

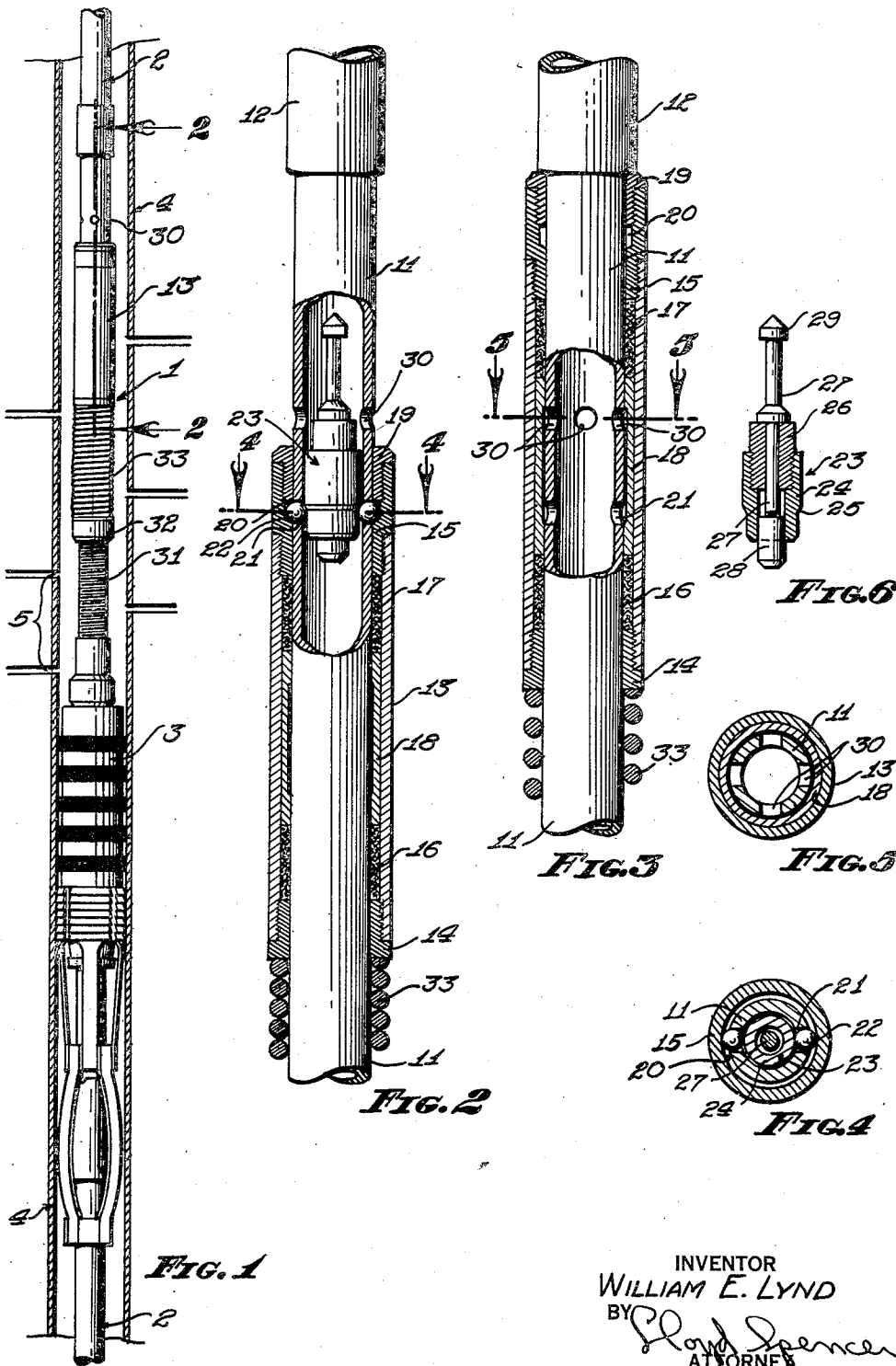
Feb. 27, 1945.

