April 22, 1952 L. L. RECTOR 2,593,793

RAM-TYPE TUBING HEAD

Filed April 21, 1947 2 SHEETS—SHEET 1

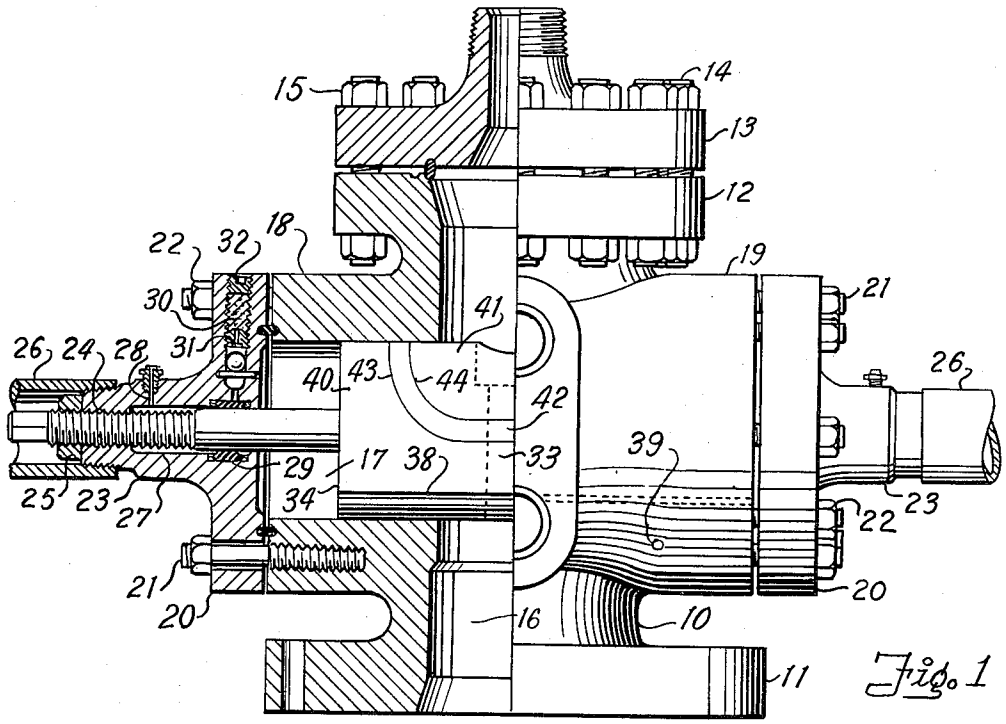


Fig. 1

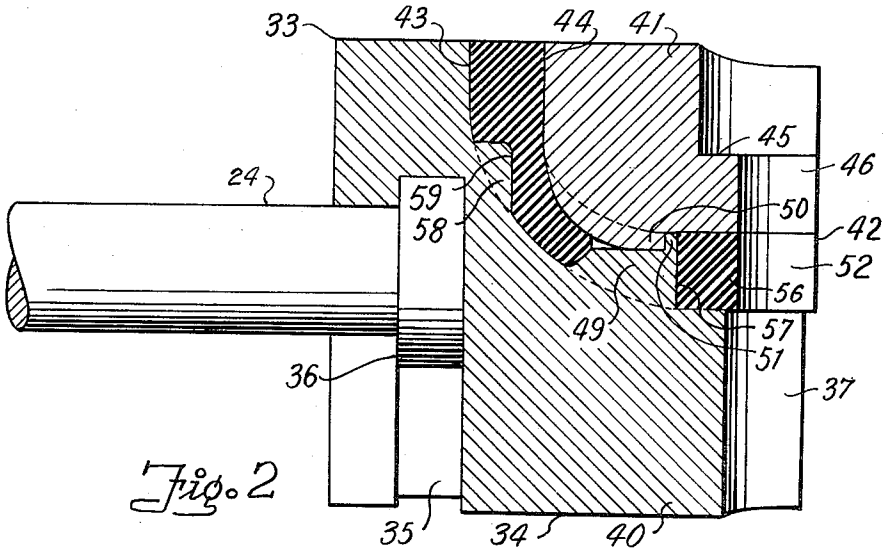


Fig. 2

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RAM-TYPE TUBING HEAD

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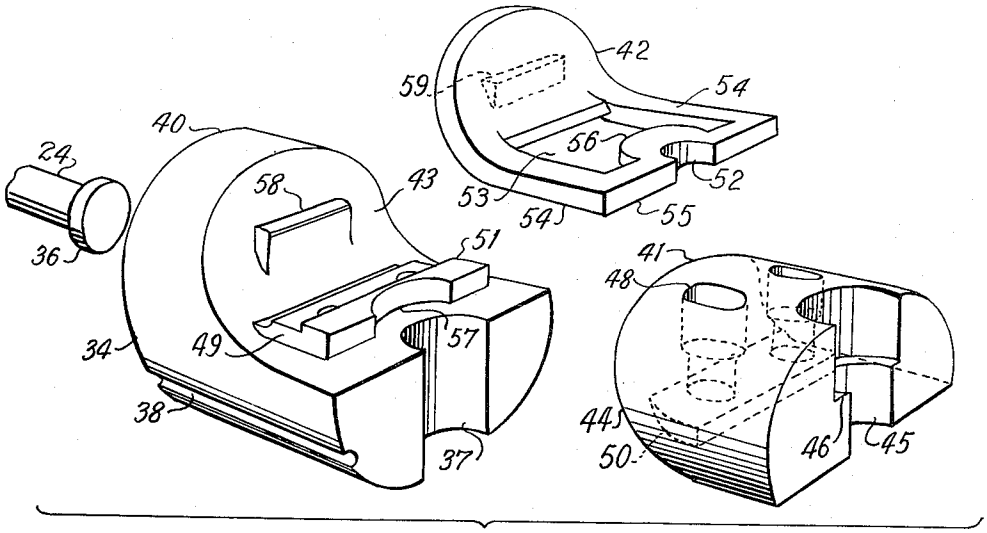


Fig. 3

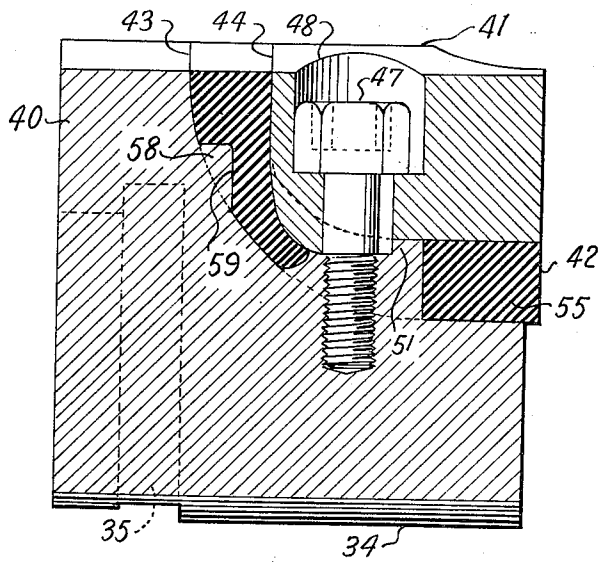


Fig. 4

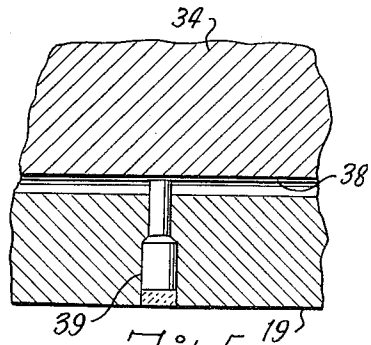


Fig. 5

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RAM-TYPE TUBING HEAD

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9 Claims. (Cl. 251—55)

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This invention relates to new and useful improvements in tubing heads and more particularly to ram-type tubing heads, known as "blow-out preventers."

