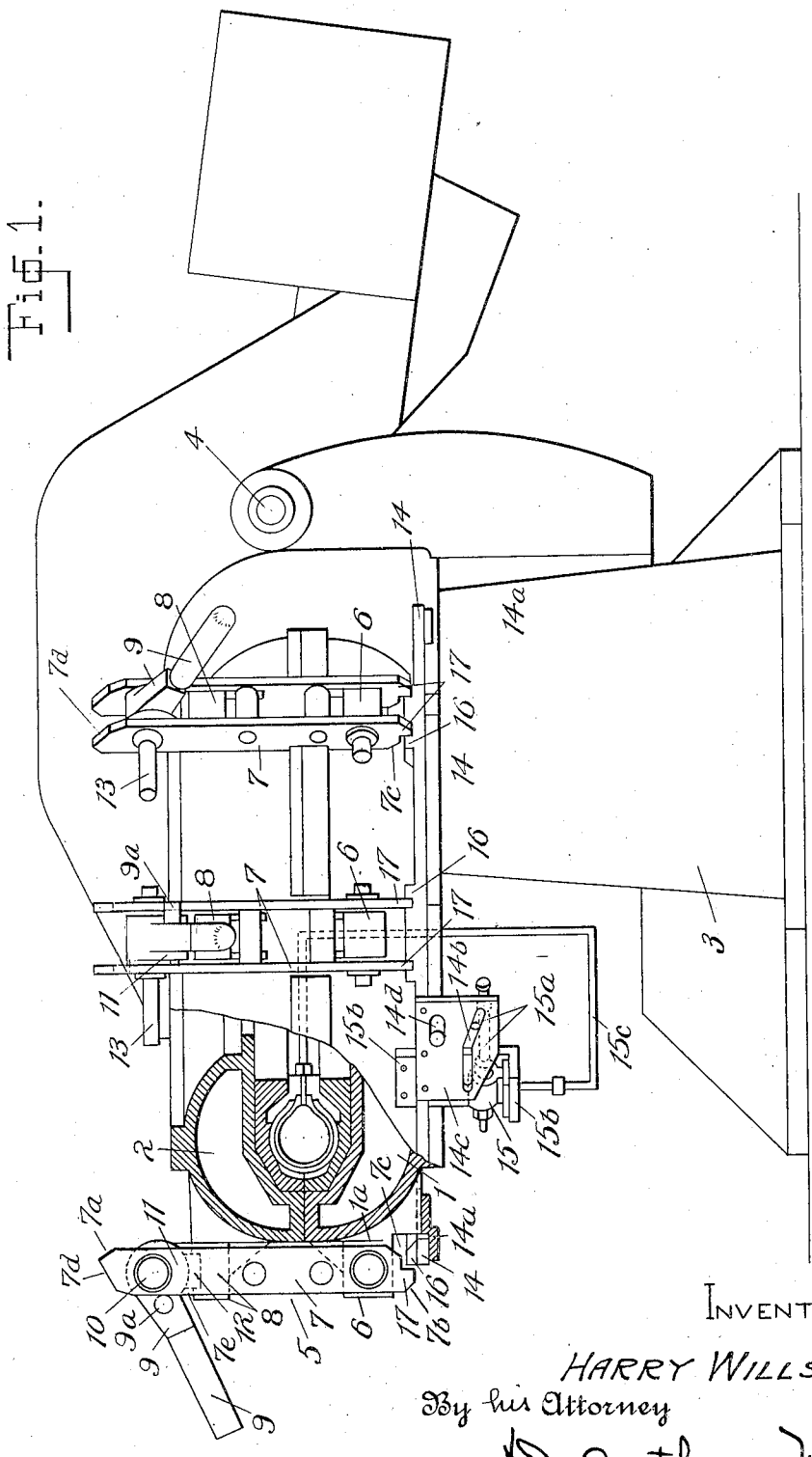
Dec. 18, 1928. 1,695,835

H. WILLSHAW

VULCANIZING APPARATUS

Filed March 16, 1927 3 Sheets-Sheet 1

Fig. 1.



