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2,035,319

BLOWOUT PREVENTER

Filed Sept. 17, 1934

3 Sheets-Sheet 1

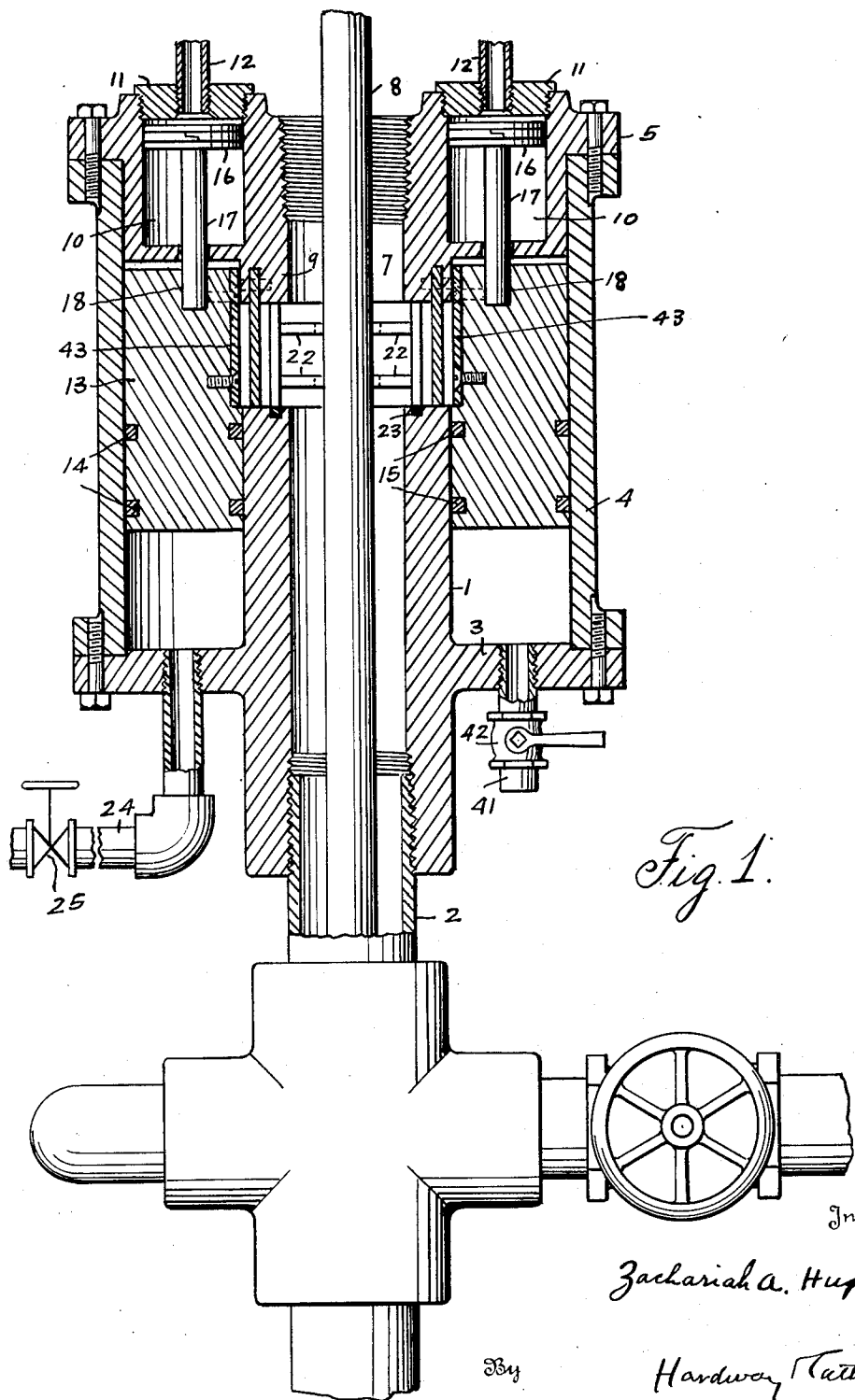


Fig. 1.

