

Aug. 20, 1940.

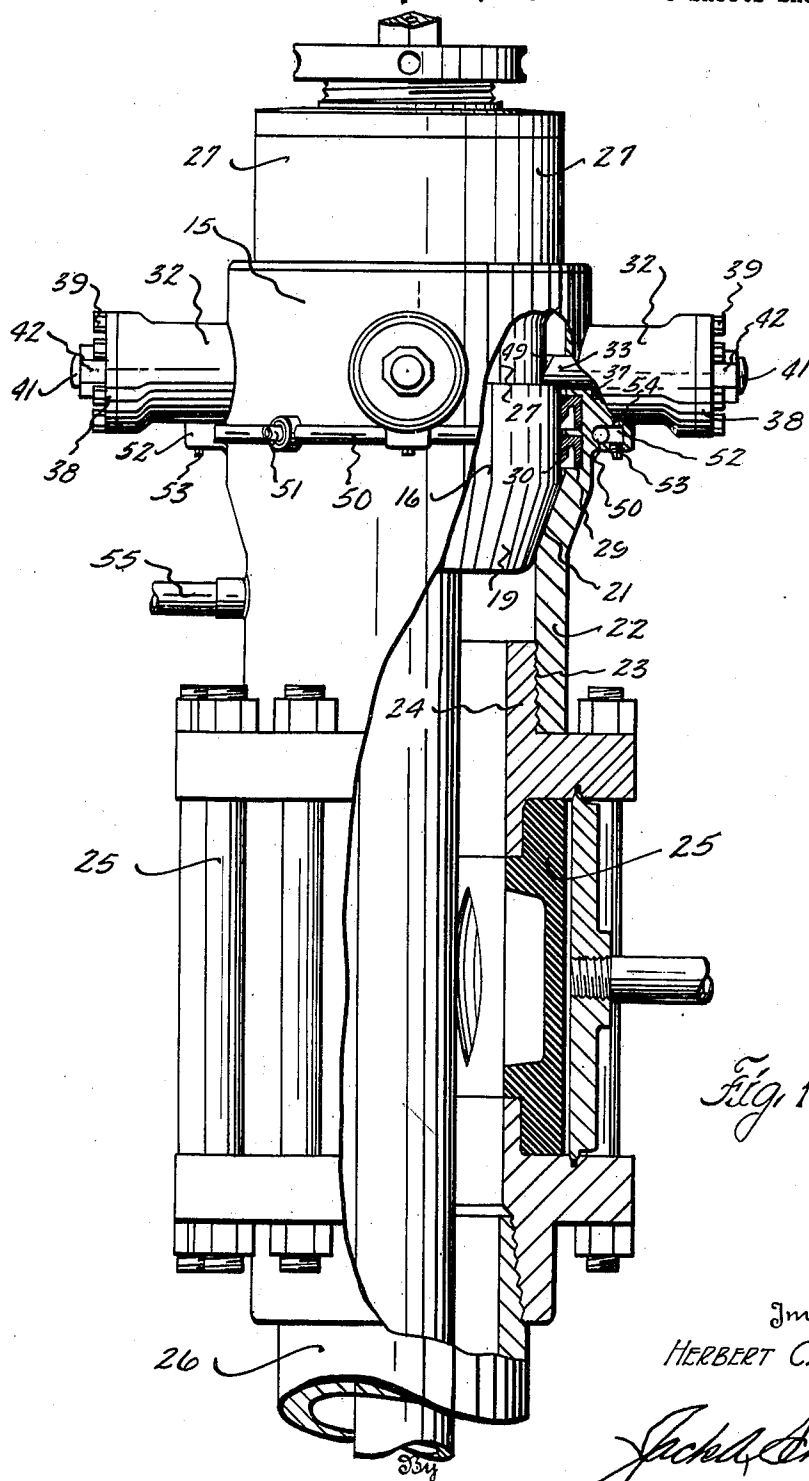
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2,212,036

UNION FOR WELL HEADS

Filed April 3, 1937

6 Sheets-Sheet 1



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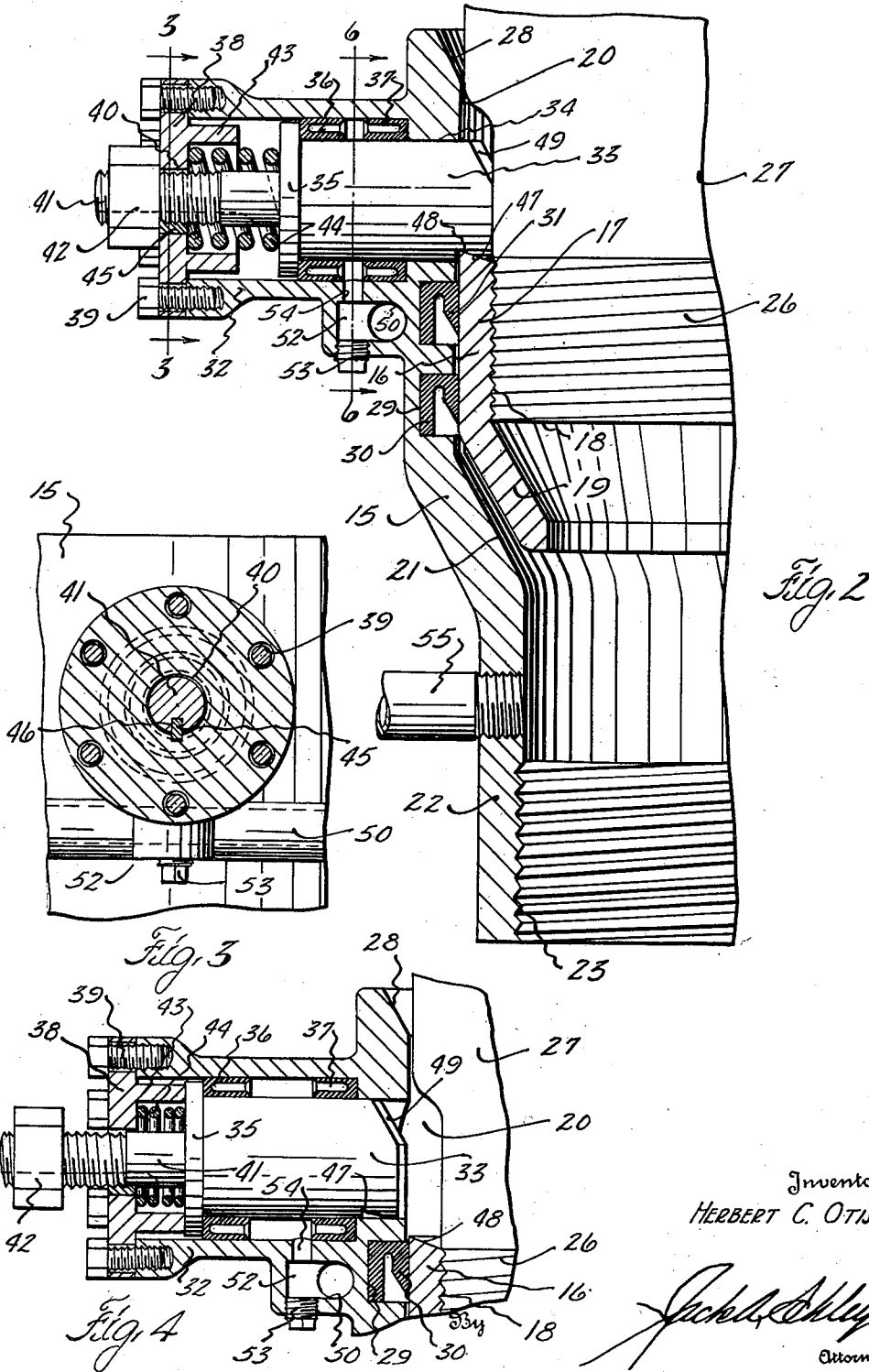
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UNION FOR WELL HEADS

