return rollers 100 and 101^a to their initial positions in which roller 101^a is against the adjustable stop arm 103. If the timer for any reason should fail to function at the end of a cure, continued rotation of the timer would cause the trip arm 101 to continue past the inflation valve lever 102 into engagement with the tumbler 115 of a switch 116 to stop the motor 89.

The inflation valve is indicated at 118 (see Figure 8) and the valve control 102 is pivotally connected to the vulcanizer locking cylinder at 102^a and preferably comprises a main lever 102^b and an auxiliary section 102^c, the latter being pivoted on the main lever at 102^d. The free end of the lever section 102^c is adjustably connected to the free end of the lever section 102^b by means of a screw 117 threaded through the latter, whereby section 102^c can be adjusted relatively toward and from the timer to vary the time between the deflation of the inner tubes or other articles in the vulcanizer and the time of opening of the vulcanizer, the former always being in advance of the latter. The main inflation pressure control lever 102^b rests on a pin or roller 119^a on an inflation valve actuating lever 119 and has a shoulder thereon at 102^e for engaging said pin as the locking cylinder 48 swings to lock the vulcanizer, thus actuating lever 119 to open the inflation valve, said pin being adapted to be disengaged from the shoulder just before the vulcanizer is unlocked and opened by engagement of roller 101^a with lever 102 to raise it, permitting pin 119^a to travel under the edge 102^f of lever 102 as the inflation valve is closed and the pressure in the tube relieved. A spring

120 acting on a rod 121 connected to lever 119 urges the lever 119 into engagement with valve stem 122 against the action of its spring 123 to open the relief port 124 of valve 118 and to permit the spring 125 acting on valve stem 126 to close the supply port 127. Chamber 128 in valve 118 is a supply chamber to which pressure line 74 is connected. Chamber 129 is connected to piping 54, being arranged to be connected either to the supply or the exhaust by actuator valve stems 126 and 122 respectively.

In operation the vulcanizing molds are kept hot at all times and the article to be vulcanized such as a tube, is mounted in the mold section 18 while the vulcanizer is open, the tube being partially inflated if desired to assist in placing in the mold. The safety catch 55^a is engaged by one hand of the operator to release lever 55 and lever 55 is engaged by the other hand and swung to the left (Figure 1) to operate valve 59 to the position thereof indicated in the drawings (Figures 7, 7^a and 7^b) in which position it is retained by pawl 58. Air under pressure is accordingly supplied to piping 30 and 67 and relieved from piping 31 and 53 by valve 59. This causes the door 12 of the vulcanizer to shut and actuates the timer cylinder 99 to start timing of the cure as shown in Figure 11.

As the door 12 of the vulcanizer shuts, valve 52^a is opened supplying pressure to line 52 and accordingly to the upper end of vulcanizer locking cylinder 48.

The first operation performed by the locking mechanism is to turn bayonet joint member 37 in the socket 36 into locked engagement as shown in Figure 4. This is accomplished by the cam slot portion 43^b through link 41 and arm 40. Cams 45 and 46 then become operative and draw the sections tightly together under great pressure, the mold sections effectively seating upon each other.

As the vulcanizer is locked, shoulder 102^e on lever 102 is actuated into engagement with pin 119^a of inflation valve lever 119 by swinging of the cylinder 48 to the left (Figures 1 and 8). This causes air under pressure to be supplied through the inflation valve 118 to the piping 54, which is connected to the tube in the vulcanizer by a suitable type of connection generally used for this purpose (not shown).

The curing of the tube continues for the time set by adjustment of the timer, toward the end of which roller 101^a engages lever 102 to release valve lever 119 permitting valve 118 to disconnect pressure supply to the inner tube and to relieve the pressure line 54 upon which roller 100 engages pawl 78 to release valve lever 58. Pressure in lines 30 and 67 is thus relieved, the spring 97 acting on the piston 98 to disengage pawls 96 and 93 from the timer ratchet 94, thus disconnecting the timer from its driving motor and pressure is

turned into lines 31 and 53. This first actuates piston 50 in cylinder 48 causing the former to unlock the vulcanizer, and as cylinder 48 swings to the unlocked position thereof the set screw 31^c on cam member 43 engages the valve stem 31^b of valve 31^a opening said valve to admit air under pressure to the rear of the door actuating cylinder 21 and also through branch line 35 to the breaking cylinder 32, whereby the vulcanizer is opened and the vulcanized article removed.

