UNITED STATES PATENT OFFICE

WILLIAM L. PEARCE, OF HOUSTON, TEXAS

BLOW-OUT PREVENTER

Application filed September 15, 1930. Serial No. 481,990.

This invention relates to a blow out preventer.

One object of the invention is to provide apparatus for use in well drilling and the particular object is to provide a blow out preventer whereby a fluid tight seal may be formed between the outer pipe or casing and an inner pipe, such as a drill stem therein, in a well bore.

Another object of the invention is to provide a blow out preventer of the character described embodying a suitable housing on the well casing having upwardly tapering walls and confronting arcuate packing or sealing members adapted to form a seal between said upwardly converging walls and the inner pipe, and means controllable by pressure fluid for moving said sealing members into active position to form said seal about the inner pipe.

The invention further comprehends means for forming a permanent seal between the inner pipe and the well casing when the escape of pressure fluid in the well has been placed under control by the blow out preventer hereinabove referred to.

The apparatus referred to and hereinafter more specifically described is primarily intended to prevent the escape of fluid under pressure which is encountered in a well bore in carrying on drilling or producing operations.

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

Figure 1 shows the side elevation, partly in section, of the apparatus installed on a well casing, and

Figure 2 shows a cross sectional view, taken on the line 2—2 of Figure 1.

In the drawing the numeral 1 designates a well casing as set in a well bore. Attached to the upper end of this casing by the coupling 2 there is a housing, designated generally by the numeral 3 and composed of the upper and lower sections 4, 5. The upper section 4 tapers upwardly, that is, it is substantially conical in contour, and whose upper end has the cylindrical shaped internally threaded neck 6 with the internal annular flange 7 at the lower end of said neck, said parts 4, 6 and 7 being preferably formed integrally together. The upper end of the lower section 5 has an outwardly and upwardly flared portion 8 and the lower margin of the upper section 4 and the outer margin of the outwardly flared portion 8 are formed with coinciding annular flanges 9 and 10 which fit together and are secured together by means of the marginal bolts 11.

There are the confronting arcuate packing or sealing members 12, 12 shaped to conform to the contour of and to fit closely around the inner pipe 13 and whose outer sides conform in shape to the upwardly tapering inside wall of the housing section 4. There are the guide rods 14, 14 whose upper ends are fitted into suitable bearings in the flange 7 and whose lower ends are threaded into the outwardly flared portion 8 of the housing, said guide rods being arranged parallel with the inner walls of the section 4 and fitting through suitable bearings in the packing members 12 and on which said members slide. These packing members 12 are preferably formed of tough rubber and their lower ends are reinforced by suitable metal plates 15, 15.

Anchored to the underside of the outwardly turned portion 8 of the lower section 5 there are the oppositely arranged fluid pressure cylinders 16, 16. In a preferred form of the construction the upper ends of these cylinders may be screwed into the heads 17, 17 which have the outwardly turned ears 18, 18 to receive corresponding clamp bolts 11 and these heads may be additionally secured in place by means of set bolts as 19 which are inserted through the outwardly turned portion 8 and screwed into said respective heads. In the cylinders are the pistons 20 which are connected to the lower ends of the piston rods 21. These rods work through suitable stuffing boxes 22 and their upper ends work against, but are not necessarily connected to, the reinforcing plates 18. These piston rods
work substantially parallel to the corresponding guides 14. There is a fluid pressure inlet line 23 preferably a steam line leading from a suitable source which has the branches 24, 24 controlled by a conventional three-way valve 25 which is located at a convenient distance from the well so that it may be manipulated with safety in case of a blow out. One of the branches 24 is connected into the delivery line 26 which in turn is connected into the outer ends of the cylinders 16. The other branch 24 is connected into a delivery line 27 which in turn is connected into the inner ends of said cylinders 16. When the valve 25 is manipulated into one position it will permit the delivery of fluid under pressure into the line 26 and thence into the outer ends of the cylinders 16 and the pistons 20 will be thereby driven upwardly forcing the sealing members 12 upwardly and inwardly, closely about the inner pipe to form a close seal to prevent the escape of internal pressure from the well around the inner pipe 13. When said sealing members 12 are in said seated position the inner pipe 13 may be lowered through the blow out preventer and the external couplings connecting sections of said inner pipe may be passed through between said sealing members 12 and a tight joint still maintained to prevent the escape of internal pressure. In order to permit a coupling to so pass through the sealing members the upper ends of said members are beveled inwardly as at 28 to facilitate such passage. When the valve 25 is manipulated into another position, the pressure fluid will be permitted to pass into the delivery line 27 and thence into the inner ends of the cylinders and the pistons 20 will be thereby forced outwardly thus permitting the release of the sealing members 12 from about the inner pipe. As the plungers 20 are moved in either direction the pressure fluid ahead of them may be relieved through the relief outlet 29. The valve 25 may be manipulated into position to close the supply line 23 and thus shut off the supply of steam to the cylinders.