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6 Sheets-Sheet 2



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UNION FOR WELL HEADS

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6 Sheets-Sheet 3

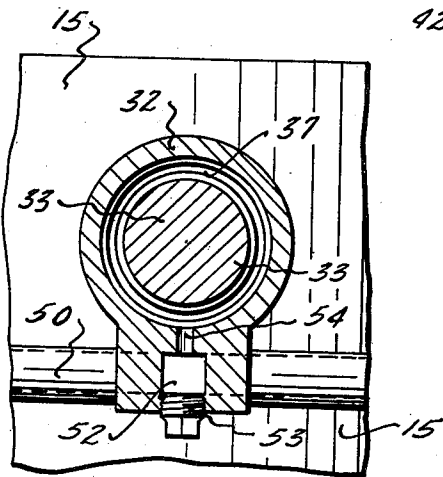
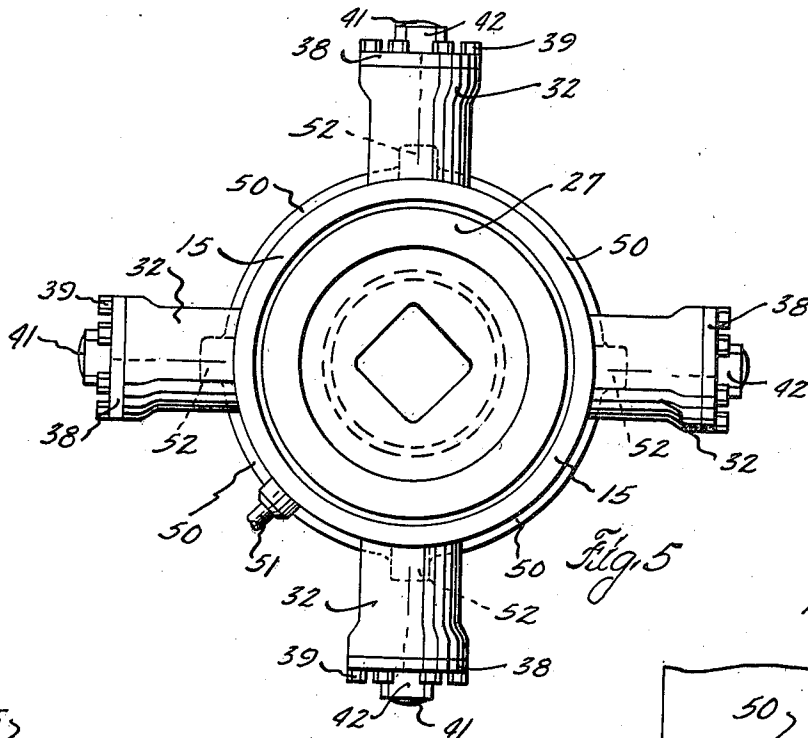


