Sept. 11, 1928.

1,683,629

J. G. ROBINSON

WELL TUBING

Filed Aug. 9, 1926

3 Sheets-Sheet 1

Fig. 1.

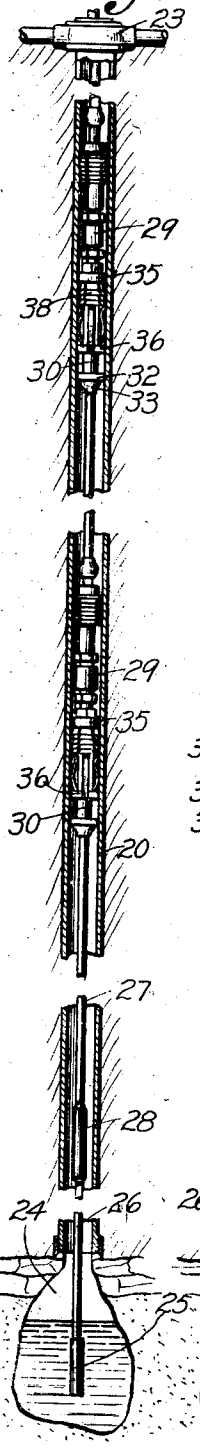


Fig. 2.

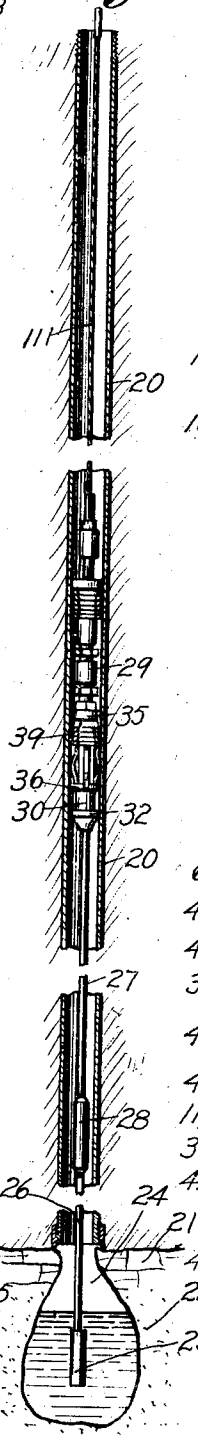


Fig. 3.

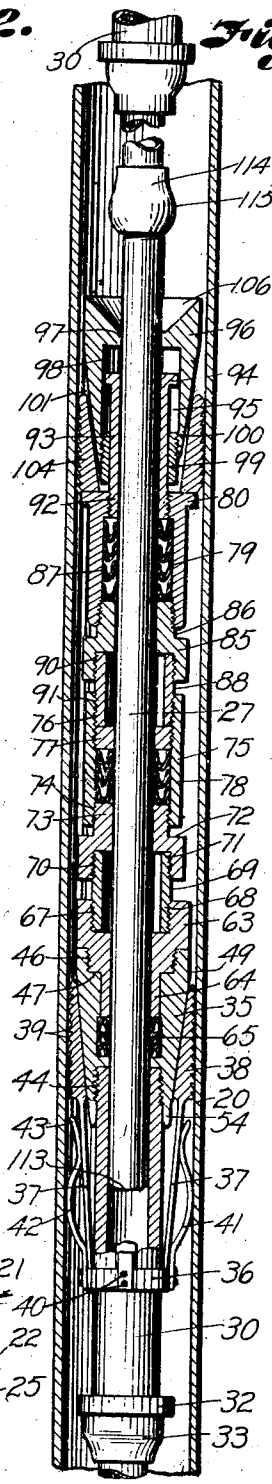
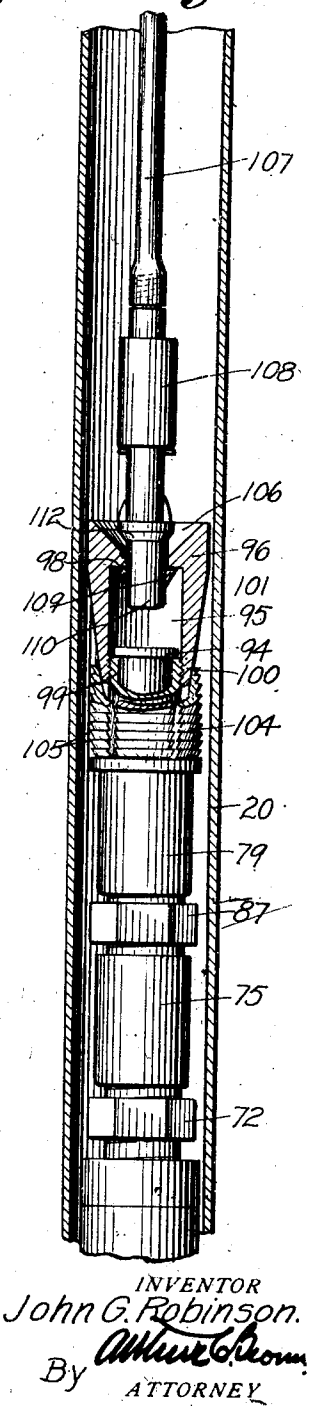


Fig. 4.