W. E. LYND

2,370,476

DUAL PRODUCTION DEVICE

Filed Aug. 11, 1941



INVENTOR
WILLIAM E. LYND
BY *Howard Spencer*
ATTORNEY

UNITED STATES PATENT OFFICE

2,370,476

DUAL PRODUCTION DEVICE

William E. Lynd, Longview, Tex., assignor to
Lane-Wells Company, Los Angeles, Calif., a corporation of Delaware

Application August 11, 1941, Serial No. 406,314

1 Claim. (Cl. 166—2)

My invention relates to dual production devices; that is to devices whereby oil may be produced simultaneously through a tubing string from a lower zone and through the annular space between the tubing string and casing from an upper zone. Among the objects of my invention are:

First, to provide a device of this character which enables the operator to prepare the well for production from each of the zones without interfering with the other, particularly in that the dual production device enables circulation to be had initially between the upper zone, the interior of the tubing and the annular space between the tubing and casing for the purpose of washing or circulating, or cleaning, so that the oil or gas may flow in, the device providing in particular an arrangement whereby the communication from the upper zone to the interior of the tubing string may be closed after such preparation and swabbing tools lowered through the tubing to the lower zone for the purpose of cleaning the lower zone by swabbing or suction created within the tubing, the lower zone being conditioned while the upper zone is actually on production.

Another object of my invention is to provide a device which is extremely simple and rugged of construction, and readily operated by the usual equipment available at an oil well.

With the above and other objects in view, as may appear hereinafter, reference is directed to the accompanying drawing, in which:

Figure 1 is an elevational view of my device shown in conjunction with a packer and tubing string, all shown in position within a casing, the latter being shown in section;

Figure 2 is an enlarged fragmentary sectional view of my device substantially through 2—2 of Figure 1, showing the parts in their initial position during circulation or separation of the upper zone for production;

Figure 3 is a fragmentary, longitudinal sectional view similar to Figure 2 but showing the parts in the positions assumed when communication is established with the lower zone;

Figure 4 is a transverse sectional view through 4—4 of Figure 2, showing particularly the key balls which lock the parts in their initial position;

Figure 5 is a transverse sectional view through 5—5 of Figure 3, showing the circulation ports as they appear when closed; and

Figure 6 is a longitudinal sectional view of the keeper which initially holds the key balls in place to lock the parts of the device in their initial position.

My dual production device, designated generally by 1, is adapted to be interposed in a tubing string 2 above a packer 3, either directly connected to the packer or a short distance above. The packer is designed to pack off between the tubing and the surrounding casing 4 and is positioned below the perforations 5 in the casing which communicate with the upper of the two zones from which production is desired. The tubing 1 extends below the packer and communicates with the lower zone.

More particularly, my device includes a mandrel 11, preferably of the same internal diameter as the tubing 1 and connected by a coupling 12 at its upper end to the tubing and threaded at its lower end for connection to the packer or another tubing coupling.

The mandrel 1 receives a sleeve 13 which is provided with a bottom spacer 14 and a top spacer 15 screw-threaded into the ends of the sleeve and slidably mounted around the mandrel so as to hold the sleeve in spaced relation therewith. Adjacent and inward of the spacers are packing glands 16 and 17 which seal the space between the sleeve and the mandrel. The packing glands are preferably of the self-sealing type, that is, the type that are cupped or chevron shaped, and are preferably arranged to seal against movement of fluid in either direction along the mandrel and sleeve. The packing glands are separated by an inner sleeve 18.

The top spacer 15 has an enlarged bore at its upper end which, in part, is threaded to receive a collar 19. The collar and top spacer define an annular channel 20 which is adapted to register with key openings 21 provided in the mandrel 11. The key openings 21 receive key balls 22 which extend into the channel 20 and also project into the mandrel 11. The key balls are initially held in place by a keeper designated generally by 23.

