Feb. 7, 1933. J. H. HOWARD ET AL 1,896,236

RETRACTABLE TUBING HEAD

Filed Feb. 3, 1931 4 Sheets-Sheet 1

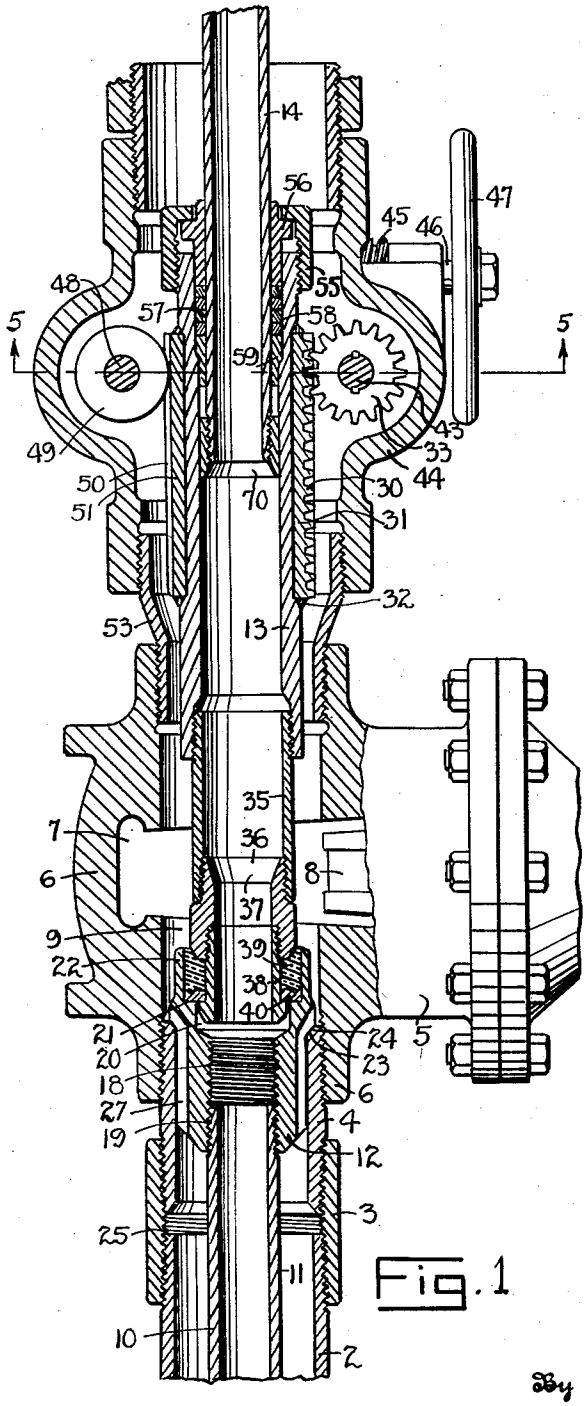


Fig. 1

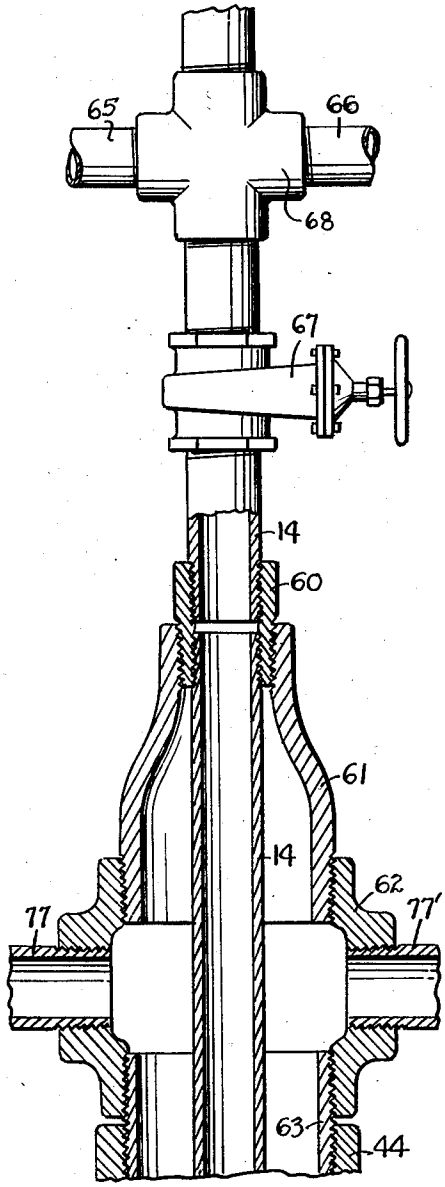