One object of the invention is to provide an improved tubing head of the ram-type having a removable ram and bonnet structure to facilitate replacement of the ram when well pipes of different diameters extend through the head, together with means for preventing rotation of said ram.

Another object of the invention is to provide an improved ram-type tubing head having packing means carried by its rams and arranged in such manner as to be urged into sealing position upon inward movement of the rams into engagement with a well pipe.

A particular object of the invention is to provide an improved tubing head, of the character described, having sectional rams with packing means confined between the sections of each ram, one ram section being movable relative to the other section so as to distort the packing means into positive sealing engagement with the well pipe upon inward movement of the rams.

A further object of the invention is to provide an improved ram adapted for use in a tubing head and having a one-piece packing extending transversely across its inner end and around its upper portion, the ram having longitudinally movable means overlying and confining the packing and normally projecting beyond the inner end of said ram whereby the confining means initially engages the well pipe upon inward movement of the ram so as to distort said packing into sealing position.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing, wherein an example of the invention is shown, and wherein:

Fig. 1 is a side elevational view, partly in section, of a ram-type tubing head constructed in accordance with the invention,

Fig. 2 is a longitudinal, vertical, sectional view of a ram embodying the features of the invention,

Fig. 3 is an exploded perspective view of the ram,

Fig. 4 is a vertical, sectional view of the ram, taken through one of the fastening bolts, and

Fig. 5 is a detailed, sectional view, showing the means for preventing rotation of the ram.

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In the drawings, the numeral 10 designates a substantially cylindrical housing or body having base and top flanges 11 and 12 by means of which it may be connected in a well head assembly (not shown). A flanged bonnet or cap member 13 is shown fastened to the top flange 12 by suitable stud bolts 14 and nuts 15. The housing 10 has an axial bore or passage 16 which is intersected by a transverse bore or passage 17. Diametrically-opposed lateral projections 18 and 19 are formed on the housing and co-act with the transverse passage 17 to provide ram chambers or cylinders. For closing the outer ends of the transverse passage 17, a flanged cap or bonnet 20 overlies the end of each of the projections 18 and 19 and each bonnet is secured in position by suitable stud bolts 21 and nuts 22. A tubular extension or neck portion 23 is carried by each bonnet 20 and has a spindle 24 screw-threaded therein so as to be movable relative to the bonnet upon rotation thereof. A lock nut 25 is screw-threaded upon the outer portion of the spindle for bearing against the end of the neck 23 to maintain said spindle in adjusted positions. The projecting extremity of the spindle 24 may be enclosed within a removable cap 26 which is screw-threaded upon the bonnet neck.

In order to seal off between the spindle 24 and the bonnet, an annular recess 27 is formed in said bonnet circumferentially of said spindle and has a lateral port 28 communicating therewith whereby a suitable lubricant or grease may be forced into the recess. The inner portion of the spindle, which projects through the bonnet into the transverse passage 17, has a smooth exterior unbroken by screw-threads and the surrounding portion of the recess 27 is enlarged to receive a packing element or ring 29. To maintain the packing ring 29 in sealing position, a plastic packing or lubricant may be forced into engagement therewith through a lateral port 30 which has a check valve 31 disposed therein and which is closed by a suitable plug or fitting 32. By this arrangement, the packing ring may be maintained under a pressure in excess of the pressure encountered in the well so as to prevent leakage around the spindle.

A ram or plunger 33, including a substantially cylindrical body 34, is slidably mounted in each ram chamber or cylinder. As is clearly shown in Fig. 2, a radial T-slot 35 is formed in the outer end or face of each ram body 34 for receiving a circular head 36 formed on the inner end of its spindle 24. This construction facilitates removal of the ram with the bonnet and spindle and disconnection of the ram body from said spindle to

permit the substitution of a different size or type of ram body. A diametric semi-circular recess or groove 37 is formed in the inner end or face of each ram body and these grooves co-act to close about a string of pipe or tubing extending through the bore 16 of the housing 10. Due to the screw-threaded connection of each spindle 24 to its bonnet 20, it is manifest that each ram is reciprocated within its cylinder by rotation of its spindle. In order to prevent rotation of the ram, a longitudinal groove 38 is formed in the ram body adjacent its lower portion and is engaged by a guide pin 39 which projects inwardly through the wall of each lateral projection 18 and 19 (Figs. 1, 3 and 5).

