March 18, 1952 J. E. ECKEL ET AL 2,589,483

WELLHEAD

Filed April 6, 1946 2 SHEETS—SHEET 1

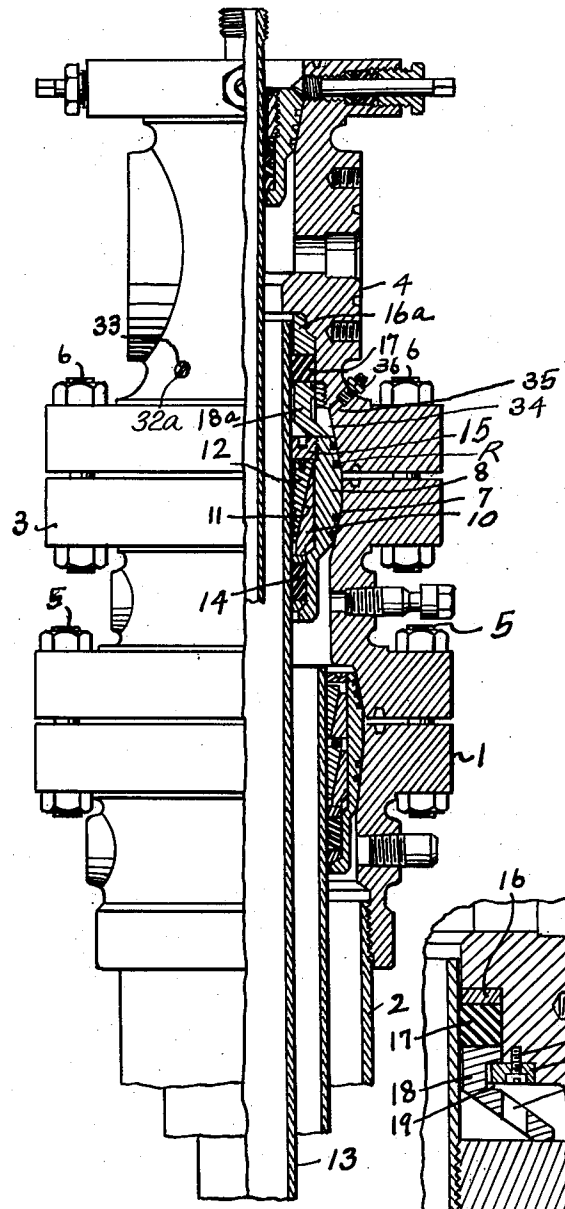

Fig. 1.

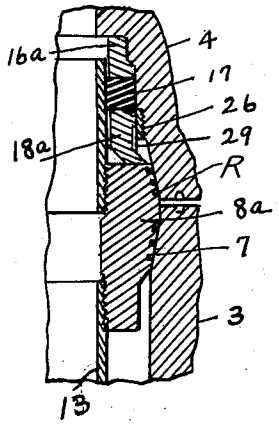

Fig. 2.

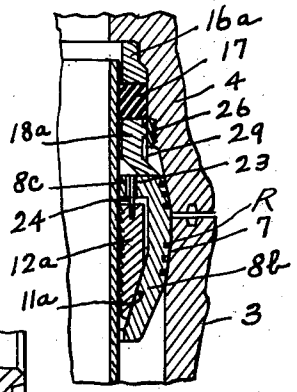

Fig. 3.

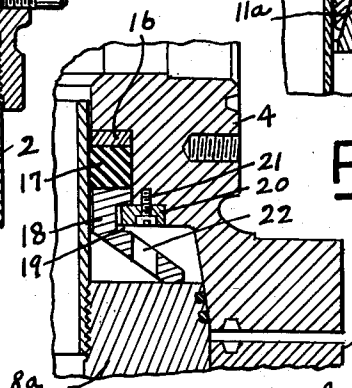

Fig. 4.