Fig. 6

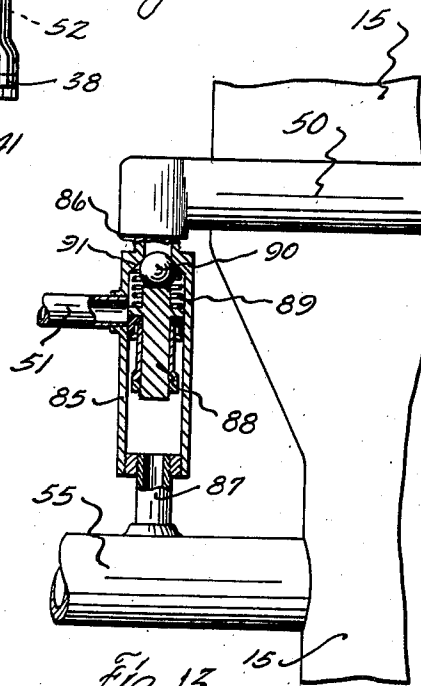


Fig. 13

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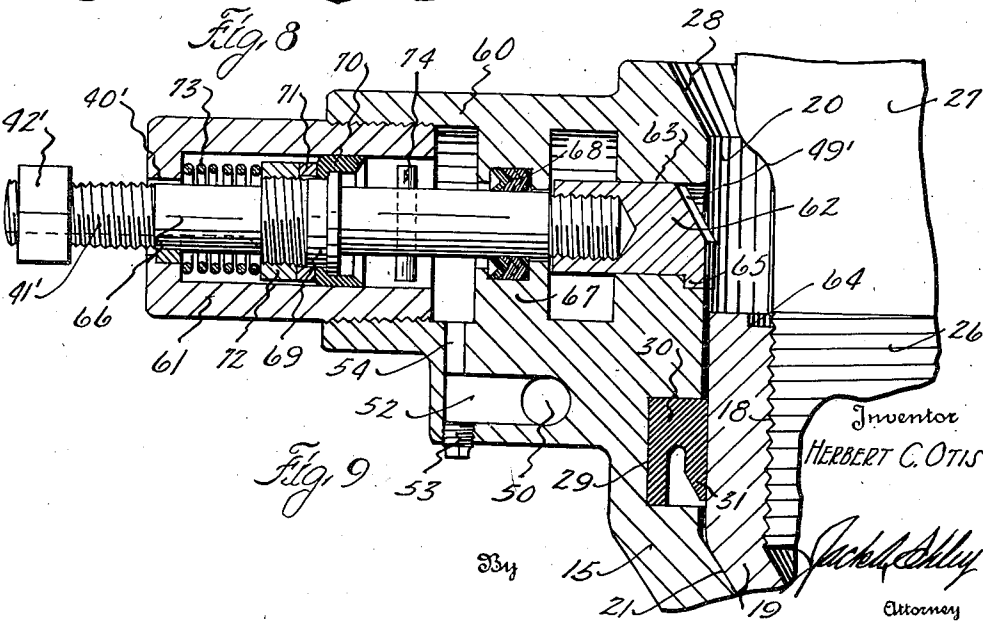
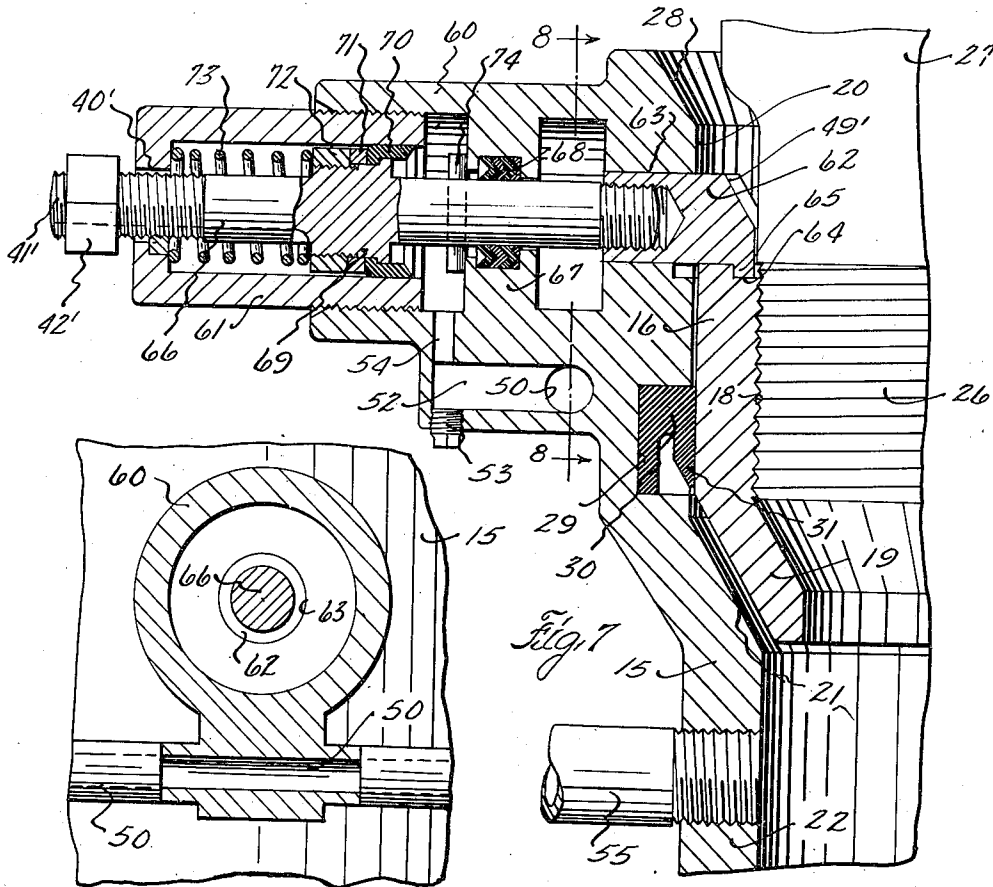
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UNION FOR WELL HEADS

Filed April 3, 1937

6 Sheets-Sheet 4



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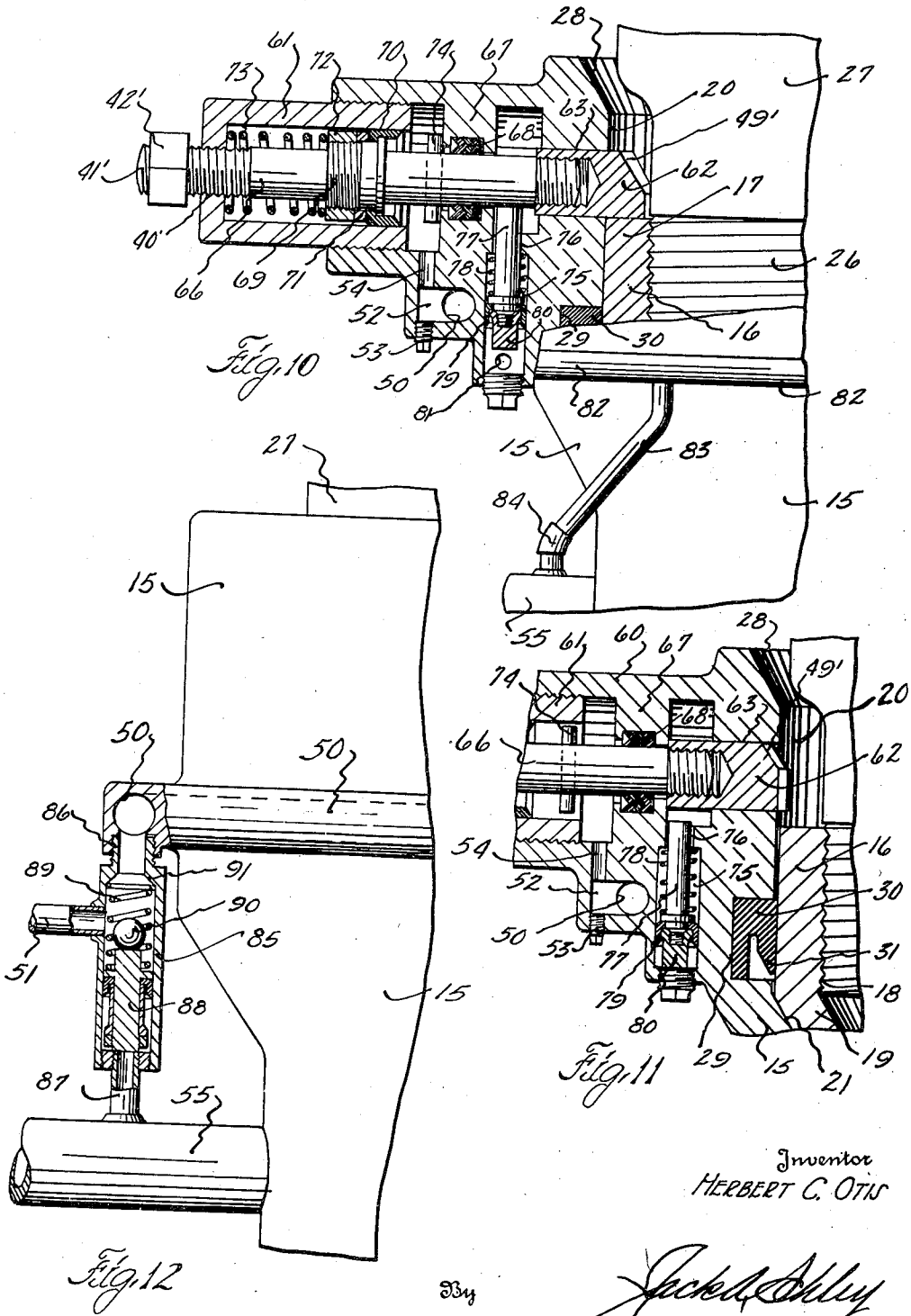
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UNION FOR WELL HEADS

