Aug. 8, 1933. C. C. BROWN 1,921,115

WELL HEAD EQUIPMENT

Filed Dec. 12, 1929

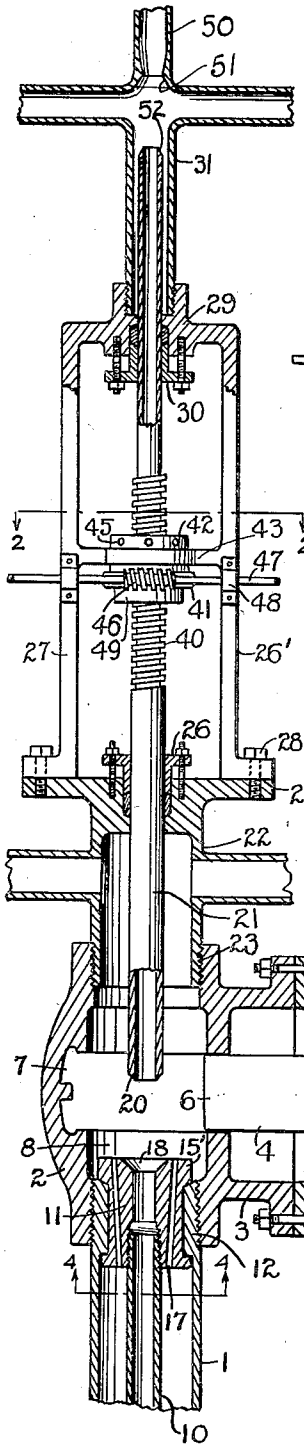


Fig. 1.

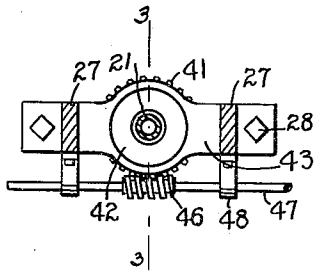


Fig. 2.

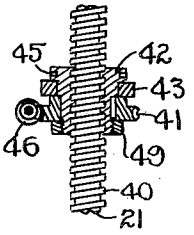


Fig. 3.

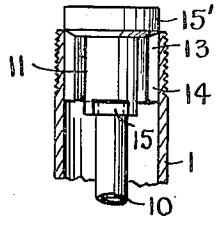


Fig. 5.

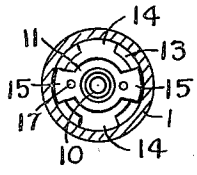


Fig. 4.

Inventor
C. C. BROWN.

By Jesse R. Stone
Lester B Clark
Attorneys

Patented Aug. 8, 1933

1,921,115

UNITED STATES PATENT OFFICE

1,921,115

WELL HEAD EQUIPMENT

Cicero C. Brown, Hebronville, Tex.

Application December 12, 1929. Serial No. 413,475

14 Claims. (Cl. 166—15)

The invention relates to an improvement in well equipment adapted to be attached to the casing head in order to close the same and prevent escape of gas and/or oil.

In drilling and pumping wells the casing is employed to prevent caving in and to serve as a supporting member for the various portions of apparatus. At times it is desirable to completely close this casing to prevent the escape of gas or oil and to prevent leaking during such times as the drilling or pumping operations are not being performed. To accomplish this closing it is usual to provide a gate valve. However, before this gate valve may be closed across the casing it is necessary to remove the drill pipe or the string of tubing so that the gate of the valve may move transversely across the casing. In devices heretofore employed it has been necessary to completely remove the drill stem or tubing before the gate valve could be closed, and in some instances, blowout preventers have been devised having a pair of co-operating rams which close about the drill stem or tubing. These devices, however, have certain disadvantages which I contemplate overcoming with my improved device.

It is one of the objects of the present invention to devise a connection for the inner string of pipe or tubing so that it may be separated at a point adjacent the gate valve.

