

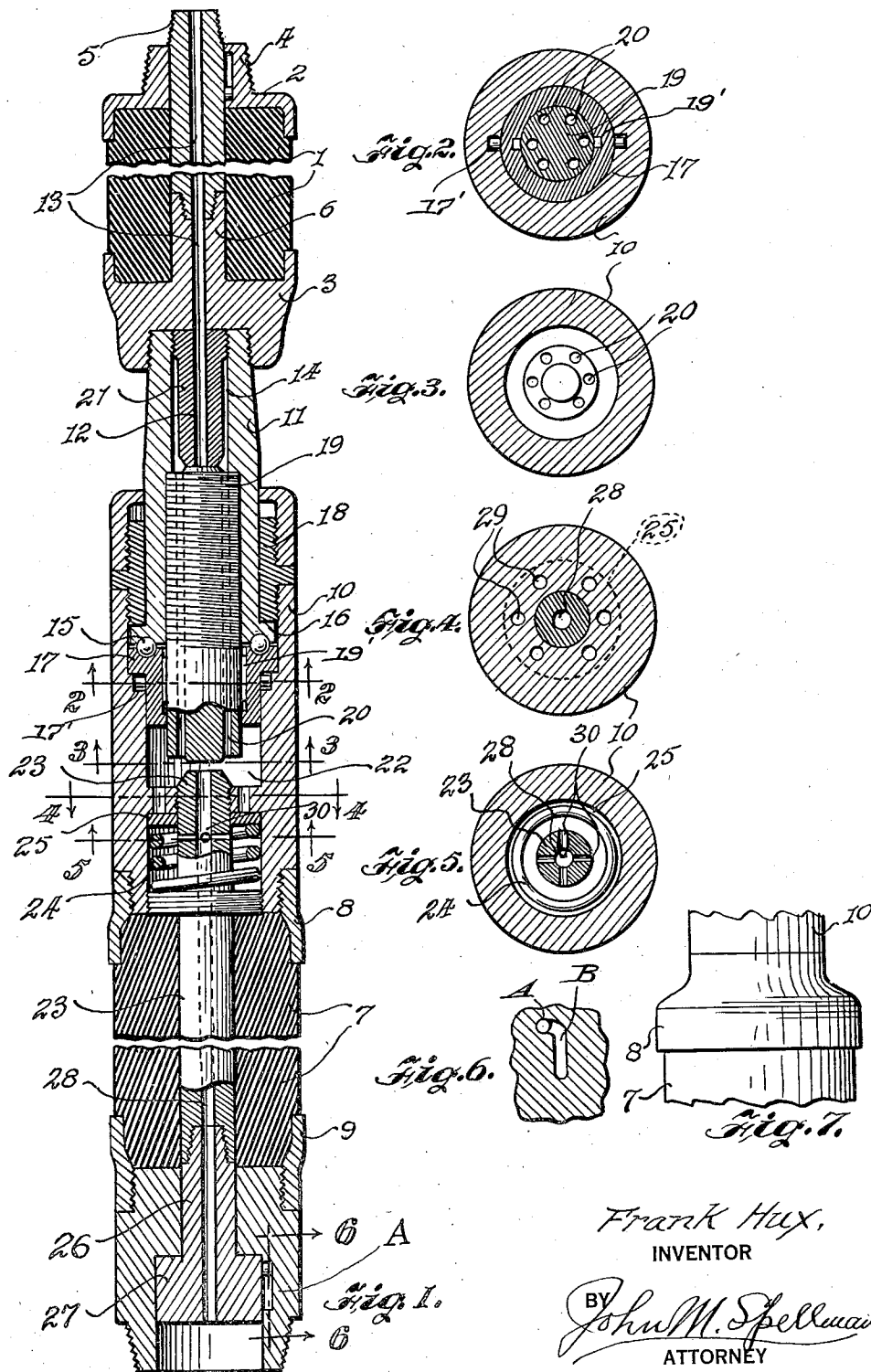
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SAND TESTING TOOL

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SAND TESTING TOOL

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My invention provides new and useful improvements in devices for deep well drilling, more specifically for making a test of the formation through which the drill passes to ascertain if a producing stratum has been encountered.

Preliminary to the hereinafter detailed description of the invention and for the purpose of making the same more easily understood, it is in order to state that ordinarily in drilling wells for oil, gas or water a full string of casing is necessary. Those familiar with well drilling know that the casing method is expensive, and that this operation also reduces the size of the hole which prevents drilling to any appreciably great depth.