Filed April 3, 1937

6 Sheets-Sheet 5



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2,212,036

6 Sheets-Sheet 6

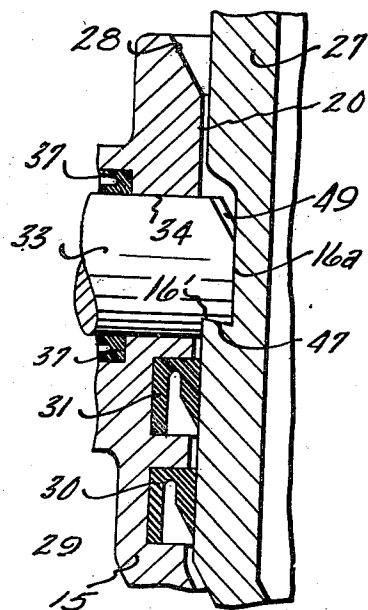


Fig. 15

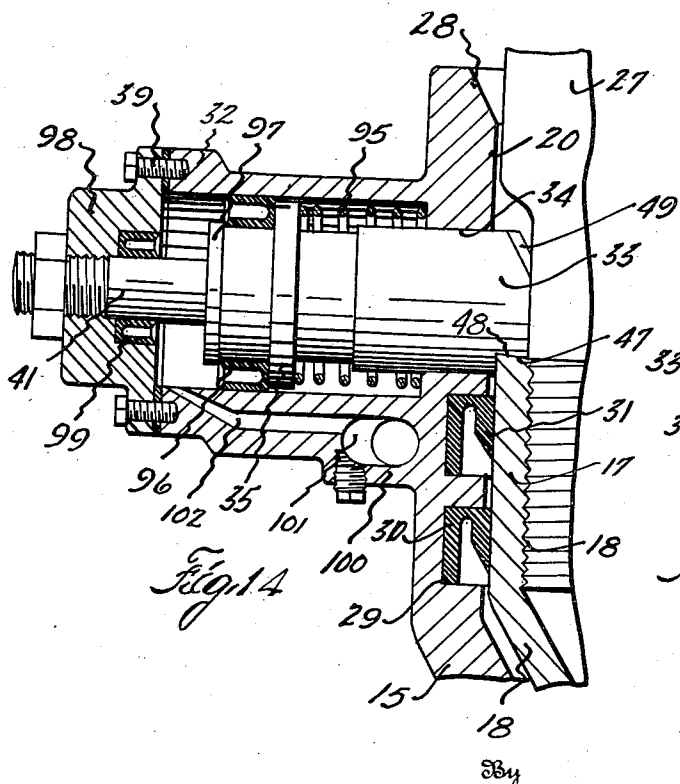


Fig. 14

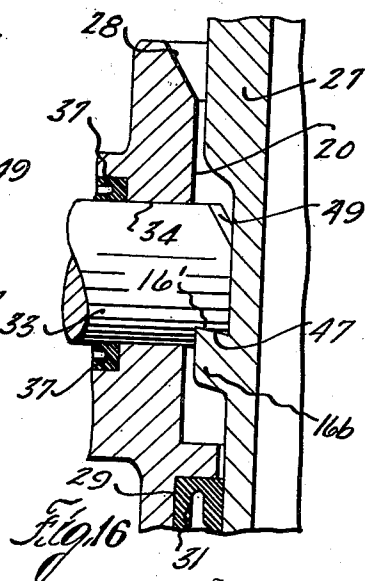


Fig. 16

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UNITED STATES PATENT OFFICE

2,212,036

UNION FOR WELL HEADS

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15 Claims. (Cl. 166—14)

This invention relates to new and useful improvements in unions.

The invention has more particularly to do with an improved union or coupling, capable of automatic or manual operation, for uniting or securing together two members or elements, or releasing the same, and if desired, providing a fluid-tight joint.

A particular advantage of the invention is, that a union constructed in accordance therewith, is especially adapted for use in connecting well tools and devices without necessitating the presence of a workman below the derrick floor in order to make or break a connection, thus avoiding the hazards ordinarily encountered in the cellar or below the derrick floor. Where a workman is required to go below the derrick floor to couple or release connections he is exposed to gas leaks, oil leaks, fire hazards and the like. Owing to the difficulty of communication between the driller on the derrick floor and the workman below, serious accidents have occurred and often wells are let loose because of misunderstanding or inability to handle the connections, particularly where high pressures or great volumes of gas are flowing.

An important object of the invention is to provide means whereby the union may be operated partially or entirely by fluid pressure, thus making it possible to operate the device from a remote or safe distance, which not only promotes safety, but saves time and labor.

Still another object of the invention is to provide improved locking means, so arranged that when the members to be coupled are brought into coupling relation they will be automatically locked together, and if desired, a fluid-tight joint formed therebetween. This arrangement permits rapid coupling, and where the union is used between a drilling head and an oil saver or blow-out preventer, or between other tools, the drilling head or other device may be quickly lowered and automatically coupled.

Another object of the invention is to provide a union wherein the coupled member, when subjected to a head pressure sufficient to displace it, cannot be released or removed from the coupling or receiving member, until the pressure is reduced and the locking means freed for retraction; together with fluid pressure or mechanical retraction of the locking means. The provision which prevents releasing the locking means until the pressure is reduced tends to eliminate careless or accidental disconnection of the locked members, thus obviating escape of gas, leakage of oil, blow-

ing out of a well, and other objections, when applied to a well or a pressure line.