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3 Sheets-Sheet 2

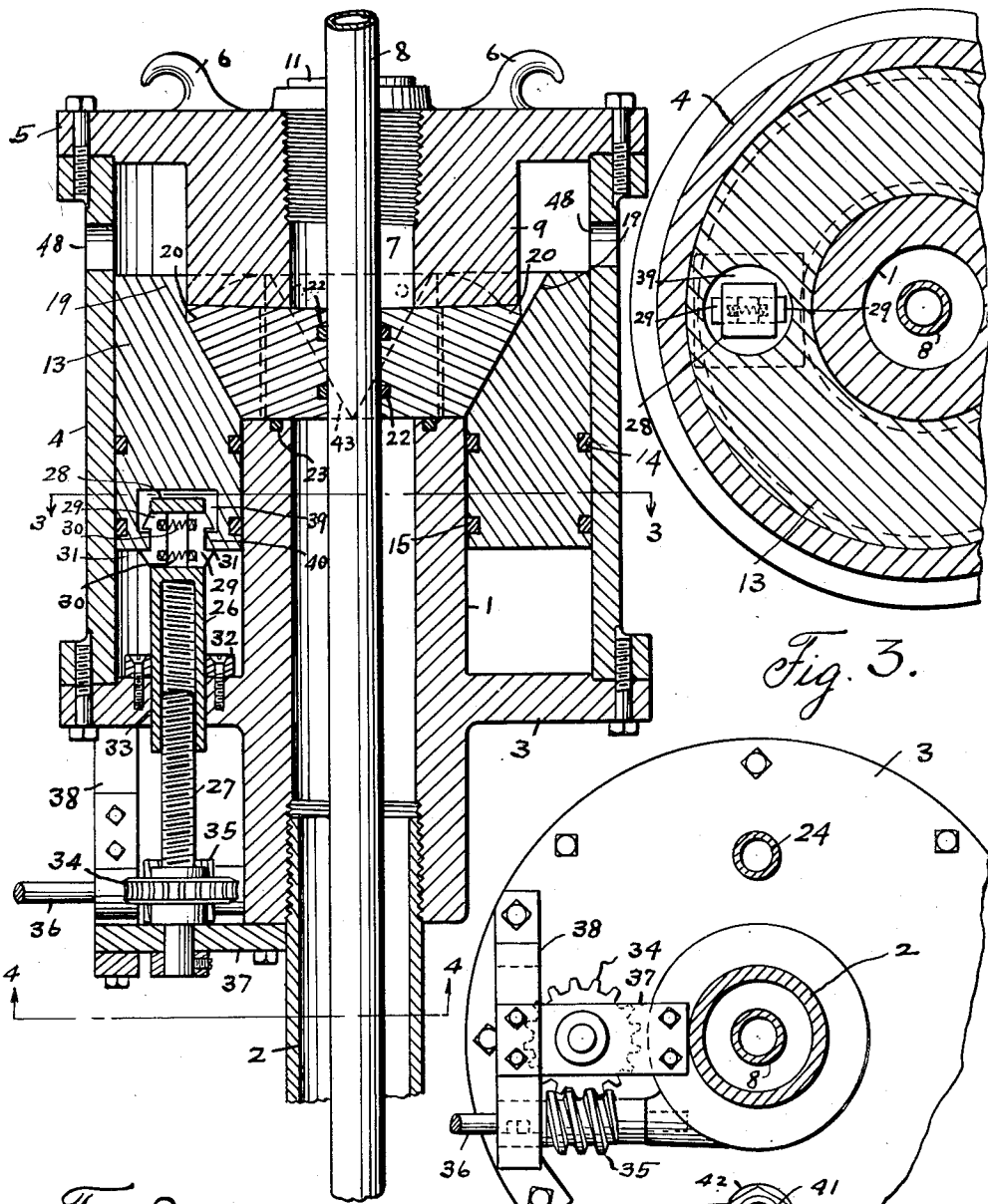


Fig. 2.

