April 9, 1929. A. B. CROWELL ET AL 1,708,261

AUTOMATIC VACUUM SEALING DEVICE

Filed May 28, 1926 2 Sheets-Sheet 1

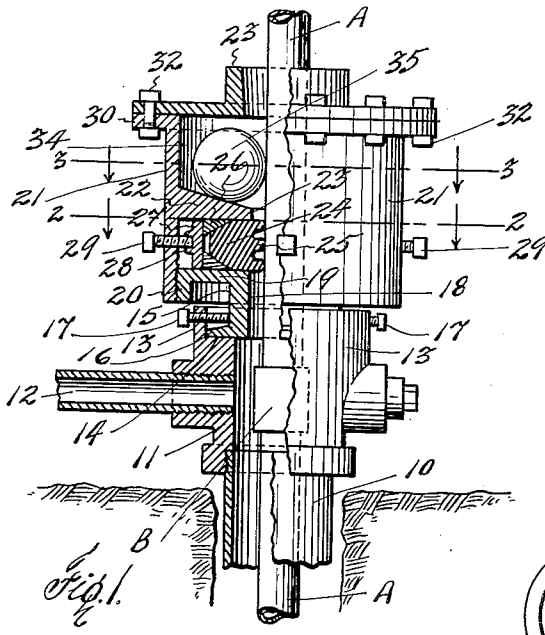


Fig. 1.

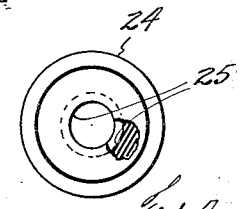


Fig. 4.

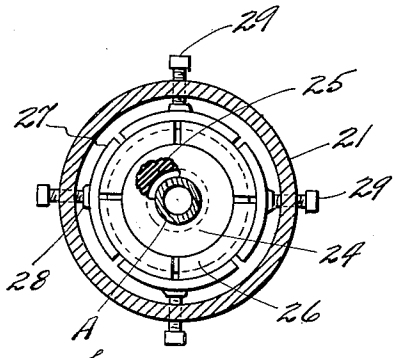


Fig. 2.

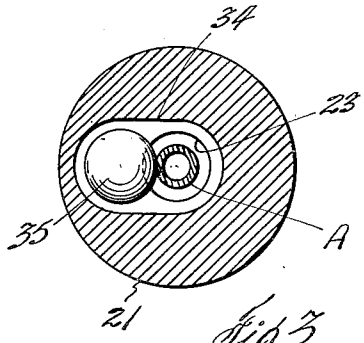


Fig. 3.

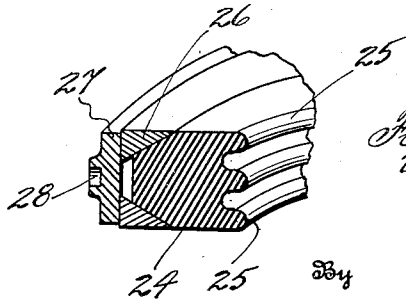


Fig. 5.

Inventors
A. B. Crowell
F. S. Bowser
By Jack A. Schley.
Attorney

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AUTOMATIC VACUUM SEALING DEVICE

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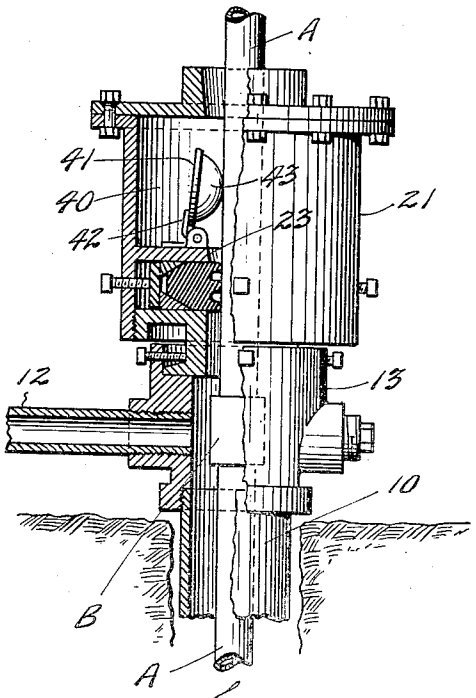


Fig. 6.