It is the general purpose of my invention to provide a sand testing tool, for connection to the drill stem and introduced into the well, the operation of the tool enabling a sample of the fluid in the bottom of the well to be had, no casing being used.

More specifically the sand or fluid tester includes means for spudding past an obstruction in the hole without expanding the packer or hole sealing element.

The construction of the invention also includes an arrangement whereby after the test is completed, the well can be pumped through the sand tester through a specially constructed valve in the tester or tool. It also provides a double packer for straight hole testing, where the formation is soft, to doubly ensure a cut-off of the drill fluid.

With the above and other objects in view, the invention will be fully understood from a perusal of the following detailed description in connection with the drawings and wherein:

Figure 1 is a vertical sectional view of the invention,

Figures 2 to 5 inclusive represent cross-sectional views taken respectively along the lines 2 to 5 inclusive in Figure 1.

Figure 6 is a detail sectional view taken on line 6—6 of Figure 1, illustrating means for locking one of the valves in open position,

Figure 7 is a side elevational view in detail of a collar for holding one end of a packer.

Having a more detailed reference to the

drawings, 1 denotes an upper packer of rubber or other compressible composition. The packer is embraced at each end by a collar 2 and a collar 3. The collar 2 includes a tapered and threaded end 4 for connection with a hollow drill stem. The collar 2 and upper packer are bored for insertion of a nipple 5 and the collar 3 includes a projection 6 for sealing and joining the nipple 5.

The lower end of the tool or tester includes a packer 7 similar to that one above and held in position on the tool by similar collars 8 and 9. The upper packer, however, is not absolutely necessary in the operation of the tool.

Between the upper and lower packers or hole sealing elements is a hollow housing 10 in which is disposed the valve mechanism for passage of fluid secured in the test. The housing is connected to the upper packer by means of a tube 11, one end of the tube threadedly seated in the lower collar 3. The tube is centrally bored at 12 and comes into alinement with the bore 13 traversing the upper packer and parts. Annular spaced and longitudinal openings 14 traverse the upper end of the tube 11 for purposes hereinafter pointed out.

The tube 11 is so positioned in the housing that it will operate in swivel fashion by means of the bearings 15. The bearings are arranged in the race provided by the annular enlarged end 16 of the tube and a member 17. There is also provided a ring 18 which holds the tube rotatable centrally of the housing.

For effecting a cut-off of the liquid or sand test from the well contents there is provided a main valve 19 with a left hand thread. This valve has a plurality of spaced longitudinal openings 20 for passage of liquid into the drill stem when the valve is opened to permit the flow upwardly into the bores 12 and 13 according to pressure. Since rotation of the drill stem to the left enhances the possibility of loosening the stem joints, the valve 19 is provided with left hand threads and therefore rotation of the stem to the right will lower this valve. It will be observed from Figure 1 that the upper end of valve 19 when in the upper position shown rests

against the opening of bore 12 in a small nipple 21 threaded into the upper end of the tube 11. This is the normal upper closed position of valve 19. This valve is keyed against rotation at 19' to the bushing 17, the latter being held in a non-rotatable position by the pins 17'.

The lower end of valve 19 projects into a chamber 22 and when the valve 19 is in lowered position, effected by a further right hand rotation of the drill stem, it will advance downwardly and make contact with a tube 23. This tube is rigidly seated as by threads in a spider, as shown in Figure 1, and in which are spaced ducts 29 and includes a disk 25, supported upon a spring 24. The lower end of this tube is connected to a nipple 26 having an enlarged end 27 and is centrally bored at 28. This disk normally rests against the walls of the opening containing the spring 24 and above the disk are ducts 29 (see Figure 4). The tube 23 also has horizontally spaced ducts 30 (see Figure 5), to permit downward passage of mud-laden fluid when necessary without changing position of the valve 19. Thus when the spring is depressed by water pressure from above the disk 25 descends below the ducts 30. When the disk is thus depressed below the ducts 30 the slush water will have a by-pass through the openings 20 into the chamber 22, thence through the ducts 29 into the ducts 30 and enter the bore 28.

In Figure 6 is shown a means for locking the packers in closed or uncollapsed position until the tool is lowered to bottom of hole, at which point the drill stem is turned, thus unlocking pin A to permit it to move into slot B and allowing drill stem to be lowered and collapsing the lower packer or sealing the hole.

It can be determined whether or not the packer has been unlocked by the distance the drill stem travels down after an effort has been made to unlock the packer.