Fig. 3.

Fig. 4.

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3 Sheets-Sheet 3

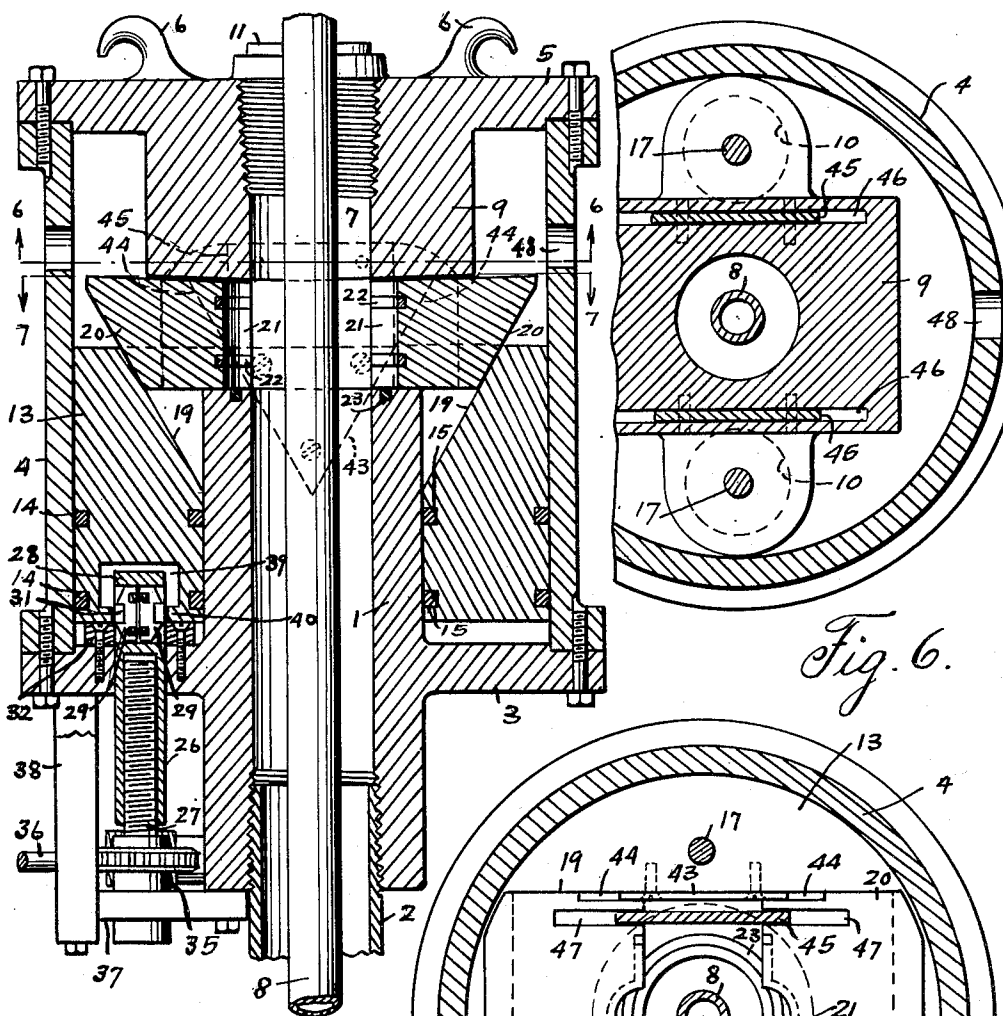


Fig. 5.

Fig. 6.

Fig. 7.

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BLOWOUT PREVENTER

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6 Claims. (Cl. 137—139)

This invention relates to a blowout preventer.

An object of the invention is to provide a blowout preventer adapted to be connected to the top of a well casing and provided with means for closing the space between the casing and the drill stem in case of a threatened blowout.

A further object of the invention is to provide a blowout preventer comprising a casing having radially movable heads therein whose confronting ends are shaped to closely surround the drill stem or other inner pipe when the heads are in active position, said heads being movable outwardly or into inactive position clear of the drill stem or other inner pipe so as not to interfere with drilling or other operations in the well.

