May 29, 1934. J. D. NIXON 1,960,592

BLOW-OUT PREVENTER

Filed Sept. 15, 1930 2 Sheets-Sheet 1

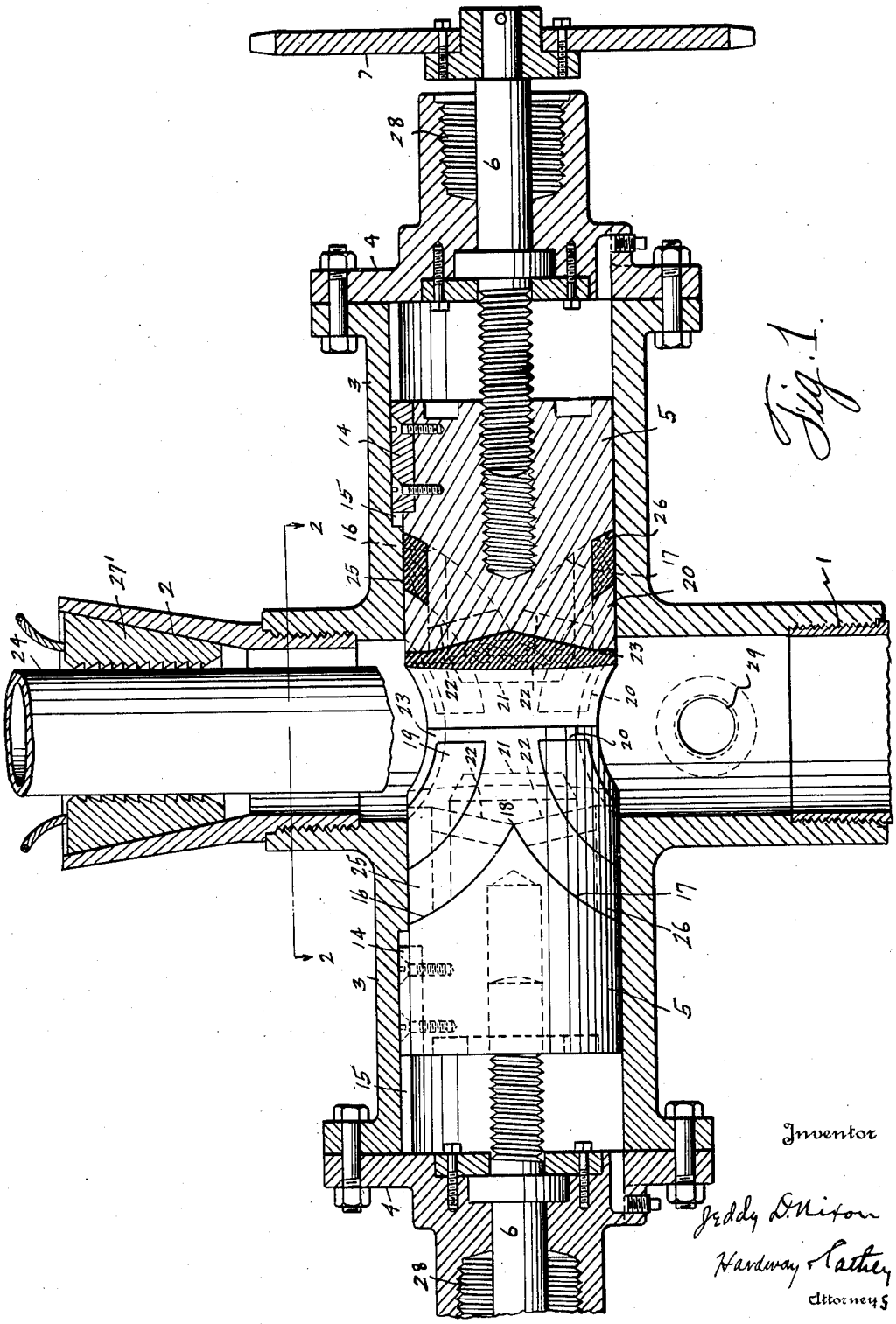


Fig. 1.