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March 18, 1952 J. E. ECKEL ET AL 2,589,483

WELLHEAD

Filed April 6, 1946 2 SHEETS—SHEET 2

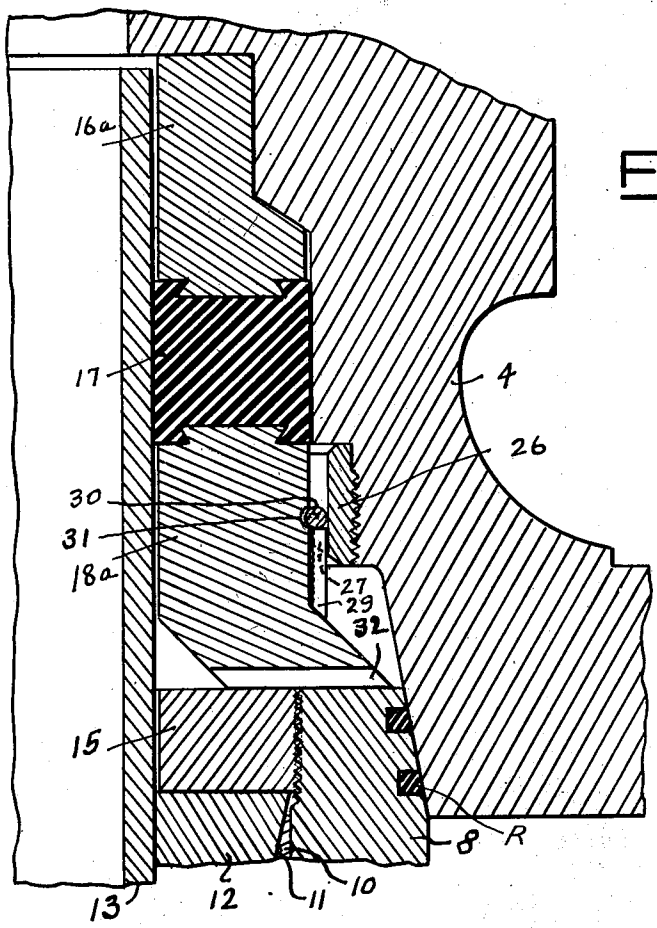

Fig. 5.

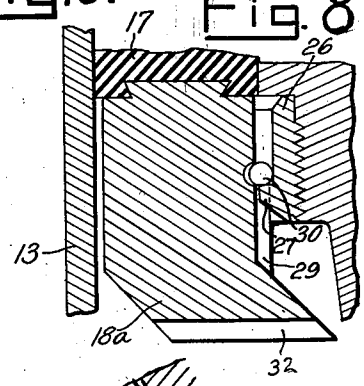

Fig. 8

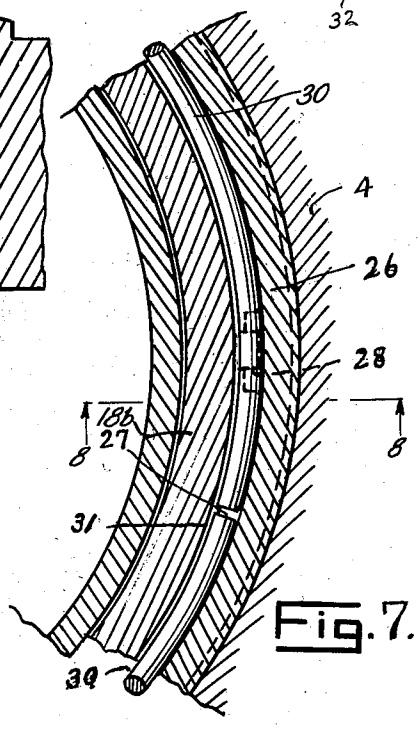

Fig. 7.

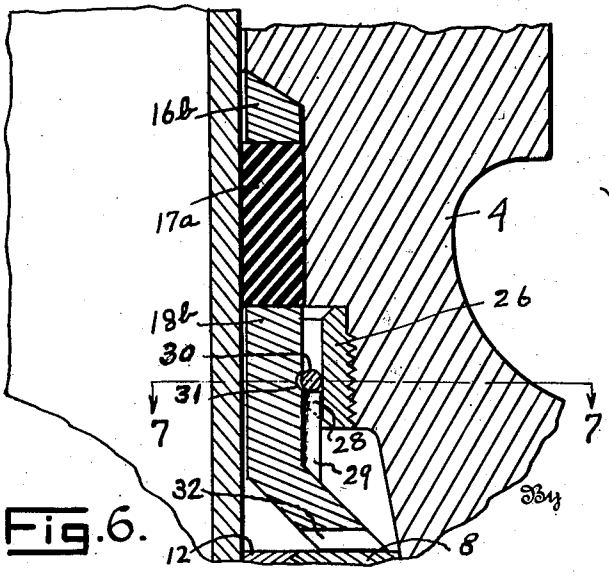

Fig. 6.

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2,589,483

WELLHEAD

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7 Claims. (Cl. 166—14)

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This invention relates to a well head.

An object of the invention is to provide in a well head, composed of upper and lower tubular members, novel means for forming a seal between the upper end of a casing, suspended in the lower head member, and the upper head member.

