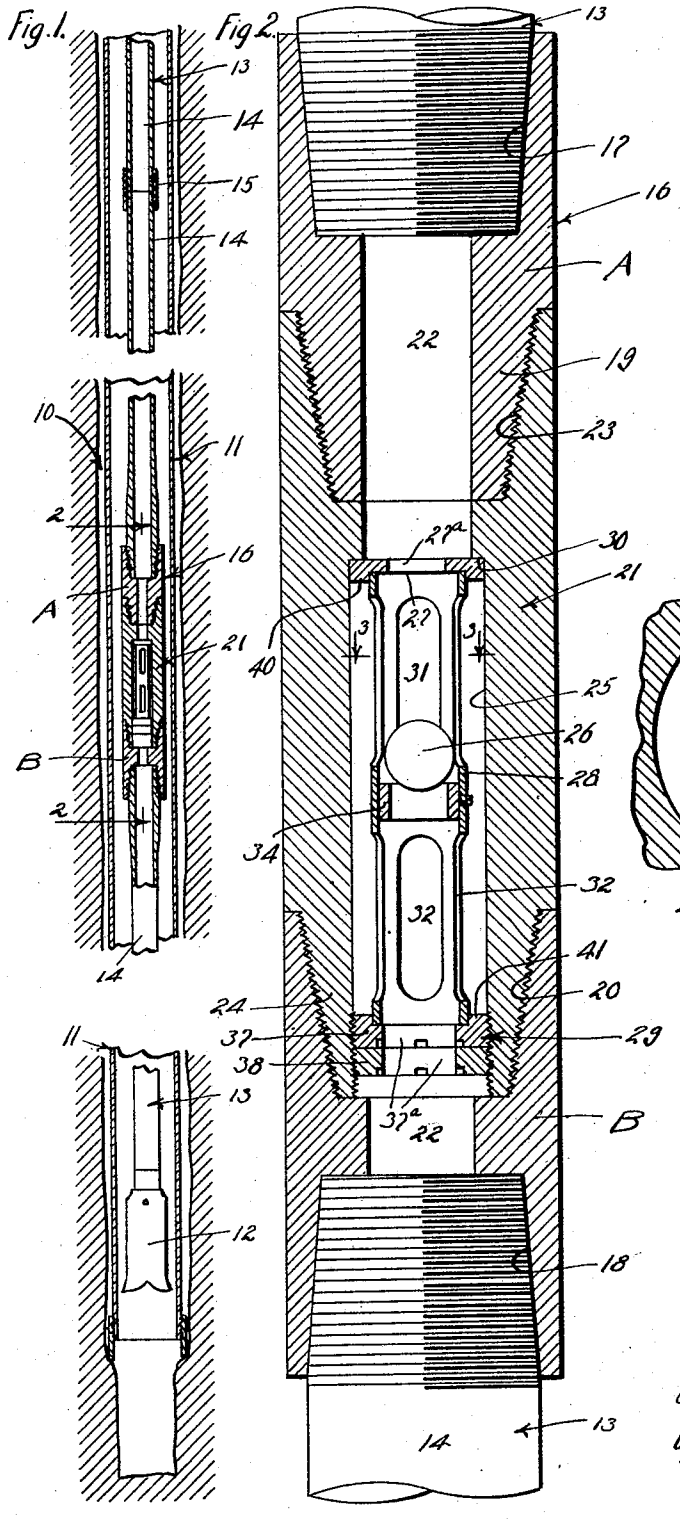
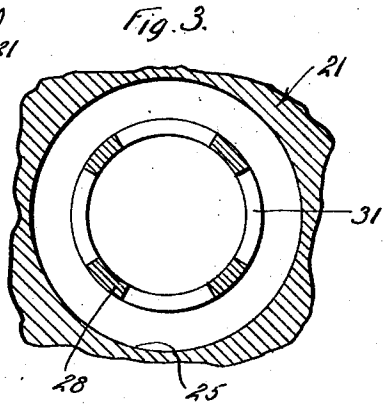
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FLOAT VALVE FOR DRILLING TOOLS

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UNITED STATES PATENT OFFICE

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FLOAT VALVE FOR DRILLING TOOLS

Application filed April 23, 1924. Serial No. 708,439.

This invention relates to a float valve for drilling tools, and it is an object of the invention to provide a simple, effective and practical device for use in connection with well drilling tools.

In drilling wells, for instance, oil wells, with the rotary method the drilling tools, that is, the drill pipe, bits, etc., are frequently removed from the hole. The drilling tools being heavy are more or less difficult, dangerous and slow to handle, this being particularly true when the drill pipe is long. To facilitate lowering tools into the hole valve devices have been applied to the tools to prevent fluid standing in the hole from entering and flowing upwardly into the drill pipe. When tools are thus "floated" into the hole they are comparatively light and easy to handle. The valve devices employed for this purpose are constructed so that they prevent flow of fluid upwardly into the drill pipe but allow free flow of fluid downwardly through the drill pipe, the downward flow being required for purpose of circulation during the drilling and various other operations.