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WELL TUBING

Filed Aug. 9, 1926 3 Sheets-Sheet 2

Fig. 5.

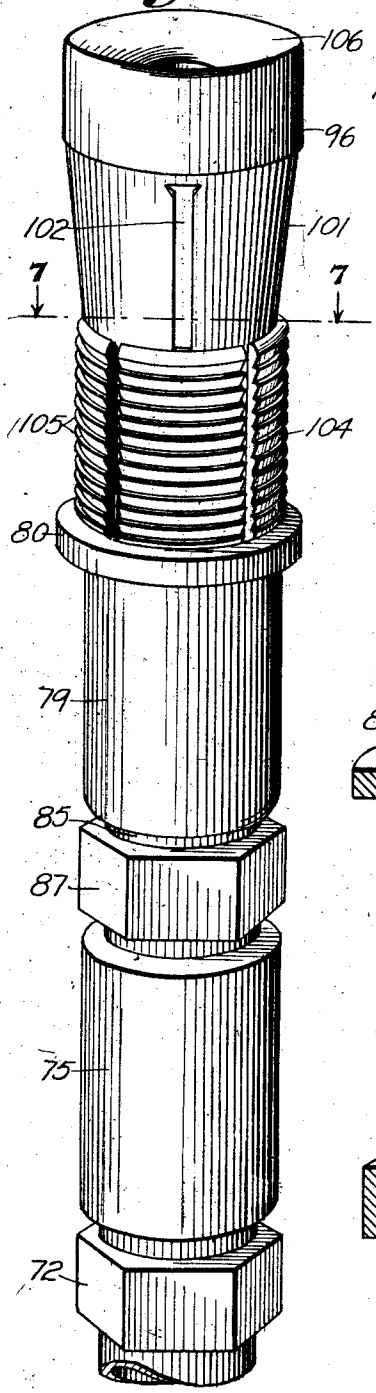


Fig. 7.

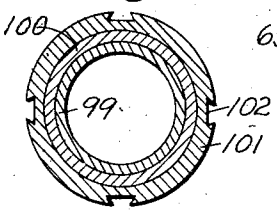


Fig. 8.

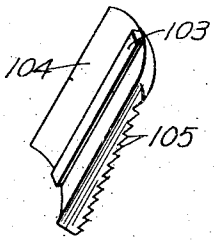


Fig. 9.

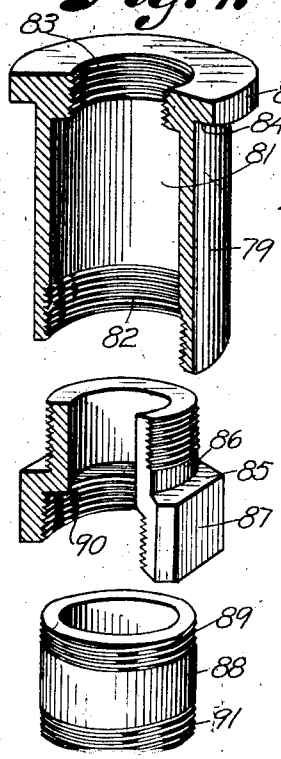
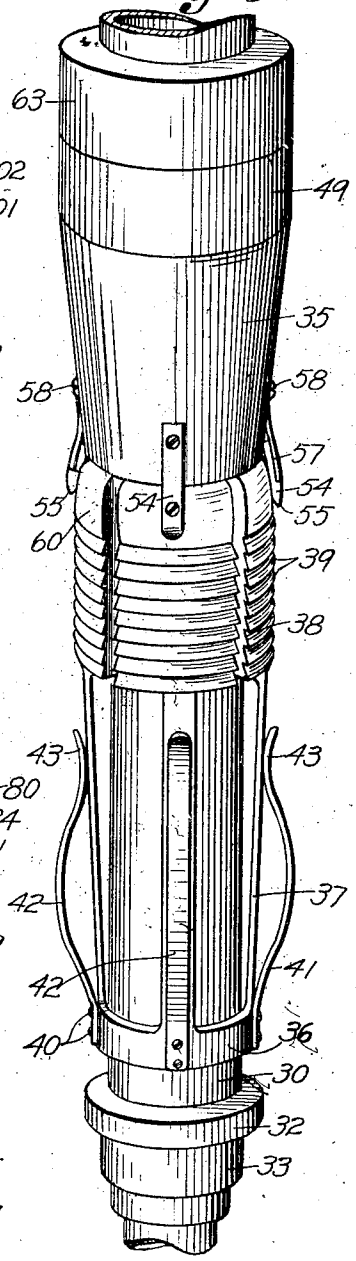