Fig. 2.

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RETRACTABLE TUBING HEAD

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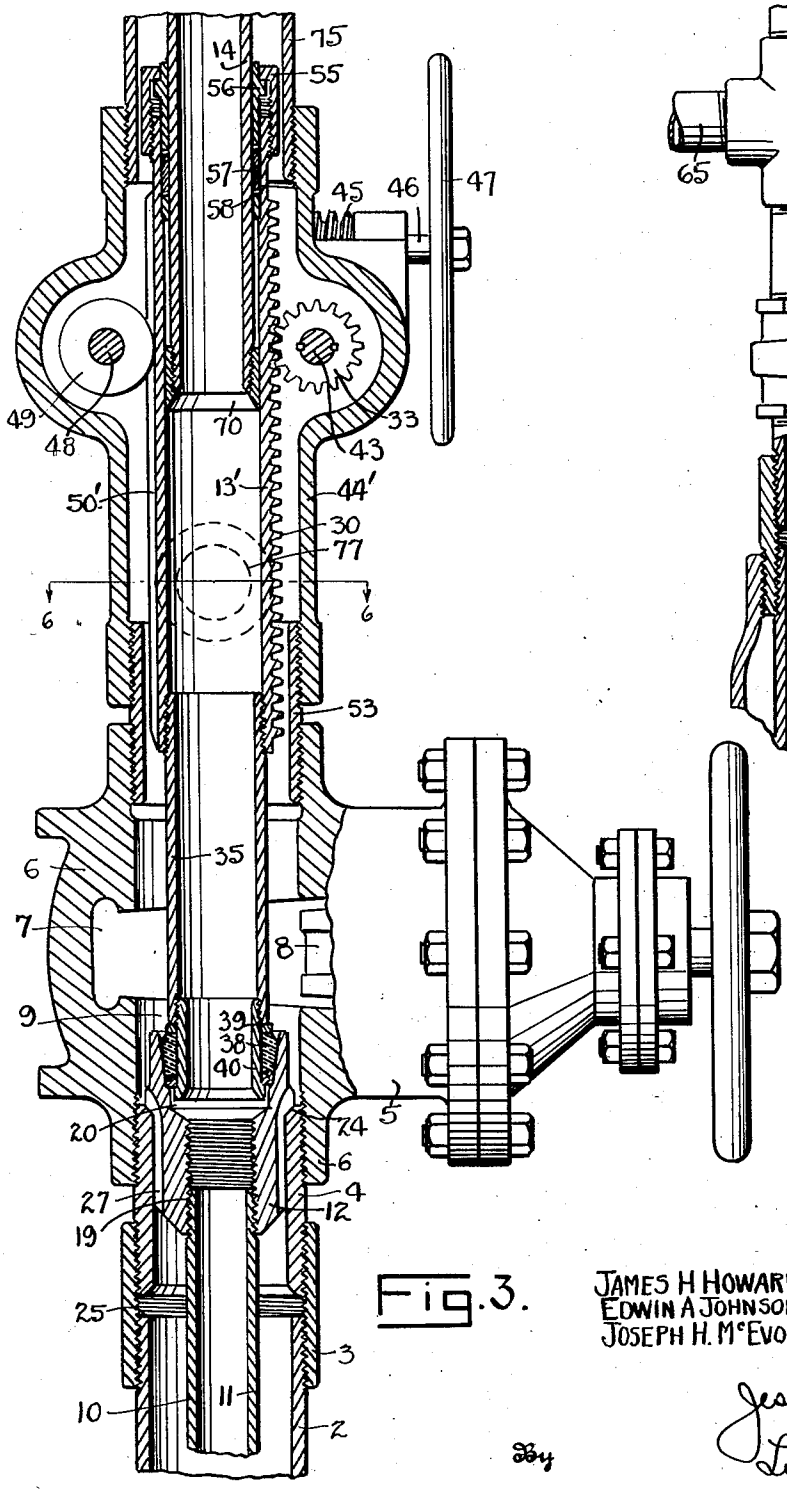


