

Feb. 7, 1939.

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2,145,844

WELL HEAD APPARATUS

Filed Sept. 1, 1936

2 Sheets-Sheet 1

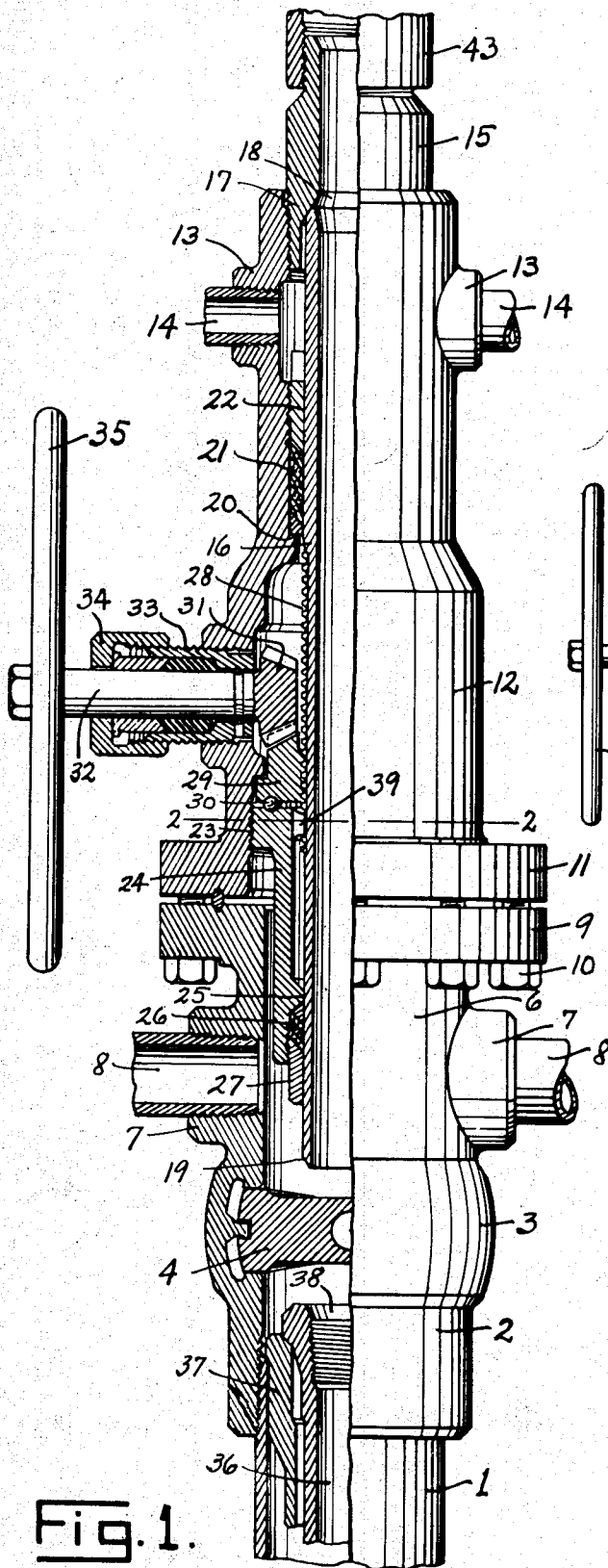


Fig. 1.

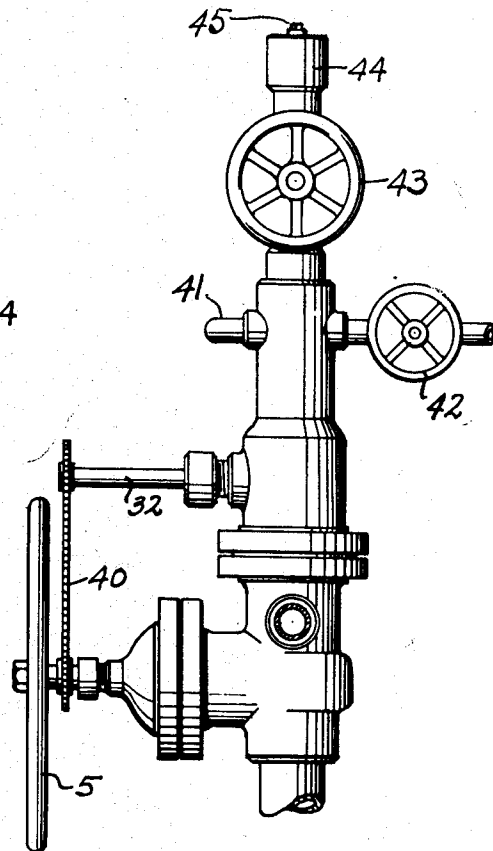


Fig. 3.