Fig. 6.



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WELL TUBING

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3 Sheets-Sheet 3

Fig. 10.

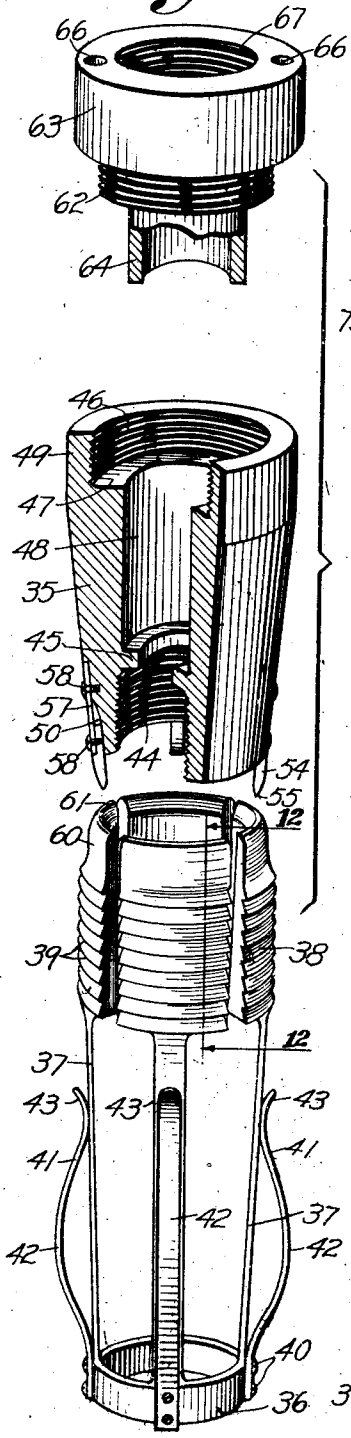


Fig. 11.

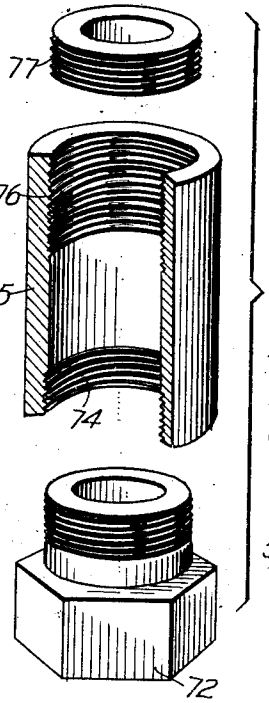


Fig. 12.



Fig. 14.

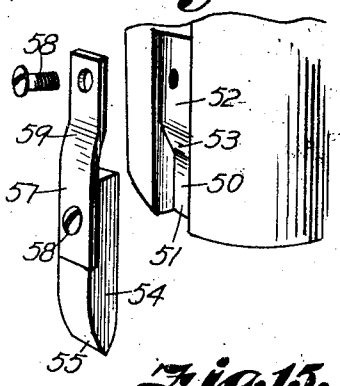


Fig. 13.

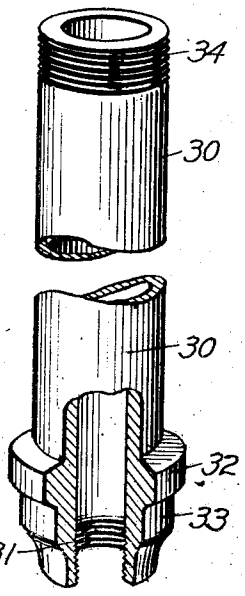


Fig. 15.

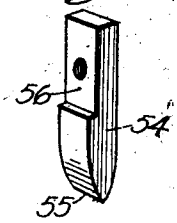
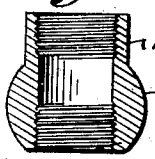


Fig. 16.



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Patented Sept. 11, 1928. 1,683,629

UNITED STATES PATENT OFFICE.

