Jan. 19, 1937. T. A. OWEN 2,068,108

SAND TESTING TOOL

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Fig. 1.

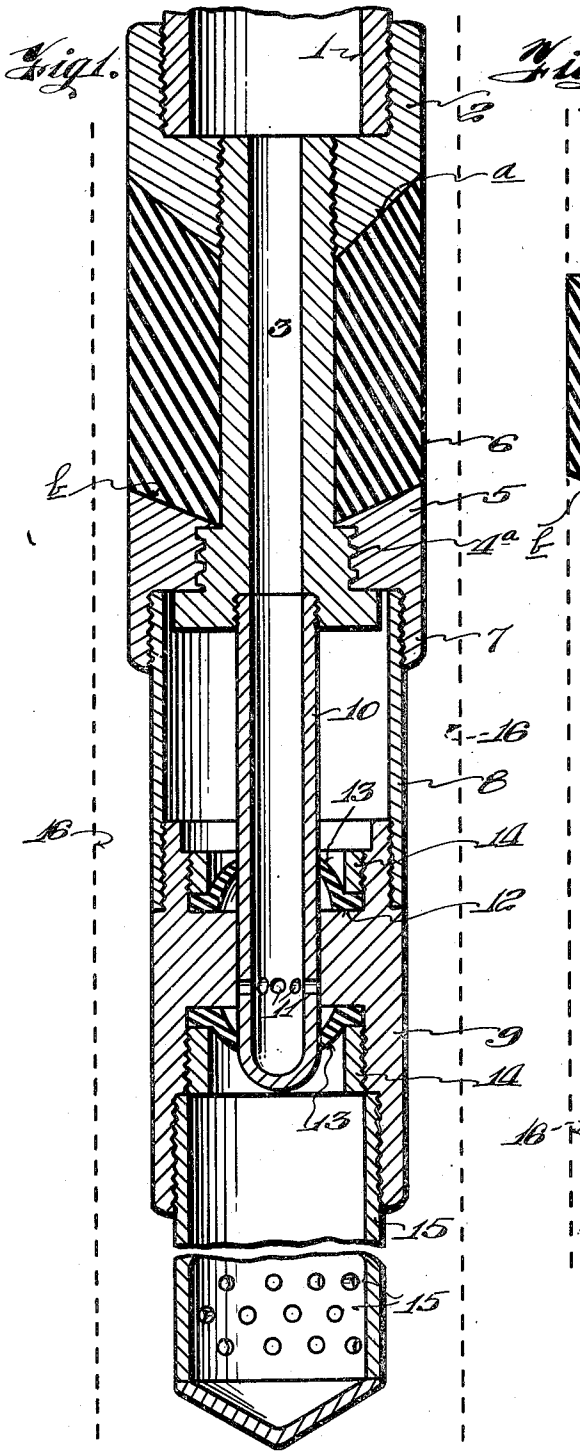
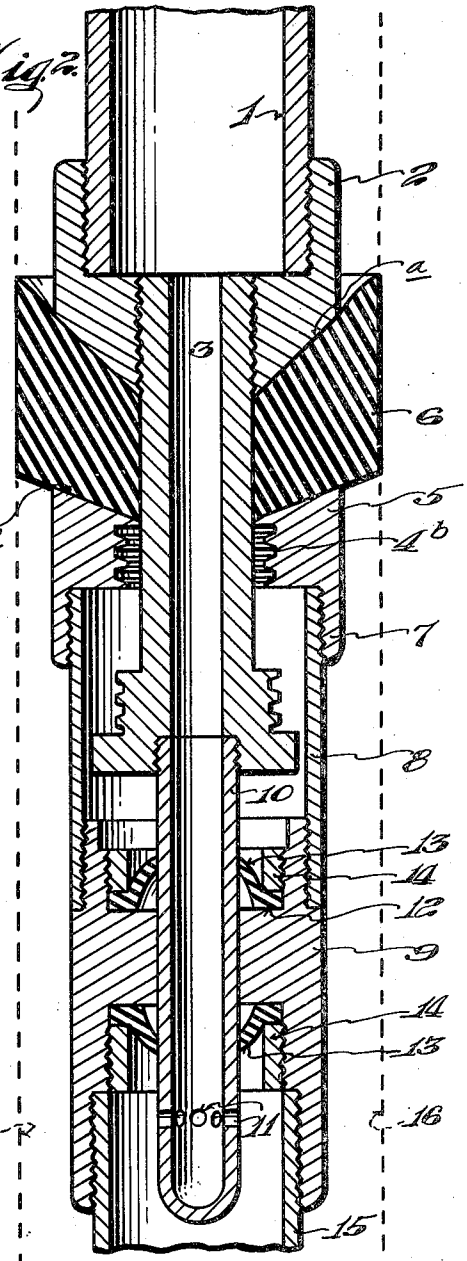


Fig. 2.