Fig. 3.

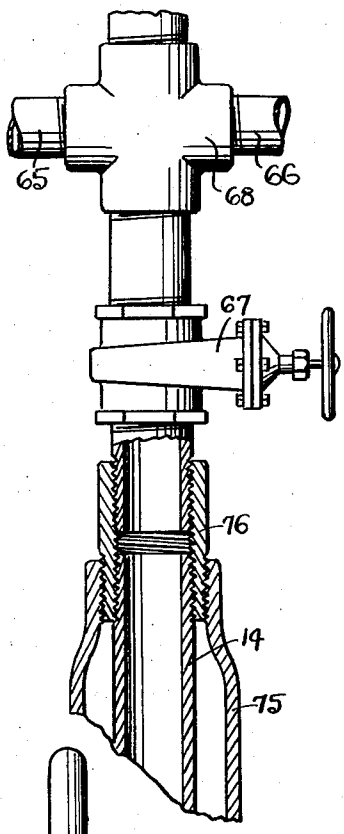


Fig. 4.

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RETRACTABLE TUBING HEAD

Filed Feb. 3, 1931 4 Sheets-Sheet 3

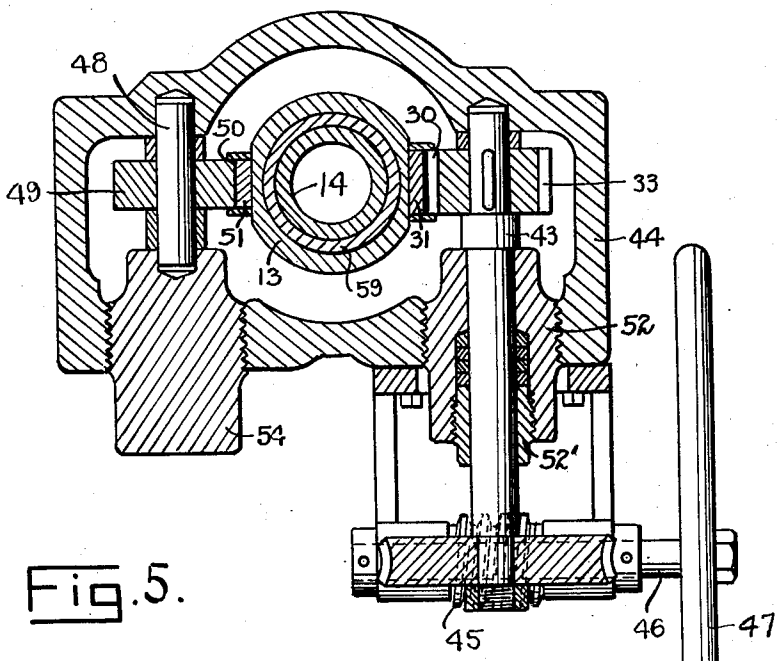


Fig. 5.

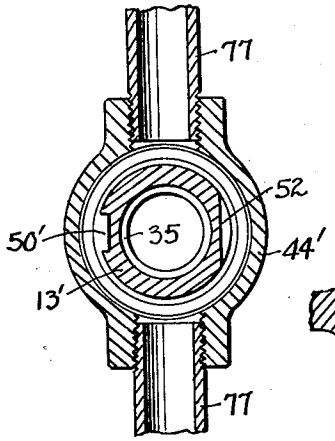


Fig. 6.