Modifications of the invention may be resorted to without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:

1. Vulcanizing apparatus comprising a fixed section and a section hinged thereon, means for locking said sections together, said means comprising bayonet joint members respectively carried by the sections, the bayonet joint member on the fixed section being secured on a shaft journaled in the fixed section, a cam member journaled on said shaft, an arm secured to the shaft, a link connected to the arm and adapted to be actuated by the cam member to rotate the shaft, and cooperating cams respectively on the cam member and the fixed section for drawing the sections together when the bayonet joint members are engaged, valve controlled means for inflating an article in the vulcanizer, a lever for actuating the inflation valve when the bayonet joint members are actuated, and means for actuating the cam member comprising a pivoted cylinder, a double acting piston therein and a connecting rod between the piston and the cam member, said lever being connected to said pivoted cylinder.

2. Vulcanizing apparatus comprising a fixed section and a section hinged thereon, means for locking said sections together, said means comprising bayonet joint members respectively carried by the sections, the bayonet joint member on the fixed section being secured on a shaft journaled in the fixed section, a cam member journaled on said shaft, an arm secured to the shaft, a link connected to the arm and adapted to be actuated by the cam member to rotate the shaft, and cooperating cams respectively on the cam member and the fixed section for drawing the sections together when the bayonet joint members are engaged, and means for actuating the cam member comprising a pivoted cylinder, a double acting piston therein and a connecting rod between the piston and the cam member.

3. Vulcanizing apparatus comprising a fixed section and a section hinged thereon, means for locking said sections together, said means comprising bayonet joint members respectively carried by the sections, the bayonet joint member on the fixed section being secured on a shaft journaled in the fixed section, a cam member journaled on said shaft,

an arm secured to the shaft, a link connected to the arm and adapted to be actuated by the cam member to rotate the shaft, and cooperating cams respectively on the cam member and the fixed section for drawing the sections together when the bayonet joint members are engaged, valve controlled means for inflating an article in the vulcanizer, a lever for actuating the inflation valve when the bayonet joint members are actuated, and means for actuating the cam member and lever.

4. Vulcanizing apparatus comprising a fixed section and a section hinged thereon, means for locking said sections together, said means comprising bayonet joint members respectively carried by the sections, the bayonet joint member on the fixed section being secured on a shaft journaled in the fixed section, a cam member journaled on said shaft, an arm secured to the shaft, a link connected to the arm and adapted to be actuated by the cam member to rotate the shaft, and cooperating cams respectively on the cam member and the fixed section for drawing the sections together when the bayonet joint members are engaged, and means for actuating the cam member.

5. Vulcanizing apparatus comprising relatively movable sections, means for locking said sections together, said means comprising bayonet joint members respectively carried by the sections, the bayonet joint member on the one section being secured on a shaft journaled in the said section, a cam member journaled on said shaft, an arm secured to the shaft, a link connected to the arm and adapted to be actuated by the cam member to rotate the shaft, and cooperating cams respectively on the cam member and the fixed section for drawing the sections together when the bayonet joint members are engaged, valve controlled means for inflating an article in the vulcanizer, a lever for actuating the inflation valve when the bayonet joint members are actuated, and means for actuating the cam member comprising a pivoted cylinder, a double acting piston therein and a connecting rod between the piston and the cam member, said lever being connected to said pivoted cylinder.

6. Vulcanizing apparatus comprising relatively movable sections, means for locking said sections together, said means comprising bayonet joint members respectively carried by the sections, the bayonet joint member on the one section being secured on a shaft journaled in the said section, a cam member journaled on said shaft, an arm secured to the shaft, a link connected to the arm and adapted to be actuated by the cam member to rotate the shaft, and cooperating cams respectively on the cam member and the fixed section for drawing the sections together when the bayonet joint members are engaged,

and means for actuating the cam member comprising a pivoted cylinder, a double acting piston therein and a connecting rod between the piston and the cam member.