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SAND TESTING TOOL

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5 Claims. (Cl. 166—1)

This invention relates to sand testing tools and it has particular reference to a tool, arranged to be suspended in a well for the purpose of obtaining samples of possible oil producing sands.

The principal object of the invention is to provide an improved type of valve for sand testing tools, which eliminates springs and other elements likely to get out of order and prevent the taking of a true sample. The present invention is positive in its operation and wholly capable of entrapping a full sample of sand and transferring the same to the surface for examination.

Another object of the invention is to provide effective packing means for the valve and which means is spaced apart in order to seal the valve against leakage or ingress of undesired fluid when the valve is closed during the lowering of the tool or when withdrawing the tool from the well.

Still another object of the invention is to provide a ready and positive, surface operated means to release the valve for operation, the same means being effective in locking the valve in closed position.

The invention likewise includes among its objects the provision of a packing means which is effective in sealing off well fluid, such as drilling mud and the like during the taking of samples and which packing means is operative whether or not a special shoulder is provided in the hole, as required in some cases for expanding the packing.

With the foregoing objects as paramount, the invention has particular reference to its salient features of construction and arrangement of parts, to become manifest as the description proceeds taken in connection with the accompanying drawing, wherein:

Figure 1 is an elevational view in longitudinal section showing the improved sand tester with its valve closed, and

Figure 2 is a similar view but with the valve open and the packer expanded.

Continuing with a more detailed description of the drawing, 1 designates fragmentarily the lowest section of drill stem which is received by the internal threads of the joint 2, the latter, in turn, having threaded therein the upper end of a tubular mandrel 3. It will be observed that the lower end of the joint 2 is tapered at *a* for the purpose to be described presently.

The lower end of the mandrel 3 is enlarged to receive threads 4, preferably of the acme type on shoulder 4a. These threads 4b engage the female threads in the ring 5, immediately below the packer 6, which latter is of rubber or composition and against which the packer is normally engaged. This ring is interiorly chamfered at *b* to conformably receive the slight taper on the bottom of the packer. Also it will be noted that the ring 5 is provided with an interiorly threaded skirt 7 which receives the sleeve 8. The sleeve 8 is threadedly connected to a member 9 which serves in the capacity of a guide for the tubular valve stem 10 and as a closure for the valve ports 11 provided in the lower end of the stem 10. This stem is closed at its lower end except for said ports.

The shoulder 12 in the guide member 9 serves as a seat or abutment for packing rings 13, one of which is disposed above and the other below the shoulder and the peculiar construction of these rings is such that not only is the fluid held against ingress into the tubular valve stem when the valve is closed but also is effective in wiping the stem clean of any adhering particles, thus insuring a positive seal. Packing retaining rings 14 bear against the packing rings 13 to hold them against displacement.

Threaded into the lower end of the valve guide 9 is a perforated pipe or strainer 15 which may be of any desired length and this pipe, as will become apparent presently, is the medium by which opening movement of the valve is effected.

In operation the tool described is lowered by the drill stem 1 into the hole, with the mandrel 3 suspended in locked position by the threads 4. In this position, the valve is closed. When the perforated pipe strikes the bottom of the hole, the drill stem is rotated at the surface to disengage the thread at 4. Obviously, then, the mandrel 3, by the weight of the drill stem assembly, moves downwardly to the position shown in Figure 2 so that the valve ports 11 will be open to the oil sand in the bottom of the hole and which enters the pipe 15 through its perforations. In the meantime, the weight of the assembly bears upon the packer 6, expanding the same outward against the walls 16 of the hole to pack off drilling mud which might otherwise pass downward into the sand to be tested and interfere with the taking of a true sample.

By gravity or gas pressure, the oil sand and fluid flows into the tubular valve stem 10 through ports 11 and when a desirable amount of such fluid enters the tool, it is lifted off the bottom of the hole and since the mandrel and valve stem are the first to be elevated, this action causes the ports to be closed by the guide 9.