The invention also comprehends novel means whereby an operating fluid under pressure may be employed to move said heads into either active or inactive positions.

A still further object of the invention is to provide novel means for securely locking the heads in said active position.

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 with the parts shown in active position, that is in position to close the space between drill stem or inner pipe and the casing.

Figure 2 shows a vertical sectional view taken at right angles to that shown in Figure 1.

Figure 3 shows a fragmentary cross sectional view taken on the line 3—3 of Figure 2.

Figure 4 shows a fragmentary cross sectional view taken on the line 4—4 of Figure 2.

Figure 5 shows a vertical sectional view showing the parts in inactive position.

Figure 6 shows a fragmentary cross sectional view taken on the line 6—6 of Figure 5, and

Figure 7 shows a cross sectional view taken on the line 7—7 of Figure 5.

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 tubular support which is adapted to be connected to, and to form an extension of the well casing 2. This support has an annular flange 3, preferably formed integrally therewith and bolted to which is the upstanding cylinder 4 forming a casing. The cylinder has the cover plate 5 bolted thereto. This cover plate has the oppositely arranged hooks 6, 6, forming

anchors for the attachment of lifting chains or cables for handling the same, and also has the central passageway 7 for the passage of the inner pipe or drill stem 8 therethrough. The cover plate has the tubular extension 9 depending therefrom and formed in said cover plate are the oppositely arranged cylinders 10, 10 whose upper ends are closed by the caps 11, 11 to which the inlet lines 12, 12 are connected for the inlet of an operating fluid into the cylinders 10.

There is a plunger 13 fitted closely around the tubular support 1 and fitting also closely within the cylinder 4. This plunger is equipped with the outer and inner rings 14 and 15 forming a close fit between the plunger 13 and the cylinder 4 and support 1 respectively. The plunger 13 is reciprocable between the lower end flange 3 and the inner ends of the cylinders 10 above.

Within the cylinders 10 are the pistons 16 which are fixed on the piston rods 17. These rods work downwardly through suitable bearings in the lower ends of the cylinders 10 and the lower ends of said rods are seated in sockets 18, 18, in the upper end of the plunger 13.

The upper end of the plunger 13 has the oppositely arranged upwardly flared guides 19, 19, in which the confronting heads 20, 20 are located. The outer ends of these heads are upwardly flared or tapered to conform to and to fit against the upwardly flared outer ends of the guides 19. The inner ends of these heads have the vertical half round grooves, or pockets, 21, 21, shaped to snugly receive the drill stem or inner pipe 8 when the heads are moved to active position as shown in Figure 2 and said inner ends also have the packing 22, 22 which closely surrounds said inner pipe as shown in Figure 2 to form fluid tight joints with the inner pipe when the heads 20 are in said active position. The upper end of the tubular support 1 also has an annular packing 23 arranged to form a fluid tight joint with the heads 20 when said heads are in active position as also illustrated in Figure 2.

While drilling or other operations are being carried on in the well the plunger 13 will be in its lower position and the heads 20 in their outer positions as illustrated in Figure 5. In case a blowout is threatened and it be desired to close the space between the outer casing 2 and the inner pipe or drill stem 8, an operating fluid may be admitted, through the pipe 24 into the bottom of the cylinder 4 beneath the plunger 13 and thereupon said last mentioned plunger will be forced upwardly and the heads 20 will be forced inwardly, into position to closely surround

the inner pipe or drill stem as shown in Figure 2. It will be noted from an inspection of Figures 2 and 5 that the upper faces of the heads 20 taper slightly inwardly and downwardly, or are slightly wedge shaped and the opposing faces of the extension 9 correspondingly taper so that said heads will move into active position with a wedging effect so as to form very close fits not only with the upper end of the support 1 but also with the lower end of the extension 9.