7. Vulcanizing apparatus comprising relatively movable sections, means for locking said sections together, said means comprising bayonet joint members respectively carried by the sections, the bayonet joint member on the one section being secured on a shaft journaled in the said section, a cam member journaled on said shaft, an arm secured to the shaft, a link connected to the arm and adapted to be actuated by the cam member to rotate the shaft, and cooperating cams respectively on the cam member and the fixed section for drawing the sections together when the bayonet joint members are engaged, valve controlled means for inflating an article in the vulcanizer, a lever for actuating the inflation valve when the bayonet joint members are actuated, and means for actuating the cam member and lever.

8. Vulcanizing apparatus comprising relatively movable sections, means for locking said sections together, said means comprising bayonet joint members respectively carried by the sections, the bayonet joint member on the one section being secured on a shaft journaled in the said section, a cam member journaled on said shaft, an arm secured to the shaft, a link connected to the arm and adapted to be actuated by the cam member to rotate the shaft, and cooperating cams respectively on the cam member and the fixed section for drawing the sections together when the bayonet joint members are engaged, and means for actuating the cam member.

9. Vulcanizing apparatus comprising hinged sections, bayonet joint members respectively on the sections for locking the sections together, means for actuating the bayonet joint members relatively to and from locked engagement, and means operable by said first means when the bayonet joint member are engaged for drawing the sections together under pressure by means of the bayonet joint members.

10. Vulcanizing apparatus comprising relatively movable sections, means for locking the sections together, means for drawing the sections together under pressure through the locking means, and means for actuating the locking means comprising a cam member having cams thereon for actuating both of said means in succession.

11. Vulcanizing apparatus comprising relatively movable vulcanizer sections, means for locking the sections together, means for drawing the sections together under pressure, and a single means for actuating the locking means and the drawing means, said means comprising a movable cam member having cam means thereon effective on the locking means over one part of its movement

and other cam means effective on the drawing means over the other part of its movement.

12. Vulcanizing apparatus comprising relatively movable vulcanizer sections, means for locking the sections together, means for drawing the sections together under pressure, and a single means for actuating the locking means and the drawing means, said means comprising a movable member having cam means thereon effective on the locking means over one part of its movement and other cam means effective on the drawing means over the other part of its movement.

13. Vulcanizing apparatus comprising relatively movable sections, bayonet means for locking the sections together, means for drawing the sections together under pressure through the locking means by relative longitudinal movement only of the locking means, and means for actuating the locking means comprising a movable member actuating both of said means in succession.

14. Vulcanizing apparatus comprising relatively movable sections, bayonet means for locking the sections together under pressure, and means for first actuating the locking means into locked engagement and then drawing the sections together under pressure thereby by relative longitudinal movement only of the locking means.

15. Vulcanizing apparatus comprising relatively movable vulcanizer sections, bayonet means for locking the sections together, additional means for drawing the sections together under pressure, and a single means for actuating the locking means and the drawing means, said means comprising a movable member having means thereon effective on the locking means over one part of its movement and other means effective on the drawing means over the other part of its movement.

16. In a vulcanizer comprising relatively movable sections, means for closing and opening the sections, means for "breaking" the vulcanizer sections to assist in opening thereof, means for locking and unlocking the sections, means for drawing the sections together under pressure through the locking means, means for inflating and deflating an article in the vulcanizer, a timer for controlling the sequence of operation of the several instrumentalities set forth above, fluid pressure means for actuating each of the said several instrumentalities and said timer, a single such actuating means operating both the locking and drawing means, a main control valve for controlling the supply of fluid under pressure to said instrumentalities and said timer, connections from said main control valve to each of said instrumentalities and said timer, manually operable means for actuating the control valve to close the vulcanizer and start the timer, a valve in the

connection to the vulcanizer locking actuating means operable by closing of the vulcanizer to actuate said locking means, a valve in the connection to the inflating means operable by locking of the vulcanizer to inflate the article therein, means for latching the main valve to maintain the vulcanizer closed, locked and the article therein inflated, said latching means being operable by the timer to release the main valve after a predetermined cure to actuate the vulcanizer locking and unlocking means, whereby the vulcanizer will be unlocked, means operable by the timer to actuate the valve in the inflation connections so as to deflate the article in the vulcanizer prior to unlocking thereof, a valve in the connections to the actuator of the vulcanizer closing and opening means and the breaking means, said last named valve being operable by unlocking of the vulcanizer to cause said closing and opening means to open the vulcanizer.