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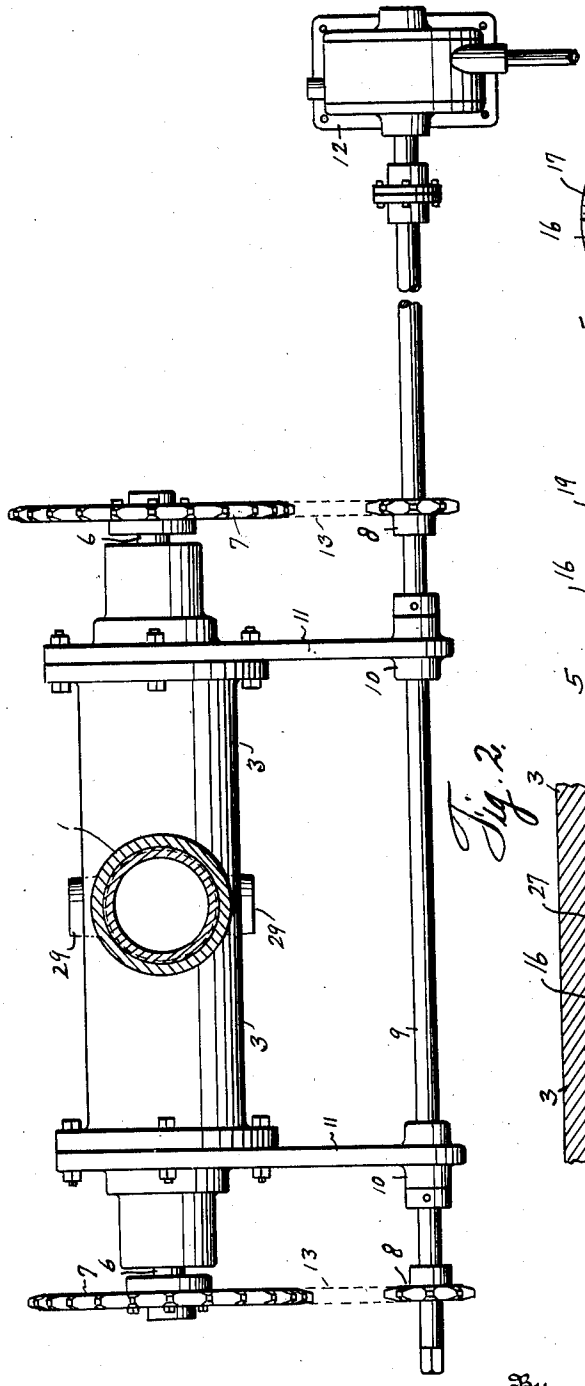


Fig. 2.

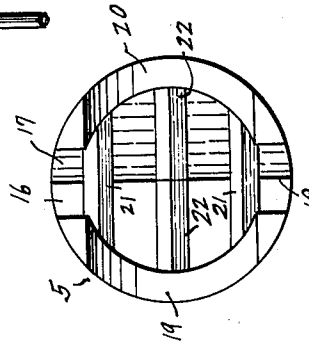


Fig. 5

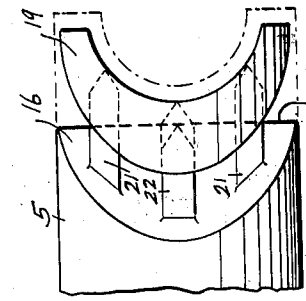


Fig. 4.

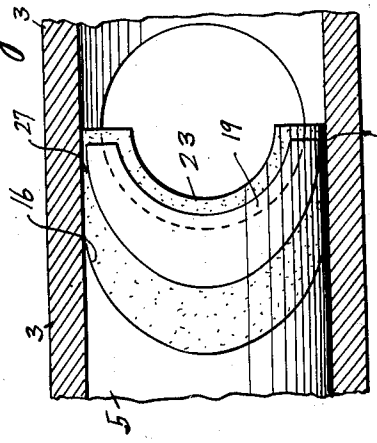


Fig. 3.

