PIPE HANGING APPARATUS FOR USE IN MULTIPLE COMPLETED WELLS

J. H. EDWARDS

Feb. 26, 1963

J. H. EDWARDS

3,078,921

Filed April 19, 1961

2 Sheets-Sheet 1

INVENTOR.

JACK H. EDWARDS,

ATTORNEY.
With reference now to the embodiment of the invention illustrated in FIGS. 1, 2, 3, and 4, there is shown a tubing head 2 which may be secured to a casing head (not shown) in the conventional manner. The tubing head includes a central longitudinal bore within which a plurality of segmented hangers 7A, 7B, and 7C are supported in side-by-side relationship. While three hanger segments are shown, any reasonable number greater than one may be used. Tubing strings, one of which is designated by the reference numeral 39, are threaded securely to the lower ends of longitudinal openings 40 through the hangers for side-by-side suspension within the well casing.

The tubing head 2 is provided with an annular flange 1 at its upper end, to which a tree (not shown) may be connected by means of bolts extending through bolt holes 3. Pipe members 5A, 5B, and 5C are respectively threadedly secured to the upper ends of hanger segments 7A, 7B, and 7C, as shown. An annular groove 9 is provided in flange 1 to receive an annular sealing member in the usual manner.

Each of the hanger segments 7A, 7B, and 7C is provided with a transverse opening 36 extending from the outer curved surface thereof into the longitudinal bore 40. This opening is best illustrated in FIGS. 2 and 4. Transverse opening 36 communicates with a corresponding opening 16 in the annular flange of the tubing head. A countercrater 46 in hanger segment 7A has the same diameter as opening 16 and is in alignment therewith. Together the openings 36 and 16 provide a substantially straight opening from the outer surface of the tubing head 2 into the longitudinal bore of a particular hanger. Similar openings are provided through the tubing head communicating with transverse openings in hanger segments 7B and 7C. Each of the hanger segments is provided with resilient sealing elements 10 (see FIG. 4) in the form of rings of rubber-like resilient sealing material disposed about the three sides of the hangers. The function of the sealing members 10 is to aid in isolating the transverse openings from the outer surface of the flange into the bores of the hanger segments.

The bore of the tubing head is provided with an upward facing seat thereabout comprising a conically tapered bowl 42 in the bore. Correspondingly tapered seating surfaces 44 are provided on the lower portions of the hangers. It is manifest that when only two hanger segments are involved in construction, the segments will be individually supported in an oriented position by the seats. However, when it is contemplated that three or more segments are used, manifestly it is necessary to provide individual support therefor so that the pipe strings and hanger segments may be individually lowered into the well bore. For this purpose, and further to assist in placement thereof, adjacent flat faces of the hanger segments are recessed at the bottom ends thereof and are provided with seating surfaces 34 at the upper end of the recesses which are adapted to seat on suitable apparatus in the tubing head for individually supporting the hanger segments in oriented position therein so that the transverse openings of the hanger segments will line up with the corresponding openings in the tubing head. Suitable apparatus of this nature is described in U.S. Patent No. 2,959,727 and will not be described herein.

An annular elongating fitting 15 extends entirely through each of the transverse openings 16 in annular flange 1 into countercrater 46 in hanger segment 7A to hold the hanger segment in place. Fitting 15 is provided with a central opening 31 extending entirely therethrough and threadedly engaging the surface of transverse opening 16 for at least a portion of its length. The bore of fitting 15 likewise is provided with threads 23 along at least a portion of its length. A gate valve 35 is positioned within the transverse opening so as to be reciprocally mov-
able into and out of the longitudinal bore 40 of the hanger segment 7A as shown in FIG. 2. Connecting rod 29 is affixed at one end to gate valve member 35, and at the other end to a rotatable shaft 24 having an enlarged portion 25 at one end thereof which is adapted to engage the threaded interior 23 of the bore. Rotation of shaft 24 thus moves gate valve member 35 in and out of the longitudinal hanger segment bore 40. For the purpose of sealing off the transverse opening, there is provided a washer 22, a suitable resilient gasket 31, and a compression nut 15 adapted to be threaded into fitting 15 so as to compress gasket 31 around shaft 24. Furthermore, gate valve member 35 is provided with annular resilient sealing gaskets 34 (see FIG. 3) on the upper and lower surfaces thereof to seal between member 35 and hanger segment 7A around longitudinal bore 40 when member 35 is in the position shown in FIG. 3.