17. In a vulcanizer comprising relatively movable sections, means for closing and opening the sections, means for locking and unlocking the sections, means for drawing the sections together under pressure through the locking means, means for inflating and deflating an article in the vulcanizer, a timer for controlling the sequence of operation of the several instrumentalities set forth above, fluid pressure means for actuating each of the said several instrumentalities and said timer, a single such actuating means operating both the locking and drawing means, a main control valve for controlling the supply of fluid under pressure to said instrumentalities and said timer, connections from said main control valve to each of said instrumentalities and said timer, manually operable means for actuating the control valve to close the vulcanizer and start the timer, a valve in the connection to the vulcanizer locking actuating means operable by closing of the vulcanizer to actuate said locking means, a valve in the connection to the inflating means operable by locking of the vulcanizer to inflate the article therein, means for latching the main valve to maintain the vulcanizer closed, locked and the article therein inflated, said latching means being operable by the timer to release the main valve after a predetermined cure to actuate the vulcanizer locking and unlocking means, whereby the vulcanizer will be unlocked, means operable by the timer to actuate the valve in the inflation connections so as to deflate the article in the vulcanizer prior to unlocking thereof, a valve in the connections to the actuator of the vulcanizer closing and opening means, said last named valve being operable by unlocking of the vulcanizer to cause said closing and opening means to open the vulcanizer.

18. In a vulcanizer comprising relatively movable sections, means for closing and opening the sections, means for "breaking" the vulcanizer sections to assist in opening thereof, means for locking and unlocking the sections, means for drawing the sections together under pressure through the locking means, a timer for controlling the sequence of operation of the several instrumentalities set forth above, fluid pressure means for actuating each of the said several instrumentalities and said timer, a single such actuating means operating both the locking and drawing means, a main control valve for controlling the supply of fluid under pressure to said instrumentalities and said timer, connections from said main control valve to each of said instrumentalities and said timer, manually operable means for actuating the control valve to close the vulcanizer and start the timer, a valve in the connection to the vulcanizer locking actuating means operable by closing of the vulcanizer to actuate said locking means, means for latching the main valve to maintain the vulcanizer closed and locked, said latching means being operable by the timer to release the main valve after a predetermined cure to actuate the vulcanizer locking and unlocking means, whereby the vulcanizer will be unlocked, a valve in the connections to the actuator of the vulcanizer closing and opening means and the breaking means, said last named valve being operable by unlocking of the vulcanizer to cause said closing and opening means to open the vulcanizer.

19. In a vulcanizer comprising relatively movable sections, means for closing and opening the sections, means for locking and unlocking the sections, means for drawing the sections together under pressure through the locking means, a timer for controlling the sequence of operation of the several instrumentalities set forth above, fluid pressure means for actuating each of the said several instrumentalities and said timer, a single such actuating means operating both the locking and drawing means, a main control valve for controlling the supply of fluid under pressure to said instrumentalities and said timer, connections from said main control valve to each of said instrumentalities and said timer, manually operable means for actuating the control valve to close the vulcanizer and start the timer, a valve in the connection to the vulcanizer locking actuating means operable by closing of the vulcanizer to actuate said locking means, means for latching the main valve to maintain the vulcanizer closed and locked, said latching means being operable by the timer to release the main valve after a predetermined cure to actuate the vulcanizer locking and unlocking means, whereby the vulcanizer will be unlocked, a valve in the connections to the ac-

tuator of the vulcanizer closing and opening means, said last named valve being operable by unlocking of the vulcanizer to cause said closing and opening means to open the vulcanizer.

