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THREE STRING LANDING HEAD

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2 Sheets-Sheet 1

Fig 1

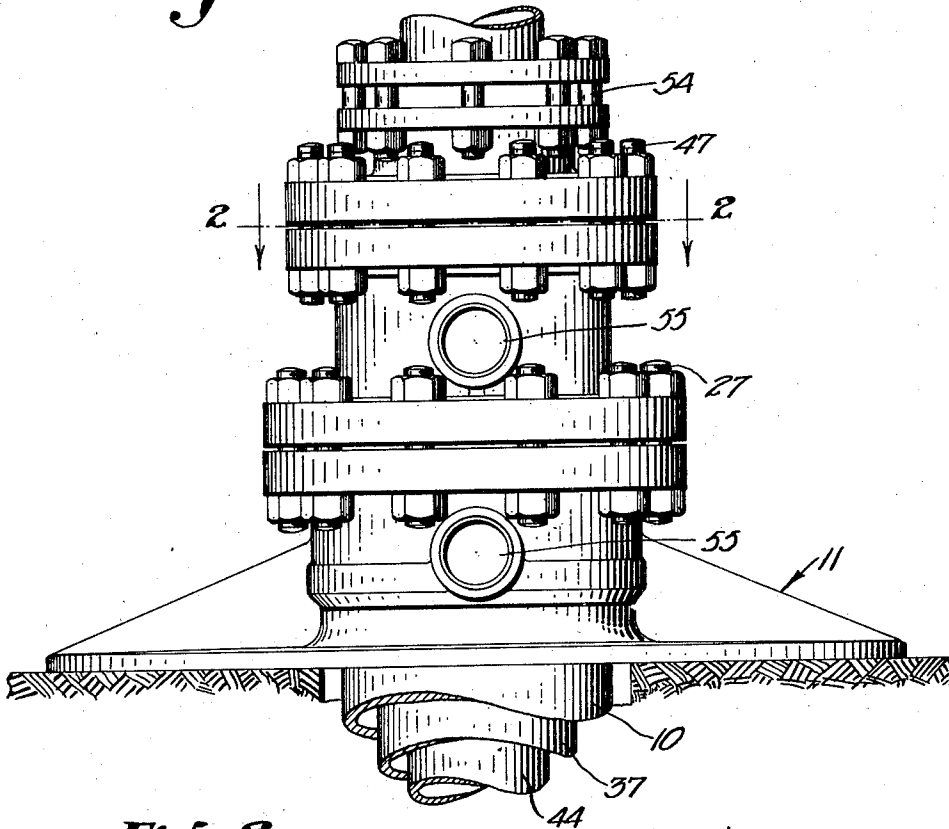
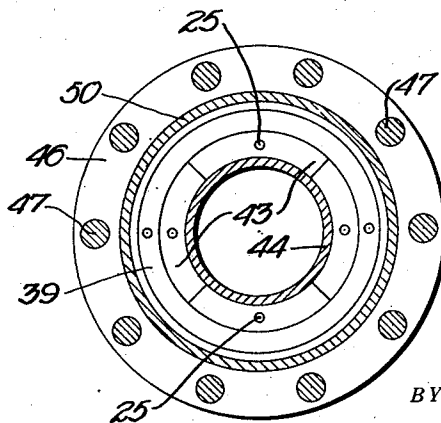


Fig 2



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THREE STRING LANDING HEAD

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6 Claims. (Cl. 166—14)

This invention relates to oil well equipment, and particularly pertains to a landing head for casing.

In constructing an oil well it is necessary to assemble a plurality of telescoped strings of casing and to hold them in an assembled position at the top of the well so that they may be successively lowered to their set positions. It is necessary in such procedure to maintain a fluid tight seal between the centermost casing section and the outer sections telescoping over it, and at the same time provide means whereby fluid may be withdrawn from the annular space between the various concentric sections. It is the principal object of the present invention to provide simple means whereby a landing head structure may be rapidly built up to accommodate and grip successive sections of casing to grip and pack the same by the use of a simple composite structure which may be readily assembled and applied to the casing.

The invention contemplates the provision of a base structure and a plurality of superposed spools by which successively reduced sections of casing may be gripped, the structure further being provided with interchangeable means whereby one part may be readily substituted for another, and casings of different diameters may be easily accommodated without a change of the main fitting.

The invention is illustrated by way of example in the accompanying drawings in which:

Figure 1 is a view in side elevation showing a form of the present invention as assembled for use with three strings of casing.

Fig. 2 is a view in horizontal section through the landing head as seen on the line 2—2 of Fig. 1, showing the slip and spider arrangement.