Means have been provided for locking or securing the plunger 13 in its upper position which will now be described. The numerals 26, 27 designate upper and lower sections of a shaft, said sections telescoping and having a threaded connection. The upper end of the section 26 is formed with a cage 28, in which the locking dogs 29, 29 are mounted. Between these dogs are the pressure springs 30, 30 which will normally hold them in outer position. The outer margins of these dogs have the notches 31, 31 and above and beneath these notches the dogs are tapered inwardly. Fastened on the flange 3 there is a plate 32 and the shaft section 26 works through a suitable bearing 33 which extends through the flange 3 and plate 32. Fixed to the lower end of the shaft section 27 there is a worm gear 34 and in mesh with this gear there is a screw gear 35 which is fixed on the horizontal shaft 36. The lower end of the shaft section 27 works through a bearing in the horizontal bar 37 whose inner end is bolted to the lower end of the support 1 and whose outer end is supported by the U-shaped bracket 38 which in turn is bolted to the underside of the flange 3. The lower end of the plunger 13 has a socket 39 provided with the inwardly extended flange 40.

When the plunger 13 is in its upper or active position the shaft 36 may be suitably turned to turn the screw gear 35 and the worm gear and this in turn will cause the shaft section 27 to rotate. The bearing 33 and the shaft section 26, fitted therethrough, are square in cross section so that as the shaft 27 is rotated in an appropriate direction, the shaft 26, having a threaded connection therewith, will be moved upwardly, and the cage 28 will enter the socket 39. When the sloping upper ends of the dogs 29 contact with the flange 40 said dogs will be forced inwardly placing the springs 30 under compression and when the notches 31 register with the flange 40 the dogs will be forced outwardly by said springs 30 and the flange 40 will be seated in said notches and the plunger 13 will be thereby locked against movement.

When it is desired to move the heads 20 into inactive position as shown in Figure 5, the valve 25 may be closed and the operating fluid may be introduced by suitable pipe connections into the cylinders 10 above the pistons 16 and said pistons and the plunger 13 will be thereby moved downwardly. As the plunger 13 is moved downwardly, the shaft 36 should be turned in an appropriate direction to run the section 26 downwardly on the section 27 and as the plunger 13 seats against the plate 32 the tapering lower ends of the dogs 29 will contact with said plate and said dogs will be forced inwardly and released from the flange 40 as shown in Figure 5. There is a relief pipe 41 leading outwardly from the lower end of the cylinder 4 and which is controlled by the valve 42. This valve 42 may be opened as the piston 13 moves downwardly to prevent the trapping of steam in the cylinder 4

beneath said plunger as well as to permit drainage of condensation from the cylinder 4.

Suitably fastened to the plunger 13 at opposite sides of the guides 19 are the wedge shaped plates 43, 43 with their apexes pointed downwardly as shown in Figures 2 and 5. The heads 20 are countersunk at opposite ends forming the downwardly tapering faces 44, 44. As the plunger 13 moves downwardly these wedge shaped plates 43 will ride against the correspondingly pitched faces 44, 44 and force the heads 20 outwardly into inactive position as shown in Figure 5.

There are the rectangular guard plates 45, 45 whose upper ends are fitted into the slots 46, 46 of the extension 9 and suitably secured therein. These guard plates extend down to the upper end of the tubular body 1 and are located in the oppositely disposed slots 47, 47 in the inner ends of the heads 20, 20. It will be noted that these guard plates bridge the space between said heads so as to prevent the slush or other foreign matter coming out of the well from passing into the cylinder 4 and interfering with the operating mechanism of the blowout preventer. They also serve as guides for said heads 20.

The cylinder 4 has the outlets 48 above the plunger 13 to permit the outlet and inlet of air upon the upward and downward movement of said plunger and also to permit the inlet and outlet of air upon the upward and downward movement of the pistons 16, the air passing into and from the cylinders 10, through the piston rod bearings at the bottom of said cylinders 10.