It is a further object of the invention to provide in a well head assembly embodying a casing head and a tubing head mounted thereon and secured thereto, a novel type of seal between the upper end of the casing, supported by the casing head, and the base of the tubing head, said sealing means being of such construction that the seal ring, or packing, therein will be compressed when the heads are drawn together by the securing means such as bolts connecting the flanges of the heads.

It is a further object of the present invention to provide a novel type of sealing assembly which may be installed, or removed, as a unit and which is designed to form a seal between the base of the tubing head and the upper end of a casing which is supported from the casing head and extended up into the tubing head.

It is a further object of the invention to provide, in a well head, a sealing assembly designed to form a seal between the upper end of the well casing and the tubing head which may be readily adapted for use in connection with casings of different diameters and which is of such construction that it may be readily removed, or installed, by means available at the location where the well head is in use.

The invention herein disclosed constitutes certain improvements over that type of producing equipment for wells disclosed in Patent No. 2,335,355 issued by the United States Patent Office on November 30, 1943.

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

Figure 1 is a side elevation of a well head shown partly in section and embodying one form of the invention.

Figure 2 is an enlarged, fragmentary, vertical, sectional view embodying another form of casing hanger.

Figure 3 is an enlarged, fragmentary, vertical, sectional view showing still another form of casing hanger.

Figure 4 is an enlarged, fragmentary, vertical, sectional view illustrating another embodiment of the sealing assembly.

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Figure 5 is an enlarged, fragmentary, vertical, sectional view of the type of casing hanger and sealing assembly shown in Figure 1, but showing the seal ring bonded to the adjacent metal parts.

Figure 6 is an enlarged, fragmentary, vertical, sectional view of the assembly illustrated in Figure 5 adapted for a larger size of casing.

Figure 7 is an enlarged, fragmentary, sectional view taken on the line 7—7 of Figure 6; and

Figure 8 is a sectional detail taken on the line 8—8 of Figure 7.

Referring now more particularly to the drawings wherein like numerals of reference designate the same parts in each of the figures, the numeral 1 designates the braden head which may be secured to the upper end of the surface casing 2 and mounted on which there is the casing head 3.

Supported on the casing head there is a tubing head 4. The heads 1, 3 and 4 are of tubular formation and their adjacent ends have external registering flanges which may be secured together in any preferred manner. As shown they are secured together by the series of lower and upper bolts 5, 6 having clamp nuts screwed on to their respective ends to draw the heads together.

As illustrated in Figure 1 the casing head has an inside downwardly tapering seat 7 whereon the tubular housing 8 is mounted. The housing contains an annular slip bowl 10 having a downwardly converging inside seat 11 and within said seat are the wedge shaped pipe engaging slips 12 which engage with, and support, an inside well casing 13. The slip bowl is mounted on an annular sealing assembly 14 which is located within the lower end of said bowl and which surrounds the casing 13.

The slips may be secured and retained, in engagement with the casing by means of a ring nut 15 which is screwed into the upper end of the bowl and abuts the upper ends of the slips.

The housing 8 extends above the casing head and the lower end of the tubing head is fitted thereof as clearly shown in Figures 1 and 5. The housing has external annular seal rings R countersunk therein and located between it and the casing head and tubing head, respectively, as is clearly shown in Figures 1 and 5.

In this type of well head the base, or lower end, of the tubing head is internally counterbored and the upper end of the casing 13 extends up into the tubing head.

Within the counterbore of the tubing head there is a sealing assembly as illustrated in Figure 4, this sealing assembly comprising an upper, annular junk ring 16, an intermediate seal ring 17, formed of rubber or other sealing material, and a lower annular compression ring 18 which is flared outwardly and downwardly and rests on the casing supporting means beneath. This compression ring 18 has an external annular groove 19 and secured to the tubing head 4 and extending radially inwardly there is an annular locking ring 20. This ring 20 may be secured to the tubing head by means of the set screws 21 and suitable openings 22 are provided in the outwardly flared portion of the compression ring for the insertion of a screw driver to insert or remove the screws 21 in assembling the sealing assembly. The locking ring 20 may be composed of sections for insertion and removal. Its inner margin projects into the groove 19 and when installed will maintain the sealing assembly in its proper position in the tubing head.

