March 24, 1936. F. W. HILD 2,034,698

TERMINAL COLLAR FOR WELL CASINGS

Filed June 5, 1933

Fig. 1.

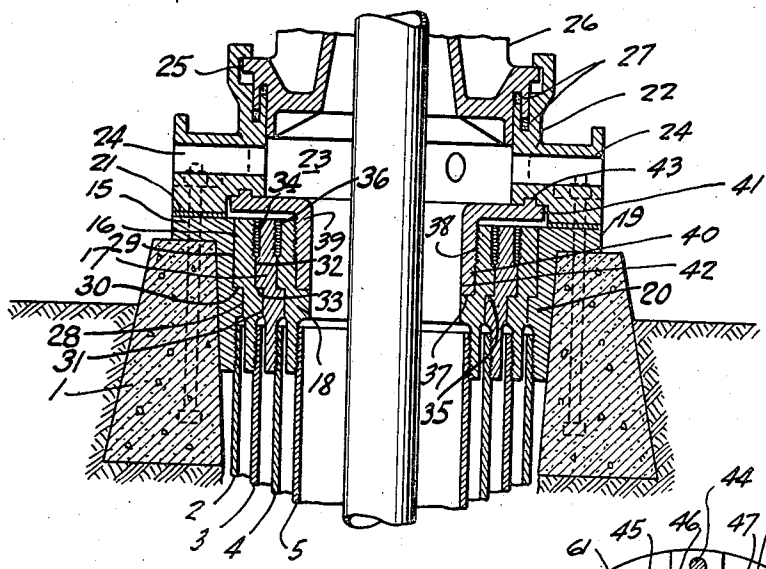



Fig. 2.

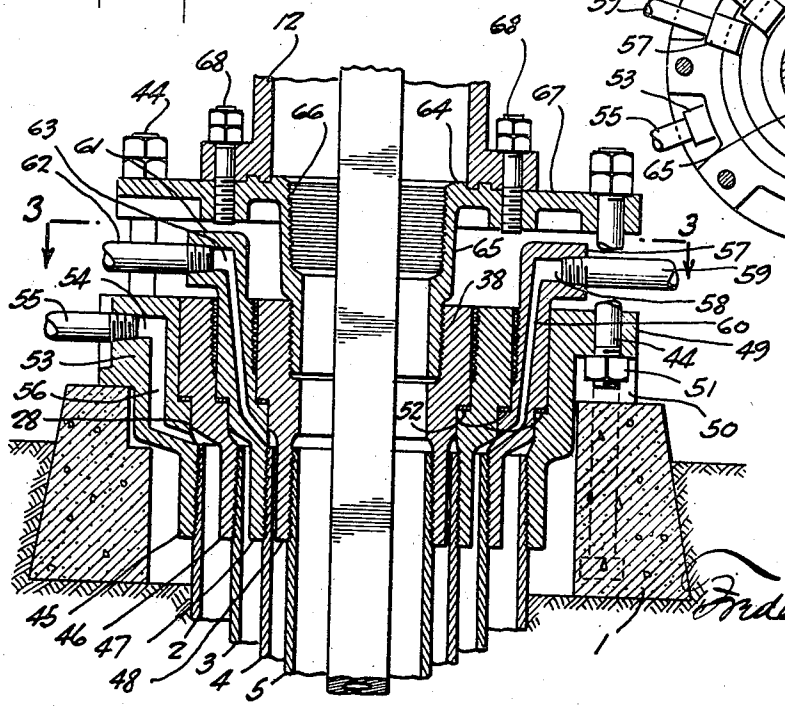
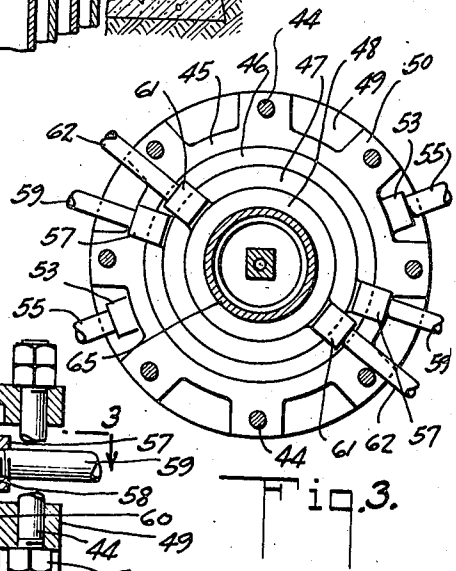



Fig. 3.