A further object of the invention is to provide an improved union including a coupling member and a coupled member with locking elements carried by one of the members and adapted to co-act with the other member, together with fluid pressure actuating means for the locking elements arranged to either expel or retract said locking elements, or to both expel and retract such elements.

A further object of the invention is to provide a union wherein the members may be so locked that the entrant member may undergo longitudinal movement within the socket member and a fluid-tight joint maintained during such movement.

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 drawings, in which an example of the invention is shown, and wherein:

Figure 1 is a view, partly in elevation and partly in section showing a drilling head and an oil saver connected by a union constructed in accordance with the invention.

Figure 2 is an enlarged vertical sectional view of a portion of the union.

Figure 3 is a transverse vertical sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a sectional view of one of the locks, showing the plunger retracted.

Figure 5 is a plan view of the drilling head and union.

Figure 6 is a transverse vertical sectional view taken on the line 6—6 of Figure 2.

Figure 7 is a view similar to Figure 2 and showing another form of lock.

Figure 8 is a transverse vertical sectional view taken on the line 8—8 of Figure 7.

Figure 9 is a view similar to Figure 7, showing the plunger retracted.

Figure 10 is a view similar to Figure 2 showing another form of lock.

Figure 11 is a like view showing the lock released.

Figures 12 and 13 are detailed views showing two positions of the pressure locking means.

Figure 14 is a view similar to Figure 2 showing spring retracting means and fluid pressure expelling means for the locking plungers, and

Figures 15 and 16 are views, similar to Figure 2,

showing the locking keeper made integral with the drilling head.

In the drawings, the numeral 15 designates a locking or receiving member or head, and 16 a keeper or attaching member. In the arrangement illustrated the head member has the general shape of a bell nipple, while the member 16 takes the form of an annular shoe in Figures 1 to 14 inclusive, and in Figures 15 and 16 a keeper 16' is formed on the drilling head or other tool 27. The shoe 16 is provided with an upright cylindrical portion 17 having internal screw threads 18 and an inwardly inclined flange 19 (Figures 2, 7 and 10). The head 15 includes an upright bowl 20 having an inclined annular seat 21 at its bottom and a cylindrical shank or skirt 22 depending from said seat. The flange 19 is of such diameter as to rest upon the seat 21. It is to be understood that the locking member and the keeper member may be made in the shape and form best suited to the purpose for which they are used, and the invention is not to be limited to shape or size.

The members 15 and 16 and 16' with their appurtenances constitute the union, and when used as a drilling connection, the member or head 15 is provided with internal screw threads 23 in the lower portion of its shank 22, for receiving the nipple 24 of a pressure fluid type of oil saver 25, which is mounted on the upper end of the well casing 26 as is shown in Figure 1. However the head may be connected to any suitable tubular support.

The member or shoe 16 is shown with its screw threads 18 in engagement with threads 26 on the reduced lower end of a drilling head 27, but of course could be mounted on any other tool or device of the proper size to enter the bowl 20 of the head. The parts are of such diameters that the shoe 16 may have a free sliding engagement in the bowl 20 and the latter may have its inner upper edge beveled at 28 (Figures 2, 4, 7, 9, 10 and 11) to guide the inclined flange 19 of the shoe into the bowl, said flange usually extending below the drilling head.

The bowl 20 just above the seat 21 (Figure 2) is formed with a pair of internal ring grooves 29 each adapted to receive a flexible packing ring 30. These rings are preferably non-metallic and are of the cup type, each having an inner, annular, depending lip 31, beveled along its lower edge, whereby the pressure fluid (oil, water or gas) flowing up through the head will expand said lips into sealing contact with the outer surface of the cylindrical portion 17 of the shoe. Such a packing prevents the escape of the pressure fluid from between the head and the shoe. Any suitable form of packing may be used and it need not be pressure expanded.

Between the upper ring groove 29 and the bevel 28, the bowl 20 is provided with a plurality of radial cylinders 32, four, equally spaced, (Figure 5) being shown. In each cylinder a locking plunger 33 is mounted to slide radially of the head, the inner end of each plunger having a snug sliding fit in a circular opening 34 in the wall of the bowl, (Figure 2) whereby the plunger may overhang the shoe 16 and lock the same in the head 15. Each plunger has a collar 35 on its outer end. Opposed non-metallic packing rings 36 and 37 of the V-shape or cup type, surrounding the plunger, are confined between the collar and the inner end of each cylinder, so that pressure fluid introduced between said rings will expand them into sealing contact with the plunger and the cylinder wall;

and will also slide the plunger and the ring 36 outwardly, as is shown in Figure 4, to withdraw or retract said plunger and release the shoe 16.

A cap 38 is fastened on the outer end of each cylinder, which latter is enlarged to receive machine bolts 39, passing through said cap. The cap has a central enlarged aperture 40, through which passes a stem 41 extending axially from the plunger. The stem is screw-threaded and receives a nut 42 which engages the outer face of the cap and limits the inward stroke of the plunger. An annular flange 43 on the inner face of each cap projects into the cylinder, acting as a stop to limit the outward stroke of the plunger, so as to prevent crushing of a coiled spring 44 confined on the stem. The springs are under sufficient compression to hold the plungers in locking position. To prevent revolving of the plungers, a key 45 is fastened in each aperture 40 and has sliding engagement in a longitudinal groove 46 in the correlated stem 41 (Figures 2 and 3).

The spring 44 forces the plunger 33 inwardly, the inward stroke being limited either by the nut 42 engaging the cap 38 or the end of the plunger striking the drilling head 27. Each plunger has the lower side of its inner end undercut to form a downwardly inclined locking shoulder 47. The upper edge of the shoe 16 is beveled inwardly and downwardly at 48. Thus when the fluid pressure lifts the shoe and the elements connected thereto, the bevel 48 engages the shoulders 47 of the plungers, whereby the upward thrust of said shoe is stopped and the plungers are locked against withdrawal. This relation will be maintained so long as the pressure is sufficient. It will be noted that when the head 27 and shoe 16 are raised, the flange 19 will be lifted from the seat 21, but the fluid-tight seal of the rings 30 with the cylindrical portion 17 will be preserved.

The upper inner edge of each plunger has a bevel 49. When the drilling head 27 and shoe 16 are lowered into the bowl 20, the inclined flange 19 will ride down these bevels, thereby displacing the plungers outwardly and permitting the shoe to pass. When the bevel 47 passes below the plungers, the springs 44 will expel the plungers, thus automatically locking the drilling head in place.