As each hanger segment is lowered into the tubing head, its seating surface 44 seats on the complementary surface 42 of the tubing head, and the seating elements 10 are brought into engagement so as to provide a complete seal above and below the transverse openings. As each hanger is lowered, the fitting 15 is placed in the tubing head, and the gate valve member 35 is moved into the bore of the hanger segment corresponding thereto by rotating the shaft 24, thereby sealing off each tubing string as subsequent strings are run into the well. When all of the hanger segments are in place after the tubing strings have been run into the well bore, the gate valve member 35 may be backed out a sufficient distance to clear the longitudinal bores of the hanger and leave the bores open for flow or passage of tools. When the valve members 35 are backed into the annular flange of the tubing head, the fittings 15 will function as hanger bolts to keep the hanger segments in place in the tubing head. The gate valve members 35 may again be moved into the hanger segments to seal off flow as may be required from time to time during operation and maintenance of the well.

The modification of the invention that is illustrated in FIG. 5 is quite similar to the embodiment of the invention described with respect to FIGS. 1 through 4. The difference lies in the use of a plug valve member 35A rather than the gate valve construction shown in FIGS. 1 through 3. The plug valve head 35A preferably has a steel core covered with a resilient layer of neoprene or similar oil resistant rubber-like material. The rotatable shaft 11 extends to the plug valve head 35A for rotating the plug valve and moving it transversely of the hanger bore 40. The hanger bore is indented as designated by the reference numeral 47 to provide a suitable seat for the plug valve head.

The invention is not necessarily to be restricted to the specific structural details or arrangement of parts herein set forth, as various modifications thereof may be effected without departing from the spirit and scope of this invention.

The objects and features of the invention having been completely described, what I wish to claim is:

1. Wellhead equipment comprising:
a tubing head having a bore therethrough and including an upwardly facing tapered surface in said bore;
at least two tubing hangers together forming substantially a cylinder and extending from above said tubing head into said tubing head, each of said tubing hangers having a longitudinal opening therethrough to receive a tubing string at the lower end thereof and wellhead pipe at the other upper end thereof, said tubing hangers being substantially sector-shaped transversely thereof;
the lower portion of the outer surfaces of said tubing hangers including downwardly facing tapered surfaces mating with said upwardly facing surface in said bore for holding said hangers at a given level in said tubing head;
a transverse opening corresponding to each of said hangers, radially extending through the tubing head from the outer surface thereof and through said each hanger into the longitudinal opening of said each hanger intermediate the ends thereof, the transverse openings being substantially equiangularly spaced around the tubing head;
elongated fitting means having a longitudinal bore, corresponding to each of said hangers and extending through the transverse opening corresponding to said each hanger from the outer surface of the tubing head into said each hanger to hold said each hanger against movement from upward forces exerted thereon; and
a movable valve member corresponding to said each hanger extending through the longitudinal bore of the fitting means into the transverse opening of said hanger corresponding thereto, transversely movable from a position within said longitudinal bore of said fitting means into the longitudinal opening of the hanger corresponding thereto to close said longitudinal opening of the hanger corresponding thereto.

2. Wellhead equipment as defined in claim 1 wherein the movable valve member is a plug valve.

3. Wellhead equipment as defined in claim 1 wherein the movable valve member is a gate valve.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Invention</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,530,006</td>
<td>Melton</td>
<td>Mar. 17, 1925</td>
</tr>
<tr>
<td>1,648,107</td>
<td>Brodgon</td>
<td>Nov. 8, 1927</td>
</tr>
<tr>
<td>1,909,304</td>
<td>Mueller</td>
<td>May 16, 1933</td>
</tr>
<tr>
<td>1,942,233</td>
<td>Alviset</td>
<td>Jan. 2, 1934</td>
</tr>
<tr>
<td>2,092,261</td>
<td>Rector</td>
<td>Sept. 7, 1937</td>
</tr>
<tr>
<td>2,134,200</td>
<td>Pivotto</td>
<td>Oct. 25, 1938</td>
</tr>
<tr>
<td>2,673,615</td>
<td>Humanson</td>
<td>Mar. 30, 1954</td>
</tr>
<tr>
<td>2,766,830</td>
<td>Church</td>
<td>Oct. 16, 1956</td>
</tr>
<tr>
<td>2,794,505</td>
<td>Allen</td>
<td>June 4, 1957</td>
</tr>
<tr>
<td>2,859,773</td>
<td>Wallace</td>
<td>Nov. 11, 1958</td>
</tr>
</tbody>
</table>