20. In a vulcanizer comprising relatively movable sections, means for closing and opening the sections, means for "breaking" the vulcanizer sections to assist in opening thereof, means for locking and unlocking the sections, means for inflating and deflating an article in the vulcanizer, a timer for controlling the sequence of operation of the several instrumentalities set forth above, fluid pressure means for actuating each of the said several instrumentalities and said timer, a main control valve for controlling the supply of fluid under pressure to said instrumentalities and said timer, connections from said main control valve to each of said instrumentalities and said timer, manually operable means for actuating the control valve to close the vulcanizer and start the timer, a valve in the connection to the vulcanizer locking actuating means operable by closing of the vulcanizer to actuate said locking means, a valve in the connection to the inflating means operable by locking of the vulcanizer to inflate the article therein, means for latching the main valve to maintain the vulcanizer closed, locked and the article therein inflated, said latching means being operable by the timer to release the main valve after a predetermined cure to actuate the vulcanizer locking and unlocking means, whereby the vulcanizer will be unlocked, means operable by the timer to actuate the valve in the inflation connections so as to deflate the article in the vulcanizer prior to unlocking thereof, a valve in the connections to the actuator of the vulcanizer closing and opening means and the breaking means, said last named valve being operable by unlocking of the vulcanizer to cause said closing and opening means to open the vulcanizer.

21. In a vulcanizer comprising relatively movable sections, means for closing and opening the sections, means for locking and unlocking the sections, means for inflating and deflating an article in the vulcanizer, a timer for controlling the sequence of operation of the several instrumentalities set forth above, fluid pressure means for actuating each of the said several instrumentalities and said timer, a main control valve for controlling the supply of fluid under pressure to said instrumentalities and said timer, connections from said main control valve to each of said instrumentalities and said timer, manually operable means for actuating the control valve to close the vulcanizer and start the timer, a valve in the connection to the vulcanizer locking actuating means operable by closing of the vulcanizer to actuate said locking means, a valve in the connection to the inflating

means operable by locking of the vulcanizer to inflate the article therein, means for latching the main valve to maintain the vulcanizer closed, locked and the article therein inflated, said latching means being operable by the timer to release the main valve after a predetermined cure to actuate the vulcanizer locking and unlocking means, whereby the vulcanizer will be unlocked, means operable by the timer to actuate the valve in the inflation connections so as to deflate the article in the vulcanizer prior to unlocking thereof, a valve in the connections to the actuator of the vulcanizer closing and opening means, said last named valve being operable by unlocking of the vulcanizer to cause said closing and opening means to open the vulcanizer.

22. In a vulcanizer comprising relatively movable sections, means for closing and opening the sections, means for "breaking" the vulcanizer sections to assist in opening thereof, means for locking and unlocking the sections, a timer for controlling the sequence of operation of the several instrumentalities set forth above, fluid pressure means for actuating each of the said several instrumentalities and said timer, a main control valve for controlling the supply of fluid under pressure to said instrumentalities and said timer, connections from said main control valve to each of said instrumentalities and said timer, manually operable means for actuating the control valve to close the vulcanizer and start the timer, a valve in the connection to the vulcanizer locking actuating means operable by closing of the vulcanizer to actuate said locking means, means for latching the main valve to maintain the vulcanizer closed and locked, said latching means being operable by the timer to release the main valve after a predetermined cure to actuate the vulcanizer locking and unlocking means, whereby the vulcanizer will be unlocked, a valve in the connections to the actuator of the vulcanizer closing and opening means and the breaking means, said last named valve being operable by unlocking of the vulcanizer to cause said closing and opening means to open the vulcanizer.

23. In a vulcanizer comprising relatively movable sections, means for closing and opening the sections, means for locking and unlocking the sections, a timer for controlling the sequence of operation of the several instrumentalities set forth above, fluid pressure means for actuating each of the said several instrumentalities and said timer, a main control valve for controlling the supply of fluid under pressure to said instrumentalities and said timer, connections from said main control valve to each of said instrumentalities and said timer, manually operable means for actuating the control valve to close the vulcanizer and start the timer, a valve in the connection to the vulcanizer locking actuat-

ing means operable by closing of the vulcanizer to actuate said locking means, means for latching the main valve to maintain the vulcanizer closed and locked, said latching means being operable by the timer to release the main valve after a predetermined cure to actuate the vulcanizer locking and unlocking means, whereby the vulcanizer will be unlocked, a valve in the connections to the actuator of the vulcanizer closing and opening means, said last named valve being operable by unlocking of the vulcanizer to cause said closing and opening means to open the vulcanizer.