INVENTOR

HARRY WILLSHAW

By his Attorney

D. Anthony Insina

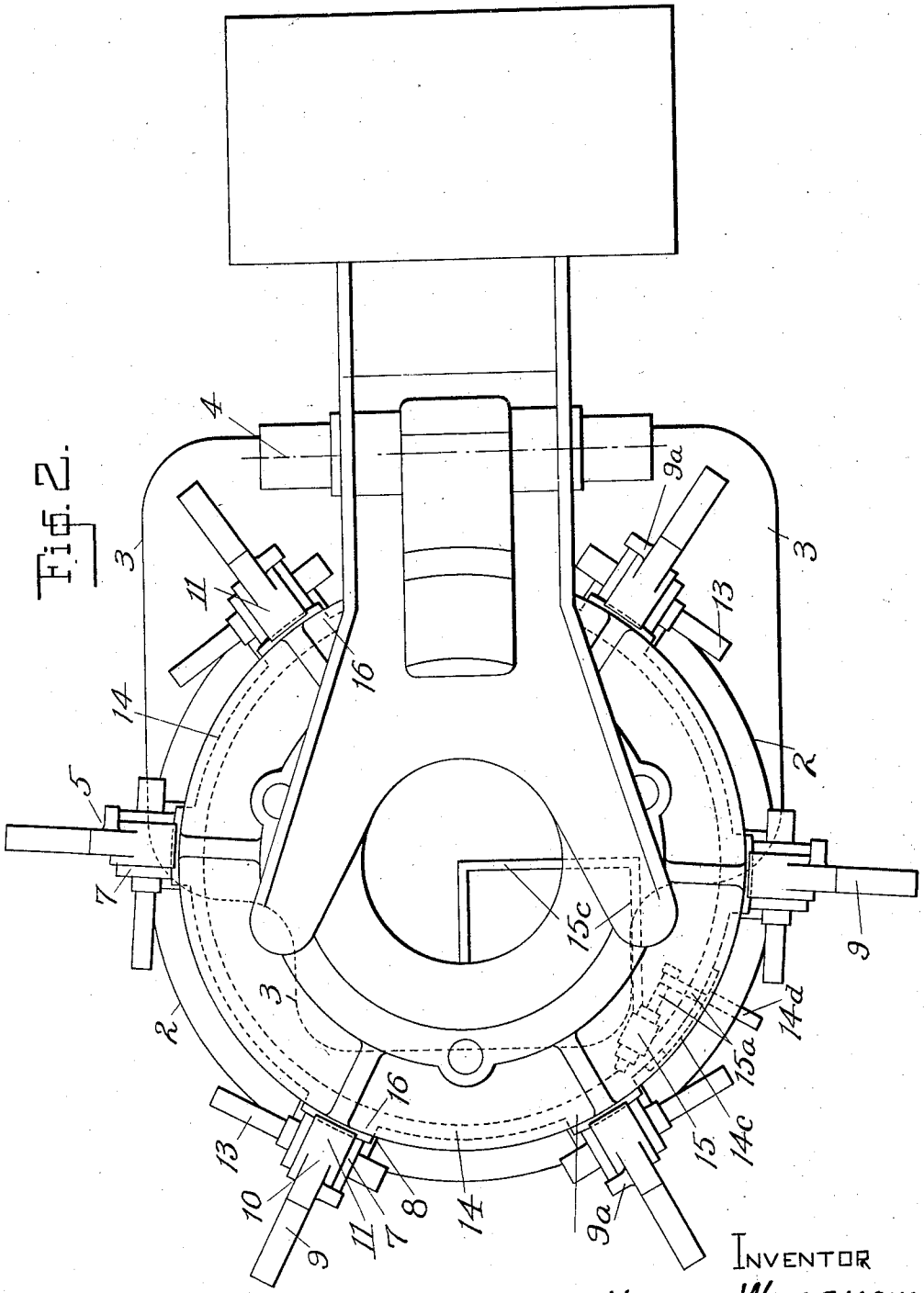
Dec. 18, 1928. 1,695,835

H. WILLSHAW

VULCANIZING APPARATUS

Filed March 16, 1927 3 Sheets-Sheet 2

Fig. 2.



