

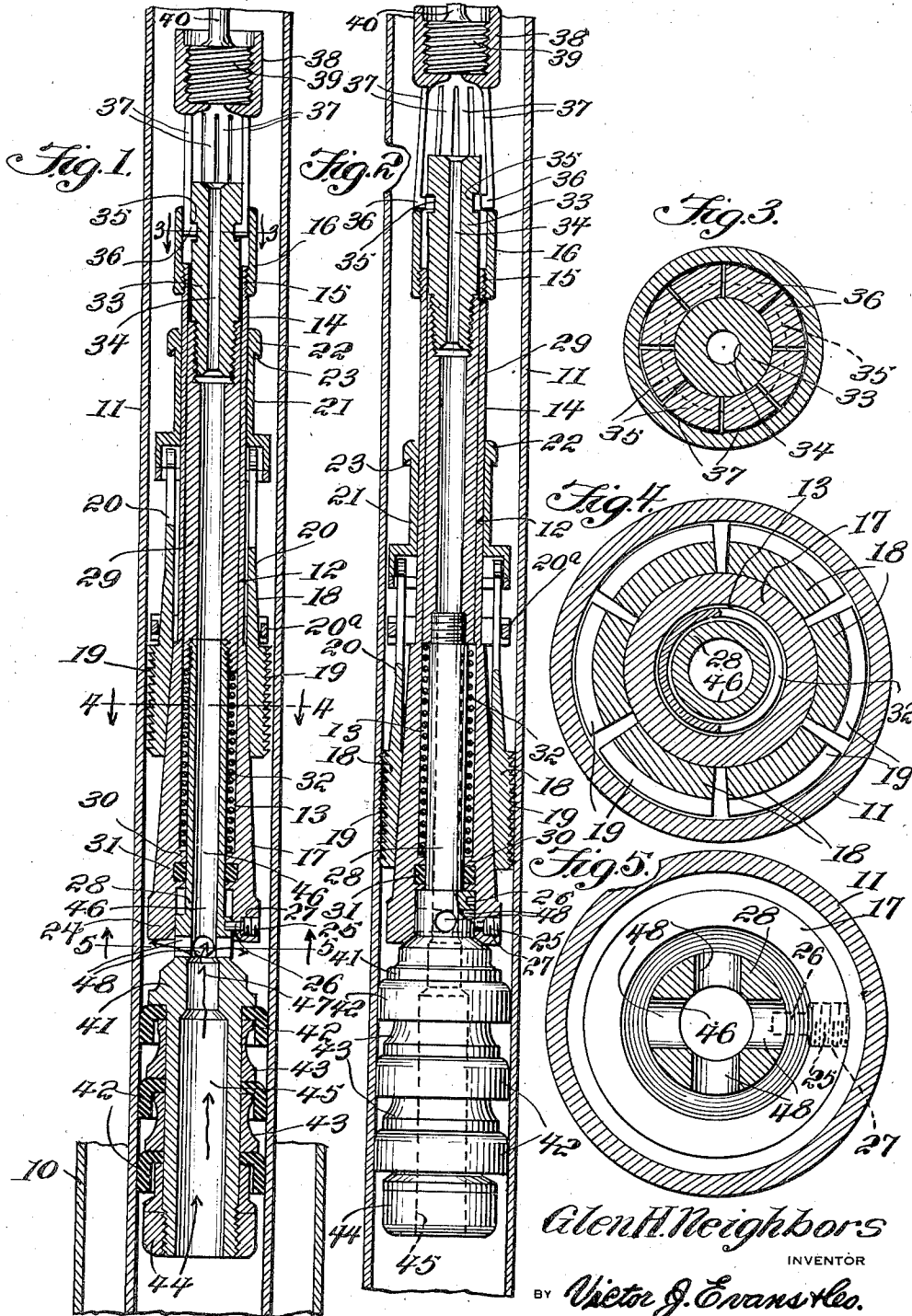
April 4, 1939.

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2,153,268

WELL TOOL

Filed Sept. 22, 1938



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2,153,268

WELL TOOL

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Application September 22, 1938, Serial No. 231,259

2 Claims. (Cl. 166—2)

My invention relates to well tools adapted for use as either a plug or choke for a string of tubing located within the casing of a flowing oil well.