When the blowout preventer is in closed position the internal pressure in the well may be relieved through line 30 leading out from the casing beneath the preventer and controlled by a suitable valve 31.

That portion of the mechanism hereinabove described may be used while drilling operations are being carried on and while said operations are being carried on the sealing members 12 will be in their downward and outward position to not interfere with drilling operations but in case a blow out is threatened the valve 25 may be manipulated to admit steam into the outer ends of the cylinders 16 so as to close the passageway about the inner pipe and prevent such blow out.

Within the neck 6 and seated on the flange 7 there is a metal ring 32 whose inner side is upwardly flared forming the seat 33 and closely surrounding the inner pipe there is an annular sealing member 34 preferably formed of resilient material such as rubber whose inner side fits closely around said pipe and whose outer side is tapered to conform to the contour of and to fit closely against the seat 33. When a permanent seal is desired about the inner pipe 13, as when the well has been completed and the screen and packer are set a gland as 35 may be threaded down into the neck 6 against the packing ring 34 so as to compress the same inwardly against the inner pipe and outwardly against the inner wall of the neck 6 so as to form a permanent seal about said inner pipe. The gland 35 is preferably formed of two vertical sections, each section having dowel pins 36 on one side and sockets as 37 on the other side, the dowels of one section fitting into the sockets of the other section to hold these gland sections in alignment so that the gland may be screwed into the neck 6. The upper end of the gland is enlarged as at 38 and has the upwardly flared seat 39 to receive suitable pipe engaging slips as 40 which may be inserted around, and which will engage with, the inner pipe to hold it at any desired place. Surrounding the upper end of the gland 35 there is a band 41 provided to prevent the gland sections from spreading. When the permanent seal has been set as above explained the sealing members 12 will then serve no further function and the steam may be relieved from the cylinders 15 and said sealing members permitted to move into neutral or inactive position.

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 blow out preventer for forming a seal between an outer casing and an inner pipe in a well bore and comprising a housing on the casing and having an upwardly tapering inside seat around the inner pipe, guides extending from the lower to the upper end of the housing substantially parallel with and extending, confronting said members in the housing movably on said guides into active position to close the passageway between said casing and inner pipe and into inactive position to open said passageway, said sealing members being formed of resilient material throughout and being shaped to fit around the inner pipe and against said seat to form a fluid tight joint when in said active position, rigid plates forming seats for said sealing members, means associated with the housing and operable by fluid under pressure against said plates and effective to move said sealing means into said active position and to...
release the same to permit said sealing means to move into said inactive position and means for controlling the application of pressure fluid to said moving means.

2. A blow out preventer for forming a seal between an outer casing and an inner pipe in a well bore and comprising a housing on the casing having a tapering seat around the inner pipe and having inwardly extended rod anchors above and beneath said seat, confronting sealing members in the housing movable into active position about the inner pipe and into inactive position away from said inner pipe, said sealing members being formed of packing material and having reinforcing end plates and being shaped to fit closely between said seat and pipe, when in said active position, to completely close the passageway between the casing and inner pipe, rods on which the sealing members slide, said rods having their upper and lower ends anchored to said upper and lower anchors.

3. A blowout preventer for forming a seal between an outer casing and an inner pipe in a well bore and comprising a housing formed with upper and lower sections, said upper section tapering upwardly forming an inside upwardly tapering seat having an internal projection at the upper end thereof forming an anchor, the upper end of the lower section having an outwardly and upwardly flared portion, said upper and lower sections having coinciding annular flanges, cylinders on the outwardly turned portion of said lower section having heads provided with outwardly turned ears, bolts through said ears and said coinciding flanges whereby said upper and lower sections and said cylinders are secured together, confronting sealing members in the housing movable into active position to close the passageway between the housing and an inner pipe therein and movable into inactive position to open said passageway, said sealing members being shaped to fit around the inner pipe and against said seat to form a fluid tight joint when in active position, pistons in said cylinders, piston rods on the pistons operative against said sealing members, means for introducing fluid pressure into and relieving the same from said pistons on either side of said pistons, rods secured to said anchor and to said outwardly turned portion on which said sealing members slide.

In testimony whereof I have signed my name to this specification.

WILLIAM L. PEARCE.