Another object of the invention is to provide an improved mechanism for manipulating the part of the pipe or tubing which is to be moved.

Still another object of the invention is to devise an improved hanger for the tubing which is below the point of separation.

Still another object of the invention is to provide a mechanism for raising a portion of the pipe or tubing so that portions of the well equipment which surmount my device will not have to be removed or their operation interfered with when the pipe or tubing is being manipulated.

Fig. 1 is a side elevation of a casing equipped with my improvement, certain parts of the view being shown in section for purposes of illustration.

Fig. 2 is a section taken on the line 2—2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a view taken on the line 3—3 of Fig. 2.

Fig. 4 is taken on the line 4—4 of Fig. 1.

Fig. 5 is a detail view showing the arrangement of the tubing hanger.

The present application is in the nature of an improvement over the structure shown in my prior co-pending application Serial No. 374,113, filed June 27, 1929.

The general assembly of the device is best seen in Fig. 1. The well casing is indicated generally at 1 and comprises a section of pipe which is placed in the well bore to support the earth formation and to serve as an anchor and support for certain portions of the well equipment. This casing 1 is threaded externally and has connected therewith a gate valve 2. This gate valve is of usual construction and is ordinarily employed in well drilling equipment.

The gate valve comprises the housing 3, the gate 4 and the hand wheel 5. As is usual in valves of this type rotation of the handle 5 causes the gate 4 to move horizontally so that the end 6 will pass into the recess 7. In this manner a complete close of the passage 8 through the valve is accomplished. In devices heretofore in use serious accidents and enormous losses have resulted from inability to quickly close this gate valve. When excessive pressures in the earth formation are encountered this valve should be closed to prevent the escape of the pressure in the well. It is also desirable to close this valve when drilling or pumping operations are not being carried on. It seems obvious, however, that this valve could not be closed when pumping operations were in effect due to the string of tubing. With the present device, however, I have arranged the construction in such a manner that the tubing may be separated to permit the passage of the gate 6. When the tubing is to be separated, however, it is necessary that the lower portion 10 thereof be supported. In order to accomplish this I have devised a tubing hanger indicated generally at 11. This hanger is seen in plan view in Fig. 4 and in side elevation in Fig. 5. The upper end 12 of the casing 1 is provided with an inwardly extending flange 13 which is provided with a pair of opposite vertical slots 14. The tubing hanger 11 comprises a circular member threaded internally at its lower end to receive the string of tubing 10. This hanger has a set of outstanding lugs 15 adapted to pass into the slots 14.

In this manner it will be seen that the hanger when arranged properly may slide downwardly through the flange 13 and by rotation the lugs 15 will pass beneath the flange 13 so that the hanger will be securely anchored to the casing 1. The upper end of the hanger 11 is formed with a head 15′ adapted to rest on top of the flange 13 and prevent downward movement of the hanger. With this construction the entire weight of the tubing string 10 and the contents thereof will rest on top of the casing 1. Any desired number of passages 17 may be formed through the hanger

to provide for the escape of gas or any fluids under pressure in the area between the tubing 10 and the casing 1.

The upper end of the hanger 11 is formed with a seat 18 which is here shown as conical or tapered. The seat, however, may take any desired form and is arranged to receive the lower end 20 of the upper section of the tubing 21. This tubing 21 is supported by a casing head 22 which is connected at 23 with the upper end of the gate valve 2. This casing head 22 may take any desired form but I here show it as arranged with an outstanding flange 25 and a stuffing box 26. Surmounting the casing head is a frame work 26'. As here illustrated it comprises a pair of legs 27, which are secured by means of bolts 28 to the casing head 25. At the upper end these legs are formed with a head 29 which carries a stuffing box 30. Any desired type of well equipment may be mounted on top of this head 29 and I have here illustrated a cross 31 of standard construction. This cross is shown as threaded into the head 29 where it may be fastened in any desired manner. In the lower end of the upper branch 50 of the cross is formed a seat 51, the walls of which converge upwardly to receive the tapered upper end of the tubing section 21 as will be later noted.