Each ram body 34 is preferably formed of two co-acting sections or segments 40 and 41 having a packing member or element 42 confined therebetween. The sections 40 and 41 have contiguous surfaces 43 and 44, respectively, which extend horizontally of the body from its inner end or face, then outward longitudinally of said body, and at a point intermediate its ends the surfaces are curved upwardly. Substantially vertical or radial portions extend from the curved portions to the periphery of the body. In other words, the upper section 41 overlies the inner portion of the main section 40 so as to be supported by the latter (Fig. 3). A semi-circular recess or groove 45 is provided in the exposed end or face of the upper section to form a continuation of the groove 37 and the upper portion of the groove 45 is enlarged to provide a semi-circular shoulder 46. A seat for receiving a coupling and supporting a string of pipe (not shown) is formed by the coaction of the shoulders 46 of the rams. The contiguous surfaces 43 and 44 of the body sections are substantially complementary and said sections are connected by a pair of shoulder bolts or screw-threaded pins 47, which are screw-threaded into the lower section 40 (Fig. 4). Elongated openings or slots 48 are formed in the upper body section and extend longitudinally of the ram body whereby said upper section may undergo limited longitudinal movement relative to the main body section. As is most clearly shown in Figs. 2 and 3, this relative movement of the upper section is limited by coacting projections or shoulders 49 and 50 formed on the contiguous section surfaces 43 and 44, respectively, and extending transversely to points adjacent their lateral margins. The lower shoulder 49 is angular in cross-section to provide a lip or keeper 51 for engaging the forward edge portion of the upper shoulder 50.

As set forth hereinbefore, the packing member or element 42 is confined between the sections of the ram body. The packing member is preferably of reinforced rubber, or other suitable material, and is of a contour generally conforming to the contiguous surfaces of the sections. A semi-circular recess or groove 52, similar to the grooves 37 and 45 of the sections, is formed in the forward edge portion of the packing member and an opening or cut-out 53 is formed in its horizontal or longitudinal portion for accommodating the shoulders 49 and 50 of said sections. Due to the provision of the opening 53, lateral marginal leg portions 54 are provided and are connected by a forward transverse marginal leg portion 55. The latter has a curved medial portion 56 to accommodate the groove 52 and this portion engages within a complementary recess 57 formed in the forward edge portion of the shoulder 49. Thus, the forward leg portion 55 of the packing member extends across the inner face of the ram body and the lateral leg portions 54 extend longitudinally of the exterior of said body. The remainder or outer portion of the packing member is confined between the upright or radial, contiguous surface portions of the sections. Due to the projection of the shoulders 49 and 50 into the opening 53, the packing member is prevented from being displaced when the rams are in pipe-engaging position. Additional means for preventing displacement of the packing member is provided in the form of a horizontal projection or shoulder 58 on the radial surface portion of the main body section and a coacting recess 59 in the adjacent surface of said packing member.

Each upper section 41 normally has its exposed face projecting inwardly beyond the inner face of its main section 40 and the packing member 42 has its inner edge portion aligned with said upper section so as to also project beyond said lower section as shown in Figs. 2 and 4. Thus, when the rams are moved into pipe-engaging position, the upper sections and packing members initially engage the pipe. Due to the loose connection of these sections, upon engaging the pipe, the same move outwardly in a longitudinal direction relative to their lower sections. This movement of the upper sections results in distortion or flowing of the packing members in substantially all directions. At the same time, the inner end portion of each packing member is distorted by its engagement with the pipe and the packing member of the other ram. Since each packing member is wholly confined between the ram sections, its distortion assures a positive seal between the pipe, ram and the bore 16 of the housing 10. Thus, pressure fluid within the well head assembly is prevented from by-passing the ram. Although the pressure fluid enters the transverse passage 17, the latter is sealed off by the packing rings 29 and the engagement of the packing members 42 with the wall of said passage.