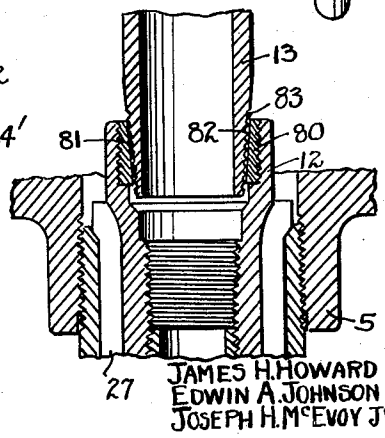


Fig. 7.

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RETRACTABLE TUBING HEAD

Filed Feb. 3, 1931 4 Sheets-Sheet 4

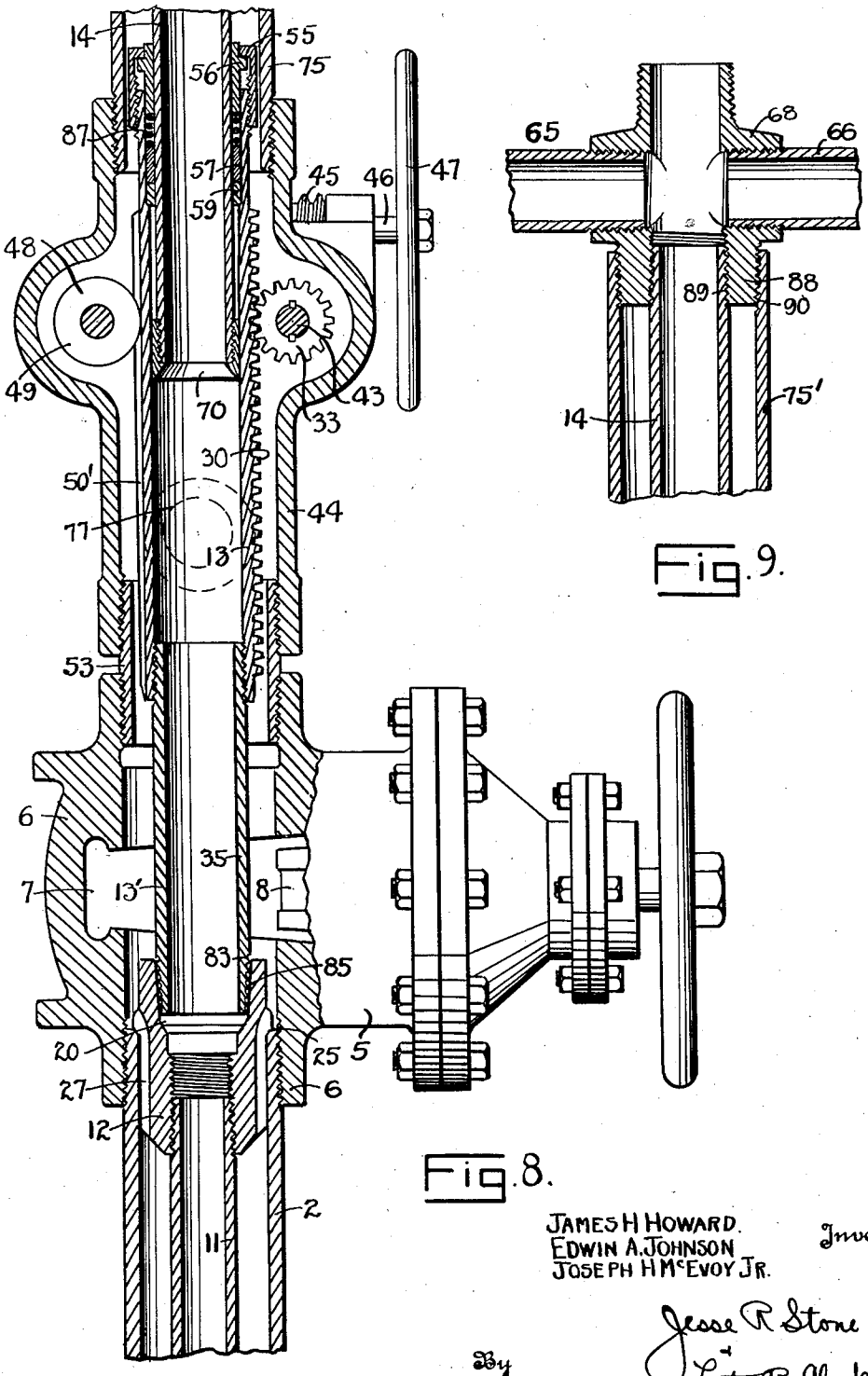


Fig. 8.

Fig. 9.

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Patented Feb. 7, 1933

1,896,236

UNITED STATES PATENT OFFICE

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RETRACTABLE TUBING HEAD

Application filed February 3, 1931. Serial No. 513,070.

The invention relates to an improvement in an apparatus for retracting a portion of the string of tubing which is used for removing fluid from wells.

It is one of the objects of the invention to provide a simple and economical structure for retracting a section of the tubing so that the well may be closed off to seal the flow of fluid therefrom.

Another object of the invention is to provide a retractable section of the tubing so that the gate valve may be closed.

A still further object of the invention is to provide a retractable section of tubing which may be associated with the general casing head assembly now in use on oil wells.

Another object of the invention is to provide a seat for the retractable tubing on the section of tubing which is anchored to the casing head or suspended therein.

Another object of the invention is to provide a retractable section of tubing which will move relative to two fixed portions of the tubing string so that an opening will be provided to permit closing of the gate valve.

It is intended that the invention may be applied to any type of casing head or well head assembly wherever a gate valve is to be applied.

The invention will be understood by having reference to the drawings wherein:

Fig. 1 is a central vertical section showing one arrangement of the various parts of the mechanism with the tubing in closed or operative position.

Figure 2 is a side elevation of a well head assembly showing certain portions in section and is a continuation of the upper end of Fig. 1.

Fig. 3 is a central vertical section similar to Fig. 1 but showing a slightly modified form of the invention.

