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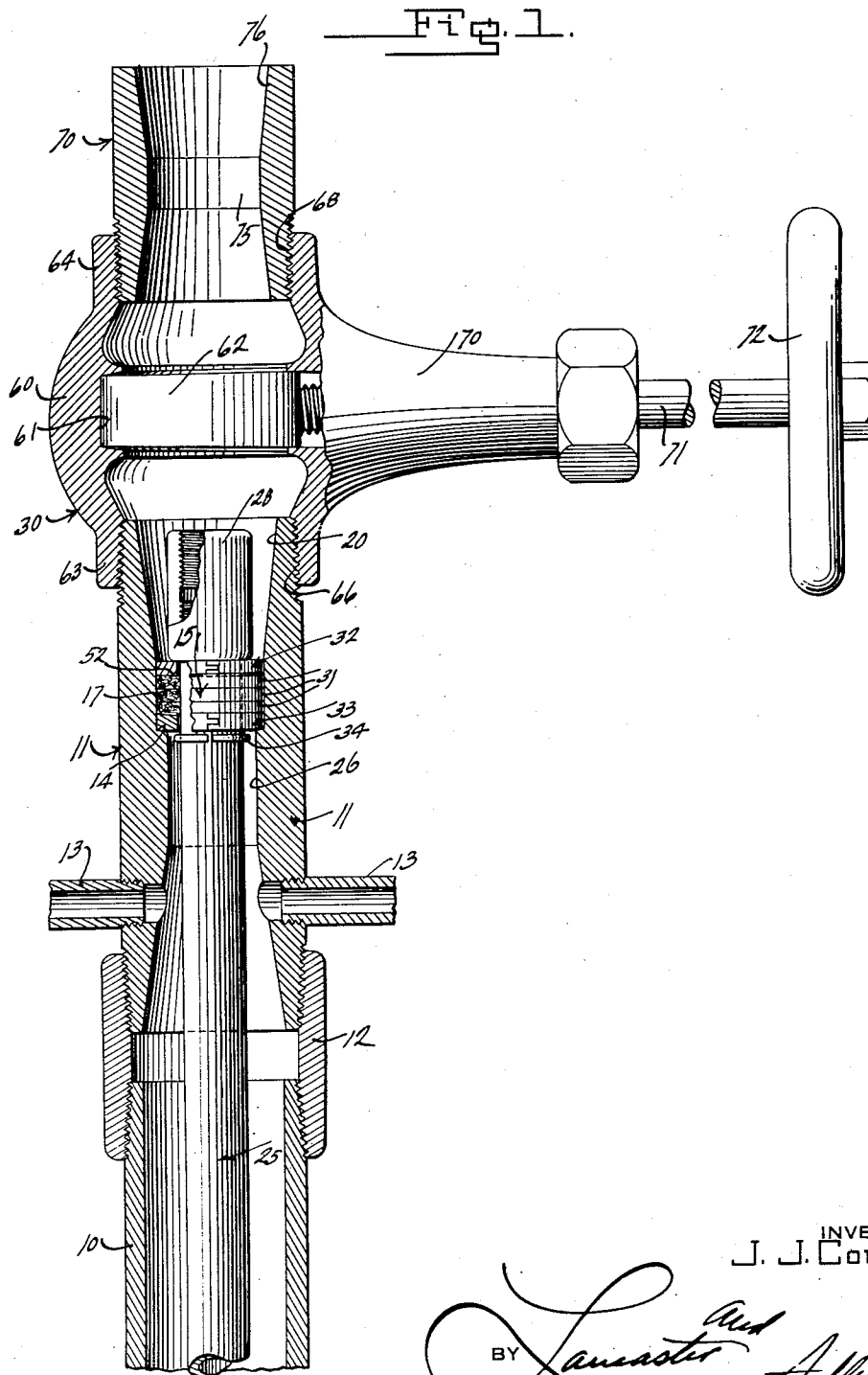
J. J. CONROY

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CASING HEAD CONSTRUCTION

Filed Dec. 12, 1929

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INVENTOR.  
J. J. CONROY

BY *Lancaster* *And* *Allison*  
ATTORNEYS.