In flowing oil well operations, to effect tubing changes, it is a common practice to lower a tool or obstructive device within the well tubing to effect a choking of the well. This is accomplished by securing an obstructive device, adapted for use as either a plug or choke, to the end of a lowering pipe, lowering the same a desired distance into the well tubing, and operating said obstructive device to seal the well a desired distance from the surface after which the well tubing may be withdrawn completely from the well casing or shifted longitudinally within the well screen section of the tubing relative to the bottom of the well.

Ordinarily, the choke or obstructive device is provided with a relative small bore which becomes clogged or sealed while being lowered due to the fact that the fluid through which the choke passes is of a heavy nature, for instance oil with congealed paraffin or heavy rotary muds. Thus in running the tool through the fluid, it requires considerable time (often many hours) to pass it down into the well tubing and sometimes it is impossible as the oil will clog ahead of the tool. One example of a tool of this character is illustrated in the United States patent to Herbert C. Otis, No. 1,920,103, granted July 25, 1933.

My improved tool eliminates the clogging of the bore of the choke, it being one of the principal objects thereof to provide a well tool equipped with means for by-passing the fluid about the choke during a lowering operation.

Another object of my invention is to provide a tool of the above described character equipped with means for by-passing the fluid during a lowering operation together with means operable for closing the by-pass means.

A further object of my invention is to provide a device of the above described character equipped with means operated by fluid pressure for permitting by-passing of fluid for choking or "killing" the well.

A special object of my invention is to provide a tool of the above described character which is simple in construction, durable in use, efficient in operation, and economical in manufacture.

Other objects and advantages will be apparent from the following description, appended claims and annexed drawing.

Referring to the drawing wherein like reference

characters designate like parts throughout the several views:

Figure 1 is a longitudinal sectional view of my invention illustrating the parts in lowering position.

Figure 2 is a view similar to Figure 1 illustrating the parts in set position.

Figures 3, 4 and 5 are enlarged detail sectional views taken on the lines 3—3, 4—4 and 5—5 of Figure 1 respectively.

In practicing my invention I provide a well casing 10 in which is located a well tubing 11, both being of an ordinary construction. As illustrated in the drawing, my improved well tool is positioned within the tubing 11 and comprises a mandrel 12 having a centrally disposed bore 13 extending therethrough and is formed with an upper straight cylindrical section 14, the upper end of which is threaded as at 15 for the reception of an externally disposed collar 16. Subjacent the cylindrical section 14, the mandrel is formed with a frusto-conical section 17 around which is disposed a plurality of independent slips 18. Each of said slips are provided on the outer peripheral face thereof with teeth 19 which are adapted to engage the inner surface of the string of tubing 11 to maintain the device or tool in a predetermined position within said string of tubing.

The inner surfaces of the assembled slips 18 taper in accordance with the taper of the external surface of the frusto-conical section 17 of the mandrel so that, upon relative longitudinal movement being affected between the slips and section 17, the slips will be caused to expand or contract to effect either engaging or releasing movement, as the case may be, of the teeth of said slips with respect to the inner surface of the string of tubing. Each of the slips 18 are supported by a tongue 20, the upper ends of which are pinned to a slip carrier 21 slidably mounted on the section 14 of the mandrel and subjacent the collar 16.

Above the slips 18 there is mounted about the tongues 20 a ring 20a for limiting the outward movement of said slips for effecting ready insertion within the top of the tubing. Said ring is of a sufficient diameter to permit sufficient expansion of the slips to engage the interior peripheral face of the tubing.

The slip carrier 21 comprises a cylindrical body section provided at the upper end thereof with an annular flange 22 formed with an undercut lower edge 23 for a purpose hereinafter set forth.

At the lower end of the frusto-conical section 17 the mandrel is provided with an annular flange

24 and has extending radially therein a shear pin 25 formed with an outwardly extending threaded head and an inwardly extending shank 26 for engagement within a radially extending cul-de-sac 27 formed in the headed section fashioned on the intermediate portion of a barrel 28 which is slidably mounted within the bore 13 of the mandrel. The upper end of the barrel is threadedly connected to the lower end of a hollow plunger 29 slidably mounted within said mandrel. The bore 13 of the mandrel adjacent the lower end of the section 17 is shouldered as at 30 to provide a packing gland 31 about the barrel 28.