For retracting the plungers the nuts 42 may be rotated clockwise and said plungers manually retracted. However it is preferable to retract said plungers by a suitable pressure fluid such as water, oil, gas, compressed air or the like. Below the cylinders 32, a manifold 50 surrounds the bowl 20 of the head 15 and under each of said cylinders is formed a pressure chest 52, which is connected in the manifold. A pressure supply pipe 51 (Figures 1 and 5) is connected to the manifold. Each chest 52 has a drain plug 53, screwed into its bottom, while a port 54 leads from the chest to the cylinder. When the pressure fluid is supplied, each plunger 33 will be moved from the position shown in Figure 2 to that shown in Figure 4, whereby the shoe is released.

In using the union the head 15 is mounted on the oil saver 25, as has been described. The drilling head 27 is assembled on the kelly (not shown) in the usual manner and the shoe 16 is slipped over the kelly and screwed onto said head. Once the drilling head is assembled on the kelly, it will always be lifted by the lower kelly sub when said kelly is elevated. After

the drilling head has been mounted on the kelly and the latter made up on the drill pipe, the string is lowered into the hole, whereby the drilling head passes down through the rotary table (not shown) to the bowl 20 of the head 15.

As the shoe 16 is carried downward the flange 19 rides down the bevels 49 of the plungers 33, thus radially displacing said plungers. The flange 19 will come to rest on the seat 21 of the head and the plungers will be expelled so that their shoulders 47 will overhang the beveled edge 48, thus automatically locking the drilling head in place. When the oil saver 25 is opened the well pressure will raise the drilling head so that the bevel 48 will engage the shoulders 47 and the lips 31 of the packing rings will be displaced into sealing contact with the portion 17 of the shoe 16. The kelly is free to move downwardly as it rotates. It will be seen that the coupling is entirely automatic and it is not necessary for a workman to go below the derrick floor.

When it becomes necessary to add an additional joint of drill pipe, the kelly is elevated until the lower sub passes through the oil saver 25. So long as the said head is exposed to the well pressure and raised thereby, the plungers 33 cannot be retracted; therefore it is necessary to close the oil saver 25 to shut off the well pressure. The pressure trapped between the oil saver and the rings 30 is released through a pipe 55 having a suitable valve (not shown). The drilling head 27 will now drop until the flange 19 rests upon the seat 21, thus withdrawing the bevel edge 48 from the shoulders 47 and freeing the plungers.

By admitting pressure fluid from the pipe 51 by way of the manifold 50, chests 52 and ports 54 to the cylinders 32, the packing rings 36 and 37 will be expanded and the plungers retracted, whereby the union will be unlocked. The kelly may now be further elevated and the drilling head 27 and shoe 16 raised from the union head 15 and through the rotary table. This is all accomplished without a man going below the derrick floor. The fluid pressure operation of the union and oil saver may be controlled from a safe and remote point.

It will be seen that the union cannot be accidentally or carelessly opened because the shoe 16 locks the plungers, until the well pressure is shut off. If the oil saver leaks when closed the head 27 will be held in its elevated position and such leak will soon be observed. After the shoe has been removed from the bowl 20 the operating pressure may be cut off and the elements 54, 52, 50 and 51 used as an exhaust conduit.

It is obvious that many variations may be made in the construction of the union and in Figures 7 to 16 inclusive some of these modifications have been illustrated. While I have described the locking member 15 as attached to an oil saver it is obvious that it might be mounted directly on the casing or on any other kind of a device for which the union is suitable and this applies also to the keeper member 16.

In Figures 7, 8 and 9 another form is shown in which the head 15 is provided with one ring groove 29 instead of two. The packing ring 30 is made slightly heavier and the lip 31 extends to a lower point than in Figure 2. The chest 52 is slightly larger and the port 54 is made longer. Instead of the cylinder 32, a cylindrical hollow boss 60 is provided in each instance and into the outer end of each boss is screwed a cylindrical cap 61, these parts becoming the equivalent of the cylinder 32. A plunger head

62 is mounted in a guide opening 63 similar to the opening 34 of Figure 2. The head has a bevel 49' similar to the bevel 49 of the plunger 33. The shoe 16 has its upper edge flat and is provided with a circular recess or groove 64 adapted to receive a locking lug 65 depending from the plunger head 62.

A plunger rod 66 has its inner end screwed into the head while its outer end has screw threads 41' extending through an opening 40' and receiving a nut 42' similar to Figure 2. Each boss 60 is provided with an internal collar 67 carrying pressure-expanding packing 68 snugly embracing the rod 66 which passes through said collar. A flanged sleeve 69 is preferably made integral with the rod 66, but could be welded or otherwise fastened thereon. The sleeve carries a flexible packing cup 70 of the same type as the rings 36 and 37. Both the rings 68 and the cup 70 are exposed to the pressure fluid entering the cylinder from the port 54, so as to be expanded thereby. The cup 70 is held in place on the sleeve by a washer 71 and a ring nut 72. A coiled spring 73 mounted in the cap 61 engages the nut 72 and expels the plunger. The inward stroke of the plunger is limited by a pin 74 mounted in the rod 66 and striking the collar 67.

The operation of this particular form of the union is substantially the same as has been described. In Figure 7 the plunger head 62 is expelled and in locking engagement with the shoe 16; whereas in Figure 9 the plunger is retracted. When the plungers are in the position shown in Figure 7 the shoe may be lowered into the head and the union automatically locked. When the plungers are retracted as shown in Figure 9 the shoe is released and may be withdrawn from the head.

In Figures 10 and 11 another form of locking means is shown. Where the parts are substantially the same, the same reference numerals will be employed. The lug 65 is omitted from the head 62 and the groove 64 is omitted from the upper edge of the shoe 16. For locking each plunger head 62 against retraction, I have provided locking means in the head 15 instead of on the shoe. In the lower portion of each boss 60 is formed a pressure cylinder 75 having a reduced guide opening 76 communicating with the bore of the boss. A locking plunger 77 is mounted in the cylinder and extends through the guide opening 76 so as to engage the plunger rod 66 back of the head 62, thus preventing said head from being retracted. The plunger 77 is moved downwardly by a coiled spring 78 and has a packing cup 79 held in place by a nut 80 and exposed to fluid pressure entering the lower end of the cylinder through a port 81.