JOHN G. ROBINSON, OF BLACKWELL, OKLAHOMA.

WELL TUBING.

Application filed August 9, 1926. Serial No. 128,032.

My invention relates to well tubing and more particularly to a sectional well tubing and means for mounting the sections in the well.

It is a purpose of my invention to provide new and improved means for mounting tubing within a well casing so that the entire weight of the tubing is not supported from the top of the well but is supported at intermediate points. In order to accomplish this purpose the tubing is preferably provided with means engaging the casing at spaced points along the length thereof wherefrom the tubing is supported.

More particularly it is a purpose of my invention to provide a well tubing that is made up of sections, each of which is provided with means engaging the well casing from which said section is supported. Preferably each section is suspended from the supporting means and is connected with an adjoining section so as to form a continuous conduit from the lower to the upper end thereof.

More particularly my invention preferably comprises tubing sections each having means for connecting the same with an adjoining section. Said connecting means being provided with gripping members engaging the well casing and each connecting means having a tubing section suspended therefrom and another tubing section extending into the same but movable lengthwise relative thereto. The gripping means preferably comprises gripping members adapted to hold the connecting means from downward movement in the casing and gripping means adapted to hold the connecting means from upward movement in the casing. The gripping means preferably comprises jaws which are wedged into engagement with the casing and which are movable out of engagement therewith to release the gripping members when it is desired to remove the tubing sections from the well. A suitable packing is also provided between the connecting means associated with one tubing section and the adjoining tubing section extending into said connecting means.

It is particularly desirable to provide means supporting the tubing in sections, as the long string of tubing used in deep wells is often of excessive weight when supported from a single supporting member at the top of the well, which causes breakage and the dropping of the tubing into the well. Such dropping of the tubing also frequently occurs due to destruction of the support at the top of the well due to fires or storms. Whenever the tubing in a well drops, considerable damage is done thereto, and by providing independent means for supporting each of the sections, this difficulty is overcome. Furthermore the gripping means for preventing the tubing from moving upwardly in the casing prevents the blowing out of the well by gas pressure and thus furthermore prevents damage to the tubing and other oil well apparatus. It will be obvious that with my invention the depth of a well is not limited by the amount of tubing which can be supported from a single supporting member, as the weight of the tubing is divided among a large number of supporting members.

Other objects and advantages of the invention will appear as the description of the accompanying drawings proceeds. However, I desire to have it distinctly understood that I do not intend to limit myself to the exact details shown or described, but that I intend to include as part of my invention all such obvious changes and modifications of parts as would occur to a person skilled in this art and as would fall within the scope of the claims.

In the drawings:

Fig. 1 is a vertical sectional view, partly broken away, through an oil well, showing the casing and tubing mounted therein.

Fig. 2 is a similar view showing one of the tubing sections in position in the well.

Fig. 3 is a vertical sectional view through a portion of the oil well, showing the connecting means for the tubing sections and the means carried thereby engaging the casing, on a larger scale.

Fig. 4 is a view partly in elevation and partly in section showing a portion of the oil well casing and the upper portion of one of the tubing units as the same is being lowered into the well.

Fig. 5 is a fragmentary perspective view of the upper end portion of one of the connecting members.

Fig. 6 is a similar view of the lower end thereof.

Fig. 7 is a section taken on the line 7—7 of Fig. 5.

Fig. 8 is a perspective view of one of the gripping members.

Fig. 9 is a perspective view, partly broken

away, of the upper stuffing box member, showing the parts thereof separated.

Fig. 10 is a similar view of the lower stuffing box member and the gripping means associated therewith.

Fig. 11 is a similar view of the intermediate stuffing box member.

Fig. 12 is a section taken on the line 12—12 of Fig. 10.

Fig. 13 is a fragmentary perspective view of the coupling member at the lower end portion of the connecting means from which the tubing section supported by the connecting means is suspended.

Fig. 14 is a fragmentary perspective view of the lower stuffing box member showing one of the jaw retaining pawls separated therefrom.

Fig. 15 is a perspective view of one of the pawls, and

Fig. 16 is a longitudinal sectional view of the upper limiting stop member.

Referring in detail to the drawings:

In Figs. 1 to 4 inclusive is shown an oil well provided with a casing 20 which extends from the cap rock 21, which overlies the oil sand 22, to the casing head 23. The usual hole 24 is provided in the oil sand 23 in which the oil collects and from which the same is drawn through a straining member 25 that is attached to the lower end of the tubing, said tubing extending from the strainer 25 to the casing head 23 and preferably comprises a section 26 carrying the strainer 25 and secured to one of the similar sections 27 of tubing by means of a coupling member 28. The tubing of the well comprises a plurality of sections 27 alternating with connecting members 29 which also serve to support the tubing in the casing 20 as will be pointed out below.