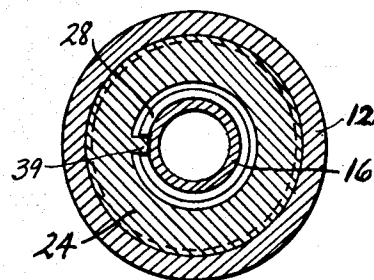


Fig. 2.

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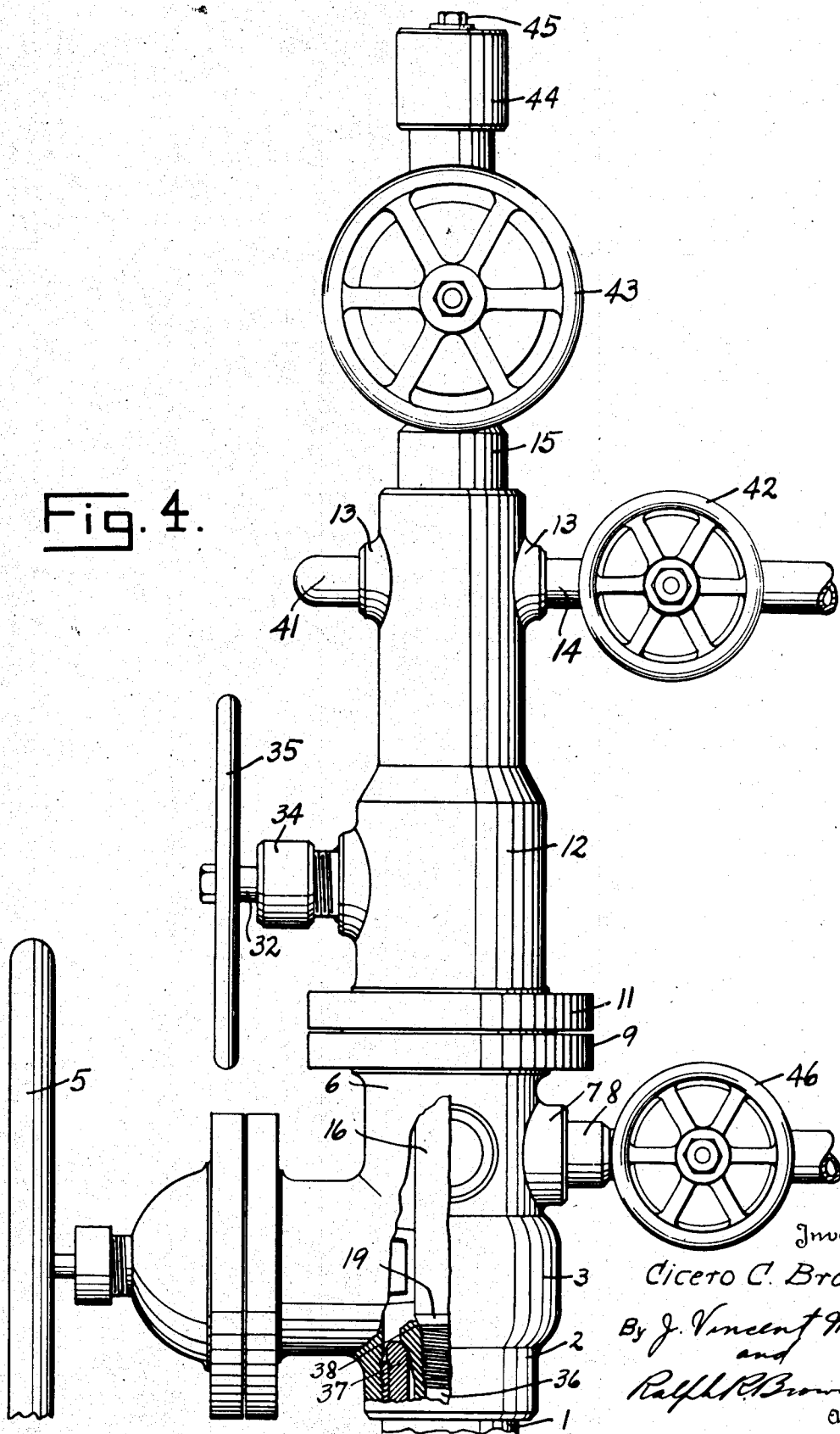
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Fig. 4.



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UNITED STATES PATENT OFFICE

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WELL HEAD APPARATUS

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Application September 1, 1936, Serial No. 98,850

4 Claims. (Cl. 166—15)

This application relates in general to well head apparatus, and has particular reference to a well head arrangement by which a positive control of the pressure and flow of a well may at all times be maintained.