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UNITED STATES PATENT OFFICE

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BLOW-OUT PREVENTER

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Application September 15, 1930, Serial No. 482,043

11 Claims. (Cl. 251—159)

This invention relates to a novel type of blowout preventer.

One object of the invention is to provide an apparatus for controlling the passageway between an outer casing and an inner pipe therein in a well bore, so as to control or prevent the flow of fluid from the bore through said passageway.

Another object of the invention is to provide a blowout preventer comprising cylinders incorporated into the casing with rams or plungers therein whose facing ends are shaped to close around the inner pipe and when in closed, or active, position to form a complete seal between the inner pipe and the casing to prevent the escape of fluid under pressure through the casing from the well.

Another object of the invention is to provide an apparatus of the type hereinabove specified wherein provision is made for also forming a tight seal not only between the inner pipe and casing but also between the plunger and the cylinder walls, the object sought being attained by the novel shape of the plungers and a novel type of packing associated therewith.

With the above and other objects in view, the invention has particular relation to certain novel features of construction, operation and arrangement of parts an example of which is given in this specification and illustrated in the accompanying drawings, wherein:

Figure 1 shows a vertical sectional view of the blowout preventer.

Figure 2 shows a plan view thereof partly in section, taken on the line 2—2 of Figure 1.

Figure 3 shows a plan view of the inner end of one of the plungers employed showing the packing thereof and showing the associated parts, in section.

Figure 4 shows a plan view of the inner end of said plunger with the packing removed but indicated in dotted lines, and

Figure 5 shows an inner end view of the plunger with the packing removed.

Referring now more particularly to the drawings wherein like numerals of reference designate similar parts in each of the figures, the numeral 1 designates a casing adapted to be set in a well bore and whose upper end is provided with upwardly flared seat 2. Incorporated into this casing are the cylinders 3, 3 whose inside diameters are somewhat greater than that of the casing itself as shown. These cylinders are preferably oppositely arranged and each cylinder has a head as 4 secured by bolts or otherwise to the outer end thereof. Within the respective cylinders are the plungers 5, 5 whose outer ends have the axial tapped bore to receive the externally threaded inner ends of the actuating shafts 6, 6. These shafts have swiveling connections with the respective cylinder heads 4 and their outer ends have the sprocket wheels 7, 7 removably attached thereto in any approved manner. The sprocket wheels 7 are aligned with smaller sprocket wheels 8 which are fixed on a suitable driving shaft 9, said shaft being mounted to rotate on the bearings as 10, 10 which may be supported by arms as 11, 11 extending outwardly from the respective heads 4. The shaft 9 may be driven by a suitable turbine 12, or other motor and rotation is transmitted from the sprocket wheels 8 to the sprocket wheels 7 through suitable driving chains as 13. The threads of the respective shafts 6 are oppositely pitched so that the plungers 5 will be simultaneously driven toward or from each other. Each plunger has a key as 14 slidable in a lengthwise keyway 15 in the corresponding cylinder wall to prevent the rotation of the corresponding plunger.

The inner end of each plunger is of special formation to receive a special type of packing shaped not only to form a tight seal between the abutting ends of the plungers but also between the plungers and the inner pipe as well as between the plungers and the walls of the casing and the cylinders to prevent the escape of fluid under pressure from the well when the plungers are in active position. This special plunger construction will now be described:

The forward end or inner end of each plunger is wedge-shaped that is it is provided with the upper and lower tapering faces 16, 17 which are slightly concaved, as shown and which terminate in a transverse apex 18. Projecting forwardly from said tapering end there is a packing-retaining cage composed of the upper and lower arcuate retainer plates 19 and 20. These plates are not only arcuate so as to conform to the contour of the inner pipe but are also curved to conform to the external curvature of the corresponding plunger. The retainer plates are formed integrally with the wing-like, vertical, side webs 21, 21 and intermediate web 22 also formed integrally with the plunger and the forward margins of these webs 21, 22 are also tapering or wedge like in form and the corresponding ends of the retainer plates 19, 20 are spaced

apart as shown more clearly in Figures 1 and 5. The retainer plates 19, 20 are thus not only maintained in spaced relation to each other but are spaced forwardly from the corresponding tapering faces 16, 17.