In the embodiment illustrated in Figure 2 the casing hanger is in the form of a coupling 8a which seats on the seat 7 and over which the lower end of the tubing head 4 is seated. In the form illustrated in Figure 3 there is a housing 8b which is seated on the seat 7 of the casing head 3 and over the upper end of which the tubing head 4 is seated. This housing 8b has an inside downwardly tapering seat 11a on which the wedge shaped, casing engaging slips 12a are seated. The housing 8b has an inwardly extended flange 8c at its upper end provided with the vertical openings 23 through which the rods 24, which are screwed into the slips 12a, extend loosely.

The external contour of the coupling 8a and of the housing 8b are the same as that of the housing 8 so as to form seals with the casing head and tubing head.

There is another type of sealing assembly which is illustrated in Figures 1, 3 and 5 to 7, inclusive. This sealing assembly embodies the upper junk ring 16a which is supported on the seal ring 17 and the seal ring, in turn, is supported on the compression ring 18a which is of approximately the same shape as the compression ring 18 and which is supported on the casing supporting means beneath. There is an externally threaded ring nut 26 and the tubing head has an internally threaded section into which said ring nut may be screwed. This ring nut has an internal, annular flange 27 at its lower end which has one or more vertical key ways 28. The compression ring 18a of this assembly has an external vertical key 29 for each key way 28. This key may be welded or otherwise secured to the compression ring and fits into the key way 28 and the ring nut 26 and the corresponding compression ring may be retained together as a unit by means of an open ring 30 which may be snapped into an external, annular groove 31 in the compression ring above the key, or keys, 29 so as to maintain the compression ring and ring nut as a unit for convenience in installing, or removing the same.

As is illustrated in Figures 5 and 6, the compression ring may have a transverse groove 32 cut across its lower end to receive a spanner wrench to be used in the removal or installation of this form of the sealing assembly.

In assembling the device shown in Figures 5 to 7, the junk ring 16a, seal ring 17 and compression ring 18a are, of course, interconnected since the seal ring 17 is molded to the parts 16a and 18a. The ring nut 26 is then engaged over the assembly and has its keyways 28 engaged with the vertical keys 29 of the compression ring 18a. The ring nut is moved to its lowermost position with respect to the compression ring, and in such position the split ring 30 may be engaged about the compression ring 18a and disposed within the groove 31 thereof; thereafter, the ring 26a is moved upwardly to substantially the position shown in Figure 5 and the ring 30 limits the downward movement of the compression ring with respect to the ring nut. Upward movement of the parts is prevented by the flared lower end of the compression ring 18a striking the lower end of the nut 26. It is thus obvious that the parts are connected as a unitary structure and may thereafter be inserted within the recess in the lower portion of the tubing head. As explained, threading of the ring nut 26 is possible because the compression ring is connected through the keys 29 and keyways 28 with the nut and a rotation of the compression ring will thread the ring nut into position.

If desired the junk ring above the seal ring 17 and the compression ring beneath may be bonded in any approved manner, with said seal ring so that the entire packing assembly may be installed or removed as a unit. This is illustrated in Figure 5 wherein the junk ring and compression ring are dovetailed into the seal ring. It is obvious, however, that these parts may be secured together in any other approved manner.

By observing Figure 1, it will be evident that when the two heads 3 and 4 are drawn together by the bolts 6, the compression ring 18a is engaged by the coupling 8 and since the compression ring may undergo independent movement with respect to the ring nut 26, connection of the heads will apply a compressive force to the seal ring 17. The arrangement thus makes it possible to assure movement of the sealing ring into sealing position when the heads are bolted together.

It is usually desirable to test the seals before the well is brought in. Means providing for this test is illustrated in Figure 1 wherein the tubing head is provided with a bleeder port 32a which is normally closed by a removable plug 33. This port 33 leads into a chamber 34 between the upper seal ring 17 and the lower seals between the casing supporting means and the tubing head and between the casing supporting means and the casing. This chamber 34 is also provided with a test port 35 having a connection 36 screwed into the outer end thereof. In making the test a pressure hose may be connected to the connection 36 and pressure fluid, such as oil, introduced into the chamber 34. While this is being done the plug 33 should be removed to permit the escape of all air from the chamber 34 and the said plug should be replaced and pressure applied to the liquid filling the chamber 34. The pressure line should be equipped with a pressure gauge and if the upper or lower seals leak it will be indicated by the gauge. If after the test is made the gauge does not indicate leakage of the seals the well can then safely be brought in.

This provision for testing the seals is shown only in connection with the form illustrated in Figure 1 but it is obvious that the other forms may be provided with similar testing equipment.