Fig. 4 is a side elevation of a well head assembly which is a continuation of the upper end of Fig. 3.

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 1.

Fig. 6 is a section taken on the line 6—6 of Fig. 3.

Fig. 7 is a detailed sectional view of one form of seating structure for the retractable section of tubing.

Figs. 8 and 9 show another modification of the invention.

By having reference to Fig. 1 a casing or pipe is shown at 2 and it is intended that this pipe represent the casing usually employed in connection with oil, gas or water wells. This casing may have connected thereto a coupling 3 and a nipple 4 in order to support the gate valve 5. The gate valve is shown as having a threaded flange 6 which may, if desired, be connected to the pipe 2. However, various types of gate valves are well known and some of them have flanges which are adapted to be bolted to the supporting structure instead of being threaded as illustrated in the drawings. Either type may be used in practising the invention. The valve 5 consists of the housing 6, the gate chamber 7 and the gate member 8. This gate member is arranged to be moved transversely of the chamber 7 so that the passage 9 through the chamber will be completely closed.

In the normal operation of wells in recovering the fluid from the earth a string of tubing is inserted in the well so that the fluid may flow therethru. This string is indicated in Fig. 1 generally by the reference character 10 and includes a lower string 11 which is suspended from the hangar or spider 12, the central section 13, which is retractable with respect to the section 11 and the upper section 14 which is stationary and with respect to which the section 13 is telescopically mounted.

With this construction of parts in event it is desired to quickly close off the entire passage from the well, it is only necessary to retract the section 13 of the tubing so that

it is separated from the section 11. This clears the passage 9 and allows the gate member 8 to move transversely to close the same.