A packing as 23 is mounted in this cage like structure of each plunger. Said packing is of suitable, resilient, material such as rubber, and is moulded in such shape as to present a semi-tubular arcuate face to the inner pipe 24. As the packing material is moulded into place it will fill in between the plates 19, 20 and the opposing tapering faces 16, 17 will be moulded flush with the external surface of the corresponding plunger forming the arcuate packing surfaces 25, 26 around opposite sides of the plunger, which surfaces merge at the sides of the plunger as at 27, 27.

The forward or inner ends of the plungers, as thus packed, are so shaped that when said plungers are moved together said ends will conform to the shape of and fit closely around the inner pipe 24 and resilient packing will thus be provided between said plungers and said inner pipe as well as between the abutting parts of the plungers themselves and also between the plungers and the walls of the cylinders all the way around on each side of the passageway up through the casing.

As pressure is applied through the mechanism hereinabove described, to force said plunger together, the packing 23 will be compressed around the inner pipe and between the abutting or opposing parts of the plungers and the tapering faces 16, 17, and the wedge shaped forward edges of the webs 21, 22, will cause said packing to expand all the way around and be forced out closely against the walls of the cylinders on each side of the passageway through the casing 1. Fluid tight joints will thus be provided to prevent the escape of the internal pressure in the bore up through the casing or out through between the walls of the cylinders and plungers and the well may be thus effectively shut in.

The inner pipe may be maintained at any desired position in the bore by means of suitable slips as 27' which may be inserted into the seat 2 around said pipe, said slips being of any conventional type.

The passageway through the casing about the inner pipe may be opened by reversing the rotation of the operating mechanism and forcing the plungers outwardly in the respective cylinders in an obvious manner.

If it be desired to permanently close the well, the sprocket wheels 7 may be removed from their shafts 6 and suitable plugs screwed into the internally threaded sockets 28 provided in the outer ends of the heads 4.

The casing 1 is provided with a suitable outlet line 29 beneath the cylinders, which is controlled by a suitable valve whereby the fluid pressure in the well may be relieved as desired.

The drawings and description disclose what is now considered to be a preferred form of the invention by way of illustration only, while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. A blowout preventer for forming a seal between an outer casing and an inner pipe in a well bore and comprising cylinders incorporated into the casing, a plunger in each cylinder, the forward end of each plunger comprising a forwardly extending cage and resilient material anchored in place by said cage, said material presenting a forward end face and a peripheral face about the plunger, said forward face being shaped to conform to the contour of, and to fit entirely around said inner pipe.

2. A blowout preventer for forming a seal about an outer casing and an inner pipe in a well bore and comprising cylinders incorporated into the casing, a plunger in each cylinder said plungers being movable into inward, or active, position to close the passageway between said casing and pipe and being also movable into outward, or inactive, position to open said passageway, the forward end of each plunger comprising a cage and resilient packing material anchored by said cage, said packing material presenting a forward face to the opposing plunger and a peripheral face to the corresponding cylinder wall, the forward end faces of said plungers being shaped to fit closely about the inner pipe when said plungers are in said active position.

3. A blowout preventer for forming a seal about an outer casing and an inner pipe in a well bore and comprising cylinders incorporated into the casing, a plunger in each cylinder said plungers being movable into inward, or active, position to close the passageway between said casing and pipe and being also movable into outward, or inactive, position to open said passageway, the forward end of each plunger comprising a cage and resilient packing material anchored by said cage, said packing material presenting a forward face to the opposing plunger and a peripheral face to the corresponding cylinder wall, the forward end faces of said plungers being shaped to fit closely about the inner pipe when said plungers are in said active position, and means to effect the expansion of said peripheral face of said packing against the cylinder wall upon the application of pressure against said end face.