INVENTOR

HARRY WILLSHAW

By his Attorney

W. Anthony Usina

Dec. 18, 1928. 1,695,835

H. WILLSHAW

VULCANIZING APPARATUS

Filed March 16, 1927 3 Sheets-Sheet 3

Fig. 3.

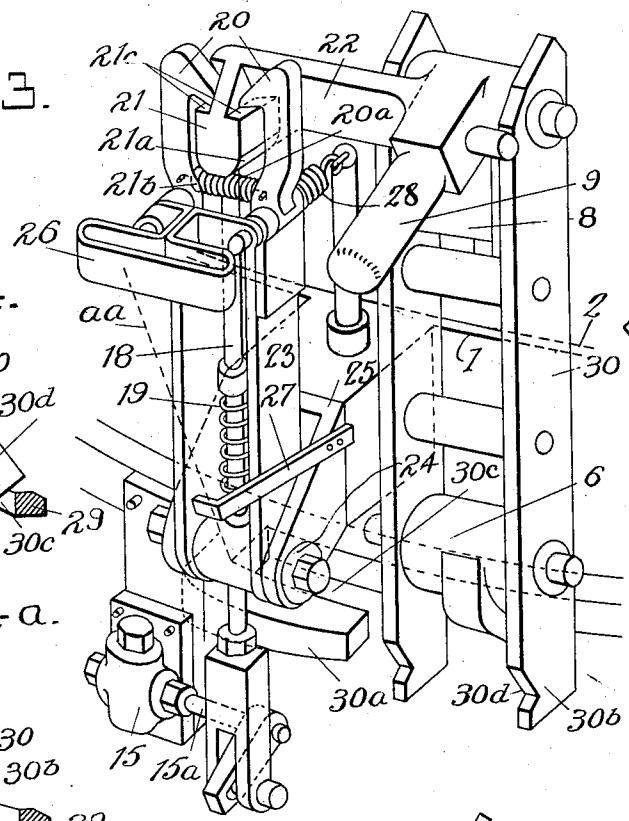


Fig. 4.

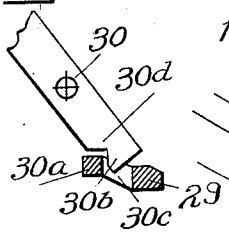


Fig. 4a.

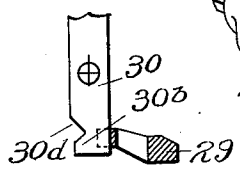


Fig. 5.

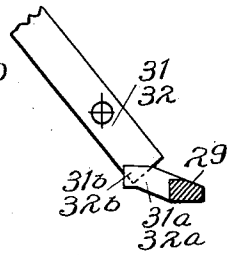


Fig. 5a.

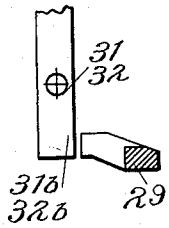
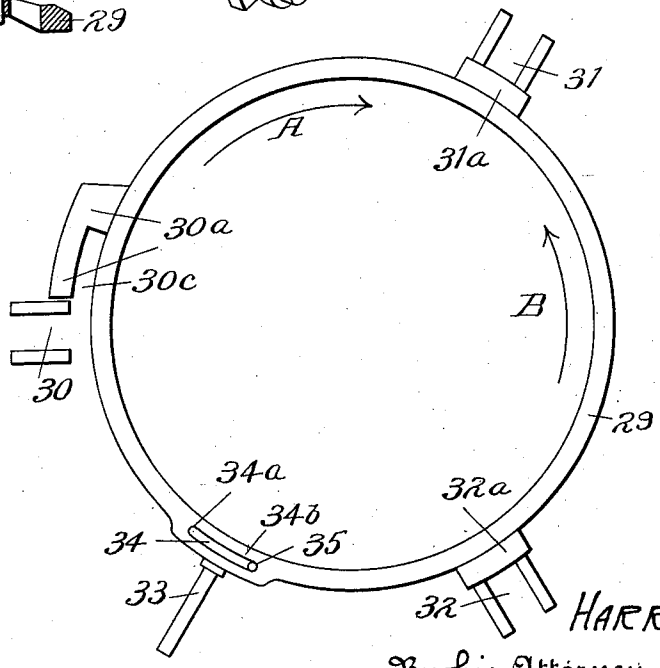


Fig. 6.