As is obvious from an inspection of Figures 5 to 7, inclusive, the sealing assembly, there shown, may be readily adapted to casings of different

diameters by merely varying the inside diameter of said sealing assembly.

The drawings and description are illustrative merely while the broad principle of the invention will be defined by the appended claims.

What we claim is:

1. In a tubular head for wells a packing assembly comprising, a seal ring formed of resilient material adapted to surround a casing in said head, an annular abutment fixed above and in contact with said ring, a compression ring beneath and supporting the seal ring, a ring nut adapted to be threaded into said head and surrounding the compression ring, said compression ring and nut having a splined connection whereby they may be rotated as a unit and means for maintaining the ring nut and compression ring together.

2. In a tubular head for wells having a casing extending therethrough a packing assembly comprising, a seal ring formed of resilient material adapted to surround a casing in said head, an annular abutment fixed above and in contact with said ring, a compression ring beneath and supporting the seal ring and bonded thereto, a ring nut threaded into said head and surrounding the compression ring, said compression ring and nut having a splined connection whereby they may be rotated as a unit thus permitting the complete packing unit to be screwed into or removed from the tubular head in one piece.

3. In a well head assembly having a lower tubular head, an upper tubular head and means in the lower head supporting a casing with the upper end of the casing extending upwardly into the upper head, a sealing assembly around the upper end of the casing and within the lower portion of the bore of the upper head, said assembly including an annular seal ring surrounding the casing, an annular compression means below the seal ring, a retaining member threaded into the lower portion of the bore of the upper head, the exterior surface of the compression means having a recess, a projection on the retaining member engageable with said recess and connecting the retaining member to the compression means, the projection being of a size which is less than the longitudinal extent of the recess in the compression means to thereby permit the compression means to undergo upward movement relative to the retaining means after the latter is in threaded engagement with the upper head, the casing supporting means within the lower head being adapted to engage the compression means when the heads are moved relative to each other to thereby urge the compression means upwardly and move the seal ring into sealing position between the upper end of the casing and the bore of the upper head.

4. In a well head assembly having a lower tubular head, an upper tubular head and means in the lower head supporting a casing with the upper end of the casing extending upwardly into the upper head, a sealing assembly around the upper end of the casing and within the lower portion of the bore of the upper head, said assembly including an annular seal ring surrounding the casing, an annular compression means below the seal ring, a retaining member threaded into the lower portion of the bore of the upper head, and means comprising interengaging keys and keyways on the compression means and retaining member mounting the compression means within the retaining member for limited axial independent movement with respect to the retaining member, whereby after the retaining member is in threaded position within the bore, said compression means may undergo independent movement relative to the retaining member to apply a compressive force to the seal ring.

5. In a well head assembly as set forth in claim 4, together with a junk ring above the seal ring and means for attaching said junk ring, seal ring and compression means together as a unit.

6. In a tubular head for wells wherein the lower end of the bore of said head is counterbored to form an annular recess, a packing assembly adapted to be mounted within the recess and comprising, a resilient seal ring within the recess and encircling a casing extending through the head, a compression ring beneath the seal ring, a ring nut threaded into the lower portion of the recess within the head and surrounding the compression ring, interengaging splines on the exterior of the compression means and within the bore of the ring nut connecting these parts together with a telescoping connection, and means carried by the compression ring and engageable with the ring nut preventing separation of the nut from said compression ring.

7. In a well head assembly having a lower tubular head, an upper tubular head and means in the lower head supporting a casing with the upper end of the casing extending upwardly into the upper head, a sealing assembly around the upper end of the casing and within the lower portion of the bore of the upper head, said assembly including an annular seal ring surrounding the casing, an annular compression means below the seal ring, a retaining member threaded into the lower portion of the bore of the upper head, means for connecting the retaining member to the compression means to permit the latter to undergo upward movement relative to the retaining means after the latter is in threaded engagement with the upper head, the casing supporting means within the lower head being adapted to engage the compression means when the heads are moved relative to each other to thereby urge the compression means upwardly and move the seal ring into sealing position between the upper end of the casing and the bore of the upper head, said compression means comprising an annular ring and the means for connecting the same to the retaining member comprising interengaging splines on the ring and member, together with a split ring within the bore of the member engaged with an annular groove in the exterior of the compression ring and limiting downward movement of the compression ring relative to the retaining member.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,900,260	Shaffer	Mar. 7, 1933
2,187,839	Penick et al.	Jan. 23, 1940
2,312,476	Penick et al.	Mar. 2, 1943
2,335,355	Penick et al.	Nov. 30, 1943