Fig. 3 is a view in vertical section through the assembled landing head showing the relative assembled position of the various parts with which the invention is concerned.

Fig. 4 is a view in section and elevation showing one of the drilling flanges.

Referring more particularly to the drawings, 10 indicates an outer casing which has been properly set in a well bore and to the upper end of which the landing head of the present invention is to be mounted. This head includes a base 11 having a base flange 12 and an upwardly extending cylindrical body 13. In the lower end of this body a bore 14 is formed to accommodate the upper end of the outer casing string 10. The bore 14 may be threaded to the casing string if desired, or welded in place as indicated at 15. An annular shoulder 16 occurs within the bore 14 at a point intermediate its length and is undercut as indicated at 17 to provide space within which the welding operation may be facilitated. The upper edge of the annular shoulder 16 is formed

with a downwardly and inwardly tapered face 18 on which an annular slip spider 19 may rest. This spider is formed with an upper cylindrical portion 20 which fits snugly within the cylindrical bore 14 occurring above the shoulder 16, and a downwardly and inwardly tapering portion 21 which extends into the opened mouth of the casing 10. The annular inner wall 22 of the spider 19 is downwardly and inwardly tapered to receive a plurality of casing slips 23, the back faces of which are tapered to cooperate with the tapered face 21 of the spider. An inclined shoulder 24 is formed on the outside of the spider 19 and seats against the face 18 of the shoulder 16. Threaded openings 25 are formed in the ends of the various spiders and slips to receive a threaded handle by which these elements may be lifted out from their seated positions and replaced. The mouth of the cylindrical body portion 13 of the base is circumscribed by a bolting flange 26. This flange accommodates a plurality of bolts 27 by which spools 28 may be held in assembled relation to the base or drilling flanges 29 may be assembled therewith. The upper face of the bolting flange is formed with an annular packing groove 30 within the bottom of which metallic packing, such as lead, is placed as indicated at 31. A lip 32 extends downwardly from the abutting face of spool 28 or drilling flange 29 and projects into the groove to compress and pack the packing and to thus form a fluid tight seal between the base 11 and the members 28 or 29 disposed thereabove. In the drawings only one spool 28 is shown. It is to be understood, however, that if necessity requires a plurality of spools may be assembled, one above the other, to accommodate the various concentrically disposed casing sections used in the landing head. Aside from the seal made between the spool 28 and the base structure a packing ring 33 of a diameter substantially equal to the outside diameter of the spider 19 is provided and rests upon this spider. A recess 34 in the lower face of the spool 28 accommodates the packing ring with some clearance. At the inner edge of the recess a downturned lip 35 is provided which seats within a packing groove on the packing ring 33 and compresses a metallic packing element against and between the packing ring 33 and a casing section 37 which telescopes upwardly through the outer casing section 10, and which is held in position by the slips 23 mounted within the spider 19. Attention is directed to the fact that the packing ring 33 fits snugly around the casing 37 and that the casing extends upwardly through the packing ring and beyond the lip 35 to a point within the cylindrical bore 38 of the spool 28. Within this bore a spider 39 is provided, the spider in this instance having a portion 40 which circumscribes the lip of the casing

string 37 and a shoulder 41 which rests upon the upper end of the casing string. The inner wall of the spider 39 is formed with an inner tapered face 42 receiving casing slips 43. Thus in the present instance the slip spider is freely mounted within the spool 28 and may have some latitude in vertical movement to adapt itself to the upwardly projecting length of casing 37. The slips 43 engage the innermost casing string 44 and hold the same. It is necessary that this casing be tightly packed and for that reason a top flange 45 is provided and is bolted against the upper face of the spool 28. The spool has a bolting flange 46 thereon to accommodate bolts 47 which pass through the flange edge of the top flange 45. The upper face of the bolting flange 46 is formed with an annular groove 48 as previously described to accommodate a packing ring 49 and a packing lip 50, which lip is carried on the under face of the top flange 45. An upper cylindrical portion of the top flange forms a stuffing box 51 within which packing 52 is disposed. A stuffing gland 53 compresses this packing around the body of the casing 44 and is held in position by bolts 54. Attention is directed to the fact that the base and spool are held together by a set of bolts 27, that the spool and top flange are held together by the separate bolts 47, and that the stuffing gland is held in its clamped position by the bolts 54. Due to this arrangement various combinations of a base, a stuffing gland, and a plurality of spools may be made and independently assembled. It is further to be pointed out that the base and spool sections may be formed with a plurality of draw-off ports 55 so that fluid may be drawn from the annular space occurring between adjacent nested casing sections. By reference to Fig. 4 of the drawings it will be seen that the drilling flanges are formed with a bolting flange 56 above which a cylindrical body portion 57 occurs, the inner wall of the drilling flange being provided with an annular tapered shoulder 58.