It is not always considered necessary to again lock the valve in closed position by re-engagement of thread 4, since the weight of the assembly, plus the weight of the fluid is sufficient to hold the valve closed. Accordingly, it will not be necessary to again rotate the drill stem to effect such engagement, consequently, the tool may be withdrawn from the hole with the sample contained in the tubular stem 10, and mandrel 3 in any amount desired.

Of course, when the packer 6 is relieved of the pressure thereon, it returns to its normal condition to enable the tool to be freely withdrawn from the well.

Manifestly, the construction shown and described is capable of considerable modification and it will be understood that certain changes and alterations may be made which fall within the meaning and scope of the appended claims without departing from the spirit or intent of the invention.

What is claimed is:

1. In a well sand testing tool arranged for suspension on a drill stem, a tubular mandrel in fixed relation with said drill stem and having a threaded shoulder on its lower end, a valve stem carried by said mandrel having ports in its lower end, a ring having interior threads to engage the threads of said mandrel shoulder and having a sleeve depending therefrom in concentric relationship with said valve stem, a valve stem guide carried by said sleeve through which said valve stem is slidably movable, a perforated tubular member suspended from said guide, sealing means carried by said guide and wipingly engaging said valve stem when the latter is vertically displaced, said sealing means being arranged above and below the ports in said valve stem when the latter is in retracted position, packing means surrounding said mandrel and expanded by the weight of said drill stem when the latter is rotated to disengage the threads of said shoulder from those of said ring to effect movement of said valve stem to open position below said guide.

2. A well sand testing tool including a mandrel having a threaded shoulder on its lower end, a valve stem depending therefrom having perforations in its lower end, a valve stem guide below said mandrel for closing the perforations in said stem and through which said stem is slidably moved to operative position to expose its perforations to the fluid of said well by the weight of said drill stem, threaded means engaging the threads of said mandrel shoulder to hold said valve stem in inoperative position and expansible means surrounding said mandrel above its shoulder and expanded by the weight of said drill stem when the latter is rotated to release the threaded parts, for sealing out fluid between said drill stem and the walls of said well.

3. Apparatus for testing the productivity of oil sands including in combination with a drill stem, a hollow mandrel suspended by and in fixed relation with said drill stem and having a threaded shoulder on its lower end, a valve stem depending from and in fixed relation with said mandrel and provided with fluid inlet ports, threaded means engaging the threads of said mandrel shoulder to hold said valve stem in retracted position and having a tubular sleeve depending therefrom in concentric relation with said valve stem, a valve guide carried by said sleeve and having spaced packing means positioned to embrace said valve stem above and below said ports when said stem is in retracted position, a perforated pipe connected to and extending below said valve guide and an expansible packing means surrounding said mandrel and operative to seal out fluid therebelow when said drill stem is rotated to disengage the threaded parts and then slidably moved downward to effect movement of said inlet ports in said valve stem to open position below said guide.

4. Apparatus for testing the productivity of oil sands including in combination with a drill stem, a hollow mandrel having threads on its lower end, a tubular valve stem depending from said mandrel and having ports in its lower end, a sleeve depending below said mandrel and in concentric relation with said valve stem, an interiorly threaded member, stationary with respect to said sleeve and arranged to hold said valve stem in retracted position, a guide for valve stem, said guide serving also to close the ports of said valve stem when the latter is retracted, a perforated pipe below said guide arranged to support the weight of said drill stem preparatory to rotation thereof to release the threads of said mandrel from those of said interiorly threaded member to effect opening movement of said valve and packing means surrounding said mandrel and expansible under the weight of said drill stems to seal off fluid tending to rise exteriorly of said apparatus.

5. A sand testing tool for wells including in combination with a drill stem, a tubular member connected to said drill stem and in fixed relationship therewith, a hollow tubular valve, connected to and depending from said tubular member and having ports in its lower end, an interiorly threaded sleeve in movable relation with said drill stem, a perforated fluid inlet pipe below and in fixed relation with said sleeve, a valve guide disposed between said sleeve and said fluid inlet pipe to close the ports of said valve when the latter is in inoperative position, an interiorly threaded ring above and connected to such sleeve, threaded means carried by the lower end of said tubular member, engageable with the threads of said ring and arranged to be released upon rotation of said drill stem to urge said valve below said guide, thereby to open said valve to well fluid, packing means carried by said guide embracing said valve ports when the valve is in closed position and means above said interiorly threaded ring and arranged to expand under the weight of said drill stem to be effective in restraining well fluid against rising exteriorly of said tool when said valve is opened.

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