INVENTOR

HARRY WILLSHAW

By his Attorney

W. Anthony Mina

Patented Dec. 18, 1928. 1,695,835

UNITED STATES PATENT OFFICE.

HARRY WILLSHAW, OF BIRMINGHAM, ENGLAND, ASSIGNOR TO DUNLOP TIRE AND RUBBER CORPORATION OF AMERICA, OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

VULCANIZING APPARATUS.

Application filed March 16, 1927, Serial No. 175,749, and in Great Britain March 22, 1926.

This invention relates to apparatus for moulding and vulcanizing the outer covers of pneumatic tyres, inflatable tubes and the like and has particular reference to that type of apparatus which comprises two annular steam chests, one hinged upon or in relation to the other, adapted to embrace the respective halves of a tyre mould or the like.

The object of the present invention is to provide improved means whereby the two hinged chests are securely clamped one to another while the tyre or the like is undergoing vulcanization and to associate therewith control means for the fluid pressure supply to the interior of the product; so as to ensure (*a*) that fluid pressure is within the product when the apparatus is closed; and/or (*b*) that such pressure is within the product only when the apparatus is closed and/or (*c*) that such pressure is released before the apparatus is opened.

According to the preferred embodiment of the invention the clamping means may comprise a unit, or units, including a hinged girder bracket provided with a pivotal lever adapted so to actuate a cam, as to exert a contracting pressure between the steam chests. Or the said lever may itself be pivotally mounted upon one of the chests. The fluid pressure control may comprise a rotatable annular member adapted to actuate the fluid pressure valve, the said member being provided with projections adapted so to co-act with opposing projections upon the cam clamps as to prevent (*a*) its rotation—to admit pressure to the product—when the said clamps are in the inoperative position, and (*b*) the actuation of the said clamps to open the apparatus before the said member is rotated to exhaust pressure from the product. Or the said control may comprise means whereby the actuation of the valve is consequent upon the actuation of the pivotal lever aforesaid, preferably however, only in admitting pressure to the product—the actuation of the said lever being preferably consequent upon the prior actuation of the said valve in exhausting pressure from the product.

In order that this invention may be clearly understood and readily carried into effect, the same will now be described with reference to the accompanying drawings in which:

Fig. 1 is a part sectional side view of the preferred embodiment of my invention.

Fig. 2 is a plan view thereof.

Fig. 3 is a perspective view of an alternative fluid pressure control according to this invention.

Figs. 4, 4ª, 5, 5ª and 6 are detail views of the alternative illustrated in Fig. 4.

Referring to the drawings; Figs. 1 and 2 illustrate an application of a preferred embodiment of this invention to that class of the hereinbefore referred to type of moulding and vulcanizing apparatus which consists essentially of two hollow annular shells or steam chests 1 and 2, horizontally disposed, the bottom chest 1 rigid with the base 3 of the apparatus and the top chest 2 hinged at 4 upon or in relation to the lower chest 1.

Referring again to Figs. 1 and 2, the clamps indicated in general by the numeral 5 are arranged substantially equidistantly around the outer periphery of the apparatus, are so disposed as to function substantially vertically, and are adapted to be operated individually.

The preferred construction of and mounting for one unit of the said clamping means as shown in the drawings will now be described.

Upon the lower or fixed chest 1, there is provided a lug 6 upon which is pivotally mounted a girder bracket 7 which extends from the said lug 6 to an adjacent lug 8 erected upon the upper or hinging chest 2. Pivotally mounted at the end 7ª of the bracket 7 is a lever 9 which is provided about its pivot 10 with an eccentric conformation or cam 11 adapted so to co-act with the last said lug 8 as to exert when the lever 9 is actuated, a contracting pressure between the steam chests. Preferably the lug 8 is provided with a reinforcing plate 12 of the required configuration.