In operation of the present invention a hole is first drilled for the casing 10. The casing 10 is then run into the hole, cemented and cut off at the point indicated for the welding operation 15. The base 11 may then be threaded or welded on to the casing 10, or both operations may be performed if desired. Drilling flange 29 is then mounted upon the top of the base 11 and may be held in position by bolts 27. A suitable blow-out preventer may be installed upon the drilling flange 29 by threading the same into the threaded openings 59 of the drilling flange. The hole is then drilled for receiving the casing section 37. At the completion of this drilling operation, and while the blow-out preventer equipment still remains attached, casing 37 is run into the hole and cemented. After the cement has set spider 19 is mounted within the bore 14 of the base 11 and rests upon the seat 18. A stretch is then taken in the length of casing 37 and slips 23 are applied to hold this section of casing. The casing is then cut off at an elevation, such as represented by the upper end of the casing 37 where it abuts against the shoulder 41. With the drilling flange 29 removed the packing ring 33 is then placed in position around the upper end of the casing section 37 with the packing material 36 in place. The spool 28 is then installed and held in its clamped position by the bolts 27. A drilling flange of reduced diameter similar in construction to the flange 29 shown in Fig. 4 is then temporarily attached to the bolting flange 46 at the

upper end of the spool 28 with the blow-out preventer suitably threaded into the mouth of the drilling flange. When the drilling operation has been completed for the casing section 44 and before the blow-out preventer is removed the casing section 44 is run into the hole and cemented. After the cement has set the spider 39 is placed over the end of the casing and rests upon the upper end of casing 37. A stretch is then taken in the casing 44 and slips 43 are placed in position. After the drilling flange 29 is removed packing 48 is installed in the annular groove 49 of the spool 28. The drilling flange 29 for the length of casing 44 is then removed and replaced by the top flange 45 which is bolted in position by the bolts 47. Packing 52 is then placed in the stuffing box around the pipe 44 and is drawn to its packed position by the stuffing gland 53 and bolts 54. Thus by tightening the bolts 27, 47, and 54 the various joints occurring between the assembled parts may be held in a fluid tight condition, which will tend to eliminate fire hazard, and due to the fact that most of the joints are such as may accommodate metal packing gaskets it will be evident that the fluid seal will be most reliable. The upper end of the casing 44 may extend any desired distance beyond the stuffing gland 53 so that a Christmas tree or other flow means may be attached thereto. Openings 60 are formed through the wall of spiders 39 so that fluid from the space between the casing elements 37 and 44 may reach the ports 55. Attention is also directed to the fact that due to the use of the spiders 19 and 39 it is possible to interchange spiders and slips so that casings of various diameters might be accommodated without requiring a large number of different bases and spools.

It will thus be seen that the landing head here disclosed is compact in construction and is sufficiently short in length as to require a cellar of shallow depth for its installation. It will be further evident that the assembly is rigid when the parts are fastened together, insuring that the fluid seals between the various parts will be permanent, and due to the relatively small sizes of the seals it is possible to use metallic packing which will decrease the hazards of leaks in case of fire. Attention is further directed to the fact that the structure is exceedingly adaptable so that the various required elements for any number of strings of casing may be readily applied to the casing and assembled, and so that the joints between parts of the landing head may be separately adjusted and tightened without reference to any other of the parts or packing joints.

While we have shown the preferred form of our invention, as now known to us, it will be understood that various changes might be made in the combination, construction, and arrangement of parts by those skilled in the art, without departing from the spirit of the invention as claimed.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. A landing head for oil well casing comprising a base to which an outer casing section is attached, a bore therein formed with a seat, a cylindrical slip spider detachably mounted within the base, slips detachably positioned within the spider to engage a second casing extending upwardly through the base, the spider and slips having cooperating faces whereby the slips will wedge downwardly and inwardly to their engaging positions, a spool mounted upon the upper

face of the base means securing the base and spool together, a spider detachably mounted within the spool, and slips carried by the spider and adapted to engage a length of casing extending through the length of casing engaged by the first named slips, the spider within the spool resting upon the upper end of the intermediate length of casing.