4. A blowout preventer for forming a seal between an outer casing and an inner pipe in a well bore and comprising cylinders on the casing, a plunger in each cylinder movable into active position to close the passageway between the casing and pipe and also movable into inactive position to open said passageway, the confronting ends of said plungers being shaped to fit closely around said pipe when the plungers are in said active position, each plunger comprising a cage at its forward end and packing anchored by said cage said packing presenting a forward end face, and a peripheral face, said cage including means effective to expand said peripheral face upon the application of pressure against said end face.

5. A blowout preventer for forming a seal between an outer casing and an inner pipe in a well bore and comprising cylinders on the casing, a plunger in each cylinder movable into active position to close the passageway between the casing and pipe and also movable into inactive position to open said passageway, the confronting ends of said plungers being shaped to fit closely around said pipe when the plungers are in said active position, each plunger comprising a cage at its forward end and a resilient packing anchored in place, by said cage, said packing presenting a forward end face to the opposing plunger and a peripheral face to the walls of the corresponding cylinder, and means associated with the cage and effective to expand said peripheral face against said walls upon the application of pressure against said end face.

6. A blowout preventer for forming a seal between an outer casing and an inner pipe in a well bore and comprising cylinders on the casing, a plunger in each cylinder movable into active position to close the passageway between the casing and pipe and also movable into inactive position to open said passageway, the confronting ends of said plungers being shaped to fit closely around said pipe when the plungers are in said active position, and said ends each comprising a forward end face and a peripheral face of resilient material and having tapering faces effective to expand said peripheral face against the inside walls of the corresponding cylinder upon the application of pressure against the corresponding end face.

7. A blowout preventer for forming a seal between an outer casing and an inner pipe in a well bore, and comprising cylinders on the casing, a plunger in each cylinder movable into active position to close the passageway between the casing and pipe and also movable into inactive position to open said passageway, the confronting ends of said plungers being shaped to fit closely around said pipe when the plungers are in said active position, each plunger including a cage at its forward end, said cage including retainer plates and webs anchoring the retainer plates in place, resilient material anchored by said cage and forming a forward end face on said plunger and a peripheral outer surface to fit said cylinder.

8. A blowout preventer for forming a seal between an outer casing and an inner pipe in a well bore, and comprising cylinders on the casing, a plunger in each cylinder movable into active position to close the passageway between the casing and pipe and also movable into inactive position to open said passageway, the confronting ends of said plungers being shaped to fit closely around said pipe when the plungers are in said active position, each plunger including a cage at its forward end, said cage including retainer plates and webs anchoring the retainer plates in place, resilient material anchored by said cage and forming a forward end face and a peripheral outer surface to fit said cylinder, the forward parts of the plunger and webs adjacent said material being wedge shaped to effect the expansion of said peripheral surface upon the application of endwise pressure to the end face.

9. A blowout preventer for forming a seal between an outer casing and an inner pipe in a well bore and comprising cylinders on the casing, a plunger in each cylinder movable into active position to close said passageway and being also movable into inactive position to open said passageway, the confronting ends of said plungers being shaped to fit closely around said pipe when the plungers are in said active position, each plunger including a cage at its forward end and a resilient packing anchored in place, by said cage, said packing presenting a forward end face to the opposing plunger and a peripheral face to the walls of the corresponding cylinder, and means associated with the cage and effective to expand said peripheral face against said walls upon the application of pressure against said end face, and means for simultaneously moving the plungers into active or inactive positions.

10. In a blowout preventer for forming a seal between an outer casing and an inner pipe in a well bore, a plunger having its forward end shaped to conform to the contour of and to fit closely about said inner pipe, said forward end being formed with a cage of rigid material and a resilient member anchored by said cage and forming the forward end face and conforming to the peripheral face of the plunger to fit within a cylinder.

11. In a blowout preventer for forming a seal between an outer casing and an inner pipe in a well bore, a plunger having its forward end shaped to conform to the contour of and to fit closely about said inner pipe, said forward end being formed with a cage and a resilient member anchored by said cage and forming the forward end face and forming part of the peripheral face of the plunger, there being wedge like forward portions of the plunger and cage effective to cause the outward expansion of said peripheral face all around the plunger upon the application of pressure against said end face thereof.

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