Each cylinder has ports 81 on each side connected in a manifold 82 which is connected by a pipe 83 and an elbow 84 with the pressure relief pipe 55. When the pressure is relieved in the head 15, the spring 78 will withdraw the locking plunger 77 from the position shown in Figure 10 to the position shown in Figure 11, thereby releasing the plunger head 62. From the foregoing, it is apparent that as long as the oil saver is open and there is well pressure against the shoe 16 and the plunger 77, the union cannot be unlocked.

In Figures 12 and 13 another form of plunger locking means is shown wherein a control is interposed between the pressure supply pipe 51 and the manifold 50. This device includes a check valve casing 85 having a nipple 86 at its

upper end connected in the manifold, and a nipple 87 at its lower end connected in the pressure relief pipe 55. A plunger 88 is mounted in the casing and is normally forced downward by a coiled spring 89. A valve ball 90 rests on top of the plunger and when moved upwardly thereby engages a seat 91.

It will be seen that so long as the plunger 88 is exposed to the well pressure said plunger 88 will be forced upwardly as shown in Figure 13, thereby closing the valve 90 and preventing fluid from the pipe 51 entering the chest 52 for retracting the plunger 62. However the pressure fluid supply to the pipe 51, will be cut off except when it is desired to retract the plungers 62; but should the pressure fluid be supplied, accidentally or otherwise, the well pressure being much greater will hold the valve closed.

It is within the scope of the invention and the claims appended to this specification to reverse the spring and fluid pressure actuation of the plungers 62, as well as to operate the said plungers entirely by pressure fluid. The source of such pressure fluid is subject to much variation and may be controlled by valves or other means located at a point remote from the union, but within easy reach of the driller or operator. The well fluid and any other fluid, suitable for the purpose and under useable pressures, may be employed either for expelling or retracting the plungers 62, or for both expelling and retracting said plungers.

In Figure 14, a modified form of the invention is shown, wherein the collar 35 is spaced from the end of the plunger 33, as in Figure 2. The cups 36 and 37 are eliminated and a coiled spring 95 surrounds the plunger being confined between the collar and inner end of each cylinder. This spring exerts its pressure to slide the plunger inwardly of the cylinder into its retracted position. A non-metallic packing ring 96, similar to the rings 36 and 37, surrounds the plunger on the opposite side of the collar. An external flange 97 on the end of the plunger prevents displacement of the ring 96 from the plunger. In place of the cap 38, a cap 98 closes the end of each cylinder and has the axial stem 41 extending therethrough. The cap 98 is formed with an enlarged annular recess at the inner end of its bore whereby a packing ring 99, surrounding the stem, may be inserted therein to prevent leakage past said stem.

For expelling the plunger under tension of the coiled spring, a manifold 100 surrounds the bowl of the head and under each cylinder a pressure chest 101 is formed. A suitable pressure supply line (not shown) is connected to the manifold. A port or passage 102 leads from each chest to the outer end of the cylinder to the space between the cap 98 and the outer end of the plunger, whereby the plunger may be moved under tension of the spring 95. The fluid pressure may be supplied from any suitable source, but it is preferable that the manifold be connected with the well so that the well pressure may be employed to move the plunger, which obviates the necessity of providing an auxiliary source of supply. With the above arrangement, it is manifest that the spring 95 acts to retract the plunger while the fluid pressure is utilized to expel the same.

It is not necessary to construct the member 16, separately and it may be integral with the head 27 or other element to be coupled or united. Neither is the invention to be limited to the bowl 20 or the seat 21. So long as the two members

or elements are brought together and locked, and the means either partially or entirely actuated by a pressure fluid, the invention is utilized.

In Figure 15 the shoe 16 is replaced by a shoulder 16' formed in the outer wall of the drilling head 27 or other tool. This shoulder may be produced in any suitable manner.

In this form, the head 27 is made integral with the shoe 16 thereby eliminating the threaded connection between these members, and the shoulder 16' is formed by providing an annular groove 16a in the wall of the structure.

In Figure 16, another way of providing the shoulder is shown wherein a collar or ring 16b is either made integral with the shoe and head, or is otherwise suitably secured thereto. In this instance, the shoulder 16' is formed by the upper end or top of the ring 16b.

Owing to the play permitted between the drilling head 27 and its keeper member 16 and the receiving member 15, when the head 27 and keeper 16 are moved upwardly, as is best shown in Figures 2 and 7, the drilling head 27 may undergo both lateral and tilting movement. This permits self alinement of the kelly (not shown) and eliminates the necessity of providing self alinement of the kelly in the drilling head. It will be seen the members 16 and 27 are free to swing down one side while still maintaining engagement with the latch 33 on the opposite side. There is sufficient clearance between the cylindrical portion 17 of the member 16 and wall of the member 15 to allow lateral movement of the head 27.

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

1. The combination with an oil saver and a drilling head, of a head member mounted on and above the oil saver, a keeper member carried by the drilling head and arranged to be lowered into the head member, means for providing a fluid-tight seal between the head member and the keeper member, locking means carried by the head member for holding the keeper member therein, said keeper member being movable upwardly by the well pressure while locked in the head member, means for securing the locking means against retraction, and an outlet on the head member below the seal for relieving pressure against the keeper member to release the locking means.

2. A union including, a head member, a drilling head having an annular shoe arranged to enter the head member, locking plungers mounted on the head member, means for projecting the locking plungers inwardly to overhang the shoe for retaining the drilling head in the head member, pressure-fluid actuated means for holding the locking plungers against retraction until the well pressure below the shoe is relieved, and pressure-fluid operated means for withdrawing the locking plungers to release the shoe.

3. A union including, a head member, a drilling head having an annular shoe arranged to enter the head member, locking plungers mounted on the head member, means for projecting the locking plungers inwardly to overhang the shoe for retaining the drilling head in the head member, pressure-fluid actuated means for holding the locking plungers against retraction until the well pressure below the shoe is relieved, pressure-fluid operated means for withdrawing the locking plungers to release the shoe, and means for providing a fluid-tight seal between the head member and shoe.

4. A union including, a head member, a drilling head having an annular shoe arranged to

enter the head member, locking plungers mounted on the head member, coiled springs for projecting the locking plungers inwardly to overhang the shoe for movably retaining the drilling head in the head member, and pressure-fluid operated means for withdrawing the locking plungers to release the shoe.