Nov. 1, 1932.

J. J. CONROY

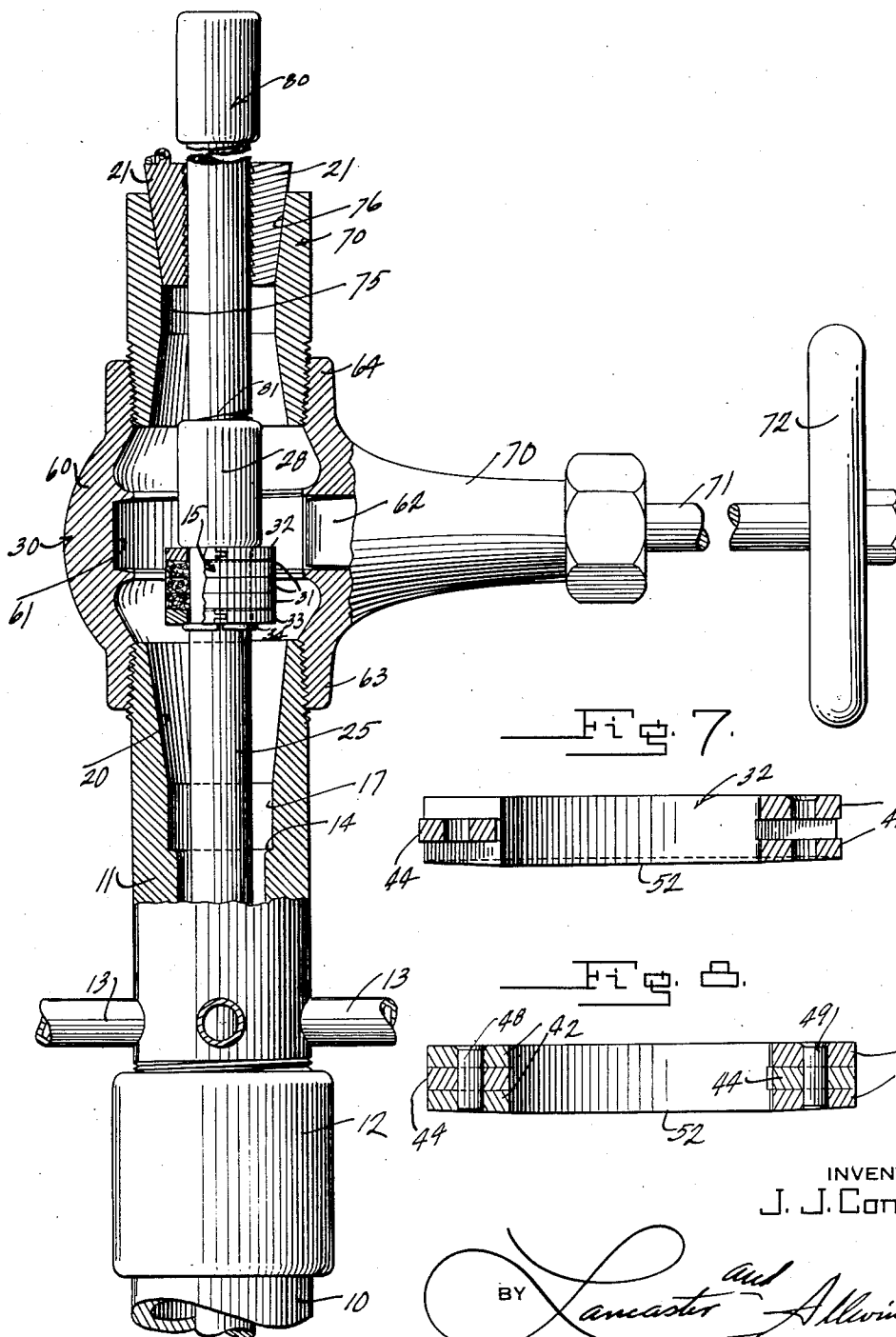
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Fig. 2.