24. In a vulcanizer comprising relatively movable sections, means for closing and opening the sections, means for "breaking" the vulcanizer sections to assist in opening thereof, means for inflating and deflating an article in the vulcanizer, a timer for controlling the sequence of operation of the several instrumentalities set forth above, fluid pressure means for actuating each of the said several instrumentalities and said timer, a main control valve for controlling the supply of fluid under pressure to said instrumentalities and said timer, connections from said main control valve to each of said instrumentalities and said timer, manually operable means for actuating the control valve to close the vulcanizer and start the timer, a valve in the connection to the inflating means operable when the vulcanizer is closed to inflate the article therein, means for latching the main valve to maintain the vulcanizer closed, locked, said latching means being operable by the timer to release the main valve after a predetermined cure to cause said breaking means to "break", the vulcanizer and said closing and opening means to open the vulcanizer, and means operable by the timer to actuate the valve in the inflation connections so as to deflate the article in the vulcanizer prior to opening thereof.

25. In a vulcanizer comprising relatively movable sections, means for closing and opening the sections, means for inflating and deflating an article in the vulcanizer, a timer for controlling the sequence of operation of the several instrumentalities set forth above, fluid pressure means for actuating each of the said several instrumentalities and said timer, a main control valve for controlling the supply of fluid under pressure to said instrumentalities and said timer, connections from said main control valve to each of said instrumentalities and said timer, manually operable means for actuating the control valve to close the vulcanizer and start the timer, a valve in the connection to the inflating means operable when the vulcanizer is closed to inflate the article therein, means for latching the main valve to maintain the vulcanizer closed, locked, said latching means being operable by the timer to release the main valve after a

predetermined cure to cause said closing and opening means to open the vulcanizer, and means operable by the timer to actuate the valve in the inflation connections so as to de-

5 flate the article in the vulcanizer prior to opening thereof.

26. In a vulcanizer comprising relatively movable vulcanizer sections, means for closing and opening the sections, means actuated
10 by closing of the sections to lock the sections and to draw the sections together under pressure, means operable by locking the sections to inflate an article in the vulcanizer, a timer means to set the timer in operation upon
15 closing of the sections, means actuated by the timer after a predetermined time of cure for deflating the article in the vulcanizer and unlocking the sections and for stopping operation of the timer, and means operable by
20 the unlocking of the sections for operating the closing and opening means to open the vulcanizer.

27. In a vulcanizer comprising relative movable vulcanizer sections, means for closing and opening the sections, means actuated
25 by closing of the sections to lock the sections, means operable by locking the sections to inflate an article in the vulcanizer, a timer, means to set the timer in operation upon closing of the sections, means actuated by the
30 timer after a predetermined time of cure for deflating the article in the vulcanizer and unlocking the sections and for stopping operation of the timer, and means operable by the
35 unlocking of the sections for operating the closing and opening means to open the vulcanizer.

28. In a vulcanizer comprising relative movable vulcanizer sections, means for closing and opening the sections, means actuated
40 by closing of the sections to lock the sections, a timer, means to set the timer in operation upon closing of the sections, means actuated by the timer after a predetermined time of
45 cure for unlocking the sections and for stopping operation of the timer, and means operable by the unlocking of the sections for operating the closing and opening means to open the vulcanizer.

29. In a vulcanizer comprising relative movable vulcanizer sections, means for closing and opening the sections, means operable
50 by locking the sections to inflate an article in the vulcanizer, a timer, means to set the timer in operation upon closing of the sections, means actuated by the timer after a predetermined
55 time of cure for deflating the article in the vulcanizer and for stopping operation of the timer, and means operable when operation of the timer is stopped for operating the
60 closing and opening means to open the vulcanizer.

30. In a vulcanizer comprising relative movable vulcanizer sections, means for closing
65 and opening the sections, a timer, means

to set the timer in operation upon closing of the sections, means actuated by the timer after a predetermined time of cure for stopping operation of the timer, and means
70 operable when operation of the timer is stopped for operating the closing and opening means to open the vulcanizer.

HENRY C. BOSTWICK.

75

80

85

90

95

100

105

110

115

120

125

130