In the operation of the tool, the nipple 21 and the valve 19 are in contact at the start and in the position shown in Figure 1, hence the channel or bore 12 is closed. Rotation of the tube 11 to the right lowers the valve, thus spacing it from the bore 12 and opening the latter, and establishing an open communication between the bore 12 and the openings 20 in the valve. When in this position, the bore of the tube 23 will be open and in communication with the openings 20, thus allowing a test of the liquid or substance from below to enter and pass up into the bore 12.

The tube 23 is stationary with the body of the tool, therefore after sufficient of the test has entered from below, a continued right hand rotation of the tube 11 will lower the valve 19 and bring the lower end thereof into contact with the tube 23, closing the opening thereof. The tool is now ready to be with-

drawn for inspection of the contents which are trapped in the drill stem.

The disk 25 with its spring 24 and the ducts or passages 30 and the ports 29 in the spider are for the purpose of pumping mud-laden fluid or slush down through the tool when it is necessary, without changing the position of the valve 19, and is used in emergencies. When in closed position, the valve 19 is in contact with the tube 23 and it will be apparent that the channel 12 in nipple 21 is then in open communication with the openings 20, and that pressure of liquid from above will compress the spring and disk, allowing the latter to descend past the ducts 30 in the tube 23, and providing a by-pass of fluid to be pumped downward through the tool. This eliminates the necessity of rotating the pipe to the left to re-establish communication through valve 19.

The weight of the drill stem compresses the lower packer and seals the hole, there being as much perforated pipe on the bottom of the tool as is required. The tool does not require a small hole drill ahead to make a test, as the lower packer will expand against the walls of the hole, thereby cutting off the fluid or drill mud. The tool can be used in all diameters of wells inside of casing or on top of liner. If used to test in a small hole, drilled ahead of a hole of larger diameter, the packer will wedge in the small hole and expand.

The invention is not to be understood as limited to the precise construction disclosed, but may be modified and altered within the scope and meaning of the appended claims.

Obviously alterations are possible in keeping with the appended claims.

What is claimed as new is:

1. A sand testing tool for oil wells, comprising a housing, a tubular element rotatably seated and projecting into the upper end of the housing and extending thereabove; a tubular element seated and projecting into the lower end of the housing and depending therebelow; a valve threadedly-engaged with said upper tubular element, said valve channeled from end to end and adapted to provide open communication with and between said upper and lower tubular members when a test of the well is being had; the valve being lowered to open and closed positions before and after the test is secured by a right hand rotation of said upper projecting element; in combination with packers above and below said housing.

2. A sand testing tool for oil wells, comprising a housing, a tubular element rotatably seated and projecting into the upper end of the housing and extending thereabove; a nipple with a central bore, said nipple seated within the upper projecting end of said tubular element; a tubular element seated and projecting into the lower end of

said housing and depending therebelow; a
channeled nipple secured to the lower end of
said lower tubular element; a marginally
channeled valve threadedly-engaged in the
5 lower hollow portion of said upper tubular
element; said valve adapted to provide an
open communication between said upper
nipple and said lower tubular element when
moved downwardly in one position by a
10 right-hand rotation of said upper tubular ele-
ment in securing a test of the well, and to
provide a closed position after the test is se-
cured by a further right-hand rotation of
said upper element to advance the lower end
15 of the valve against said lower tubular ele-
ment.

3. A sand testing tool for oil wells and
as claimed in claim 1, and wherein said valve
is provided with a plurality of marginal
20 channels from end to end thereof, the center
of the valve being solid for the purpose of
obtaining a closure when the lower end of
the valve abuts the upper end of said lower
tubular element after the test is secured.

25 4. A sand testing tool for oil wells and as
claimed in claim 2, and wherein said valve
is provided with a plurality of marginal
channels from end to end thereof, the center
of the valve being solid for the purpose of
30 obtaining a closure between the upper end of
the valve and the lower end of said upper
nipple, initial to the first advancement of the
valve downwardly.

5. A sand testing tool for oil wells, com-
35 prising a housing, a tubular element rotat-
ably seated and projecting into the upper end
of the housing and extending thereabove; a
tubular element seated and projecting into
the lower end of the housing and depending
40 therebelow; a valve threadedly-engaged with
said upper tubular element, said valve pro-
vided with a plurality of marginal channels
from end to end, the center thereof being
solid; means to prevent the valve from rota-
45 tion; said valve adapted to provide open
communication with and between said upper
and lower tubular elements when a test of
the well is being made; the valve being low-
ered to open and closed positions of the tool
50 before and after a test is secured by a right-
hand rotation of said upper projecting ele-
ment.

In testimony whereof I affix my signature.
FRANK HUX.

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