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## TERMINAL COLLAR FOR WELL CASINGS

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4 Claims. (Cl. 166—14)

My invention relates to terminal collars for well casings and has to do with prevention of blow-outs between casings in a well.

This application is a continuation in part of my co-pending applications Serial No. 326,208 filed Dec. 15, 1928 for Methods and equipment for blow-out prevention, Serial No. 382,384, filed July 31, 1929 for Control head and blow-out preventer, Patent No. 1,906,265 filed Aug. 12, 1929 and issued May 2, 1933 for Blow-out preventers for rotary drilling, and application Serial No. 471,114 filed July 18, 1930 for Automatic casing head equipment.

Each string of the concentric casings in a well is usually cemented into the well hole for a considerable distance upward from its lower end. Failure of the cement through vibrational stresses during drilling or lack of cement in the lower portion of casing permits underground fluid to flow into the inter-casing space. Unless it is desired to utilize this fluid it is customary to fill the space between the casings with heavy mud in order to suppress the underground fluid.

A substantial part of the weight of the casings should be suspended from the casing couplings or collars at the top of the hole where provision may be made for controlling inter-casing fluid. The terminal assembly for these purposes is usually a series of superimposed couplings and collars in which each inner casing terminates substantially above the couplings and collars of the next outer casing. The assembly attains such a height as to necessitate a "cellar" of substantial depth and width to contain it, and which usually is filled with dirty oil and mud.

An object of the present invention is to provide for concentrically disposed well casings, terminal collars which nest into one another at about the same level at or above the ground surface and thereby obviate the need for "cellars".

Another object of the invention is to provide terminal collars having vent heads and vent pipes at approximately a common level at or above the ground surface.

A further object of the invention is to provide for each casing a unitary terminal collar having nesting and venting provision and forming with the other collars a compact solid fluid tight assembly at or above the ground surface.

Still another object is to provide a terminal collar with a collar head which is the common fluid chamber for each successive casing.

Other objects and advantages of my invention will be apparent from the following description and the accompanying drawing.

Figure 1 shows in vertical section the common fluid chamber secured by a flanged coupling to an inner collar of the nested terminal collars.

Figure 2 shows in vertical section the nested collars with vent heads and vent outlets at a common level, also the flange coupling securing the innermost collar to the outermost collar and to a control head.

Figure 3 is a plan view of the nested collar assembly as seen on the plane 3—3 of Figure 2.

Referring to the drawing, at the top of the bored well hole is a concrete foundation 1 which supports a portion of the weight of the assembled casings 2, 3, 4 and 5 and their respective terminal collars and control head, the remainder of the weight being supported by the sides of the bored hole into which each string of casing is usually cemented for a substantial part of its length. The great weight of the assembly together with the solid anchorage in the hole are usually more than ample to resist any upward force of the well fluids.

Referring to Figure 1, casings 2, 3, 4 and 5 are threaded into terminal collars 15, 16, 17 and 18 respectively. Outermost terminal collar 15 consists of the outwardly extending collar head 19 and the thread body 20 projecting downwardly therefrom. The thread body 20 is threaded for receiving outermost casing 2. The upper surface of collar head 19 is machined and may have packing with tongue and groove to provide fluid tight joint 21 with the mating base of collar extension head 22 which is bolted to collar head 19 and to the foundation. The extension head 22 provides the common fluid chamber 23 for all the casings. The extension head has lateral openings 24 adapted for securing to valves and conduits and its upper end forms the half of a breech lock 25 adapted to receive a control head 26 such as described in my aforesaid applications and patent. Packings 27 aid in making the breech lock joint fluid tight. Terminal collar 15 has two inner bores of different diameters, the lower bore 28 being smaller than upper bore 29 and thereby forming the inner seat 30.