In the past, various forms of apparatus have been devised for the purpose of controlling the pressure and flow of a well, some of these being very elaborate mechanically, and certain of them proving quite efficient and satisfactory. However, it has been found from experience that the most efficient and satisfactory of these previously devised forms of well head equipment have been quite bulky and complicated, and have proven very expensive to manufacture, as well as to keep up. It has also been found that they are not fool-proof, and that if operated improperly or carelessly they may be irreparably damaged.

It is an object of this invention to provide a well head apparatus which will be highly efficient and satisfactory in operation, and which will be more compact and less expensive than those of the prior art.

It is a further object to provide such an apparatus in which certain elements of the prior art devices have been omitted without a consequent omission of their function.

It is a further object to provide a well head apparatus having the fewest possible number of component parts which will make it possible to selectively connect the tubing and the casing to their respective flow lines to flow the well, or to disconnect the tubing from its flow lines and shut off the flow of the well both to the tubing and to the casing flow lines.

It is one other object of this invention to provide a means whereby the tubing may be disconnected from its flow lines and the entire flow of the well simultaneously shut off.

With the foregoing and other objects in view, this invention contemplates the various parts and combinations set forth in the accompanying drawings and the following description, it being understood that said drawings and description are by way of example and illustration only, and are not to be taken as limiting the spirit or scope of this invention. Such limitation is to be only by the prior art, and by the terms of the appended claims.

Referring now to the drawings:

Fig. 1 is a side elevation with parts broken away and shown in section illustrating one form of well head apparatus constructed in accordance with this invention.

Fig. 2 is a horizontal section taken along the line 2—2 of Fig. 1.

Fig. 3 is a side elevation on a reduced scale illustrating a slightly modified form of construction.

Fig. 4 is an enlarged side elevation with parts

broken away and shown in section illustrating the apparatus shown in Fig. 1 with the various parts in position for flowing the well.

In Fig. 1 there is shown coupled to the upper end of the casing 1 the lower end 2 of the valve housing 3, this valve housing being formed with a seat adapted to receive the gate valve element 4 operated by a hand wheel 5 in the customary manner. Above the gate valve 4 this valve housing is continued as illustrated at 6, and is provided with lateral openings 7 adapted to receive the casing flow lines 8. At its upper end this housing is provided with a flange 9 secured by bolts 10 or the like to the flange 11 of a tubing head structure 12. The valve housing thus serves also as a casing head and as a seat for the tubing head structure, thus making possible two elements of the prior art without omission of their functions.

The upper end of the tubing head structure 12 is provided with lateral openings 13 similar to the openings 7 in the valve housing or casing head, these openings 13 providing connections for the tubing flow lines 14. Connected to the upper end of the tubing head structure 12 is a fitting 15 for a purpose which will be presently described.

Slidably mounted within the tubing head housing 12 and forming a part of the tubing head structure is a retractable tubing section 16 formed at its upper end with an external bevel 17 adapted to seat against an internal bevel 18 in the lower end of the fitting 15. At its lower end, this tubing section or sleeve 16 is formed with a second external bevel 19. The housing 12 adjacent its upper end is provided with an internal upwardly facing shoulder 20 adapted to receive the packing 21 which is in turn compressed by means of a gland 22 so as to form a seal between the interior of the housing 12 adjacent its upper end and retractable tubing section 16.

The lower end of the housing 12 is internally threaded at 23 to receive the upper end of a supporting sleeve 24 which is threaded therein and which depends therefrom to extend into the interior of the upper portion 6 of the valve housing. This supporting member 24 is provided with an internal downwardly facing shoulder 25 adapted to receive a packing 26 which is in turn compressed into seating position by means of a gland 27. The tubing section 16 is thus sealed with respect to the tubing head housing 12 both adjacent the upper and lower ends thereof, and it is guided at a position adjacent the upper side of the gate valve 4.

Intermediate its ends, the retractable tubing section is provided with external threads 28 adapted to receive the nut 29 which is in turn supported upon the upper end of the support 24 by means of anti-friction bearings 30.