The anchor 12 may assume various configurations but it has here been illustrated as being made of a body portion 18 threaded internally at 19 to receive the section 11 of tubing. About the threads 19 is an enlarged portion 20 formed with a shoulder 21 and an upstanding flange 22. The outer surface of the body 18 is provided with a shoulder 23 which is adapted to seat on the bevelled face 24 of the nipple 4, or if desired it may be constructed to seat upon the upper end 25 of the casing 2. This outer surface of the body 18 is fluted as at 27 to allow passage of the fluid around the anchor and to permit the escape of gases accumulated in the casing 2 and outside of the tubing 11.

When the tubing is to be inserted a hook or section of pipe may be inserted in the upper end of the threaded portion 19 and the anchor with its suspended tube 11 can be lowered through the valve 5 to assume the position shown in Fig. 1.

The retractable section of tubing or sleeve 13 is of special construction and is arranged to be moved by means of a rack 30 and a pinion 33, which rack is shown as formed of a separate piece of material 31 which is affixed by welding or otherwise at 32 to the piece of pipe 13. The lower end of the pipe 13 may be elongated to a point such that it will enter the flange 22 of the anchor 12 or it may be provided with an additional nipple 35 which is threaded to the sleeve 13. A coupling 36 is connected to the nipple 35 and is provided with a tapered portion 37 so that it will merge with the nipple 35.

Below this coupling 37 is a gland 38 arranged to retain a packing 39 and a support ring 40 in position and in contact with the coupling 36. It is to be understood that by adjustment of the gland 38 the packing may be expanded or if the gland is removed the packing may be replaced. This packing is of such size that it fits snugly inside of the flange 22 so that a seal will be formed which will prevent the escape of fluid from inside of the tubing 11 and anchor 12. The pinion 33 is mounted on a shaft 43 which is supported in a housing 44 and the bearing plug 52 which threads into the housing 44 so that the pinion 33 may be removed. This plug 52 also carries the stuffing box 52′ to insure a seal about the shaft 43 which is arranged for rotation by means of a worm 45 on the shaft 46 which is to be rotated by means of the hand wheel 47. Diametrically opposite the shaft 43 is a second shaft 48 upon which is the guide roller 49 which contacts with track 50 formed in the member 51 connected to the sleeve 13. This roller 49 absorbs the thrust between the teeth due to the rack and pinion on the opposite side of the sleeve and serves to support the sleeve 13 in a central position. A plug 54 retains the shaft 48 and roller 49 in position so that they are readily accessible for adjustment or repair.

A swaged nipple 53 serves to connect the valve and the housing 44 of the retractable portion of the device. It is intended, however, that these parts may be connected by flanges or in any other manner. The nipple 53 is shown as swaged in Fig. 1 and straight in Fig. 8. With this construction the same sized retractable tubing section and housing apparatus may be used with any size of gate valve and an appropriate nipple used to adapt the same to the particular valve. The upper end of the sleeve 13 is arranged to support a cap 55 which retains a gland 56 and the packing 57 in position in the enlarged portion 58 of the sleeve. This packing 57 is provided in order to insure a seal between the upper section of tubing 14 and the sleeve 13. A supporting gland 59 is adapted to serve as a rigid support for the packing 57.

The section 14 of tubing is held stationary by being anchored to the nipple 60 which is in turn connected to the fitting 61 connected to the cross 62. This cross is in turn supported by a fitting 63 which is connected with the housing 44 of the retracting device and has the bleeder lines 77 and 77′, connected thereto. This structure forms a portion of the casing head assembly which is designated as the Christmas tree and includes the flow lines 65 and 66 as well as the gate valve 67 and the cross 68. The bleeder lines 77 and 77′ are adapted to permit escape of fluids passing through the flutes 27. The gate 67, however, is adapted to close the passage through the tubing 14 when necessary.