2. A landing head for oil well casing comprising a base to which an outer casing section is attached, a bore therein formed with a seat, a cylindrical slip spider detachably mounted within the base, slips detachably positioned within the spider to engage a second casing extending upwardly through the base, the spider and slips having cooperating faces whereby the slips will wedge downwardly and inwardly to their engaging positions, a spool mounted upon the upper face of the base means securing the base and spool together, a spider detachably mounted within the spool, slips carried by the spider and adapted to engage a length of casing extending through the length of casing engaged by the first named slips, the spider within the spool resting upon the upper end of the intermediate length of casing, an outlet port through the wall of the spool, and passageways through the spider therein to establish communication between the interior of the intermediate casing string and the outlet port.

3. A landing head for oil wells comprising a base having a central opening within which the upper end of an outer casing string is fastened, a bore formed through the base as a continuation of the bore receiving said outer casing string and having a shoulder intermediate its ends, a slip spider removably positioned within said bore and resting upon the shoulder, casing slips disposed within the spider and engaging an inner casing string to support the same, a packing ring resting upon the upper end of the slip spider and circumscribing the inner casing string, said ring being formed with a counterbore in its upper face adjacent to the inner casing string, a packing element disposed within said counterbore, an annular groove formed in the upper face of the base structure, a packing element therein, and an upper fitting formed with concentric lips for engaging the two packing elements and forming a fluid seal therewith, and means for clamping the upper member to the base structure and for forcefully holding said packing lips against the packing elements.

4. A landing head for oil wells comprising a base having a central opening within which the upper end of an outer casing string is fastened, a bore formed through the base as a continuation of the bore receiving said outer casing string and having a shoulder intermediate its ends, a slip spider removably positioned within said bore and resting upon the shoulder, casing slips disposed within the spider and engaging an inner casing string to support the same, a packing ring resting upon the upper end of the slip spider and circumscribing the inner casing string, said ring being formed with a counterbore in its upper face adjacent to the inner casing string, a packing element disposed within said counterbore, an annular groove formed in the upper face of the base structure, a packing element therein, an upper fitting formed with concentric lips for engaging the two packing elements and forming a fluid seal therewith, and means for clamping the upper member to the base structure and for forcefully holding said packing lips against the packing elements, said upper fitting being formed with an

upwardly extending cylindrical portion, a slip spider mounted within said cylindrical portion of the upper fitting, casing slips carried by the spider and engaging a central casing section.

5. A landing head for oil wells comprising a base having a central opening within which the upper end of an outer casing string is fastened, a bore formed through the base as a continuation of the bore receiving said outer casing string and having a shoulder intermediate its ends, a slip spider removably positioned within said bore and resting upon the shoulder, casing slips disposed within the spider and engaging an inner casing string to support the same, a packing ring resting upon the upper end of the slip spider and circumscribing the inner casing string, said ring being formed with a counterbore in its upper face adjacent to the inner casing string, a packing element disposed within said counterbore, an annular groove formed in the upper face of the base structure, a packing element therein, an upper fitting formed with concentric lips for engaging the two packing elements and forming a fluid seal therewith, means for clamping the upper member to the base structure and for forcefully holding said packing lips against the packing elements, said upper fitting being formed with an upwardly extending cylindrical portion, a slip spider mounted within said cylindrical portion of the upper fitting, casing slips carried by the spider and engaging a central casing section, and a stuffing box structure through which the upper end of the central casing section extends, means fastening said stuffing box structure to the upper end of the upper fitting, a stuffing gland carried by the stuffing box structure, and means for tightening and holding said gland.

6. A landing head for oil wells comprising a base having a central opening within which the upper end of an outer casing string is fastened, a bore formed through the base as a continuation of the bore receiving said outer casing string and having a shoulder intermediate its ends, a slip spider removably positioned within said bore and resting upon the shoulder, casing slips disposed within the spider and engaging an inner casing string to support the same, a packing ring resting upon the upper end of the slip spider and circumscribing the inner casing string, said ring being formed with a counterbore in its upper face adjacent to the inner casing string, a packing element disposed within said counterbore, an annular groove formed in the upper face of the base structure, a packing element therein, an upper fitting formed with concentric lips for engaging the two packing elements and forming a fluid seal therewith, means for clamping the upper member to the base structure and for forcefully holding said packing lips against the packing elements, said upper fitting being formed with an upwardly extending cylindrical portion, a slip spider mounted within said cylindrical portion to the upper fitting, casing slips carried by the spider and engaging a central casing section, a stuffing box structure through which the upper end of the central casing section extends, means fastening said stuffing box structure to the upper end of the upper fitting, a stuffing gland carried by the stuffing box structure, means for tightening and holding said gland, and fluid outlets formed as a part of the base and the upper fitting whereby fluid may be withdrawn from between the separate fluid spaces occurring between the casings.

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