Seated in and contained by terminal collar 15, is terminal collar 16 into which is threaded the casing 3. The outer circumferential surface of collar 16 is machined to fit the inner bores 28 and 29 and the seat 30 of outermost terminal collar 15. Terminal collar 16 has two inner bores of different diameters 31 and 32 respectively, and forming the seat 33 as described for terminal collar 15. The upper end of the terminal collar 15 is threaded at 34 so as to receive a pipe or a

cement head when setting and cementing casing 3.

Similarly the terminal collar 17 is machined to fit and be seated in terminal collar 16 and to provide a seat 35 for terminal collar 18. The lower end of collar 17 is threaded to receive casing 4 and the upper end is threaded at 36 to receive the temporary pipe and cement head for setting casing 4. Likewise the terminal collar 18 is contained by and seated in collar 17. Terminal collar 18 which has seat 37, is screwed onto casing 5 and has thread 38 at its upper end.

The described arrangement enables assembling the terminal collars at a common level above the ground surface and the fluid from each casing may discharge successively into the common fluid chamber 23 of extension head 22. The threads at the upper end of each inner terminal collar provide means for securing it to a control head or a production head as presently described for Figures 1 and 2.

Figure 1 shows means for tying all of the casings at their terminal collars into a solid compact assembly whereby the combined weight and anchorage of all the strings oppose upward force on any string.

This tying means is flanged coupling 39 which has thread body 40 and flanged head 41. The outer circumferential surface of thread body 40 is machined and threaded to fit fluid tight into the upper bore and thread 38 of innermost terminal collar 18. The inner bore 42 of flanged coupling 39 is flush with the lower and smallest bore of terminal collar 18. The flanged head 41 extends outwardly over the tops of intermediate terminal collars 17 and 16 and its upper surface is machined for packing and tongue and groove for fluid tight joint 43 with the extension head 22 or with a control head such as 12. The foundation bolts and other suitable bolts which secure the extension head 22 to the outermost terminal collar 15, exert compressive force on flanged coupling 39, forcing each terminal collar firmly into its seat in the adjoining containing collar so that all are united into a solid fluid tight assembly. Similar flange couplings may be used with terminal collars 16 and 17 when each respectively is innermost.

In Figures 2 and 3 the outermost casing 2 is threaded into outermost terminal collar 45, and casings 3, 4 and 5 are threaded into terminal collars 46, 47 and 48 respectively which are contained and consecutively seated within terminal collar 45 in the manner described for Figure 1. The upper part of outermost terminal collar 45 extends radially outward and forms the collar head having a base 49 for resting on foundation 1. The base has pockets 50 for the nuts 51 of bolts 44 which may be used to secure the terminal collar to an extension head such as 22 or a control head 12. Packings 52 in the seats of the terminal collars aid in making the joints between the collars fluid tight. The upper end of each inner terminal collar is threaded as described for Figure 1.

Between pockets 50 are vent lugs 53 each having a radially threaded bore 54 for receiving a vent pipe 55 which extends radially outward from the vent lug. Vent channel 56 extends downward through the body of terminal collar 45 from threaded bore 54 to the lower end of inner face 28 of the collar and provides free passage for fluid to or from vent pipe 55 and the space between casings 2 and 3. The pipe 55 leads to suitable control valves and piping (not shown) so that fluid accumulating in the inter-casing space may flow therefrom and be utilized or dissipated as desired, and conversely, mud fluid may be pumped into the inter-casing space to suppress underground fluid.