It should be noted that the upper end of the tubing 21 is of such diameter that it passes smoothly through the stuffing box 30 and may slide vertically within the lower arm of the cross 31.

With the construction just described it seems apparent that the upper section 21 of the tubing may be moved vertically so that the end 20 will come into contact with the seat 18 or it may be moved upwardly to separate these two parts and permit the gate 6 to pass transversely across the housing 3 to completely close the passage from the casing 1. Any desired means may be used to manipulate this upper section 21 of the tubing and I have here illustrated a work gear arrangement which is adapted to engage with the threads 40 on the tubing. This worm gear comprises the gear 41, which is mounted upon a bushing 42, which is in turn carried by the cross member 43. This cross member is a part of the legs 27. It should be noted that the bushing 42 is enlarged at its upper end so that any weight upon this bushing will be supported by the cross member 43. This upper enlarged portion is provided with a plurality of openings 45 which are adapted to receive a jack bar so that the bushing may be rotated in this manner. However, it is intended that normally the bushing 42 will be rotated by means of the gear 41, which meshes with a worm 46. A shaft 47 is arranged transversely of the leg members and is supported in bearings 48. The worm 46 is rigidly mounted on this shaft 47 so that rotation thereof will rotate the gear 41. The inside of the bushing 42 is threaded to receive the threads 40 on the tubing. A locking ring 49 is shown as securing the gear 41 to the bushing 42. In this manner it will be seen that a rotatable connection has been provided which will cause longitudinal movement either upwardly or downwardly of the tubing 21.

The particular advantage of the structure herein illustrated is that the tubing 21 may telescope upwardly inside of the cross 31 so as to separate the tubing and allow the closing of the gate 4 and also to bring the tapered upper end 52 of the tubing into the seat 51 of the cross. This closes the passage of gas or other fluid from the tubing into the lateral branches of the cross and leaves but one outlet. If only the lateral branches need repair or adjustment, it may not be necessary to close the master valve 4. The passage of fluid from the well may be controlled without endangering the connections forming the outlet from the well or wasting the production from the well. It will be noted that any equipment which surmounts my improved head or tubing separator is not moved or disturbed in any manner by manipulation of my device. The stuffing boxes 26 and 30 prevent the escape of any fluid and at the same time the tubing 21 is exposed so that it may be manipulated to permit the operation of the gate valve.

I have disclosed herein an embodiment of my present improvements which I believe to be entirely satisfactory and practical for the purpose in view. Nevertheless, it is to be understood that the several essential parts of the improved embodiment may be constructed in various other alternative forms and it is accordingly to be understood that in the further development of the device that I reserve the privilege of resorting to all such legitimate changes therein as may be fairly embodied within the spirit and scope of the invention as claimed.

What I claim as new is:

1. In combination with a well head equipment embodying a separable string of tubing, a tubing hanger including a slotted flange support, a collar on the tubing having flow passages therethrough, a set of outstanding lugs on said collar arranged to pass thru said slotted flange and be rotated to a position beneath said flange whereby upward movement of said hanger is prevented.

2. In combination with a well head equipment embodying a separable string of tubing, a tubing hanger including a slotted flange support, a collar on the tubing having flow passages therethrough, a set of outstanding lugs on said collar arranged to pass thru said slotted flange and be rotated to a position beneath said flange whereby upward movement of said hanger is prevented, and a head on said hanger adapted to abut said flange whereby the weight of the tubing string is supported.

3. The combination of a well casing, a well tubing therein projecting above said casing, a flow line connected with said tubing at the upper end thereof, said tubing having a movable section slidable vertically in said casing, and having a telescopic connection with said flow line, branches in said flow line, means in said flow line adapted to interfit with the upper end of said section to seal off said section to one of said branches, means to preserve a fluid seal between said section and said casing, and similar means to form a seal between said section and said flow line.