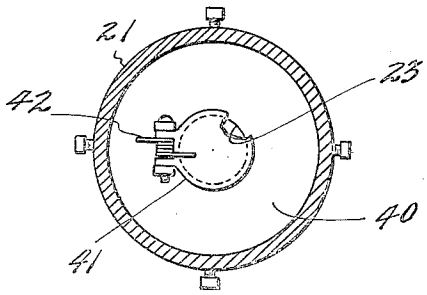


Fig. 7.

Inventors
A. B. Crowell
F. S. Browser
By Jack A. Ashley
Attorney

Patented Apr. 9, 1929. 1,708,261

UNITED STATES PATENT OFFICE.

ALVIN B. CROWELL AND FRANCIS S. BOWSER, OF EL DORADO, ARKANSAS.

AUTOMATIC VACUUM-SEALING DEVICE.

Application filed May 28, 1926. Serial No. 112,236.

This invention relates to new and useful improvement in automatic vacuum sealing devices.

This invention has to do with a device for sealing the upper end of a well casing for maintaining the vacuum therein while the tubing is being removed and replaced in accordance with the method covered in my copending application executed of even date herewith.

The object of the invention is to provide means for automatically sealing the opening at the top of the well, so that upon the withdrawing of the tubing and working barrel, the opening will be instantly closed without manual assistance.

A further object of the invention is to provide an automatic seal which will be air tight and which will take the place of the usual sand cap while the tubing is out of the casing.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown and wherein:

Fig. 1 is a view partially in elevation and partially in section, showing a device constructed in accordance with the invention,

Fig. 2 is a horizontal cross-sectional view taken on the line 2—2 of Fig. 1,

Fig. 3 is a horizontal cross-sectional view taken on the line 3—3 of Fig. 1,

Fig 4 is a plan view of the packing ring,

Fig. 5 is an isometric view of the packing members,

Fig. 6 is a view similar to Fig. 1 showing another form of automatic closure, and

Fig. 7 is a horizontal cross-sectional view taken on the line 7—7 of Fig. 6, showing the valve in its closed position.

In the drawings the numeral 10 designates the upper end of a well casing on which a casing head 11 is mounted. The head has a pipe 12 leading therefrom through which the gas is conducted and also which is connected to the vacuum plant, the air suction being employed to pull the gas from the casing, and to create a vacuum in the well.

The casing head, which may be of the usual construction, has an annular upstanding flange 13 at its upper end which flange surrounds a seat 14. A circular base member 15 has a flanged base 16 resting on the seat 14 and is confined by set screws 17 threaded through the flange 13 and engaging over the base. The base member has an axial bore 18 while its top is formed into a flat circular plate 19 having a depending annular flange 20 flush with its outer edge. The plate and flange are spaced above the flange 13.

A circular housing 21 has its lower end internally screw-threaded and is screwed onto the plate and its flange. The housing may have its upper portion solid or otherwise formed, but near its center is provided with a transverse flat partition 22, spaced above the plate 19 to form a packing chamber therebetween. The housing has an axial bore 23 extending upwardly from the partition.

A circular packing member or ring 24 is disposed in the packing chamber and is formed with internal annular ribs 25 of such diameter as to snugly embrace the tubing A, but sufficiently flexible to permit the coupling B to pass through the ring. The upper and lower outer edge portions of the ring are beveled as is shown. This ring may be made of rubber, rubber composition or any other elastic and compressible material suitable for the purpose.

It is apparent that the ribs will wear and as the joint around the tubing must be kept air tight, means are provided for compressing the ring to maintain this point. Upper and lower quadrants 26 have their inner faces beveled for engagement with the bevels of the ring, while the outer faces of the quadrants are flat to contact with the flat surfaces of the plate 19 and the partition 22. Each quadrant has a greater radial extension than the bevels of the ring and thus may be driven or forced radially toward the bore of the ring and by their wedging action, compress said ring. The quadrants have their ends spaced apart.