Terminal collar 46 has vent heads 57, which are lugs projecting upward and outward from the upper circular end surface of the collar. Each vent head has a threaded bore 58 for receiving a vent pipe 59 which extends radially outward just above the outermost collar 45 to the aforesaid system of control valves and piping. Vent channel 60 extends downwardly through the body of terminal collar 46 from threaded bore 58 to the space between casings 3 and 4. In like manner terminal collar 47 has vent head 61, vent pipe 62 and vent channel 63 leading to the space between casings 4 and 5.

Innermost casing 5 is the final string through which the flush production flows and through which tubing may be inserted when the flush subsides and pumping becomes necessary. It therefore does not require the lateral venting provision described for the outer casings. Instead, flanged coupling 64 is provided which is adapted to secure the innermost terminal collar 48 to extension head 12, 22 or to a control head or blow-out preventer such as described in my aforesaid applications and patent, and to a production head.

Flange coupling 64 has the thread body 65 the lower portion of which is externally threaded for fluid tight fit into thread 38 of innermost terminal collar 48; the inner face of this portion of the body is flush with the inner side of the terminal collar and casing 5. The upper portion of thread body 65 has an internal thread 66 for securing to a production head. A flange head 67 extends radially outward from the upper portion of thread body 65 sufficiently to engage bolts 44. The upper surface is machined for tongue and groove to effect a fluid tight joint, by aid of bolts 68 or bolts 44, with a control head 12 or blow-out preventer as described for flanged coupling 39.

Most of the threaded body of each inner terminal collar is contained within the next outer terminal collar into which the inner collar nests and is secured, all of the lower thread in which the casing terminates and a portion of the upper thread being below the collar seat. This results in relatively small aggregate height for the terminal collar and venting assembly which therefore may be mounted on a suitable foundation at or above the ground surface and without a "cellar".

Although I have described two specific embodiments of my invention, it will be obvious to those skilled in the art, that various modifications may be made in the details of construction, the general arrangement, the association of the several co-operating parts and the application of my invention without departing from the spirit thereof or the principles herein set forth.

I claim as my invention:

1. In combination, a plurality of terminal collars nested one within the other, each of said collars having threaded downwardly extending portions engaging well casing, each succeeding inner collar having a flange accommodated within the flange of the next outer collar, and resting on a shoulder formed in said outer collar flange, the flange of the outermost collar being at least as high as any of the flanges of the other collars, means attached to the top of the innermost collar, providing a horizontal flange,

and fastening means cooperating with said horizontal flange for exerting an axial compressive force between the said horizontal flange and the outermost collar.

2. In combination, a series of terminal collars for well casing, in nested concentric arrangement, each of said collars being provided with means for attachment to well casing, the outer collar of any adjacent pair having an internal cylindrical surface as well as a shoulder at the bottom of the cylindrical surface, the inner collar of any adjacent pair having an external cylindrical surface in contact with the said internal surface, as well as a reduced portion forming a shoulder contacting with the shoulder at the bottom of the internal surface, means attached to the top of the innermost collar, providing a horizontal flange, and fastening means cooperating with said horizontal flange for exerting an axial compressive force between the said horizontal flange and the outermost collar.

3. In combination, a series of terminal collars for well casing, in nested concentric arrangement, each of said collars being provided with means for attachment to well casing, the collars having cylindrical stepped surfaces whereby all of the collars extend along substantially the same axial distance along the common axis of the collars, means attached to the top of the innermost collar, providing a horizontal flange, and fastening means cooperating with said horizontal flange for exerting an axial compressive force between the said horizontal flange and the outermost collar.

4. In combination, a series of terminal collars for well casing, in nested concentric arrangement, each of said collars being provided with means for attachment to well casing, the collars having stepped surfaces whereby all of the collars extend along substantially the same axial distance along the common axis of the collars, an extension head disposed above the collars, means attached to the top of the innermost collar and in sealing relation to the head, and fastening means cooperating with the extension head for exerting an axial compressive force between the said means and the outermost collar.

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