Each of the connecting members 29 is provided with a coupling member 30 (Fig. 13) which has an internally threaded lower end portion 31 with which the tubing section 27 associated therewith is screw-threadedly connected. An annular flange 32 is provided on the member 30 adjacent the lower end thereof and said member 30 is further thickened as at 33 to strengthen the same adjacent the flange 32. The upper end of the member 30 is exteriorly threaded as indicated at 34 and has the conical wedging member 35 (Fig. 10) screw-threadedly engaging therewith.

Slidably mounted on the member 30 between the member 35 and the flange 32 is a collar 36 from which the flexible arms 37 extend upwardly, said arms 37 having the jaws 38 provided on the upper ends thereof, there being one jaw provided on each of the members 37, said jaws 38 collectively forming an annular gripping means adapted to engage the inner wall of the casing 20. The jaws 38 are provided for gripping the casing 20 to hold the connecting member from downward movement relative to the casing, ratchet teeth 39 being provided on the members 38 for this purpose. The members 38 are preferably slightly spaced when in their contracted position so as to assure freedom of movement thereof, as will be evident from Fig. 10. Secured to the collar 36 by any suitable securing means such as the rivets 40 are the resilient members 41 which have the bowed out portions 42 that are adapted to frictionally engage with the wall of the casing 20 and with the curved end portions 43 which engage with the members 37, the springs 41 lying opposite the members 37 and corresponding in number thereto. Thus the springs act not only to frictionally engage the wall of the casing but also to hold the jaws 38 in their contracted position.

The conical wedging member 35 is provided with an opening extending through the same, which is internally threaded as indicated at 44 at one end thereof and which is provided with an inwardly directed annular flange or rib 45 above the threaded portion 44 and is further provided with an enlarged internally threaded opening 46 at the opposite end thereof, thus providing an offset or ledge 47 between the bore 48 and the opening 46. The outer surface of the member 35 is tapered throughout the major portion of its length to thus provide a conical wedging surface, the extreme upper end thereof preferably being made cylindrical as indicated at 49. The lower end portion of the member 35 is preferably provided with a plurality of grooves 50 which have deeper portions 51 and shallower portions 42 that are connected by means of the inclined portions 53. Mounted in the deeper portions 51 of each of the grooves 50 are the body portions of the fingers 54 which have the beveled end portions 55 and are provided with offset portions 56 for receiving the springs 57 which are secured in the shallower portions 52 of the grooves by means of the securing members 58, said springs being slightly offset as at 59 to throw the lower ends thereof outwardly from the secured ends thereof. The fingers 55 are adapted to resiliently grip the reduced upper end portions 60 of the members 38 which are provided with beveled extremities 61 adapted to co-operate with the beveled ends 55 of the members 54 to move the members 38 outwardly into embracing relation to the member 35 upon relative movement of the members 35 and 36 toward each other. When the connecting device is being inserted in the well, the members 35 and 36 are assembled with the fingers 54 engaging the outer sides of the reduced end portions 60 of the members 38, and upon insertion of the connecting member with its tubular member 27 attached thereto into the well and after the same has reached its desired position within the well, the member 35 is moved upwardly away from the member 36 so as to disengage the fingers 54 from the members 38.

Then the member 35 is again moved downwardly, causing the beveled ends 55 of the fingers 54 to cam the members 38 outwardly into engagement with the inner wall of the casing 20. This is accomplished due to the fact that the springs 41 at the bowed out portions 42 thereof frictionally engage with the casing 20, thus causing the member 36 to be retarded in its movement upon an upward pull on the member 35, leaving the member 36 behind the member 35 in such upward movement and causing separation of the jaws 38 and the fingers 54. Upon downward movement of the member 35 the springs 41 again act to retard the movement of the member 36, thus causing the fingers 54 to engage with the beveled faces 61 on the members 38, forcing the same outwardly and eventually engaging the teeth 39 with the inner wall of the casing 20.