Curved follower sectors 27 surround the quadrants in break joint relation thereto and each has a central step 28 for receiving and adjusting screw 29 threaded through the housing. The sectors do not extend to the partition 22, thus permitting the housing to be screwed down to further compress the ring.

The housing has an outwardly directed annular flange 30 at its upper end and a cir-

cular cover 31 overlies the top of the housing and the flange. The cover is secured to the flange by bolts 32. An upstanding collar 33 is provided at the center of the cover. This collar is tapered to receive the slips (not shown) when the tubing is being run and the stuffing box (not shown) is inserted in said collar when the well is pumped. At one side of the bore of the housing, a pocket or recess 34 is provided for receiving a ball 35, which may be made of metal or other material suitable for the purpose. The bottom 36 of the recess is inclined toward the bore 23, so that the ball will roll into the bore and on top of the ring 24, when the working barrel is pulled from the well.

In using the device the screws 29 are turned to move the sectors 27 and quadrants 26 inwardly whereby the ring 24 is compressed and the ribs kept in close engagement with the tubing A. The stuffing box (not shown) is removed from the collar 33. The tubing is removed in the usual manner, the couplings B passing the ribs and the air-tight joint being maintained. As air is excluded from entering through the housing 21 and head 11, the vacuum in the well is maintained and gas is drawn out through the pipe 12. There may be a slight variation in the vacuum, but experiments have shown that gas may be extracted from the well during the entire time the tubing is being run. When the end of the working barrel passes the ball, the latter seats on the ring 24 and seals the bore 23 of the housing.

Where it is desired to replace or run in the tubing the ball 35 is pushed with a suitable tool or if desired suitable means (not shown) may be mounted on the bottom of the working barrel for dislodging the ball.

It is obvious that other means for automatically closing the bore 23 may be used and an illustration of one of such means is set forth in Figs. 6 and 7. The construction of the device is not changed, except as to the recess and ball. In the latter form a transverse recess 40 is provided in the housing and a swing valve 41 is pivoted on the bottom of the recess. A coiled spring 42 coiled around the hinge pintle of the valve has one end bearing on the bottom of the recess and the other resting against the valve. The spring is tensioned when the valve is opened so as to close said valve when it is released.

The valve has a semi-spherical head 43 which bears against the tubing when the valve is open and seats in the bore of the packing rings when the valve is closed. Owing to its rounded shape the head will be displaced outwardly when engaged by the collars or couplings of the tubing. By making the closure automatic no time is lost in sealing the bore and no dependence is placed on the operators, so that a quick air tight seal is assured instantly upon the removal of the tubing and working barrel.

This is very important because if the hole was not closed upon the removal of the tubing the vacuum would be lost and the purpose of the invention defeated. Some tubing is badly corroded and therefore is rough. In such cases it is best to grease the tubing when it is run in; however, means could be provided for greasing the tubing in advance of the packing ring while it was being pulled out. The advantage of of conserving and extracting the gas while the tubing is being run is highly important as this keeps up the revenue from the well and provides gas, either for sale or for use. The maintaining of the vacuum prevents the oil from receding back into the sands and keeps the well in condition to quickly regain pumping capacity when the tubing is landed and pumping started.

Various changes in the size and shape of the different parts, as well as modifications and alterations, may be made within the scope of the appended claims.

What we claim, is:

1. In a vacuum sealing device, a base member connected to a vacuum producing means and having a vertical bore, a housing having a vertical bore, a packing ring having a central bore alined with the bores of the base and housing, and a valve mounted in the housing and held open by a well tubing and automatically seating in the top of the bore of the ring and at the bottom of the bore of the housing upon withdrawal of said tubing and when the pressure in said base member does not exceed the pressure within the housing.

2. In a vacuum sealing device, a base member connected to a vacuum producing means and having a vertical bore, a housing having a vertical bore, a packing ring having a central bore alined with the bores of the base and housing, a valve mounted in the housing and held open by a well tubing and automatically seating in the top of the bore of the ring and at the bottom of the bore of the housing upon withdrawal of said tubing and when the pressure in said base member does not exceed the pressure within the housing, and means for compressing the ring to contract its bore.