To limit to the required degree the movement of the bracket 7, there is preferably provided thereupon, at its end 7ᵇ, a face 7ᶜ adapted in the inoperative position to abut against an opposing face 1ᵇ upon the lower chest 1—thereby the said bracket is held in a position of ready accessibility in the inoperative position.

To limit for a like purpose the movement of the lever 9 preferably the same is provided with a stop 9ª adapted to contact the face 7ᵈ of the bracket 7. The said stop serves the further purpose—by contacting in the operative position the face 7ᵉ of the bracket—of

retaining the said lever in the desired position relative to the dead centre of its cam and the lug 8 in the operative position, as shown in Fig. 1.

To facilitate the clamping operation, the bracket 7 is provided with a handle 13 whereby the clamp may be swung readily into or out of position.

The preferred construction of and mounting for the fluid pressure control will now be described.

As illustrated in Figs. 1 and 2, the same comprises an annular member 14 rotatably mounted upon brackets 14^a dependent from the lower chest 1, the said member, hereinafter called the control ring, being provided at a point adjacent the fluid pressure valve 15 with a cam slot 14^b which as shown in Figs. 1, 1^a and 2, is adapted to engage the actuating lever 15^a of the said valve. Preferably the said cam slot is formed in a plate 14^c dependent from the control ring 14 of the said plate further carrying a handle 14^d to facilitate the rotation of the said ring. The fluid pressure valve 15 may be of any convenient type, and is preferably mounted upon a bracket 15^b dependent from the lower chest 1.

Means are provided to cause the actuation of the said valve and the said clamps to be interdependent for the purpose hereinbefore referred to. Preferably the control ring is provided with lugs 16, hereinafter called ring lugs, disposed around its circumference to coincide with the disposition of the clamps, the said clamps being provided with opposing lugs 17, hereinafter called bracket lugs.

In Fig. 1 the ring lugs are shown arranged vertically while in Fig. 2 they are shown projecting radially, it being apparent that either construction may be utilized. The ring lugs and the bracket lugs co-act together as hereinafter more fully explained, to cause the actuation of the control ring to be dependent upon the position of the clamps and the actuation of the clamps to be dependent upon the position of the control ring. I now proceed to describe the operation of apparatus characterized in the above referred to features.

The raw tyre being in position, the upper chest is lowered gently thereonto. At this point the clamps are supported in the inoperative position by the contacting of the faces 7^c and 1^a. The bracket lugs 17 are projecting into the path of the ring lugs 16 and therefore the control ring cannot be rotated to open the valve 15. Thus I ensure that fluid pressure cannot be admitted to the interior of the tyre while the clamps are in the inoperative position. The chests being initially closed, the clamps are then swung into engagement with the lugs 8 upon the upper chest and the cam lever is forced over into the locked position until its stop 9^a contacts the face 7^c of the bracket. Now the bracket lugs have swung out of the path of the ring lugs and, thereby radially free, the control ring 14 is then rotated to actuate the valve, the cam slot 14^b depressing the actuating lever 15^a of the said valve as the said ring is rotated, thereby admitting fluid pressure to the interior of the tyre via the supply pipe 15^c. It is arranged that the rotation required to actuate the valve is such as to cause the ring lugs to coincide with the bracket lugs. Now therefore, as shown in Figs. 1 and 2, the ring lugs are positioned immediately behind the bracket lugs, projecting into the path of the same about the pivot of the bracket and thus the clamps cannot be swung out of engagement with the upper chest to open the apparatus until the control ring has been rotated to actuate the valve to release the fluid pressure from the interior of the tyre. Thus I ensure that the fluid pressure must be released from the interior of the tyre before the apparatus can be opened.

It is not to be construed that I am limited to the particular design of cam clamp or its arrangement described, as any suitable kind of cam clamp may be associated with apparatus of the kind described in a variety of ways. To exemplify, the bracket may pivot upon the lug with which the cam lever co-acts or alternatively the said bracket may be dispensed with entirely and the cam be pivotally mounted upon one of the chests. In this latter arrangement, the cam lever would preferably be adapted to slide into initial engagement with an opposing lug on the other chest.

Neither is it to be construed that I am limited to the particular fluid pressure control or its arrangement described, as it will be apparent that a variety of kinds of such control may be associated with cam clamps in a variety of ways.