Engaging the internal threads 46 on the member 35 are the external threads 62 on the packing gland member 63, said packing gland member being provided with a tubular sleeve portion 64 which extends within the bore 48, compressing the gaskets 65 between the same and the annular rib 45. The gasket members 65 are preferably U-shaped in cross section with the grooved portions thereof downwardly so that the upward pressure of the gas in the passage in the member 30 and the member 35, will cause said gaskets to more closely adhere to the wall portions of the member 35 and the tubing member 27 of the next higher section of tubing, which is mounted within the same when the parts are in assembled relation. The member 63 is provided with suitable openings 66 in the upper end wall thereof for engagement by a suitable tool to rotate the member 63 whereby the same is threaded into the member 35 to adjust the members 63 and 35 relative to each other. The end portion of the member 63 opposite the projecting sleeve-like member 64 is enlarged as will be evident from Fig. 10, and is provided with internal screw threads 67, it being, of course, understood that there is an opening extending through the member 63 from end to end thereof.

Engaging with the internal threads 67 are the threads 68 on the externally threaded coupling member 69, said member being also provided with threads 70 on the opposite end thereof which engage with the internal threads 71 on the stuffing box member 72.

The stuffing box member 72 has an externally threaded end portion 73 and is provided with suitable flat faces, as will be evident from Fig. 11 for engagement of the same by a suitable tool such as a wrench, whereby the member 72 may be rotated. The externally threaded end portion 73 of the member 72 engages with the internal threads 74 at one end of the stuffing box sleeve 75, said sleeve being provided with internal threads 76 at the opposite end thereof. The threads 76 are of greater extent than the threads 74, and an externally threaded member 77 is engaged with the threads 76 so as to provide an abutment in the sleeve member 75 between the ends thereof. Suitable gaskets 78 are inserted between the member 77 and the externally threaded end portion 73 of the member 72 being compressed therebetween. Said members 78 are also preferably U-shaped in cross section and have the grooved sides thereof extending upwardly so that the weight of the liquid in the tubing will tend to expand the same against the walls of the member 27 and the member 75.

A packing gland comprising the sleeve member 79 having the annular flange 80 at one end thereof and having an enlarged opening 81 in the same which is internally threaded as at 82 and which is further provided with the internally threaded portion 83 of reduced diameter providing the internal shoulder 84, is also provided embracing the tubular member 27. Said packing gland further comprises the member 85 having the tubular extension 86 of reduced diameter having threads thereon co-operating with the threaded portion 82 for compressing the gaskets 87 between itself and the shoulder 84. The member 85 is provided with flattened faces 87′ for engagement by a suitable tool to rotate said member for adjusting the same relative to the member 79, and is connected with the sleeve-like member 75 of the intermediate packing gland by means of the tubular member 88 having the screw threaded end portion 89 engaging with the internal screw threads 90 in the member 85, and the screw threads 91 engaging with the threads 76 provided in the member 75. The gaskets 87 are arranged in the same manner as the gaskets 78.

Engaging with the internal threads 83 of the member 79 is the externally threaded lower end portion 92 of the stop sleeve 93 which is provided with a stop flange 94 at the upper end thereof. The flange 94 is adapted to slide longitudinally within the bore 95 provided in the upper wedging member 96, said wedging member being provided with a reduced bore 97 providing a stop shoulder 98 within the same adjacent the upper end thereof and is further provided with a stop ring 99 screw threadedly engaging with the threaded lower end portion 100 of the bore 95 to limit the movement of the sleeve 93 in the opposite direction.

The wedging member 96 is provided with a conical outer wedging face 101 which has the dovetailed grooves 102 therein for receiving the dovetailed ribs 103 on the gripping members 104, said gripping members being provided with ratchet teeth 105 which are inclined so as to hold the jaws 104 from upward movement in the casing 20 when engaged therewith, said jaws being adapted to en-

gage with the flange 80 to limit the downward movement thereof. Thus as the wedging member 96 is moved downwardly relative to the member 79, the jaws 104 will be wedged outwardly toward the inner wall of the casing 20. The upper end of the wedging member 96 is provided with a tapering opening 106 which leads to the opening 97 and thus into the opening 95.

In inserting the connecting members carrying the tubing sections 27 into the well, a tool which has a stem portion 107 is provided, the tool 108 having pawls 109 thereon which are adapted to be projected and retracted by suitable mechanism which is not shown in detail in the drawing, and being in the projected position as shown in Fig. 4, thus engaging with the shoulder 98. The distance between the sleeve 99 and the shoulder 98 is such that the flange 94 of the member 93 will be in such a position, as the connecting means and the tubing section are being lowered into the well, that there will be sufficient room in the bore 95 for the projecting end portion 110 of the tool 108. After the tubing section 27 carried by the connecting means at the lower end thereof has reached the desired position in the well, the flexible supporting means 111 carrying the tool 108 is manipulated so as to cause the jaws 38 to engage with the inner wall of the casing 20. This, as previously stated, is done by first moving the flexible member 111 upwardly to disengage the members 54 from the jaws 38 and after this has been done, the flexible member 111 is moved downwardly to cause the jaws 38 to move outwardly due to the action of the wedging member 35 and into engagement with the casing 20. This having been done, the further downward movement of the member 111 will cause the wedging member 96 to move downwardly relative to the jaws 104, wedging these jaws outwardly into engagement with the casing 20. In order to firmly engage the jaws 38 with the casing 20, the wedging member 35 may be rammed downwardly by suitable jarring apparatus provided in the line 111 of the usual construction. The jar is transmitted to the jaws 38 and 104 by means of the beveled shoulder 112 provided on the tool 108 that engages with the beveled surface 106 on the wedging member 96.