Interposed between the lower end of the plunger 29 and said shoulder 30 is a coil spring 32 surrounding the barrel 28 and normally urging the plunger 29 upwardly within the bore 13. The upper end of the plunger 29 is interiorly threaded and receives therein the lower end of a choke bushing 33 formed with a bore 34 extending there-through and in communication with the bore of the plunger 29 and barrel 28. The upper end of the bushing extends through the section 14 of the mandrel and into the collar 16 and slightly beyond the upper end of said collar. The upper end of the bushing is fashioned with a circumferentially extending groove 35 normally located below the upper end of the collar when my device is being lowered within the tubing. The circumferentially extending groove 35 receives therein offset lower ends 36 of a plurality of resilient arms 37 connected together at their upper ends and to an internally threaded sleeve 38. The sleeve 38 receives therein the lower enlarged threaded end 39 of a lowering rod or pipe 40 whereby my device is lowered within the tubing as hereinafter more fully described.

Subjacent the head section of the barrel 28, said barrel is fashioned with a lower cylindrical section 41 on which are mounted a plurality of cup washers 42. The lower cylindrical section 41 has secured thereon between said washers 42 spacers 43 and on the lower end a lock nut 44 whereby said spacers and washers are maintained in assembled condition.

The lower section 41 of the barrel is fashioned with a bore 45 communicating with a bore 46 in the upper section of said barrel by means of an intermediate passage 47. Said intermediate passage has communication with a plurality of radially extending ports 48 in the headed section of the bore which communicate without said barrel into the interior of the tubing. The shank 26 of the shear pin 25 serves to maintain the headed section spaced relative to the shoulder 30 and lower face of the flange 24 whereby to maintain the ports 48 in opened condition.

In use, the rod or pipe 40 is secured within the collar 38 and the ends 36 of the arms 37 are seated within the groove 35 and embraced by the upper end of the collar 16. In this position of the parts, as illustrated in Figure 1, my device is gradually lowered into the tubing and oil or other fluid entering the bore 45 of the section 41 below the washers 42 will pass upwardly through said bore and passage 47 and outwardly through the ports 48, thereby effecting an easy lowering of the tool even though the bore 34, which is of a relatively narrow diameter, should become clogged by heavy fluid passing therethrough. When the tool has

been lowered to a desired depth, a raising of the pipe 40 serves to expand the slips 18 to effect engagement with the inner face of the tubing against upward movement due to the angular faces of the teeth 19.

When the teeth 19 thus engage the interior surfaces of the tubing, continued pressure on the pipe 40 serves to shear the shank 26 of the pin 25 and thus permit a raising of the headed section of the barrel a sufficient distance to close the ports 48 and at the same time permit a like raising of the bushing 33 a sufficient distance to dispose the groove 35 above the upper end of the collar 16 as clearly illustrated in Figure 2 of the drawing. When the bushing is thus raised, the offset ends 36 of the arms 39, due to the expansion of said arms, disengage from said bushing and permit the pipe 40 together with the arms 37 to be raised out of the tubing thereby effectively closing the tubing against upward flow except through the bore 34 of the bushing 33 and communicating bores. The spring 32 serves to maintain the section 41 raised relative to the mandrel, thus closing the ports 48. Should it become necessary to "kill" the well, fluid pumped down the tubing will overcome the pressure of the spring 32 and permit a lowering of the barrel and subsequent opening of the ports 48 to permit fluid to by-pass through the passage 47 and bore 45.

What I claim is:

1. A device of the character described, comprising, a mandrel equipped with slips adapted to engage the inner wall of a tubing and secure said mandrel fixed thereto, a bored barrel slidably mounted in said mandrel and fashioned with ports adapted for effecting communication between said tubing and the bore of said barrel subjacent said mandrel, said barrel provided with a section subjacent said ports, sealing elements carried by said section and adapted for engagement with said tubing whereby to effect flow of fluid through said section and through said ports, means connected to said barrel for moving the latter relative to said mandrel for disposing said ports within said mandrel, and a shear pin securing said mandrel to said barrel whereby to maintain said ports spaced below said mandrel.

2. A device of the character described, comprising, a mandrel equipped with slips adapted to engage the inner wall of a tubing and secure said mandrel fixed thereto, a bored barrel slidably mounted in said mandrel and fashioned with ports adapted for effecting communication between said tubing and the bore of said barrel subjacent said mandrel, said barrel provided with a section subjacent said ports, sealing elements carried by said section and adapted for engagement with said tubing whereby to effect flow of fluid through said section and through said ports, means connected to said barrel for moving the latter relative to said mandrel for closing said ports, a shear pin securing said mandrel to said barrel whereby to maintain said ports spaced below said mandrel, a spring for moving said barrel relative to said mandrel upon shearing of said pin, and means connected to said barrel for shearing said pin.

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