It is a general object of our present invention to provide an improved valve device for floating drilling tools into a well and of the general character set forth in our Patent No. 1,577,740 entitled Device for use in connection with drilling tools, issued March 23, 1926.

It is an object of this invention to provide a drill pipe float valve which is simple, effective and practical in construction and arrangement.

It is another object of this invention to provide a drill pipe float valve which is applicable to a drill pipe without changing or in any way disturbing any of the parts or stands of the drill pipe.

It is another object of this invention to provide a drill pipe float valve in which the parts are simple and inexpensive in construction and can be easily and quickly repaired or replaced.

It is another object of our invention to provide a drill pipe float valve in the form of a unit which can be easily and quickly applied to various parts of a drill pipe, and which does not require careful adjustment or setting.

The various objects and features of our present invention will be best and more fully understood from the following detailed description of a typical preferred form of our invention, throughout which description reference is had to the accompanying drawings, in which:

Fig. 1 is a sectional view showing a well with typical drilling tools being lowered into it, the drilling tools being provided with the device of the present invention;

Fig. 2 is an enlarged longitudinal detailed sectional view of a portion of the drilling tools, showing in detail our improved valve device and its application to the drill pipe; and

Fig. 3 is an enlarged detail plan section, taken as indicated by the line 3—3 on Fig. 2.

In the drawings numeral 10 designates a well, and numeral 11 designates a casing set in the well in the usual manner. In Fig. 1 of the drawings we illustrate a typical drilling bit 12 being lowered into the well through the casing 11 on a string of drill pipe 13. The drill pipe 13, in accordance with standard practice, includes a plurality of sections 14 of pipe joined by suitable couplings 15 to form groups of pipe sections or stands. The stands are joined by suitable tool joints 16. In handling the drill pipe it is usually separated or disconnected only at the tool joints 16. In the drawings we have illustrated an ordinary or standard form of tool joint comprising a pin section A, and a box section B. The pin section A is formed at its upper end with a screw threaded socket 17 to receive the end of a section 14 of drill pipe, and is provided at its lower end with a tapered heavily screw threaded projection or pin 19. The box section B is formed at its lower end with a screw threaded socket 18 to receive the upper end of a section 14 of drill pipe, and at its upper end with a tapered heavily screw threaded socket 20 to receive a pin 19, or like part. In accordance with standard practice the sections of the tool joint have openings 22 extending longitudinally

through them to conduct fluid between the joined sections of drill pipe.

For the purpose of this description we will use the term "drilling tools" to designate the drill pipe, couplings, tool joints, bit, or any like, similar or equivalent parts.

The device provided by our present invention is particularly applicable to the drilling tools at one of the tool joints, and in its preferred form it is suitable for insertion between the two sections of a tool joint.

The device of our present invention includes, generally, a body 21, and a valve carried by the body. The body in its preferred form is suitable for application to or insertion between the two sections of a tool joint, and is, therefore, preferably made the same size in outside diameter as the tool joint. It is provided at one end, for instance, at its upper end, with a tapered screw threaded socket 23 to receive the pin of a tool joint section A, and at its other end with a tapered screw threaded part 24, in the form of a pin adapted to fit the socket 20 of a tool joint section B. The end parts of the body 21 are shaped and finished to cooperate with the tool joint sections just as two tool joint sections cooperate. The body is, in practice, made sufficiently long to properly carry the other parts to be described, and is made strong and heavy so that it may be handled much the same as a tool joint part, and will withstand the strains and shocks to which drilling tools are subjected. The body has a passageway or opening 25 extending longitudinally through it. The opening 25 connects the openings 22 of the two tool joint sections between which the body is inserted, and is preferably in the form of a centrally located bore.

In accordance with our present invention the valve mechanism is located or carried in the opening 25 in the body 21. The valve mechanism includes, generally, a valve part 26, a seat 27 for the valve part, a cage 28 for the valve part, and retaining means 29. The valve part 26 is preferably in the form of a ball, and the seat 27 has an opening 27*a* through it so that it is in the form of a ring. The seat 27 is supported by a downwardly facing shoulder 30, formed in the opening 25 near its upper end. The valve 26 is arranged below the seat 27 and is somewhat larger than the opening in the seat so that it operates to close the opening when in engagement with the seat.

The cage 28 carries and guides the valve 26, and is preferably cylindrical in form. The cage is considerably smaller than the opening so that it fits the opening 25 with substantial clearance. The upper end of the cage engages the seat 27 to hold it in proper engagement with the shoulder 30. The cage is provided, near its upper end, with a plurality of openings or ports 31, and near its lower end with a plurality of openings or ports 32. The ports 31 and 32 allow free passage of fluid between the interior of the cage and the space between the cage and the wall of the opening 25. The valve 26 is freely carried in the upper end portion of the cage. A stop 34 is provided in the cage to limit the downward movement of the valve. The stop is preferably in the form of a ring set in the cage at a point between the ports 31 and 32.