4. In a well head equipment, a casing, a tubing therein projecting above said casing, a cross above said casing into which said tubing projects, a seat in said cross adapted to engage the upper end of said tubing when said tubing and cross are telescoped together and means to preserve a fluid seal about said tubing.

5. In a device of the character described, a casing, a gate valve thereon, a casing head above said valve, a support on said casing head, a branching flow line above said support, a frame on said support spacing said flow line from said casing head, a separable string of tubing extending from said casing and fitting within said flow line, means to seal said casing head about said

tubing, means to seal said flow line about said tubing, and means between said sealing means engaging said tubing to move the same to separate said tubing adjacent said valve.

6. In a device of the character described, a casing, a gate valve thereon, a casing head above said valve, a support on said casing head, a branching flow line above said support, a frame on said support spacing said flow line from said casing head, a separable string of tubing extending from said casing and fitting within said flow line, means to seal said casing head about said tubing, means to seal said flow line about said tubing, and means between said sealing means engaging said tubing to move the same to separate said tubing adjacent said valve, said means to move including a bracket, and a gear and worm connection carried by said bracket and engaging said tubing.

7. In a device of the character described, a casing, a gate valve thereon, a casing head above said valve, a support on said casing head, a branching flow line above said support, a frame on said support spacing said flow line from said casing head, a separable string of tubing extending from said casing and fitting within said flow line, means to seal said casing head about said tubing, means to seal said flow line about said tubing, said tubing between said sealing means being threaded, a nut on said threaded portion, means to prevent vertical movement of said nut and means to rotate said nut.

8. In a device of the character described, a casing, a gate valve thereon, a casing head above said valve having outlets for fluid from said casing, a support on said casing head, a branching flow line above said support, a frame on said support spacing said flow line from said casing head, a separable string of tubing extending from said casing and fitting within said flow line, means to seal said casing head about said tubing, means to seal said flow line about said tubing, and means between said sealing means engaging said tubing to move the same to separate said tubing adjacent said valve.

9. A well head equipment including a casing, a gate valve thereon, a casing head above said valve, a flow line spaced above said casing head, a separable tubing extending from said casing and having a telescopic connection with said flow line, means to support said tubing below said valve, a joint in said tubing adjacent said valve, and means between said casing head and said flow line to part said tubing at said joint and move the upper portion thereof vertically.

10. A well head equipment including a casing, a gate valve thereon, a casing head above said valve, a flow line spaced above said casing head, a separable tubing extending from said casing and having a telescopic connection with said flow line, means to support said tubing below said valve, a joint in said tubing adjacent said valve, means to seal said casing head about said tubing, lateral outlets in said casing head below said seal, and means between said casing head and said flow line to part said tubing at said joint and move the upper portion thereof vertically.

11. A well head equipment including a casing, a valve thereon, a casing head above said valve, a tubing in said casing supported below said valve, an upper separable section on said tubing, a flow line connected slidably with said upper section, means between said flow line and said casing head to move said upper section so that said valve can be closed, and means to seal about said tubing in said casing head and said flow line.

12. A well head equipment including a casing, a gate valve thereon, a casing head above said valve, a flow line spaced above said casing head, a separable tubing extending from said casing and having a telescopic connection with said flow line, means to support said tubing below said valve, a joint in said tubing adjacent said valve and means to part said tubing at said joint and move the upper portion thereof vertically.

13. A well head equipment including a casing, a valve thereon, a casing head above said valve, a tubing in said casing supported below said valve, an upper separable section on said tubing, a flow line connected slidably with said upper section, means below said flow line to move said upper section so that said valve can be closed, and means to seal about said tubing in said casing head and said flow line.

14. The combination of a casing, a valve body connected to said casing, a valve in said body, a tubing in said casing and supported beneath the path of said valve, a first pipe supported stationarily above the path of said valve, and a second pipe connecting said tubing and said first pipe, said second pipe being movable to permit closure of said valve.

CICERO C. BROWN.