3. In a vacuum sealing device, a base member connected to a vacuum producing means and having a vertical bore, a housing having a vertical bore, a packing ring having a central bore alined with the bores of the base and housing, the ring having continuous flexible lips in its bore for engaging the tubing, and a valve mounted in the housing and held open by a well tubing and automatically seating in the top of the bore of the ring and at the bottom of bore of the

housing upon withdrawal of said tubing and when the pressure in said base member does not exceed the pressure within the housing.

4. In a vacuum sealing device, a base member connected to a vacuum producing means and having a vertical bore, a housing having a vertical bore, a packing ring having a central bore alined with the bores of the base and housing, the ring having continuous flexible lips in its bore for engaging the tubing, a valve mounted in the housing and held open by a well tubing and automatically seating in the top of the bore of the ring and at the bottom of the bore of the housing upon withdrawal of said tubing and when the pressure in said base member does not exceed the pressure within the housing, and means for compressing the packing ring to contract the ribs about the tubing.

5. In a vacuum sealing device, a base member communicating with a vacuum producing means and having a central bore and a plate provided with a screwed edge, a housing having its lower portion screw-threaded and engaging the threads of the plate, a partition transverse of the housing, a packing ring mounted between the plate and the partition, the housing having a central bore, the ring having a central bore connecting the bores of the base and the housing, quadrants engaging the ring, adjustable sectors engaging the quadrants, and a valve at the bore of the housing mounted to automatically seat in the bores of the housing and the ring when a tubing is withdrawn and the pressure in the housing is not exceeded by the pressure in the base.

6. In a vacuum sealing device, a base member communicating with a vacuum producing means and having a central bore and a plate provided with a screwed edge, a housing having its lower portion screw-threaded and engaging the threads of the plate, a partition transverse of the housing, a packing ring mounted between the plate and the partition, the housing having a central bore, the ring having a central bore connecting the bores of the base and the housing, quadrants engaging the ring, adjustable sectors engaging the quadrants, the housing having a recess provided with a bottom inclining to the bore of said housing, and a ball arranged in the recess of said housing for rolling down said inclined bottom and sealing the bores of the housing and ring when a tubing is withdrawn and the pressure in the housing is not exceeded by the pressure in the base.

7. Means for maintaining a vacuum in a well pumped under a vacuum, while running tubing, which comprises an enclosure at the top of the well connected with a vacuum means and through which the tubing passes, and a closure held inoperative by the tubing and disposed to automatically seal the enclosure against air inlet when the tubing is removed and the pressure above said closure is not exceeded by the pressure beneath the same.

8. Means for maintaining a vacuum in a well pumped under a vacuum, while running tubing, which comprises an enclosure connected with a vacuum effecting means and having a bore through which the tubing passes, a packing member engaging the tubing to prevent air entering the well through the bore, and a valve held inoperative by the tubing and disposed to automatically seal the bore of the enclosure against air inlet when the tubing is withdrawn and the pressure above said valve is not exceeded by the pressure within the vacuum enclosure.

9. In a vacuum sealing device, a base member having a vertical bore and a vacuum chamber, a housing having a vertical bore, a packing ring between the base member and the housing for receiving a tubing passing through the bores of the base member and housing, and a valve held inoperative by the tubing and mounted to automatically close the passage through the bores when the tubing is removed and the pressure above said valve is not exceeded by the pressure beneath the same.

10. In a vacuum sealing device, a base member having a vertical bore and a vacuum chamber, a housing having a vertical bore, a packing ring between the base member and the housing for receiving a tubing passing through the bores of the base member and housing, a valve held inoperative by the tubing and mounted to automatically close the passage through the bores when the tubing is removed and the pressure above said valve is not exceeded by the pressure beneath the same, and means for compressing the packing ring.

In testimony whereof we affix our signatures.

ALVIN B. CROWELL.
FRANCIS S. BOWSER.