The keeper as shown in detail in Figure 6 comprises a keeper body 24 in the form of a short cylinder fitting within the mandrel 11, the lower portion of which is reduced slightly in diameter to form a shoulder 25 which engages the key balls 22, the smaller diameter portion of the keeper body being adapted to fit between the key balls, while the upper or larger portion of the keeper body is too large to pass between the key balls. The keeper body is hollow and internally threaded at its upper end to receive a guide member 26 which, in turn, receives a stem 27.

The stem 27 is provided with a lower end piece 28 which engages the guide 26 to limit upward

movement of the stem. And the upper end of the stem is provided with a suitable head 29 for engagement by a conventional retrieving device or fishing tool. Such retrieving devices are used in conjunction with various types of well tools such as removable core barrels and are adapted to be lowered by a wire line. Sufficient play is provided between the end piece and guide so that the stem may be jarred upwardly to aid in freeing the keeper body from between the key balls.

The mandrel 11 is provided at a point above the sleeve 13, when the sleeve is held in position by the key balls, with circulation ports 30. These ports are employed initially to provide circulation between the interior of the tubing string and the annular space between the tubing string and casing 4.

The lower end of the mandrel 11 is provided with a threaded portion 31 which receives a compression nut 32. Between the compression nut and lower end of the sleeve 13 there is interposed a heavy spring 33 which urges the sleeve upwardly and is initially restrained by the key balls 22.

Operation of my dual production device is as follows: Initially the parts are in the positions shown in Figures 1, 2, and 4, that is, the spring is compressed, the sleeve is in its lower position, held there by the key balls 22 which in turn are held in position by the keeper 23. The tubing, dual production device and packer are lowered to a position in which the packer is below the upper zone from which production is to be obtained, that is, below the perforations 5. The packer is then set and liquid is circulated between the interior of the tubing string 2 and the annular space between the tubing string and casing, to wash out any mud, sand, or the like, and to remove the water, or, if desired, treat the formation with different chemicals for the purpose of preparing it for production. The upper zone is then brought in either through the tubing string or the annular space, that is, production is established from this zone.

Thereafter the keeper 23 is removed by the use of a retrieving device. This releases the key balls, which drop to the bottom of the tubing, allowing the spring 33 to move the sleeve 13

upwardly until the inner or separator sleeve 18 covers both the key openings and the circulation ports, as shown in Figure 3. The coupling 12 serves as a stop to locate the sleeve in the desired position. After the parts have assumed the positions shown in Figure 3, that is, after the ports 30 are closed, the lower production zone may be brought in by swabbing through the tubing 1. It should be noted that the mandrel 11 is equal in diameter to the tubing string, so that the production device in no manner interferes with the movement of a swabbing tool, or other tool that may be lowered through the tubing.

Also, it should be noted that the actual increase in outside diameter required for the dual production device is only nominal, so that ample clearance is assured between the device and the well casing.

Various changes and alternate arrangements may be made within the scope of the appended claim, in which it is my intention to claim all novelty inherent in the invention as broadly as the prior art permits.

I claim:

25 A dual production device for wells comprising a tubular mandrel interposed in a tubing string, circulation ports in the wall of said mandrel, key openings in the wall of said mandrel longitudinally spaced from said circulation ports, a tubular sleeve around said mandrel and movable longitudinally thereof, a pair of packing glands between the interior of said sleeve and the exterior of said mandrel, said packing glands being longitudinally spaced apart a greater distance than the distance between said circulation ports and said key openings, key members positioned in said key openings, a removable plug within said mandrel for holding said key members in positions protruding outwardly from the outer wall of said mandrel for engaging and holding said sleeve in a position in which said circulation ports are uncovered, and a compression spring member around said mandrel and arranged, upon removal of said plug, to force said sleeve longitudinally along said mandrel into a position in which one of said packing glands is spaced above and the other is spaced below said circulation ports and key openings.

WILLIAM E. LYND.