From the foregoing, it is manifest that an improved ram-type tubing head has been provided. The packing of the ram is arranged in such a manner that it efficiently seals off around said ram. Due to the projection of the upper ram section, the packing is distorted and urged into positive sealing position. Upon retraction of the ram, the loose connection between the ram sections permits the return of the upper ram section to its inwardly projecting position and the movement of the packing to an undistorted position. It is pointed out that the packing normally seals about its ram irrespective of whether said packing is distorted or undistorted and the distortion of the same merely urges or maintains the same in sealing position.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. A tubing head including, a housing having a vertical axial bore and an intersecting transverse passage, rams slidably confined within each end portion of the passage on opposite sides of the bore adapted to engage a tubing in said bore, actuating means connected with each ram, each ram being divided thereacross into a lower section and an upper section, said lower and upper

sections having complementary faces extending across the same and curving longitudinally and upwardly from the inner end of each ram to the top thereof, the face of each upper section overlying and being spaced from the underlying face of the bottom section thereunder, packing across each ram confined between the faces of the sections of each ram and extending longitudinally and upwardly from the inner end to the top thereof, the upper section of each ram being movably connected to the lower section and capable of movement longitudinally and separately from the lower section to distort the packing into sealing engagement with the bore of the passage, the wall of the bore and the tubing.

2. A tubing head as set forth in claim 1, including retaining means on the underlying section engaging the packing to prevent undue displacement of said packing upon distortion thereof.

3. A tubing head ram including, a non-rotatable cylindrical body comprising a lower section occuping the entire length of the body and an upper section occupying the inner upper corner portion of said body, the sections having opposing upwardly curved surfaces thereacross extending from the inner end of the body to the top thereof, a broad pad-like elastic packing disposed between and across the curved surfaces of the ram sections exposed along its entire edge portions, the free ends of the sections having exposed upright grooves intersected by one end of said packing, and an attachment between the upper and lower sections loosely engaging the upper section to permit independent movement of the upper section longitudinally of the body.

4. A tubing head ram as set forth in claim 3, wherein the lower section of the body is rigid throughout its length and the upper section is yieldable and normally extends beyond the lower section at its free end.

5. A packing member for a sectional tubing head including, an elastic pad-like member of approximately uniform thickness adapted to be curved longitudinally and upwardly from end to end and having a medial recess in its lower end, said member having an interior opening extending thereacross and therethrough and an elongate recess thereacross in its under side adjacent its upper end.

6. A ram-type tubing head including, a housing having a vertical bore therethrough and horizontally alined passages on each side of said bore, cylindrical ram bodies deposed in opposed

relation in said passages adapted to be moved longitudinally toward each other into said bore, each ram body being held against rotation and including a lower section extending the entire length of the body having an uncovered upright groove in its inner end and an upper ram section occupying the upper inner corner portion of said body and having a groove in its free end, each body having a space extending thereacross between its sections curved upwardly from the inner end of the body toward and through the upper portion of the cylindrical surface of said body, elastic packing members of approximately uniform thickness, each disposed in one of said spaces and extending from the inner ends of the sections of each body to the upper surfaces of said body and having an enlarged opening therethrough, and a fastening attaching the upper section of each body to the lower section thereof including protruding surfaces of the upper and lower sections engaging each other through the opening of the packing member.

7. A ram-type tubing head as set forth in claim 6, wherein the upper section and its protruding surface of each body is movable longitudinally of the lower section to compress the packing member.

8. A ram-type tubing head as set forth in claim 6, wherein each lower section has an upstanding bolt with its head loosely confined in the upper section, whereby each upper section is longitudinally movable of its lower section and with respect to each packing member.

9. A ram-type tubing head as set forth in claim 6, wherein the sections of each body have protruding shoulders disposed to engage when the upper section of a body is moved longitudinally to overhang the lower section and whereby the packing member is compressed when the upper member is moved longitudinally and inwardly of its underlying section.

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