INVENTOR.  
J. J. Conroy

BY *Lancaster and Allwine*  
ATTORNEYS.

Nov. 1, 1932.

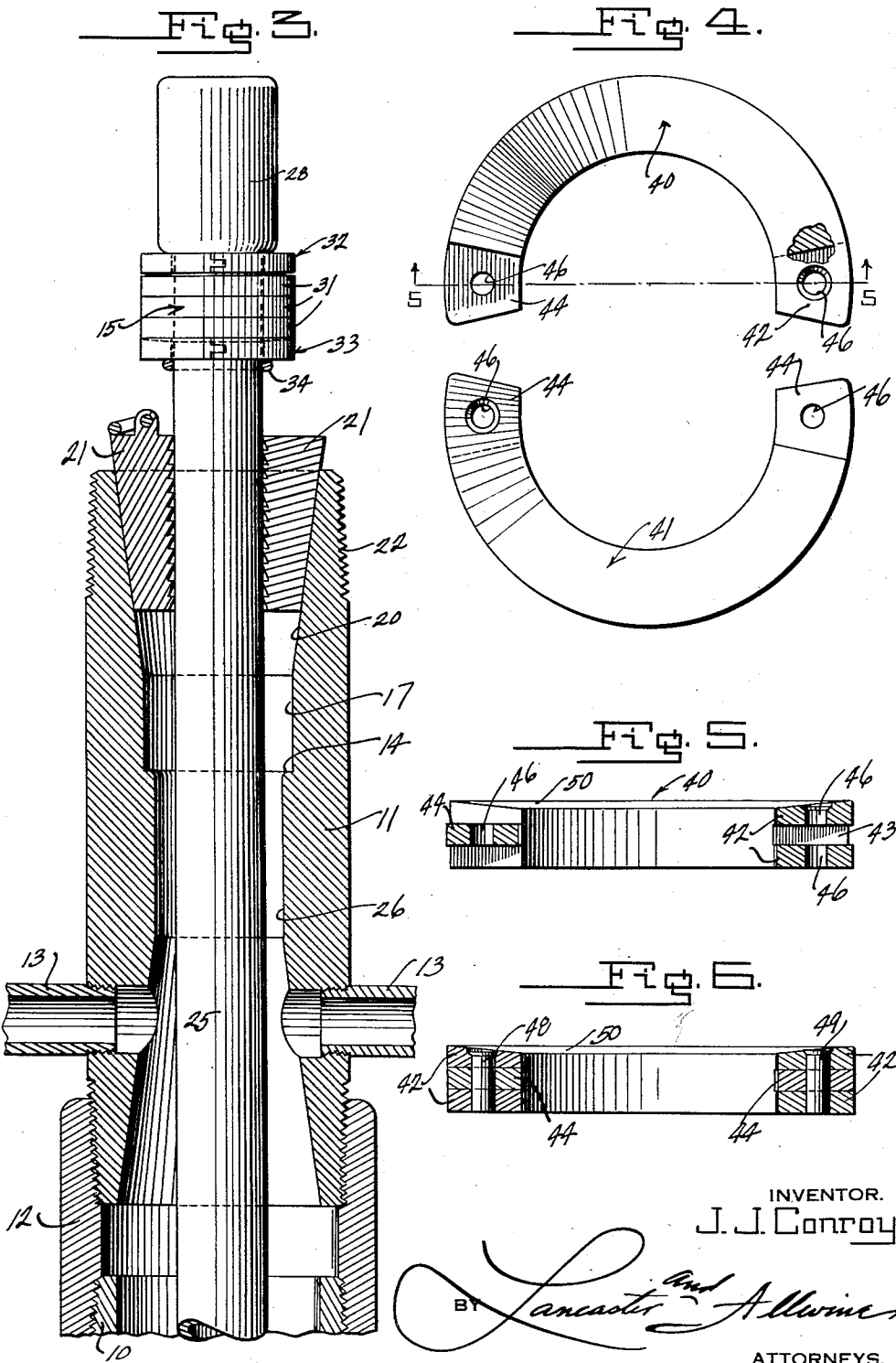
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## UNITED STATES PATENT OFFICE

JESS J. CONROY, OF MARACAIBO, VENEZUELA

## CASING HEAD CONSTRUCTION

Application filed December 12, 1929. Serial No. 413,598.