The next higher section of tubing 27 is inserted in the well in a similar manner and each section is provided with a beveled lower end portion 113 which is adapted to engage with the beveled or tapered wall 106 of the member 96 to guide the member 27 into the connecting member provided at the upper end of the next lower section 27. Furthermore each tubing section is provided with a coupling member 114 which has a convex outer wall portion 115 providing a lateral enlargement in the tubing section 27 adapted to engage with the beveled end wall 106 of the member 96. In placing the tubing sections 27 in position, the member 114 is permitted to engage with the end wall 106 to determine the position of the next lower section of tubing 27 whereupon the same is drawn upwardly so as to space the member 114 from the member 96. When the members 114 and 96 are thus separated, the next higher section 27 will not be supported in any manner by the connecting means carried by the next lower section 27, but will be independently supported by its connecting means located at the upper end thereof. It is, of course, understood that the tubing section 27 extends upwardly to the next higher coupling member 30 where the same apparatus as shown in Fig. 3 is again provided, the connecting means shown in Fig. 3 and the tubing sections 27 alternating throughout the length of the casing. The tubing sections are of such length that the same can be readily supported by the gripping jaws 38 engaging the casing, and will be held from upward movement due to gas pressure by means of the jaws 104 engaging the casing.

It is, of course, to be understood that the pawls 109 are withdrawn by proper manipulation of the tool 108 after the tubing section 27 that has been lowered into the well is in its final position secured to the inner wall of the casing 20, and the tool 108 is thereupon moved upwardly by upward movement of the flexible member 111 so as to be disengaged from the member 96, and this is repeated for the succeeding sections 27. When it is desired to remove the sections 27, the reverse operation is performed, the tool 108 being inserted in the uppermost one of the members 96, the pawls 109 then projected, engaging with the shoulder 98 whereupon the tool 108 is jarred in an upward direction to move the wedging member 96 upwardly, releasing the jaws 104 and finally the jaws 38, the jaws 38 being aided in their return movement to contracted position by means of the springs 41. The connecting member 29 is then free of the casing 20 except for the frictional engagement of the springs 41 therewith, and may be drawn upwardly by means of the flexible member 111, the tubing 27 carried thereby sliding out of the next lower connecting member 29, and after the connecting member 29 previously referred to and the tubing 27 carried thereby are removed from the well, the operation is repeated for the next section by engaging again with the connecting member 29 by means of the tool 108, the pawls 109 engaging with the shoulder 98 on the next lower member 96 and this is continued until all or any desired number of the sections of tubing are removed.

What I claim and desire to secure by Letters Patent is:—

1. The combination with a well casing of

tubing mounted therein, said tubing comprising a plurality of sections collectively forming a continuous conduit, and means on each of said sections for suspending said section from said casing independently of the other sections and means on each of said sections engaging said casing for holding the same against upward movement in said casing.

2. The combination with a well casing of tubing mounted therein, said tubing comprising a plurality of sections collectively forming a continuous conduit, each of said sections comprising means for connecting said section with an adjoining section, said means each being provided with means engaging said casing to support said section from said casing.

3. The combination with a well casing of tubing mounted therein, said tubing comprising a plurality of sections collectively forming a continuous conduit, each of said sections comprising means for connecting said section with an adjoining section, said means each being provided with means engaging said casing to hold said connecting means from downward movement in said casing.

4. The combination with a well casing of tubing mounted therein, said tubing comprising a plurality of sections collectively forming a continuous conduit, each of said sections comprising means for connecting said section with an adjoining section, said means each being provided with means engaging said casing to hold said connecting means from downward movement in said casing and means for holding said connecting means from upward movement in said casing.

5. The combination with a well casing of tubing mounted therein, said tubing comprising tubing sections and coupling devices, one of said coupling devices being associated with each of said sections and the section associated therewith being suspended from its coupling device and extending into the next lower coupling device, and casing gripping means on each of said coupling devices.