On its upper surface the nut 29 is formed with beveled gear teeth adapted to receive the correspondingly beveled gear teeth on the pinion 31. This pinion 31 is carried by a shaft 32 which extends outwardly through a stuffing box 33 having a gland nut 34 for compressing the packing therein, and the shaft 32 is provided with a hand wheel 35 on its outer end whereby it may be rotated. Referring now to the lower portion of Fig. 1, it will be seen that the tubing 36 within the well is suspended at its upper end by means of a suitable hanger 37, and is provided with an internal bevel 38 adapted to receive the external bevel 19 on the lower end of the tubing section 16. The support 24 at its upper end is provided with an internal inwardly extending key or lug 39 which rides in a slot or keyway extending longitudinally of the tubing section 16 transversely of the threads 28 thereon. It will readily be seen that a rotation of the hand wheel 35 will cause the pinion 31 to rotate the nut 29, and that since the tubing section 16 is prevented from rotation by the key 39, this tubing section will be raised or lowered depending upon the direction in which the hand wheel 35 is turned. When the valve 4 is in its open position it will be understood that this tubing section can be moved downwardly so that its lower end 19 seats against the seat 38 in the upper end of the tubing 36, and the tubing section 16 then forms a continuation of the well tubing. Flow may then take place through the well tubing, the section of tubing 16, and out through the tubing flow lines 14. This is illustrated in Fig. 4 of the drawings. On the other hand, when it is desired to close off the well entirely, the tubing section 16 may be raised until its upper end 17 seats against the seat 18 in the fitting 15, thus shutting off flow to the tubing flow lines 14 and breaking the continuity of the well tubing so that the valve 4 may be closed. Closing the valve 4 shuts off the flow, not only through the tubing, but also through the casing, as will readily be seen.

Referring now to Fig. 3, it is noted that the hand wheel 35 has been omitted from the shaft 32, and that in its place there has been positioned a sprocket. A similar sprocket has likewise been placed upon the shaft by which the valve 4 is operated, and a chain has been placed about these two sprockets so that when the hand wheel 5 is operated to open or close the valve 4 the shaft 32 will be rotated to lower or raise the tubing section 16 simultaneously with the opening or closing of the valve. By this means, it is made impossible for the valve to be closed against the tubing section 16 when said section is in its lower position, and it is likewise impossible for the tubing section 16 to be turned down against the upper face of the valve when the valve is closed. The device is thus made less susceptible to damage due to inadvertence or carelessness of the operator.

Also illustrated in Fig. 3, are the connections at the upper end of the tubing head structure. As illustrated, one of the flow lines has been removed and a bull plug 41 substituted therefor, it being contemplated that this flow line may be used if and when desired. The opposite flow line is adapted to be controlled by a valve 42 placed therein, and a valve 43 is connected to the upper end of the fitting 15 for the purpose of closing the upper end of the tubing head structure. The upper end of this valve 43 may if desired be closed by a cap or the like 44 having a plug 45 in its upper end which is to be removed for the pur-

pose of connecting a pressure indicator thereto. If desired, also valves 46 may be provided for controlling the casing flow lines 8 as illustrated in Fig. 4.

It will be understood that by this invention the well has been provided with what might be termed a casing head structure in which a valve is incorporated capable of entirely closing off the well. This casing head structure provides not only for this valve, but also for the flow lines for flowing the casing. In addition there has been combined with this novel casing head structure a tubing head structure which cooperates therewith to furnish a complete control of the pressure and flow of the well. The smallest possible number of parts has been utilized, and provision has been made for eliminating the hazard of damage due to inadvertence of the operator.

I claim:

1. In a well head structure, a valve adapted to connect with a well casing and adapted to close off said well casing, a tubing head structure mounted above said valve and including a retractable tubing section adapted to extend through said valve when the same is open, means for raising and lowering said tubing section, and means connecting said valve and said means for raising and lowering the tubing section for simultaneous operation, whereby a lowering of said tubing section and an opening of said valve will accompany each other, and a raising of said tubing section and a closing of said valve will accompany each other.

2. In a well head apparatus, a casing head comprising a unitary valve structure having an inlet opening at one end thereof and adapted for connection to a well casing, and an opening at the opposite end thereof adapted to form a seat for a tubing head structure, said valve having a lateral outlet opening adjacent said seat, and a tubing head having a part seated on said seat and a retractable tubing section adapted to extend through said casing head when the valve is open, means for raising and lowering said tubing section, and means connecting said valve and said means for raising and lowering the tubing section for simultaneous operation, whereby a lowering of said tubing section and an opening of said valve will accompany each other, and a raising of said tubing section and a closing of said valve will accompany each other.

3. In a well head structure, a casing having an outlet and a gate valve below said outlet, a tubing extending from the point below said valve to a point above said casing, said tubing having separable sections adapted to be united at a point below said valve, and an actuating element to move said valve out of the path of said tubing and to thereupon lower the upper section of said tubing upon the lower section thereof, and to elevate said upper section of tubing out of the path of said valve and to thereupon close said valve.

4. In a well head structure, a casing having an outlet and a gate valve below said outlet, a tubing extending from a point below said valve to a point above said casing, and consisting of a fixedly positioned section terminating below said valve and a section movable through said valve when the same is open to form a continuation of said first section, and a single actuating means for simultaneously raising said section and closing said valve or lowering said section and opening said valve.

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