This invention relates to improvements in casing head structures for oil well apparatus.

The primary object of the invention is the provision of improved means to facilitate the lowering of tubing into an oil well, and to enable a facile shutting off of the flow at desired intervals, either before or after the tubing has been landed, in a practical and economical manner.

Other objects and advantages of this invention will be apparent during the course of the following detailed description.

In the accompanying drawings, forming a part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views,

Figure 1 is a vertical sectional view taken through the improved casing head structure, showing the tubing supported therein upon a suitable packing, with a superstructure consisting of a gate valve and spider by means of which the well may be selectively shut off, or the valve opened and additional tubing lowered if desired.

Figure 2 is a fragmentary view, partly in section, longitudinally of the casing head structure showing the lowering of the tubing with packing thereon into the casing head.

Figure 3 is a vertical sectional view taken through the casing head, showing the relation in which the tubing is conveniently lowered with a special packing attached thereto.

Figure 4 is a view showing details of a special type of clamp ring adapted to be used with the packing upon tubing.

Figure 5 is a sectional view taken substantially on the line 5—5 of Figure 4.

Figure 6 is a cross sectional view taken through the connecting junctures of the two parts of the clamping ring of Figure 4.

Figure 7 is a transverse sectional view taken through the connecting ends of a portion of an upper clamping ring structure.

Figure 8 is a sectional view taken through the connected ends of the two-part upper ring structure of the packing device of this invention.

In the drawings, wherein for the purpose of illustration is shown only a preferred embodiment of the invention, the numeral 10

may generally indicate a well casing having a casing head 11 connected thereon by a conventional collar or coupling 12. Lateral outlets 13 of any approved number are provided in the lower portion of the casing head, and in the upper portion of the casing head there is provided an annular upwardly facing shoulder or seat 14 for receiving special packing means 15 adapted to fit about tubing lowered into the casing head. The upper portion of the casing head 11 above the seat 14 is cylindrical in shape, at 17, providing a socket in which the packing rests, and thereabove the passageway through the casing head flares in a tapered relation upwardly and outwardly at 20, forming a spider for receiving conventional clamping slips 21, as shown in Figure 3. The casing head 11 at the top thereof is externally screw threaded at 22. It is to be particularly noted that the tapered spider seat 20 forming the spider for the slips 21 is formed as an integral part of the casing head 11. Under normal circumstances with practically little pressure existing in the well the tubing sections shown at 25 in Figure 3 of the drawings are respectively coupled and lowered through the passageway 26 through the casing head and downwardly into the well casing in a manner well understood in this art. Of course the passageways through the casing head are sufficient to permit the tubing sections to be properly lowered, and the slips 21 seated in the upper spider end of the casing head 11, as shown in Figure 3, to facilitate such lowering. Assuming that the well "comes in" or there is an undesirable pressure necessitating shutting off of the well, or assuming that the desire to discontinue lowering of the tubing prior to actual landing thereof, the special packing means 15 shown in Figure 3 of the drawings will preferably be attached to the upper end of the tubing section 25 then held by the slips 21 in the casing head 11, at a point above the slips 21, but immediately below the enlarged coupling end 28 of the tubing. Thereafter the tubing section 25 will be back lifted and the slips 21 withdrawn and the tubing sections 25 lowered until the packing 15 seats on the shoulder 14 and seals off the well

between the casing head and the tubing. This position is shown in Figure 1 of the drawings, and thereafter the two-way valve structure 30 is added.