Alternatively, for instance, I may provide that actuation of the valve is consequent upon the actuation of one or more of the pivotal levers 9 which function to exert the required contracting pressure between the chests.

Preferably the operation of the valve to admit pressure to the product is consequent upon the actuation of the said lever to close the apparatus, while the actuation of the said lever to open the apparatus is consequent upon the prior operation of the said valve to exhaust pressure from the product.

In the preferred arrangement of this alternative, illustrated in Figs. 3 to 6, I associat with one of the clamps a spring loaded plunger 18 adapted to be displaced longitudinally consequent upon the actuation of the lever 9. At the end remote from the said lever, the plunger 18 is operatively connected to the actuating arm 15^a of the fluid pressure supply valve 15. Not until the lever 9 is depressed to close the apparatus may the valve be actuated to admit pressure to the interior

of the tyre, the said actuation being consequent upon the depression of the plunger 18 by the lever 9 as the said lever moves into the operative position.

The said internal pressure may be exhausted automatically as the said lever 9 moves in the reverse direction to open the apparatus—the plunger 18 being thereby allowed to rise under the influence of its loading spring 19 to open the valve 15 to atmosphere.

Then however, occurs a possibility that the pressure would not be fully exhausted before the apparatus might be opened, and therefore, to obviate this possibility, I prefer to provide that the lever 9 may not be actuated to open the apparatus until after the opening of the valve to atmosphere.

Referring again to Fig. 3, the preferred means consist in associating with the plunger 18, a spring loaded catch having jaws 20 adapted to co-act with a projection 21 upon an extension 22 of, or a bracket attached to, the pivotal lever 9. When the said lever is depressed to close the apparatus the cam face 21^a of the lug 21 passes between the jaws of the catch until the lower face 21^b of the said lug contacts the plunger 18 to actuate the valve. Under the influence of their loading spring 20^a, the said jaws 20 contract over the edges 21^c of the said lug 21. Thus it will be apparent that the lever 9 cannot be actuated to open the apparatus until the lug 21 is freed from the restraint of the said jaws 20.

Means are provided to ensure that in achieving that end, the valve 15 is necessarily opened to atmosphere. As shown in the drawings, the plunger 18 is arranged in a housing 23 pivoted at 24 in a bracket 25 attached to the fixed chest 1, the said housing carrying the jaws 20 of the catch. When it is desired to free the cam clamp from restraint prior to the opening of the apparatus, the housing 23 is swung about its pivot 24 into the position indicated by the dotted line 22 in Fig. 3. A handle 26 is provided to facilitate the operation; and a stop 27 is provided to limit the extent thereof. When the housing 23 contacts the said stop, the jaws 20 have moved out of engagement with the lug 21 and the plunger 18, no longer restrained by the under face 21^b of the said lug, has moved upward under the influence of the spring 19 to open the valve 15 to atmosphere. Thus I ensure that fluid pressure is released from the interior of the tyre before the clamp adjacent the valve is actuated.

To return the plunger and its housing into the position whereby it is ensured that pressure is admitted to the tyre upon the actuation of the lever 9, a spring 28 is provided to function between the said housing and the steam chest 2.

A control ring, similar to the ring 14, may be provided to ensure (*a*) that the valve actuating clamp may be swung into position only after the other clamps are in position and (*b*) that the last said clamps may not be actuated to unlock the apparatus until the first said clamp has been swung out of position—the valve being thereby necessarily open to atmosphere.

Referring to Fig. 6 which illustrates in plan, and more or less diagrammatically, an arrangement applicable to apparatus having three cam clamps; the control ring now, for the sake of convenience, indicated by the numeral 29, is provided adjacent the valve actuating clamp 30, with a claw lug 30^a forming a slot 30^c and adjacent the other clamps 31 and 32 with radially extending lugs 31^a and 32^a respectively. The girder brackets of the clamps are provided with an opposing conformation or projection 30^b, 31^b and 32^b respectively. The control ring is provided with a handle 33 to facilitate its rotation, and a guide slot 34 engaging with a pin 35 rigid with the lower chest 1 to limit its rotation as hereinafter more fully explained.