6. The combination with a well casing of tubing mounted therein, said tubing comprising tubing sections and coupling devices, one of said coupling devices being associated with each of said sections and the section associated therewith being suspended from its coupling device and extending into the next lower coupling device, and casing gripping means on each of said coupling devices, said gripping means comprising gripping members engaging said casing to hold said coupling device from downward movement in said casing and gripping members engaging said casing to hold said coupling device from upward movement in said casing.

7. The combination with a well casing of tubing mounted therein, said tubing comprising tubing sections and coupling devices, one of said coupling devices being associated with each of said sections and the section associated therewith being suspended from its coupling device and extending into the next lower coupling device, and casing gripping means on each of said coupling devices, said gripping means comprising gripping members engaging said casing to hold said coupling device from downward movement in said casing and means for holding said gripping members out of engagement with said casing as the tubing section with which the same is associated is being lowered into position in said casing.

8. The combination with a well casing of tubing mounted therein, said tubing comprising tubing sections and coupling devices, one of said coupling devices being associated with each of said sections and the section associated therewith being suspended from its coupling device and extending into the next lower coupling device, and casing gripping means on each of said coupling devices, said gripping means comprising gripping members engaging said casing to hold said coupling device from downward movement in said casing, means for holding said gripping members out of engagement with said casing as the tubing section with which the same is associated is being lowered into position in said casing, and means for moving said gripping members into engagement with said casing.

9. The combination with a well casing of tubing mounted therein, said tubing comprising tubing sections and coupling devices, one of said coupling devices being associated with each of said sections and the section associated therewith being suspended from its coupling device and extending into the next lower coupling device, and casing gripping means on each of said coupling devices, said gripping means comprising gripping members engaging said casing to hold said coupling device from downward movement in said casing and wedging means for moving said gripping members into engagement with said casing.

10. The combination with a well casing of tubing mounted therein, said tubing comprising tubing sections and coupling devices, one of said coupling devices being associated with each of said sections and the section associated therewith being suspended from its coupling device and extending into the next lower coupling device, and casing gripping means on each of said coupling devices, said gripping means comprising gripping members engaging said casing to hold said coupling device from downward movement in said casing, gripping members engaging said casing to hold said coupling device from upward movement in said casing and wedging means for moving said gripping members into engagement with said casing.

11. The combination with a well casing of

tubing mounted therein, said tubing comprising tubing sections and coupling devices, one of said coupling devices being associated with each of said sections and the section associated therewith being suspended from its coupling device and extending into the next lower coupling device, and casing gripping means on each of said coupling devices, said gripping means comprising gripping members engaging said casing to hold said coupling device from downward movement in said casing, and wedging means for moving said gripping members into engagement with said casing, said wedging means having a limited movement lengthwise of said coupling device.

12. The combination with a well casing of tubing mounted therein, said tubing comprising tubing sections and coupling devices, one of said coupling devices being associated with each of said sections and the section associated therewith being suspended from its coupling device and extending into the next lower coupling device, and casing gripping means on each of said coupling devices, said gripping means comprising gripping members engaging said casing to hold said coupling device from downward movement in said casing, gripping members engaging said casing to hold said coupling device from upward movement in said casing and wedging means for moving said gripping members into engagement with said casing, each of said wedging means having a limited movement lengthwise of said coupling device.

13. The combination with a well casing of tubing mounted therein, said tubing comprising tubing sections and coupling devices, one of said coupling devices being associated with each of said sections and the section associated therewith being suspended from its coupling device and extending into the next lower coupling device, and casing gripping means on each of said coupling devices, said gripping means comprising gripping members engaging said casing to hold said coupling device from downward movement in said casing and wedging means for moving said gripping members into engagement with said casing, said wedging means having resilient casing engaging means associated therewith.

14. The combination with a well casing of tubing mounted therein, said tubing comprising tubing sections and coupling devices, one of said coupling devices being associated with each of said sections and the section associated therewith being suspended from its coupling device and extending into the next lower coupling device, and casing gripping means on each of said coupling devices, said coupling device slidably receiving an adjoining section of said tubing.

15. The combination with a well casing of tubing mounted therein, said tubing comprising tubing sections and coupling devices, one of said coupling devices being associated with each of said sections and the section associated therewith being suspended from its coupling device and extending into the next lower coupling device, and casing gripping means on each of said coupling devices, said coupling device slidably receiving an adjoining section of said tubing and having means therein providing a liquid tight joint between said coupling device and said last mentioned section.

In testimony whereof I affix my signature.

JOHN G. ROBINSON.