Referring at the time to the special packing structure 15, the same preferably comprises a plurality of compressible packing rings 31, which are of a nature to be slipped circumferentially about the body of the tubing, between an upper metallic compressing ring structure 32 and a lower metallic compressing ring 33; a split clamping ring 34 frictionally clamping circumferentially about the tubing 25 to hold the entire packing structure 15 on the upper end of the body of the tubing with the upper metallic ring 32 engaging against the enlargement coupling 28 of the tubing, and the rings 31 compressed between the metallic rings 32 and 33.

Referring to the lower metallic ring structure 33 of the packing arrangement 15, the same as shown in Figures 4, 5 and 6 of the drawings comprises half-circular complementary segments 40 and 41, each of which is provided at one end with a pair of spaced circumferentially extending ends 42 defining a socket 43 therebetween and at the other end being provided with a single circumferential extension 44. In assemblage, the extension 44 of the section 40 is adapted to fit between the extensions 42 of the section 41; said extensions having transverse passageways 46 therethrough for receiving a connecting pin 48. Similarly the single extension end 44 of the section 41 is adapted to extend between the spaced extensions 42 of the section 40, and be retained in position by a transverse pin 49 extending through the transverse opening 46. The segments 40 and 41 of the lower metallic packing ring 33 are provided with dished upper surfaces 50, which slope from the outer periphery of the ring segments inwardly and downwardly towards the axis thereof. The upper ring 32 is formed of a pair of segments having connected ends similar in practically all respects to the ring structure 33 above described, and insofar as applicable similar reference characters have been applied to similar parts of the ring structures 32 and 33. There is just this difference in the segments of the upper ring structure 32, in that the lower surface 52 thereof is bowed downwardly, that is, slopes at an angle from the outer periphery thereof downwardly and inwardly towards the axis of the ring. The action of the rings 32 and 33 in the provision of their lower and upper surfaces 52 and 50 respectively enables a more efficient packing of the compressible rings 31 between the tubing and walls of the casing head adapted to receive the same. In action, as shown in Figure 1, the lower ring structure 33 rests on the annular seat 14, and the upper coupling end 28 of the tubing section 25 rests against the upper ring 32, the weight of the tubing string

in the well functioning to pack the compressible rings in a sealing relation between the tubing and walls of the casing head.

Referring to the valve 30, the same is of the gate type including a casing 60 provided with the annular seat 61 therein into which the valve member 62 may slide in the usual relation. Outlets 63 and 64 are provided below and above the valve 62, the latter being internally screw threaded at 66 for detachable connection at 22 to the top of the casing head 11. The outlet 64 faces upwardly and is in alignment with the outlet 63, being internally screw threaded at 68 for detachably receiving therein any approved superstructure, such as the "Xmas tree", or a detachable spider 70. The passageway through the casing 60 is such as to permit tubing to be freely elevated and lowered through the outlets 63 and 64. A lateral portion 70 of the casing accommodates the operating shaft 71 of the valve member 62. Upon adjusting the shaft 71 through the handle 72 it is readily apparent that the valve 62 may be seated to close off the passageway thru the valve casing between the outlets 63 and 64, or may be entirely withdrawn into the portion 70 of the valve casing to open the passageway through the seat 61 between the outlets, as shown in Figure 2 of the drawings.

The spider 70 is of sleeve-like formation, having a lower externally screw threaded end for detachable connection in the outlet 64 of the valve casing, being provided with a passageway 75 therethrough and provided with an outwardly divergent and flaring seat 76 for receiving the slips 21 of tubing clamping means therein, as shown in Figure 2. The lower end of the spider 70 may also be tapered in a downwardly divergent relation.

As above mentioned the tubing may be lowered through the casing head 11 in the relation shown in Figure 3. If it is desired to shut off the well and leaving the tubing in a packed off or suspended relation therein, it is necessary to lower the tubing to the position shown in Figure 1, and upon application of the valve 30 the latter may be operated to shut off flow from the well casing, as is quite obvious. If it is desired to continue lowering of the tubing, the usual superstructure is detached from the valve casing 30 at the outlet 64, and the spider 70 substituted as shown in Figure 1. The tubing may then be lowered in the well, of course, after detachment of the packing from the position shown in Figure 1.