The function of the said control ring will now be described, it being first understood that the raw tyre is in position in the mould, that the chests have been brought loosely together and that all three clamps, 30, 31 and 32 are lying swung out in the inoperative position as shown in Figs. 4 and 5. At this stage the projection 30^b upon the valve actuating clamp 30 engages the slot 30^c formed by the claw lug 30^a as shown in Fig. 4. Thereby the said clamp 30 is prevented from being swung into position until the control ring 29 has been rotated to release the said projection 30^b upon the said clamp from restraint. In the inoperative position of the clamps 31 and 32, such rotation is prevented—the projections 31^b and 32^b upon the said clamps projecting into the path of the lugs 31^a and 32 respectively upon the control ring as shown in Fig. 5. Rotation of the ring in the other direction is prevented by the pin 35 contacting the end 34^a of the guide slot 34. Thus I ensure that the valve actuating clamp 30 is necessarily the last to be swung into position.

Proceeding with the description of the operation, the clamps 31 and 32 are swung into position and actuated. Then the control ring—thereby freed from the restraint of the projections 31^b and 32^b—is rotated in the direction of the arrow "A" and the valve actuating the clamp 30—thereby freed from the restraint of the claw lug 30^a—is actuated as hereinbefore described, to admit fluid pressure to the interior of the tyre. At this stage illustrated in Fig. 6, the lugs 31^a and 32^a upon the control ring have moved behind the projections 31^b and 32^b upon the clamps 31 and 32 as shown in Figs. 5^a and 6, and thus the said clamps cannot be swung down to open the apparatus until the control ring is rotated to release them from restraint.

In the operative position of the valve actu-

ating clamp 30—i. e. when the apparatus is closed—such rotation is prevented, the projections 30^b upon the said clamps projecting into the path of the circumferentially extending portion of the claw lug 30^a as shown in Figs. 3, 4^a and 6. Rotation in the opposite direction is prevented by the pin 35 contacting the end 34^b of the guide slot 34.

Thus I ensure that the valve actuating clamp is necessarily the first clamp to be disengaged. Proceeding again with the description of the operation; after the required time, the valve actuating clamp 30 is disengaged as hereinbefore described—thereby releasing fluid pressure from the interior of the tyre. Then the slot 30^d in the clamp 30 coincides as shown in Fig. 4 with the circumferentially extending portion of the claw lug 30^a. The control ring—thereby free—is then rotated in the direction of the arrow "B". Then the clamps 31 and 32—thus freed from the restraint of the lugs 31^a and 32^a—are disengaged and the apparatus is opened for the removal of the cured tyre.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. Vulcanizing appartus of the character described including coacting mold chests one of which is movable relatively to the other, a valve operative to control the supply of fluid pressure to an inflatable member within the mold chests, actuating means for said valve, a locking member swingably mounted on one of said mold chests and carrying a clamping member adapted to coact with the other mold chest and co-operating parts carried by said locking member and by said valve operating member whereby the actuation of one is dependent upon the position of the other.

2. Apparatus of the character described including a pair of coacting mold chests one of which is movable relatively to the other, a bracket member pivotally secured to one of said chests carrying a clamp arranged for coaction with the other chest, fluid pressure control means operatively connected with an inflatable tube supported within said chests, a member guided on one of said chests carrying means for coaction with said pressure control means, said member having an interlocking part and said bracket having a portion formed to co-operate with said interlocking part whereby actuation of said bracket is depended upon the position of said member.

3. Apparatus of the character described comprising a pair of chests one movable relatively to the other, clamping means for locking the chests together comprising a girder bracket pivoted to one chest and having pivoted to the free end thereof a cam for coaction with a portion of the movable chest adapted to exert a contracting pressure between the chests, a ring slidable relatively to one chest, fluid pressure control means operatively connected with an inflatable tube within the chests, means carried by the ring for actuating the fluid pressure control means and co-operating interlocking members carried by said ring and said girder bracket whereby the movement of the bracket and the ring are dependent one upon the other substantially as and for the purpose described.

In witness whereof, I have hereunto signed my name.

HARRY WILLSHAW.