The retaining means 29 may include a nut 37 screw threaded into the lower end of the opening 25 to engage the lower end of the cage and hold it up in engagement with the seat 27. The nut 37 may be set in the proper position by a lock nut 38. The nuts have openings 37*a* in them registering with each other and with the cage. The cage 28 may be held in the proper central position in the opening 25 by annular flanges 40 and 41, provided on the seat 27 and nut 37, respectively.

In using our present invention the device is preferably handled as a unit, that is, with the various parts arranged together or assembled so that it is ready for immediate use. To assemble the various parts of the device the seat is arranged in the opening through the lower end of the opening so that it engages the shoulder 30. The cage with the stop ring 34 and valve part 26 in it is then arranged in the opening to engage the seat. The nut 37 is then screw threaded into the opening 25 to set the parts in position and the lock nut 38 is applied to the nut 37. In using the device in a rig the body 21 with the valve mechanism assembled in it is applied or inserted in a tool joint at the desired point in the drilling tools. It will be apparent that the body may be applied to or connected with the tool joint parts in substantially the same manner as tool joint parts are applied to each other and without in any way changing, moving or interfering with the stands of drill pipe or any permanent joints in the entire string of tools. The body 21 is, of course, applied to the drilling tools with the valve 26 below the seat 27, as we have illustrated throughout the drawings. With the device thus applied to the drilling tools it will operate to check or prevent upward flow of fluid into the drill pipe beyond the point where the device is located. As the drilling tools are lowered into the well the fluid standing in the well will enter the lower end of the drill pipe and will pass upwardly in the drill pipe until it reaches the device of the present invention. The fluid reaching the device passes through the nuts 37 and 38 into the cage 28, passes upwardly in the cage and opening 25 and carries up the valve 26 until the valve engages the seat 27. The valve in engaging the seat 27 closes the opening in the seat so that further upward flow of the fluid is prevented. When it is desired to circulate fluid down-

wardly through the drill pipe the fluid may be pumped into the upper end of the drill pipe in the usual manner. The fluid flowing downwardly in the drill pipe will not be checked or interfered with by the device of the present invention. Downward flow of fluid carries and holds the valve 26 away from the seat 27 and in engagement with the stop 34 so that the fluid flows downwardly into the upper end of the cage from which it escapes through the ports 31 into the opening 25 passes downwardly in the opening 33 and enters the lower end portion of the cage through the ports 32. From the lower end of the cage the fluid is free to pass on through the nuts 37 and 38 downwardly through the other parts or tools.

From the foregoing description it will be obvious that our present invention provides a float valve for drilling tools which is effective and practical. Our device is simple and inexpensive of manufacture, is particularly simple and convenient to handle, and can be easily and quickly repaired, if necessary, the parts of the device being arranged and assembled so that they can be easily and quickly taken apart for purpose of repair and replacement.

Having described only a typical preferred form of our invention we do not wish to limit ourselves to the specific details hereinabove set forth but wish to reserve to ourselves any changes or variations that may appear to those skilled in the art or fall within the scope of the following claims:

Having described our invention, we claim:

1. A device for use in connection with drilling tools including, a body adapted to be inserted between two tool parts and having an opening extending longitudinally through it, a seat in the opening, a tubular member substantially smaller than the opening and arranged in the opening so that one end engages the seat, a part carried in the opening to engage the other end of the member to hold the member in place, said part having an opening continuous with said member, a valve carried in said member to cooperate with the seat, and a stop in said member to limit movement of the valve away from the seat, the tubular member having ports at either side of the stop.

2. A device for use in connection with drilling tools including, a body adapted to be inserted between two tool parts and having an opening extending longitudinally through it, the opening having a shoulder near one end, an annular seat member arranged in the opening to engage the shoulder, a tubular cage substantially smaller than the opening and arranged in the opening so that one end engages the seat member to hold it in engagement with the shoulder, an annular nut screw threaded in the opening to engage the other end of the cage to hold the cage in place, a ball carried in the cage to cooperate with the seat, and a stop in the cage between its ends to limit movement of the ball away from the seat, the cage having openings in it at either side of the stop.

3. A device for use in connection with a tool joint including, a body having an opening extending longitudinally through it and having a projection on one end to engage the socket of the joint and a socket at the other end to receive the pin of the joint, the opening in the body having a shoulder near one end, an annular seat member arranged in the opening to engage the shoulder, an annular nut screw threaded in the opening, a tubular cage substantially smaller than the opening and arranged between the seat member and nut, parts on the seat member and nut to hold the cage concentrically in the opening, a ball carried in the cage to cooperate with the seat member, and a stop in the cage between its ends to limit movement of the ball away from the seat member, the cage having ports in it at either side of the stop.

In witness that we claim the foregoing we have hereunto subscribed our names this 7th day of April 1924.

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