To facilitate packing off of the tubing in the casing head in event it is desired to shut off the well to the valve 30, a special nipple 80 is provided, preferably tubular, having a coupling end 81 which detachably threads into the coupling end 28 of the uppermost section of the tubing 25, as shown in Figure 2; the shank or body of the nipple 80 be-

ing sufficiently long that it will extend up through the valve casing and spider 70 and exteriorly thereof, as shown in Figure 2, when the packing 15 is seated on its seat 14. This nipple 80 may be detached after the packing supports the tubing in the position shown in Figure 1, and the valve 30 may then be closed to shut off the well. The nipple 80 is preferably tubular in form, although it may be solid if desired, and other than shown in Figure 2 may be provided with a polygonal wrench engaging head at the top thereof. When it is desired to start lowering of the tubing, the nipple 80 is lowered into the well and coupled in the coupling shank of the uppermost section of tubing; the latter is elevated until the packing 15 is exposed above the spider 70; the packing is then removed and the slip constructions 21 employed in the usual relation for lowering of additional sections of tubing as desired.

Various changes in the shape, size, and arrangement of parts may be made to the form of invention herein shown and described, without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In combination with a well casing, a casing head therefor, the upper portion of the casing head being formed to detachably receive the usual superstructure, a gate valve detachably connected upon the upper end of the casing head provided with a passageway axially aligning with the passageway thru the casing head, a valve slidable transversely across the passageway of said housing to seal off the same about the casing head, and a tubing spider carried by said valve having a passageway axially aligning with said passageway thru said valve.

2. In combination a well casing, a casing head upwardly thereon having a passageway therethrough and an upwardly facing annular packing seat, a shut-off valve including a housing detachably connected on the casing head having a passageway therethrough aligning with the passageway of the casing head, a valve member slidable in the housing to shut off the passageway therethrough, a spider detachably connected in the valve housing at the opposite side thereof from the casing head, slips for said spider to engage tubing for lowering the latter into the well casing, a packing having means to detachably clamp the same upon the length of tubing near the upper coupling end thereof, said packing being of a size to seat in the packing seat of the well casing head, and a detachable nipple for lowering the tubing with the packing thereon thru the spider and valve housing into the casing head to seat the packing in said casing head, said nipple being of a length that the upper end thereof will project above the spider when the packing is seated

in the casing head to shut off the well between the tubing and casing head wall.

3. In combination with well casing a casing head therefor having a passageway therethrough, a valve including a housing with a passageway therethrough and opposed aligning outlets, one of which is adapted to be detachably connected to the upper end of the casing head, a gate valve slidable in the valve casing, means to move the gate valve to shut off the passageway through the valve housing, and tubing retaining means connected to the upper outlet end of the valve housing including a spider and slips to hold and facilitate lowering of tubing therethrough and through the casing head into the casing.

4. In combination with well casing a casing head therefor having a passageway therethrough with an upwardly facing annular packing seat and upwardly diverging slip seat in the top thereof, a shut-off valve including a housing detachably connected with the top of the casing head, the housing having aligning outlets and a passageway therethrough, a gate valve, means to operate the gate valve and the housing to shut off said passageway through the housing, a detachable spider for the upper outlet end of said valve housing, slips operable in the top of said spider, and a ring packing having means to clamp the same on a section of tubing to be lowered into the well, the packing being of a size to pass through the spider, valve housing, and into the casing head for seating on the annular seat therein.

5. In combination with a well casing, of a head upon said casing, said head having a passageway therethru and an integral annularly disposed seat therein facing upwardly, tubing in the head adapted to be raised and lowered therein, a packer about said tubing with its lower end normally resting upon said shoulder, and a split clamping ring frictionally clamped circumferentially about the tubing below the packer, preventing downward sliding movement of the packing along the tubing when said tubing is raised.

JESS J. CONROY.