The sleeve 13, as will be readily understood from the foregoing description, telescopes about the lower end of section 14 which is provided with a shoe 70 so that portions of scale or other deposits occurring on the inside of the sleeve 13 will be removed as this section is retracted.

The operation of the device is as follows:

The parts are connected and assembled as shown in Fig. 1, but in event excessive pressure occurs in the well and there is danger of a blow out, it is only necessary to rotate the hand wheel 47 causing the pinion 33 to move in the rack 30 and retract the section 13 of tubing which will telescope upwardly about the section 14. This movement raises the packing 38 from within the flange 22 and leaves the passage 9 through the gate valve entirely open. The gate 8 may be moved transversely to completely close the entire well bore. In the embodiment of the invention shown in Figures 1 and 2 the gate 5 is located on the casing head below the bleeder lines 77 and 77′ so that closing of the valve will completely close the well casing. However, when it is desired to merely close the

passage through the tubing, the valve 67 may be manipulated to accomplish this and the valve 5 need not be closed.

Figs. 3 and 4 show a somewhat modified form of the invention which basically is constructed in accordance with the disclosure of Fig. 1. The sleeve 13, however, is of somewhat different construction and is indicated by the reference character 13′, and has the teeth 30 formed integrally thereon. The track 50′ is also formed integrally with the sleeve and is preferably milled in the surface of the sleeve as best seen at 52 in Fig. 6. The remaining structure of Fig. 3 is substantially identical with Fig. 1 and the description thereof need not be repeated.

Fig. 4 showing the continuation of Fig. 3 discloses a coupling 75 which receives the anchor 76 supporting the tubing 14. It should be noted, however, in this form of the invention that the bleeder lines 77 and 77′ are shown as extending laterally from the housing 44′ of the retracting device and the cross 62 has been omitted. It is understood that suitable valves can be placed on these bleeder lines so that accumulation of fluid in the casing may be exhausted. The flow lines 65 and 66, as well as the cross 68 are mounted in this form of the invention above the valve 67.

Fig. 7 shows a modified form of the seating structure between the retractable section of tubing 13 and the tubing anchor 12 which includes a bushing 80 which is threaded or otherwise fixed in the anchor 12. This bushing 80 has an inner smooth tapered face 81 and the sleeve 13 is provided with a tapered outer face 82 which is formed with a plurality of concave angular grooves 83. The crests of these grooves as will be readily apparent, protrude sufficiently to contact with the face 81 so that each crest forms a complete seal.

As seen in Fig. 7, a plurality of separate and independent seals with the face 81 will be provided. This structure has been found to be of advantage in devices of this type for the reason that grains of sand and other particles accumulate on the surface 81 when the sleeve is retracted and when the sleeve is then moved to closed position they interfere more or less with proper seating of the device. But with the grooves 83 it has been found that such particles are displaced and will lodge in the grooves without interfering with the seating of the sleeve.

It has also been found that due to the plurality of independent seats that a positive seal is provided by at least several of the seats whenever the valve is moved to sealing position. It is intended that this type of seat may be provided with either modification of the invention herein disclosed.

The present invention is somewhat similar to the disclosure of the co-pending application Serial No. 497,757 filed November 24, 1930, of J. H. Howard.

Figs. 8 and 9 show a more or less composite view of the various features which are disclosed in the modifications which have already been described as well as some new features. In this form the nipple 4 has been dispensed with and the casing 2 has been coupled directly to the flange 6 of the valve 5 and the spider or anchor 12 is seated directly on the upper edge of the casing 2. The pipe 13 is similar to that illustrated in Fig. 7 but the spider 12 is modified to some extent in that the bushing 8, as shown in Fig. 7, has been omitted and the bushing is formed with a tapered seat 85, against which the crests of the grooves 83 are adapted to seat. It is understood that this tapered seat 85 may be of softer material than the sleeve 13 so that the crest will tend to seat in the softer material. The remaining parts of the structure shown in Fig. 8 are substantially the same as those shown in Fig. 3, with the exception of a spring 87, which has been inserted between the gland 56 and the packing 57. This spring assists in retaining the packing in its proper position when the pipe section 14 is moved.