What I claim is:—

1. A blowout preventer comprising a casing adapted to be connected to the top of an outer pipe in a well, and having a central tubular support and a single cylinder around the support, radially movable heads in the casing whose facing ends are shaped to fit around an inner pipe in the support, a plunger in the cylinder, said plunger and the heads having coacting parts effective to move the heads radially in the cylinder upon longitudinal movement of the plunger therein, and means for applying an operating fluid, under pressure, to the plunger to operate the same.

2. A blowout preventer for closing the space between an outer pipe and an inner pipe in a well, comprising a tubular supporting body adapted to be connected to the top of the outer pipe, a casing supported on the body and having a single cylinder therein around the body; a plunger around the body and fitting in the cylinder, heads movably mounted in the casing and whose inner ends are shaped to closely surround the inner pipe said heads being movable into inner or active position, to close said space and movable into outer, or inactive position to open said space, said plunger and heads having co-acting parts effective to move the heads inwardly into active position when the plunger is moved in one direction and to move the heads outwardly or into inactive position, when the plunger is moved in the other direction and means through which an operating fluid may be applied, under pressure, to move the plunger in either of said directions.

3. A blowout preventer for closing the space between an outer pipe and an inner pipe in a well, comprising a tubular supporting body adapted to be connected to the top of the outer pipe, a casing supported on the body and having a cylinder therein around the body, a plunger around the body and fitting in the cylinder, heads movably mounted in the casing and whose in-

ner ends are shaped to closely surround the inner pipe said heads being movable radially into inner, or active position, to close said space and movable into outer, or inactive position to open said space, said plunger and heads having co-acting parts effective to move the heads inwardly into active position when the plunger is moved in one direction and to move the heads outwardly or into inactive position, when the plunger is moved in the other direction and means through which an operating fluid may be applied, under pressure, to move the plunger in either of said directions and means detachably connected to the plunger for locking the plunger to maintain the heads in said active position.

4. A blowout preventer for closing the space between an outer pipe and an inner pipe in a well, comprising a casing adapted to be attached to the outer pipe and having an inner tubular body and a cylinder, heads in the cylinder whose inner ends are shaped to fit closely about the inner pipe, said heads being movable inwardly to fit about the inner pipe and close said space and the heads being movable outwardly to clear said space, a single plunger in the cylinder around the body said plunger and heads having co-acting parts effective to move the heads inwardly upon movement of the plunger in one direction, means for applying an operating fluid, under pressure, to the plunger to effect such movement of the plunger, means on the plunger effective to move the heads outwardly upon movement of the plunger in another direction, means operable by an operating fluid, under pressure and effective to move said plunger in said other direction.

5. A blowout preventer for closing the space between an outer pipe and an inner pipe in a well, comprising a casing adapted to be attached to the outer pipe and forming a cylinder, heads in the cylinder whose inner ends are shaped to

fit closely about the inner pipe, said heads being movable inwardly to fit about the inner pipe and close said space and the heads being movable outwardly to clear said space, a plunger in the cylinder said plunger and heads having co-acting parts effective to move the heads inwardly upon movement of the plunger in one direction, means for applying an operating fluid, under pressure, to the plunger to effect such movement of the plunger, means on the plunger effective to move the heads outwardly upon movement of the plunger in another direction, means operable by an operating fluid, under pressure and effective to move said plunger in said other direction, and guard plates on opposite sides of the inner pipe for closing the spaces between the heads when the heads are in either of said positions, to prevent passage of the well liquid into the cylinder.

6. A blowout preventer for closing the space between an outer pipe and an inner pipe in a well, comprising a casing adapted to be attached to the upper end of the outer pipe and having a passageway for the passage of the inner pipe vertically therethrough, means in the casing shaped to fit closely about the inner pipe and movable into inner or active position to fit about the inner pipe and close said space and movable into outer or inactive position to clear said space, means in the casing arranged to be actuated by fluid under pressure and operative to move said closing means into said active position and other means arranged to be actuated by fluid under pressure and effective to move said closing means into inactive position and vertical guards on opposite sides of the inner pipe for bridging the spaces between said space-closing means when the latter are in inactive position, to prevent passage of well liquid from said passageway inwardly into the casing.

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