5. In a well head connection, an upright keeper member adapted to be mounted on a well head member, an upright receiving member arranged to be mounted on a well casing and open at its upper end to receive the keeper member when the latter is lowered thereinto, said receiving member having a seat engaged by the keeper member to limit the downward movement of said keeper member, a laterally movable latch carried by the receiving member retractable to permit vertical movement of the keeper member and engaging the keeper member to hold the latter against upward displacement from the receiving member, the keeper member having vertical movement between the seat and the latch and being elevated above the seat by the well pressure when in engagement with the latch, whereby said keeper member may fall to free the latch when the pressure below the keeper member is relieved, and fluid pressure means for operating the latch.

6. In a well head connection, an upright keeper member adapted to be mounted on a well head member, an upright receiving member arranged to be mounted on a well casing and open at its upper end to receive the keeper member when the latter is lowered thereinto, said receiving member having a seat engaged by the keeper member to limit the downward movement of said keeper member, a laterally movable latch carried by the receiving member retractable to permit vertical movement of the keeper member and engaging the keeper member to hold the latter against upward displacement from the receiving member, the keeper member having vertical movement between the seat and the latch and being elevated above the seat by the well pressure when in engagement with the latch, whereby said keeper member may fall to free the latch when the pressure below the keeper member is relieved, spring impelled means for holding the latch in the path of the keeper, whereby said latch is yieldable and the members are automatically coupled when telescoped, and fluid pressure means for retracting the latch against the compression of the spring for withdrawing and holding the latch from the path of the keeper member.

7. In a well head connection, an upright keeper member adapted to be mounted on a well head member, an upright receiving member arranged to be mounted on a well casing and open at its upper end to receive the keeper member when the latter is lowered thereinto, said receiving member having a seat engaged by the keeper member to limit the downward movement of said keeper member, a laterally movable latch carried by the receiving member retractable to permit vertical movement of the keeper member and engaging the keeper member to hold the latter against upward displacement from the receiving member, the keeper member having vertical movement between the seat and the latch and being elevated above the seat by the well pressure when in engagement with the latch, whereby said keeper member may fall to free the latch when the pressure below the keeper member is relieved, fluid pressure means for operating the latch, and pressure releasing means connected

to the receiving member below the latch for releasing the well pressure below the keeper member.

8. A union including, an open-ended upright receiving member, a keeper member arranged to be lowered into the open end of the receiving member and to be coupled to said member, a locking element carried by one of said members for co-acting with the other member to lock them together, said keeper member being movable in the receiving member when locked, means for actuating the locking element in one direction, pressure actuated means for operating the locking element in the opposite direction, whereby the keeper member is locked in and unlocked from the receiving member, means for locking the locking element against retraction when the keeper member is subjected to fluid pressure and is moved by such pressure, and means for relieving such fluid pressure to release said locking element prior to retraction thereof.

9. A union including, an open-ended upright receiving member, a keeper member arranged to be lowered into the open end of the receiving member and to be coupled to said member, a locking element carried by one of said members for co-acting with the other member to lock them together, said keeper member being movable in the receiving member when locked, means for actuating the locking element in one direction, pressure actuated means for operating the locking element in the opposite direction, whereby the keeper member is locked in and unlocked from the receiving member, means for locking the locking element against retraction by the foregoing means, and means for releasing said locking element whereby it may be retracted by one of said foregoing means.

10. The combination with a well casing having pressure fluid therein, an oil saver connected with said casing and a coupling head mounted above and connected with said oil saver, said coupling head having its upper and open end unrestricted, a drilling head having a keeper thereon arranged to be lowered into the coupling head through the open end of the latter, locking elements carried by the coupling head and movable into locking position with respect to the keeper of the drilling head, means for urging the locking elements into locking position, said keeper member being movable in the receiving member when locked, means for retracting said elements to release the keeper, means for locking the locking elements against retraction when the drilling head is subjected to the well pressure fluid from below, and means for releasing the fluid pressure below the drilling head to unlock the same from the locking elements prior to retracting said elements.

11. The combination with a well casing having pressure fluid therein, an oil saver connected with said casing and a coupling head mounted above and connected with said oil saver, said coupling head having its upper end open and unrestricted, a drilling head having a keeper thereon arranged to be lowered into the coupling head through the open end of the latter, locking elements carried by the coupling head and movable into locking position with respect to the keeper of the drilling head, means for urging the locking elements into locking position, said keeper member being movable in the receiving member when locked, means for retracting said elements to release the keeper, means for locking the locking elements against retraction when the drilling head is subjected to the well pressure fluid from

below, means for trapping the well pressure fluid below the drilling head, and means for releasing said trapped pressure fluid to permit the drilling head to unlock from the locking elements prior to retracting the latter.

12. A union including, a coupling head having an upright bowl and an inclined seat at the lower end of its bowl, cylinders disposed radially of the bowl of the head and communicating therewith, spring pressed plungers mounted in said cylinders and normally projecting into the bowl, fluid pressure means for retracting said plungers from the bowl, an annular shoe arranged to be mounted on the bottom of a drilling head when the latter is lowered into said bowl, said shoe having an inclined flange at its bottom for engaging the seat at the bottom of the bowl and its upper end arranged to engage the plunges when the head is moved upwardly by the well pressure, and a pressure packing ring carried by the bowl of the head and engaging the shoe.

13. A union including, a receiving member arranged to be mounted on a well casing, a drilling head member of smaller diameter than the interior of the receiving member and arranged to be coupled within said receiving member, a locking element carried by one of said members for co-acting with the other member to movably lock them together, the drilling head member being arranged in the receiving member to undergo vertical movement when locked therein, whereby the drilling head member may undergo lateral and tilting movements within said re-

ceiving member, and pressure fluid operated means for actuating the locking element.

14. A union including, a receiving member arranged to be mounted on a well casing, a drilling head member of smaller diameter than the interior of the receiving member and arranged to be coupled within said receiving member, a locking element carried by one of said members for co-acting with the other member to movably lock them together, the drilling head member being arranged in the receiving member to undergo vertical movement when locked therein, whereby the drilling head member may undergo lateral and tilting movements within said receiving member, pressure fluid operated means for actuating the locking element, and fluid pressure actuated packing means disposed between the member and arranged to maintain contact with the drilling head member when the latter is moved laterally or tilted.

15. A union including, a receiving member arranged to be mounted on a well casing, a drilling head member of smaller diameter than the interior of the receiving member and arranged to be coupled within said receiving member, a locking element carried by one of said members for co-acting with the other member to movably lock them together, the drilling head member being arranged in the receiving member to undergo vertical movement when locked therein, whereby the drilling head member may undergo lateral and tilting movements within said receiving member, and means for actuating the locking element.

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