The pipe 75 shown in Figs. 3 and 4 has been modified to some extent in Figs. 8 and 9 and is formed of a straight pipe section 75′, which is arranged to receive the branch 88 of the cross 68. This particular branch 88 is threaded both internally and externally at 89 and 90. In this manner more or less complicated portions of the apparatus have been eliminated and the device may be fabricated in the shop at a much less expense and is somewhat simpler in its construction. As shown in Fig. 9, the pipe 14 is anchored directly inside of the flange or portion 88 of the cross 58, so that the cross serves the purpose of the adapter or nipple 76 in Fig. 4. It is to be understood that the flow lines and bleeder line may be arranged in the modification shown in Fig. 8 in a manner similar to those in Figs. 1 and 3, and that the parts may be varied in order to obtain satisfactory operation of the device.

While several modifications of the invention have been shown and described it is intended that the various features may be combined in any modification in order to obtain the desired results with any particular assembly.

Having described the invention, what is claimed is:

1. A tubing retractor including in combination a casing head, a valve thereon, two suspended sections of tubing, a telescoping section joining said two sections, and means to move said last section including a rack on said section and a pinion arranged for rotation to move said section.

2. A tubing retractor including a housing, a pair of telescoping sections of tubing therein, a rack formed integral on one section of

tubing, a pinion mounted on said housing and adapted to engage said pinion.

3. A tubing retractor assembly including a valve, a tubing anchor therein, a retractable section of tubing adapted to engage said anchor, a stationary section of tubing about which said retractable section may telescope, a stuffing box forming a seal about said stationary and said retractable section, and a housing enclosing said retractable section and said stuffing box.

4. A tubing retractor assembly including a valve, a tubing anchor therein, a retractable section of tubing adapted to engage said anchor, a stationary section of tubing about which said retractable section may telescope, a stuffing box forming a seal about said stationary and said retractable section, and a housing enclosing said retractable section and said stuffing box, whereby said stuffing box will be subjected to only the differential pressure between the inside and outside of said stationary section.

5. A tubing retractor assembly including a valve, a tubing anchor therein, a retractable section of tubing adapted to engage said anchor, a stationary section of tubing about which said retractable section may telescope, a stuffing box forming a seal about said stationary and said retractable section, and a housing enclosing said retractable section and said stuffing box, whereby said stuffing box will be subjected to only the differential pressure between the inside of said stationary section and the inside of the well casing.

6. A tubing retractor including a housing, a retractable section of tubing therein, means to move said section of tubing, and thrust absorbing means adapted to engage and support said tubing in a vertical position, said thrust means including a roller.

7. In a tubing head assembly a housing, a retractable section of tubing therein, a stationary section of tubing in said housing, a Christmas tree above said housing including a cross, a branch on said cross, internal and external threads on said cross whereby both said housing and said stationary section of tubing may be connected therewith.

8. In a tubing head assembly including a housing, a retractable section of tubing, means to retract said section including a rack and pinion, a shaft on which said pinion is mounted, and a gear and worm to rotate said shaft.

9. In a tubing head assembly including a housing, a retractable section of tubing, means to retract said section including a rack and pinion, a shaft on which said pinion is mounted, a gear and worm to rotate said shaft, and a plug carried by said housing as a bearing for said pinion shaft.

10. In a tubing head assembly including a housing, a retractable section of tubing, means to retract said section including a rack and pinion, a shaft on which said pinion is mounted, a gear and worm to rotate said shaft and a thrust member adapted to receive the thrust on said section exerted by said pinion.

In testimony whereof I hereunto affix my signature this 24th day of January, A. D. 1931.

JOSEPH H. McEVOY, Jr.

In testimony whereof we hereunto affix our signatures this 7th day of January, A. D. 1931.

JAMES H. HOWARD.
EDWIN A. JOHNSON.